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Roundnose Grenadier - Greenland Halibut Ratio in Bottom

Trawl Catches Taken in NAFO Area in 1970-1983

by

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ABSTRACT

Bottom catches taken by commercial ships deeper than 500 m on the continental slope of the Baffin Island, Labrador and Newfoundland are composed mainly of roundnose grenadier and Greenland halibut because the areas of their distribution coincide. In the catches of commercial ships for 1973-1981 and in those of scouting and research ships for 1970-1983 Greenland halibut averaged 40.9% and 48.4%, respectively. The highest percentage of halibut in the catches is observed in Subareas 0 and 2, a smaller one - in Subarea 3, grenadier being the main fishing object in summer-autumn, because their concentrations at that time are at shallower waters, thus being more available for fishery. With the depth increasing from 400 to 1100 m in Divs. OB, 2C, 2H, 2J the variations of the ratio of grenadier and halibut are not great, while in Div. 3K they are more prominent. The increase of Greenland halibut percentage in the catches taken recently, especially in the northern part of the continental slope of Canada, is observed, which is, apparently, connected with the increase in their abundance.

INTRODUCTION

Roundnose grenadier (Coryphaenoides rupestris) and Greenland halibut (Reinhardtius hippoglossoides) form mixed concentrations in depths of 400-1100 m off the continental slope of Canada, because the areas of distribution of these two

species coincide and the range of vertical distribution is similar. The Notre Dame Bay (3K), North(2G) and Central (2H) Labrador, Baffin Island (OB) and West Greenland are the main areas of fishing for roundnose grenadier and Greenland halibut in the Northwest Atlantic. The highest total catch of grenadier is taken annually in Div.3K where the yearly catch averaged 16.9 thou. t for the period 1967 to 1978, and in Subareas 0 and 2 - 2.3 thou. t and 9.1 thou. t, respectively. The catch in Subareas 0+1 was the highest in 1974 - 12.3 thou. t. With the start of fisheries the greatest catch was taken in Subarea 0, and by 1974 it displaced to Subarea 1 at the expense of high catches of grenadier taken by the fleet of the West Germany. The catch in Subarea 2 was small except the year of 1971 when 54 thou. t were taken in Div.2G and 57.0 thou. t in the Subarea as a whole (Table 1).

As is seen from Table 1, in 1979 a sharp decline in the catch happened caused mainly by reduction in the catches from Div.3K - the traditional area of the Soviet fishery for grenadier. The total mean yearly catch in this area for 1979-1982 amounted to 2.6 thou. t, while the USSR catch - 2.2 thou.t.

It should be underlined that the total catch in recent years never exceeded the optimum allowable catch (Table 2).

The fisheries in 1967-1982 did not influence negatively the abundance of roundnose grenadier, which is now at the mean level (Savvatimsky, Shafran, MS 1981). The decline in grenadier catch may be accounted for by the recent intensive cooling of water masses in the Northwest Atlantic. It is known that with the year-to-year fall of temperature off the Baffin Island halibut catches are on the increase while those of grenadier decline, and, on the contrary, with the rise of temperature the efficiency of grenadier fishery is higher and that for halibut - lower (Burmskin, 1978).

Captains of Soviet commercial ships fishing for grenadier in the Northwest Atlantic inform of a general increase of halibut by-catch in the recent years. Specialists of the NAFO member countries state that one of the reasons for

the decline in the total catch of grenadier is the limitation of halibut by-catch to 10% during a specialized fishery for grenadier by bottom trawls (Atkinson, MS 1982; Bowering, MS 1983; Chumakov, Savvatinsky, MS 1983). As a result of this limitation commercial ships do not always fish on dense concentrations of grenadier because halibut by-catches are often very high. A recent increase in Greenland halibut abundance apparently generated the growth of their by-catches. That is why commercial ships fishing for grenadier have to cover marginal areas or fish at very great depths where fishing efficiency is lower (Atkinson, MS 1982).

The paper aims at studying the ratio of Greenland halibut and roundnose grenadier in the catches from different areas, in different seasons and at different depths in order to solve the problem of regulation of fishery for these objects.

