Northwest Atlantic Fisheries Organization

Serial No. N382

NAFO SCR Doc. 81/IX/89

THIRD ANNUAL MEETING - SEPTEMBER 1981

Bottom Trawl Codend Selectivity for Greenland Halibut in NAFO Subarea 0 and Div. 2H, 2J and 3K

by

A.K. Chumakov, K.N. Nikeshin, and A.S. Gorshkova
Polar Institute of Marine Fisheries and Oceanography (PINRO)
Murmansk, USSR

Abstract

Data on results of assessment of selective features of codends with 117, 124, 127 and 133 mm mesh sizes in Greenland halibut (Reinhardtius hippoglossoides) fishing conducted with bottom trawls are represented in the paper.

Introduction

The problems concerning the development of practical arrangements to obtain a stable status of commercial stock and maximum available catch that wouldn't disturb the reproductive capacity of the population fished had been most keenly raised to fisheries with introduction of 200-mile economic zones by coastal states into force.

Along with studying the abundance and biomass of fish populations and establishment of TAC for each stock, at present time a great attention is also paid to the oldest and most popular measure of marine fishery regulation - the variations in mesh sizes of commercial trawl codend.

The data showing the selective features of codends with different mesh sizes in Greenland halibut fishing carried out by bottom trawls separately on shelf and continental slope in various areas of the Canadian economic zone are given in the present paper. A similar differential approaching the problem of studying the trawl selectivity was taken up in relation to

the fact that as a result of previous investigations on size composition of halibut there was revealed that small immature specimens chiefly inhabited the shelf, and the larger ones were observed on continental slope. Differences in size composition of halibut were found in all the NAFO Divisions. It was stated that while migrating from south northward an increase of halibut mean length was observed, the area north of the Grand Bank to Hamilton Bank was a region of inhabitation, mainly, of immature fish with equal growth rates of males and females (Chumakov, 1975, 1979; Bowering, 1977).

The investigations on bottom trawl codends selectivity conducted during Greenland halibut fishery showed the availability of essential differences in escapement of small-sized specimens through the netting of codend on the shelf and continental slope.

The data obtained as a consequence of these investigations already now give grounds to announce an inefficiency of using the codends with mesh size over 120 mm in the Greenland halibut fishery on the continental slope in Area 0 and Divisions 2JH.

On the shelf, where small immature specimens mainly inhabit it is reasonable to limit trawl fishery because the problem of viability of halibut specimens passed through the codend mesh is not still clear.

More complete information on selective features of different parts of commercial trawl (wings, square, codends) and also on viability of halibut specimens can be presented after conduction of additional special investigations under conditions as much as possible approximate to the fishing ones carried out by commercial vessels. The authors of the paper hope that the agreement from Canadian side for conduction of special investigations intended for solving the different problems related to marine fishery regulation by variations in mesh sizes in the fishing zone in 1981-1983 will be received.

Methods

The data on bottom trawl codends selectivity in relation to Greenland halibut represented, were collected aboard the research vessels "Suloy" in cruise from August 1 to December 22, 1979 and"Nikolay Kononov" in cruise from April 11 to August 19, 1980 and in cruise from October 10, 1980 to February 17, 1981. The experiments were carried out:

- on continental slope of Central Labrador (Division 2H) by codend with actual inner mesh size of 124 mm;
- on continental slope of Baffin Land (Area 0) by trawl codends with actual inner mesh sizes of 124, 127 and 133 mm;
- on shelf of South Labrador (Division 2J) by codends with actual inner mesh sizes of 117 and 127 mm;
- on shelf of Division 3K by codend with actual inner mesh size of 127 mm.

An assessment on selectivity was carried out by trawlings with bottom trawl with codend rigged with the ICES type cover. Codends were made of kapron netting (polyamide) knitted of the yarn with a 3.1 mm diameter in two compositions and total density R = 5 700 text. An inner mesh size was measured by wedge-shaped flat plate of the ICNAF gauge type under pressure of 5 kg. The thickness of plate is 2 mm. The cover retaining the fish escaped from the codend was made of kapron net with a 40 mm mesh size. Total density of yarn (R) was 2 700 text. A front edge of the cover was fixed near the joint of the conic part of codend with cylindrical part. Sides of the cover net were connected with pennants, the breadth of the cover in plait was 1.4 times as large as that of the top side of codend. To prevent the escapement of fish through the mesh of bottom side of codend, the latter was fitted with netting with the same mesh size as in cover from top inside the codend along the whole length of cylindrical part.

Experimental trawlings were carried out at a speed of 3.2-3.5 knots. The catches in examined trawlings constituted from 200 to 1 000 and more specimens per trawling.

Results

The investigations on codends selectivity of bottom trawls in Greenland halibut fishery showed the availability of escapement of small-sized specimens through the codend netting (Figs.1-7).

Size composition of Greenland halibut from covers and codends with different mesh sizes due to all the examined trawlings conducted on the shelf of Division 3K and South Labrador (Div.2J) are presented in Tables 1-3. Analogous data on size composition of retained and escaped fishes during fishing by codends with different mesh sizes on the continental slope are given in Tables 4-6.