MATERIAL AND METHODS

The paper is based on the ICNAF and NAFO statistics on total catches of roundnose grenadier and Greenland halibut taken by bottom trawls (OTB I, OTB 2, OTSI, OTSN) in Subareas 0, 2, 3 and corresponding Divisions in 1973-1981 (Stat. Bull., 1975-1983). The catches with grenadier and halibut or grenadier alone were picked out by months and Divisions. To avoid the effect of a specialized halibut fishery in the deeps of the shelf on the results of analysis, the catches with halibut but lacking grenadier were not taken into account. The by-catches of other species were not considered either. The data allowed to reveal the variations in the ratio of roundnose grenadier and Greenland halibut in the catches taken by commercial ships in different Divisions through the year. Besides, variations in the ratio of these two species in the catch were elucidated for two periods: 1973 to 1977 and 1978 to 1981, as well as 1973 to 1981 on the whole. The data on the catches taken by PINRO ships and scouting ships of "SEVRYEPROMRAZVEDKA" (Northern Fish Scouting Service) in 1970-1983 were used. They were analysed for two periods separately:

1970-1976 and 1977-1983, as well as for 1970-1983 on the whole by certain Divisions, months and depths with 100 m range from 401-500 m to 1001-1100 m. The change in halibut catch (in % of grenadier and halibut catch) by months and depths is smoothed in the Figures. Smoothing of percentage frequencies was carried out by the methods described before (Chumakov, Savvatimsky, MS 1983).

RESULTS

Roundnose grenadier and Greenland halibut of the Northwest Atlantic form mixed concentrations in depths of 400 to 1000 m and deeper. The ratio of these species in the catches should be taken into account in organizing the rational exploitation of their commercial stocks, because the specialized fishery for one species may influence the stock of another. In Sub-areas 0-3 the percentage of halibut (in relation to grenadier and halibut catch) in the total catch of commercial ships amounted to 37.6% in 1973-1977, 52.8% - in 1978-1981, 40.9% - in 1973-1981 (Tables 3-5). In the catches taken by research and scouting ships in these Subareas halibut amounted to 34.3% in 1970-1976, 72.2% in 1977-1983 and 48.4% in 1970-1983. It is noteworthy that, firstly, the portion of Greenland halibut in the catches taken both by research and scouting and by commercial ships is high (close to 50%) and, secondly, the percentage of halibut in the catches grew as compared with previous year, which is, apparently, resulted from the increase in their abundance.

The fishing areas of grenadier and halibut are extended latitudinally, that is why the portion of each species in the catches from different NAFO Subareas and Divisions varies. The highest percentage of Greenland halibut in the catches of commercial ships in Subarea 0 for the whole period considered (1973-1981) was 63.9%, being much higher (94.8%) in recent years (1978-1981) as compared with preceding ones (58.7% in 1973-1977), although fishing was performed mainly in autumn when grenadier by-catch is the highest (Tables 3-5). In the catches taken by research and scouting ships the percentage

of halibut was also the highest in Subarea 0 (46.0% in 1970-1976, 81.9% in 1977-1983, 62.0% in 1970-1983), being higher in recent years as compared with preceding ones (Tables 6-8). This is typical of all Divisions (Tables 3-8, Figs. 1-2) save Div. 2H (Fig. 1) where the percentage of halibut in the catches of commercial ships was lower (44.7%) in the last years as compared with preceding ones (55.7%). This is accounted for by fishing carried out primarily in September-October when halibut by-catch is the lowest.

Farther southwards the portion of halibut in the catches taken by commercial, research and scouting ships is on the decline. Thus, in Div. 3K the percentage of halibut in commercial catches for the whole period considered (1973-1981) averaged 31.1% (Table 5), while in the catches of research and scouting ships for 1970-1983 - 45.4% (Table 8).

Halibut-grenadier ratio in the catches is subject to notable variations through the year, these changes being greater in southern Divisions as compared with northern ones (Fig. 1). Thus, in Div. 3K where the percentage of halibut in the catches is the lowest as compared with other Divisions, the portion of halibut in commercial catches in 1973-1981 in winter-spring (January to June) was from 45.2% to 85.3%, and in summer-autumn (from July to December) it ranged from 9.0 to 17.5%. The seasonal changes of water temperature off the continental slope influence the distribution of grenadier and halibut and determine conditions for formation of commercial concentrations of these species. Roundnose grenadier being a warm water species form dense concentrations and are exploited by fishing fleet mainly in summer and autumn, while halibut - in winter and spring. The highest percentage of grenadier in the catches occurs in the period August to November in all Subareas save Subarea 0.

The analysis of catches taken by research and scouting ships shows that there were no notable fluctuations in the ratio of halibut and grenadier with the increase of fishing depth from 400 to 1100 m (Tables 9-11). Such changes were observed

in Subarea 0, Divs 2G and 3K in 1970 to 1976. Later (1977-1983) the decline in the percentage of halibut in the catches with the increase of fishing depth was observed only in Divs. 2J and 3K where few hauls were made (Fig. 3). It should be mentioned that in recent years (1977-1983) the portion of halibut in the catches grew significantly as compared with previous years at all depths from 400 to 1100 m and in all surveyed Divisions, which is apparently connected with the increase in abundance of this fish.

CONCLUSIONS

The highest percentage of halibut in the catches of commercial, research and scouting ships is taken in the northern areas of the continental slope of Canada and the lowest - in the southern ones. This percentage in all Divisions exceeds 10% (about 10% in Div. 3K in summer-autumn). With the increasing fishing depth from 400 to 1100 m the portion of halibut changes insignificantly. In the last years the percentage of halibut in the catches grew which is, apparently, caused by the notable increase in their abundance. Current limitations of halibut by-catch impede fishing for grenadier, which is one of the reasons for a sharp decline in the total catch of the fish.

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Table 1. Total catch (t) of roundnose grenadier by years in Subareas 0, 1, 2 and Div. 3K in 1967-1982
(Stat. Bull. ICNAF, NAFO, 1969-1983)

Year	0	1	2	3K
1967	1129	6	1085	16009
1968	5996	284	7104	23553
1969	2642	68	651	11682
1970	545	5980	468	22267
1971	4172	4132	56998	18392
1972	5783	2311	3109	21122
1973	1054	3830	6744	10655
1974	2661	9657	5560	22816
1975	204	4749	11779	15388
1976	2610	5893	6682	13636
1977	721	2214	3328	11935
1978	-	5839	5437	15250
1979	106	6815	4563	3200
1980	32	1721	1498	451
1981	-	392	3123	3920
1982*	43	50	1635	2709

* The data for 1982 are preliminary.

Table 2. TAC and actual catch of roundnose grenadier in
Subareas 0+1 and 2+3 in thou. t
(NAFO SCS Doc. 83/VI/21, Ser. No. N730).

Year	Subareas 0 + 1		Subareas 2 + 3	
	TAC	Catch	TAC	Catch
1975	10	5	32	27
1976	14	9	35	21
1977	8	3	35	15
1978	8	6	35	21
1979	8	7	35	8
1980	8	2	30	2
1981	8	+	27	7
1982	8	+	27	4
1983	8	+	11	+
1984	8		11	

Table 3. Total catch of roundnose grenadier and Greenland halibut by bottom trawl in tons
(numerator) and percentage of halibut catch (denominator) in 1973-1977 by months

Subarea, Division	M O N T H S												Total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0	—	7	2	6	6	78	484	4020	4757	2430	2891	1005	15636
		0,0	0,0	0,0	0,0	84,6	29,7	54,5	64,7	58,2	50,5	83,5	58,7
2	16886 54,3	9478 37,1	6314 62,1	3857 75,8	III7 88,3	4687 77,7	I09II 70,1	9563 46,0	9185 30,3	6180 28,7	4448 36,3	I0938 51,0	93544 51,3
2 G	327 41,3	386 21,2	530 67,2	387 47,0	—	1564 64,1	6066 52,0	4647 21,6	4663 II,0	3234 26,3	2224 36,2	4419 32,4	28147 33,7
2 H	1276 35,8	422 17,5	IT79 30,1	I89 29,6	—	I820 89,8	3304 95,0	I95I 62,1	254I 31,2	2239 18,8	I670 29,2	4243 70,4	20834 55,7
2 J	15283 56,2	8670 38,7	4605 69,7	326I 81,9	III7 88,3	I303 77,2	I54I 87,7	2965 73,8	228I 66,4	707 71,4	554 58,3	2276 50,8	44563 60,3
3	6425 25,2	I2333 22,7	8370 45,I	7234 71,2	4II0 76,9	4753 56,3	8040 IO,4	I2720 7,2	I2223 9,6	I0407 14,5	I9158 14,7	I4410 18,4	I20183 24,2
3 K	5594 26,6	II594 23,2	7932 45,9	6930 72,4	3826 80,3	4372 59,8	7358 IO,8	II8I4 7,3	I0356 9,9	8588 13,9	I780I I4,0	I3619 I8,0	I09784 24,9
3 L	83I 16,0	739 15,2	438 29,9	304 41,8	284 31,7	38I 15,2	682 6,7	906 5,2	I867 7,9	I8I9 17,6	I357 23,5	79I 25,9	I0399 16,7
0 - 3	233II 46,3	2I8I8 28,9	I4686 52,4	II077 72,7	5233 79,3	95I8 67,I	I9385 44,4	26303 28,5	26I65 26,9	I90I7 24,7	26497 22,2	26353 34,4	229363 37,6

Table 4. Total catch of roundnose grenadier and Greenland halibut by bottom trawl in tons (numerator) and percentage of halibut catch (denominator) in 1978-1981 by months

Subarea, Division	M O N T H S												Total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0									8	I542	609	502	2661 94,8
2	I764 83,8	I631 85,2	558 92,5	70 88,6			320 67,5	2751 27,5	4641 34,3	3876 34,5	3980 48,9	2776 64,2	22367 49,5
2 G	528 90,0						99 5,0	479 31,9	I219 I4,3	I980 34,7	744 82,7	962 46,2	6011 42,5
2 H	I321 77,2						I214 98,6	I751 20,6	2825 36,6	I389 25,5	I854 52,3	I468 82,6	9822 44,7
2 J	I915 92,8	I631 85,2	558 92,5	70 88,6			7 0,0	I521 46,8	597 64,5	507 58,0	I382 26,2	346 36,1	6534 63,3
3	2242 94,5	5567 91,4	4215 94,9	I958 91,9	3143 92,8	2410 58,2	5551 I4,2	4355 22,5	2668 26,2	I765 I3,8	2702 I5,8	3907 I6,4	40483 51,8
3 K	2225 94,9	5460 92,0	4153 95,5	I843 93,4	2722 92,4	I227 I3,7	4947 6,5	3838 I5,7	2298 22,0	I616 I3,2	2530 I5,4	3722 I5,7	36581 49,5
3 L	I7 29,4	I07 61,7	62 54,8	I15 67,8	421 91,4	I183 94,2	604 77,6	517 72,5	370 51,9	I49 20,1	I72 21,5	185 30,8	3902 72,8
0-3	4006 89,8	7198 90,0	4773 94,6	2028 91,8	3143 92,3	2410 58,2	5871 I7,1	7106 24,4	7317 31,3	7183 43,2	7291 40,0	7185 40,1	65511 52,8

Table 5. Total catch of roundnose grenadier and Greenland halibut in tons (numerator) and percentage of halibut catch (denominator) in 1973-1981 by months

Subarea, Division	M O N T H S												Total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0		7 0,0	2 0,0	6 0,0	6 0,0	78 84,6	434 29,7	4020 54,5	4765 64,6	3972 73,9	3500 57,2	I507 85,9	I8297 63,9
2	I8650 57, I	III09 44, I	6872 64,6	3907 76,0	III7 88,3	4687 77,7	II231 70,0	I2314 41,9	I3826 31,7	I0056 30,9	8428 42,3	I3714 53,6	II5911 50,9
2 G	855 71,3	386 21,2	530 67,2	387 47,0		I564 64,1	6165 51,3	5126 22,6	5582 II,7	5214 29,5	2968 47,9	5381 34,9	34158 35,2
2 H	I597 44, I	422 I7,5	II79 30, I	189 29,6		I820 89,8	3518 95,2	3702 42,5	5366 34,0	3628 21,4	3524 41,3	5711 73,5	30656 52,2
2 J	I6198 57,7	I0301 46, I	5163 72,2	3331 82,0	III7 88,3	I303 77,2	I548 87,3	3486 69,8	2878 66,0	I214 65,8	I936 35,4	2622 48,9	51097 60,6
3	8667 43, I	I7900 44, I	I2585 61,8	9192 75,6	7253 83,6	7163 55,2	I3591 II,9	I7075 II, I	I4891 I2,6	I2172 I4,4	21860 I4,8	I8317 I8,0	I60666 31,2
3 K	7819 46,0	I7054 45,2	I2085 62,9	8773 76,8	6548 85,3	5599 49,7	I2305 9,0	I5652 9,4	I2654 I2, I	I0204 I3,8	20381 I4,2	I7341 I7,5	I46365 31, I
3 L	848 16,3	846 21,0	500 33,0	419 48,9	705 67,4	I564 74,9	I286 40,0	I423 29,6	2237 I5,2	I968 I7,8	I529 23,3	976 26,8	I4301 32,0
0-3	27317 52,7	29016 44, I	I9459 62,8	I3105 75,7	8376 84, I	II928 64,3	25256 38, I	33409 27,7	33482 27,8	26200 29,8	33788 26, I	33538 35,6	294874 40,9

Table 6. Average catches (t/trawling hour) of grenadier and halibut taken by scouting and research ships (numerator) and percentage of halibut catch (denominator) for 1970-1976 by months

Subarea, Division	M O N T H S						Total
	Jul	Aug	Sep	Oct	Nov	Dec	
0	<u>1,55</u> 47,2	<u>1,03</u> 44,9	<u>1,12</u> 42,0	<u>0,86</u> 78,7	<u>0,5</u> 10,0	—	<u>1,11</u> 46,0
2	<u>1,17</u> 43,6	<u>1,13</u> 23,1	<u>1,74</u> 9,3	<u>1,44</u> 18,2	<u>1,29</u> 30,1	<u>0,94</u> 31,7	<u>1,36</u> 24,3
2 G	<u>1,35</u> 29,7	<u>1,30</u> 23,9	<u>1,68</u> 9,6	<u>1,44</u> 15,9	<u>1,35</u> 18,5	<u>0,74</u> 14,2	<u>1,44</u> 19,5
2 H	<u>0,78</u> 75,0	<u>0,64</u> 23,3	<u>2,77</u> 5,1	<u>1,51</u> 25,3	<u>1,30</u> 36,7	<u>1,22</u> 56,0	<u>1,27</u> 40,4
2 J	<u>0,45</u> 25,0	<u>0,35</u> 7,0	—	<u>1,25</u> 21,4	<u>0,75</u> 38,0	<u>0,69</u> 23,3	<u>0,83</u> 26,9
3 K	<u>0,65</u> 12,8	—	—	<u>0,05</u> 0,0	—	<u>0,31</u> 74,1	<u>0,70</u> 42,9

Table 7. Average catches (t/trawling hour) of grenadier and halibut taken by scouting and research ships (numerator) and percentage of halibut catch (denominator) for 1977-1983 by months

Subarea, Division	M O N T H S						Total
	Aug	Sep	Oct	Nov	Dec		
0	<u>0,85</u> 90,4	<u>0,55</u> 72,9	—	<u>0,78</u> 85,4	<u>0,40</u> 72,7	<u>0,78</u> 81,9	
2	—	<u>3,00</u> 1,2	<u>0,90</u> 46,2	<u>1,11</u> 54,6	<u>1,83</u> 70,6	<u>1,58</u> 61,0	
2 G	—	<u>3,00</u> 1,2	<u>2,41</u> 10,0	<u>1,33</u> 60,1	<u>2,31</u> 74,1	<u>2,03</u> 60,6	
2 H	—	—	<u>0,76</u> 49,3	<u>0,85</u> 30,0	<u>1,66</u> 71,7	<u>1,37</u> 64,3	
2 J	—	—	—	<u>0,28</u> 37,1	<u>1,04</u> 49,4	<u>0,74</u> 44,4	
3 K	—	—	—	<u>0,20</u> 62,1	<u>0,45</u> 42,7	<u>0,39</u> 47,4	

Table 8. Average catches (t/trawling hour) of grenadier and halibut taken by scouting and research ships (numerator) and percentage of halibut catch (denominator) for 1970-1983 by months

Subarea, Division	M O N T H S						Total
	Jul	Aug	Sep	Oct	Nov	Dec	
0	I,50 47,2	I,00 55,9	0,89 54,5	0,86 78,7	0,78 85,0	0,40 72,7	0,93 62,0
2	I,I7 43,6	I,I3 23,1	I,80 8,8	I,3I 25,I	I,18 33,6	I,62 61,I	I,4I 34,5
2G	I,35 29,7	I,30 23,9	I,76 9,0	I,47 15,7	I,34 34,5	I,79 54,3	I,55 25,8
2H	0,79 75,0	0,64 23,3	2,77 5,I	I,08 39,3	I,29 37,4	I,57 68,7	I,3I 50,5
2J	0,45 25,0	0,35 7,0	—	I,25 21,4	0,50 37,5	0,99 45,3	0,78 36,2
3K	0,65 I2,8	—	—	0,05 0,0	0,20 62,I	0,43 47,7	0,53 45,4

Table 9. Average catches (t/trawling hour) of grenadier and halibut taken by scouting and research ships (numerator) and percentage of halibut catch (denominator) for 1970-1976 by depths

Subarea, Division	D E P T H, M						Total	
	40I-500	50I-600	60I-700	70I-800	80I-900	90I-1000		
0	I,07 99,6	0,56 54,9	I,07 50,7	I,I7 41,3	I,26 41,I	I,00 32,0	— —	I,1I 46,0
2	I,26 23,5	I,29 28,3	I,I7 29,6	I,75 20,6	I,6I 35,2	I,48 15,7	I,6I 8,7	I,36 24,3
2G	I,24 I8,2	I,38 I9,2	I,26 24,2	I,72 I7,2	I,70 32,I	I,54 I2,2	I,6I 8,7	I,44 I9,5
2H	I,40 38,5	I,I9 42,5	I,00 40,6	I,90 33,I	I,50 45,0	I,00 42,0	— —	I,27 40,4
2J	I,05 I5,7	0,80 34,2	0,67 25,0	—	0,45 25,0	—	— —	0,83 26,9
3K	0,78 62,0	0,72 2,0	0,10 25,0	I,37 20,0	0,80 6,4	— —	0,10 8,7	0,70 42,9

Table 10. Average catches (t/trawling hour) of grenadier and halibut taken by scouting and research ships (numerator) and percentage of halibut catch (denominator) for 1977-1983 by depths

Subarea, Division	D E P T H S, M							Total
	!40I-500	!50I-600	!60I-700	!70I-800	!80I-900	!90I-1000	!100I-II00	
0	0,25 72,3	0,39 80,4	0,59 91,7	0,72 74,0	0,73 86,3	0,79 78,4	1,46 79,6	0,70 81,9
2	0,59 53,1	0,64 53,3	0,82 56,6	1,50 62,6	2,20 73,2	2,50 70,9	2,31 51,3	1,58 61,0
2 G	0,31 43,8	0,41 59,6	0,78 66,1	1,93 68,8	2,79 77,6	2,48 67,2	2,66 35,0	2,03 60,6
2 H	0,79 52,0	0,74 52,4	0,77 56,3	1,33 61,1	1,83 78,2	2,80 80,6	1,70 79,6	1,37 64,3
2 J	0,32 63,2	0,47 39,7	1,09 40,0	1,10 53,0	0,57 26,5	0,43 37,3	—	0,74 44,4
3 K	0,34 54,3	0,71 47,2	0,25 30,0	0,35 28,5	0,47 25,0	0,60 20,0	—	0,39 47,4

Table 11. Average catches (t/trawling hour) of grenadier and halibut taken by scouting and research ships (numerator) and percentage of halibut catch (denominator) for 1970-1983 by depths

Subarea, Division	D E P T H S, M							Total
	!40I-500	!50I-600	!60I-700	!70I-800	!80I-900	!90I-1000	!100I-II00	
0	0,62 84,4	0,47 67,9	0,87 67,4	1,00 58,7	1,06 58,0	0,82 70,8	1,46 79,6	0,93 62,0
2	1,05 29,3	1,21 28,2	1,07 37,2	1,68 33,0	1,89 52,9	2,06 47,2	2,09 37,4	1,41 34,5
2 G	1,05 19,5	1,33 15,9	1,19 30,3	1,75 24,8	2,12 48,9	1,97 37,3	2,21 23,6	1,55 25,8
2 H	1,14 44,1	1,11 44,4	0,93 47,0	1,58 47,7	1,68 64,9	2,48 73,4	1,71 79,6	1,31 50,5
2 J	0,82 38,7	0,72 35,3	0,94 34,5	1,07 53,0	0,73 32,8	0,43 37,3	—	0,78 36,2
3 K	0,52 57,6	0,71 39,7	0,12 26,2	0,61 26,4	0,68 13,4	0,60 20,0	0,07 8,7	0,53 45,4

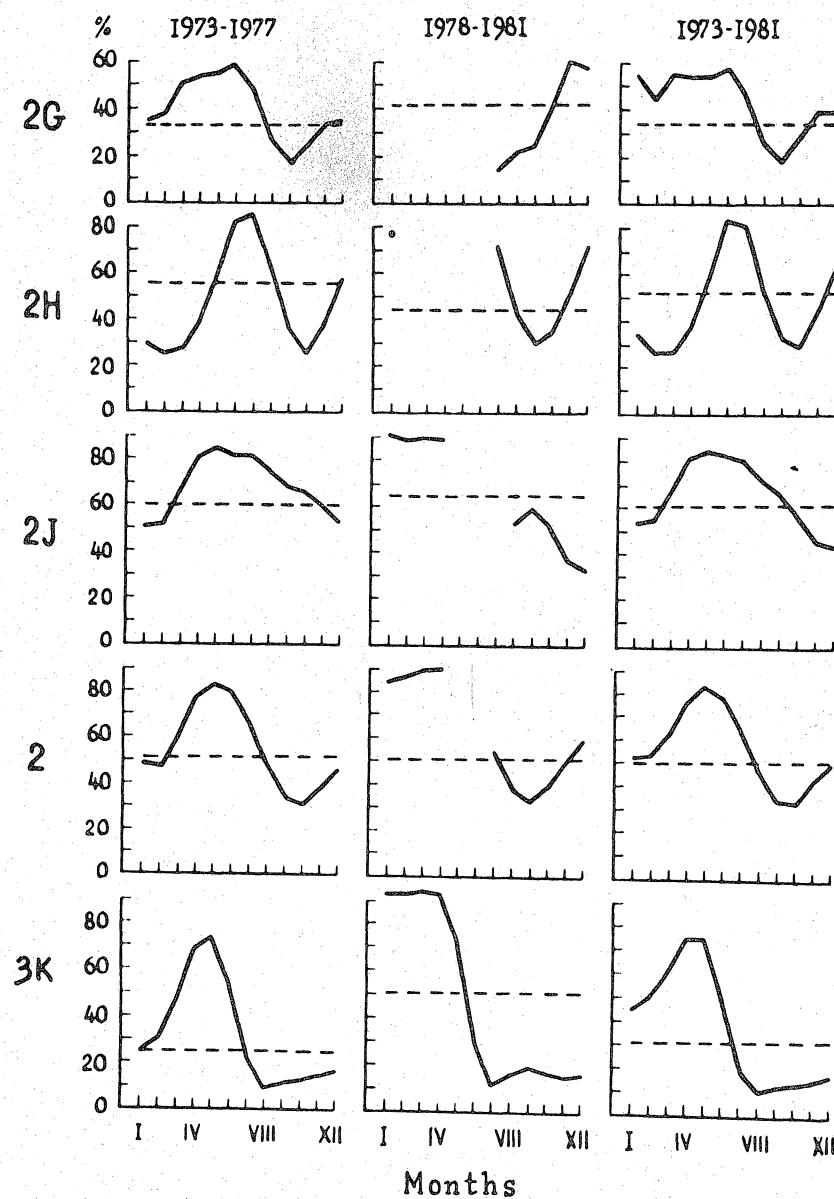


Fig. 1. Halibut catch (in % of grenadier and halibut catch) taken by commercial ships in different NAFO Divisions by months for 1973-1977, 1978-1981 and 1973-1981 (the average value for all months is marked by the broken line).

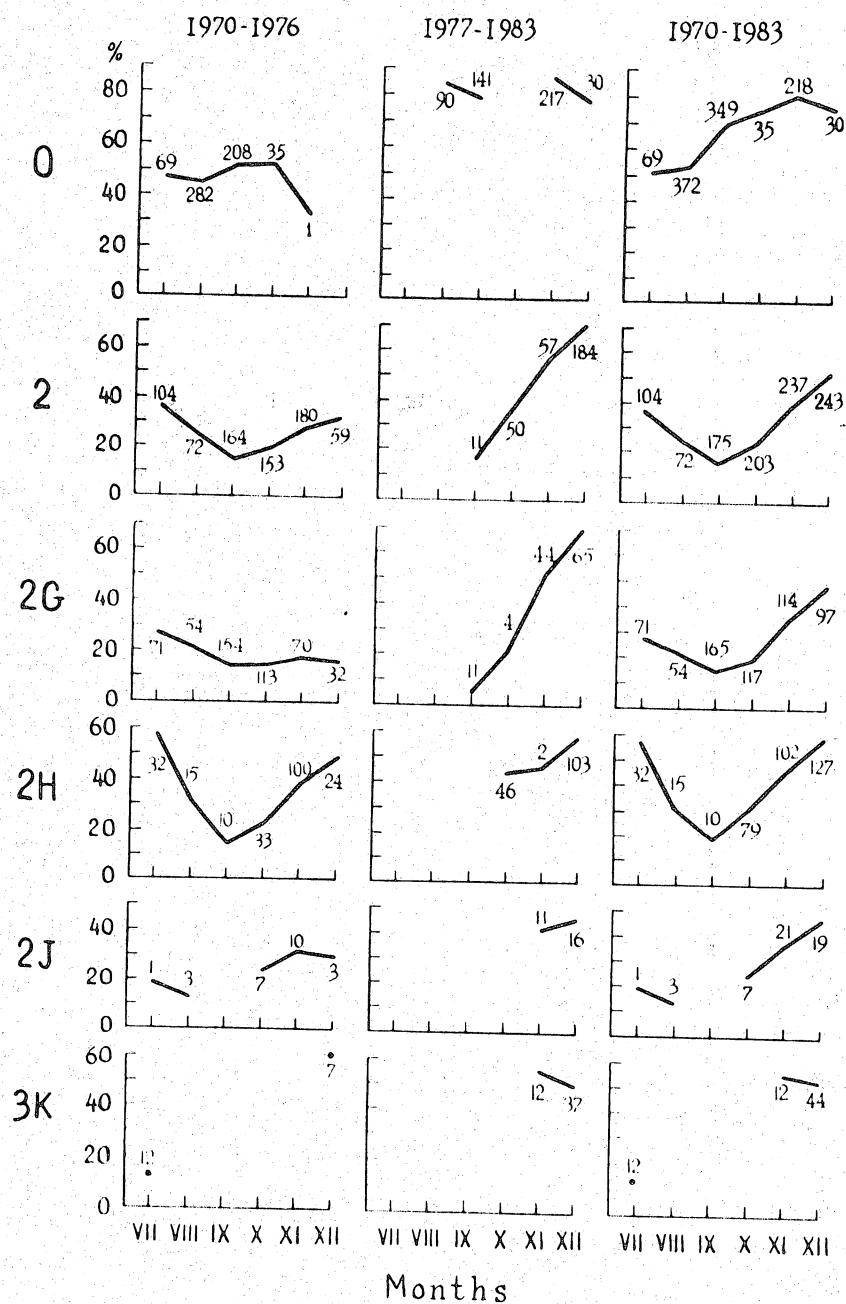


Fig. 2. Average catches of halibut (in % of grenadier and halibut catches) taken by scouting and research ships in different NAFO Divisions by months for 1970-1976, 1977-1983 and 1970-1983 (figures on the curves stand for a number of catches analysed).

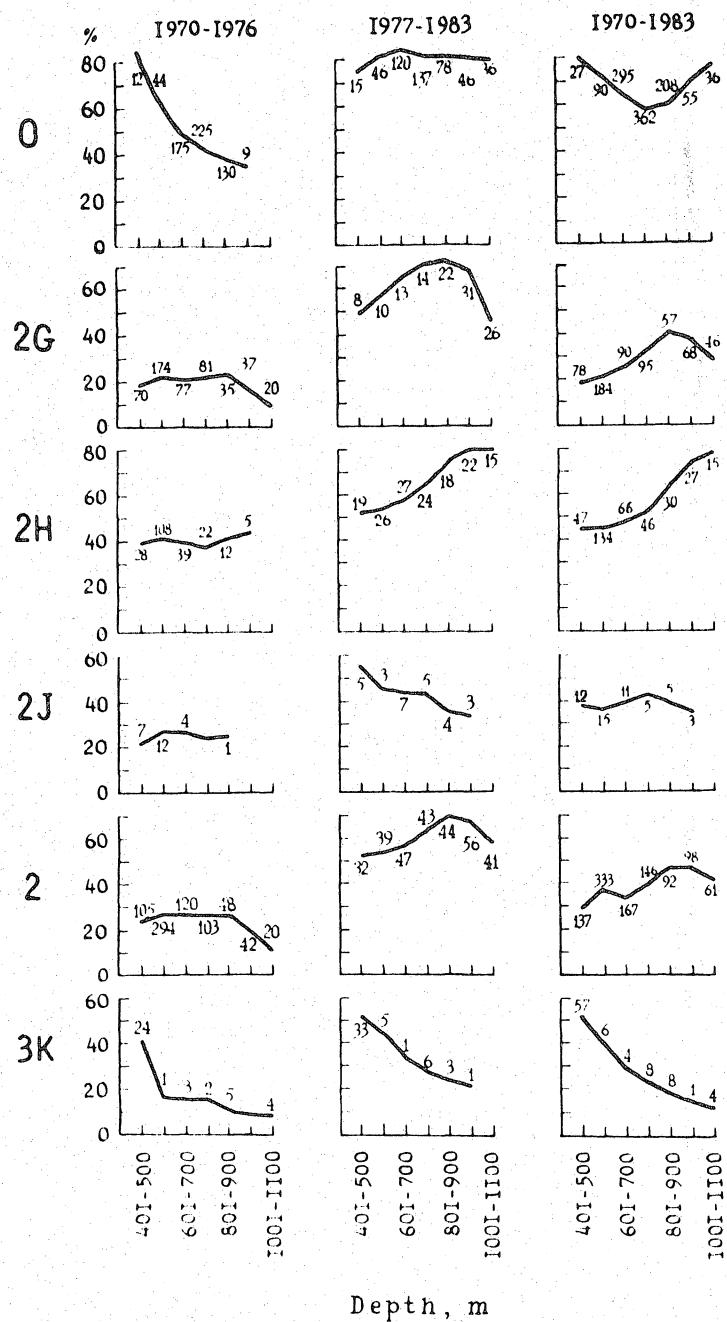


Fig. 3. Average catches of halibut (in % of grenadier and halibut catch) taken by scouting and research ships in different NAFO Divisions by depths for 1970-1976, 1977-1983 and 1970-1983 (figures on the curves stand for a number of catches analysed).