From the data presented it follows that larger fishes than those on the shelf were caught on the continental slope. The catch of larger specimens on the continental slope undoubtedly stipulates a smaller number of escaped fishes and their lesser range in size frequences. The escapement of fish from codends with inner mesh size from 124 to 127 mm includes the specimens up to 55 cm long, but with a 133 mm mesh size - up to 67 cm. The masses of similar fishes were equal to 1.5 and 1.8 kg, respectively. Maximum length of escaped fish while fishing with 117 and 127 mm mesh-sized codends was 53 cm. Considerable differences in mean length both among the fishes caught and those retained and escaped by codends with different mesh sizes on shelf and continental slope were registered (Table 7). In some cases mean length among the fishes caught and retained on the continental slope was 15 cm bigger than that on the shelf.

It is known that the transfer from one mesh size in fishing gear to another, is usually connected with variations in size composition of catches. In this connection the comparison between mean lengths in size composition of fishes caught and retained is fairly interesting. If mean length of retained fish on the continental slope is approximately 1 cm more than that

of caught fish, then on shelf as a result of considerable escapement of small-sized fish this difference varies over the range from 2 to 5 cm and constituted, on the average, 3.1 cm. This indicates the possibility of more considerable influence of selectivity of trawling fishing gears upon the halibut stock structure on the shelf than that on the continental slope.

Instantaneous losses of catch on the continental slope of the Baffin Land (Area 0) and Central Labrador (Div.2H) at the variations in the codend mesh size from 124 to 133 mm are statistically incomparable because the trawlings were carried out in different depths with different size composition of fish. In particular, mean length and mode position of size frequency of fish caught indicate this. However, it can be noted that, on the average, the losses for all codends by number of fish constitute about 6.1%, by mass - about 2.1%.

On the South Labrador shelf (Div.2J) the investigations on codends selectivity assessment were conducted for more uniform composition, e.g. mean length of fish caught by codend with a 117 mm mesh size was 41.60 cm, and with a 127 mm mesh size - 44.01cm The retainment of fish at variations in codend mesh size from 117 to 127 mm constituted by number of fish 76.9 and 69.8, by mass - 92.3 and 89.9%, respectively. The total losses varied from 23.1 to 30.2% by number of fish and from 7.7 to 10.1% by mass.

On the shelf of Division 3K while fishing the halibut concentrations by codend with a 127 mm mesh size the losses of catch constituted 25.6% by number of fish and 15.5% by mass.

While solving the problem concerning the variations in commercial trawls codends mesh sizes it is necessary to reveal the adequacy of the mesh size applied to the size composition of fish caught and expediency of similar variations. Towards this end, to our opinion, the comparison between the percentages of fish retainment by number and mass is fairly useful, because if the transfer to a larger mesh size in codend will be unjustified, it leads to a proportional poor catch of abundance and mass. Such increase of the codend mesh size is

irrational and causes only the growth of fishing effort. If the difference in retainment percentages by mass and number of fish on the continental slope is small and varies in the limits from 2.3 to 5.4%, then on the shelf it is significant and for codends with 117 and 127 mm mesh sizes it constitutes 15.4 and 20.1%, respectively. Thus, the regulation of Greenland halibut fishery by means of variations in mesh sizes of codends is effective only on shelf, where a great number of small-sized fish inhabit.

A minimum commercial length for Greenland halibut is not established, but it can be considered that the fishes up to 35 cm long with mass about 400 g are not of great commercial value and therefore they can be referred to the small-sized fishes. Analysing the data given in Tables 8 and 9 it can be noted that in all the series of trawlings conducted on the continental slope by codends with 124–133 mm mesh sizes, a total number of specimens of 35 and more cm long among the escaped fish constitutes the value exceeding 80%. Thus, more than 80% of the escaped fish are of commercial value. Apparently, a further increase in mesh size will cause an increase in escapement of larger specimens, that was fairly well observed for a 133 mm mesh size codend. It can be also noted that on the continental slope the availability of small-sized specimens by abundance does not exceed 10% and their retainment is equal to about 30–50%, i.e. the bycatch of small-sized fish is insignificant.

On shelf during the fishing by codend with a 117 mm mesh size the greatest total number of escaped small-sized fish was observed. With an increase in mesh size of codend the escapement of large fishes and losses of catch by mass increase.

On the basis of the above mentioned it can be preliminary concluded, that the applying of the 120 mm mesh size in codends is the most optimum in the Greenland halibut trawl fishery both on the shelf and continental slope.

A final decision concerning the codend mesh size aimed at

halibut trawl fishery conduction on the shelf can be accepted after carrying out the comprehensive program of selectivity of trawl codends with different mesh sizes. Besides, to evaluate correctly the influence of mesh size upon the exploited stock it is necessary to study the viability of fishes escaped through the mesh. Without solving this important problem it is impossible to consider the variations in mesh size of codends to be the regulatory measures of the Greenland halibut fishery, because this can lead only to increased mortality of numerous age groups of commercial value being not useful for humanity. The authors have a lot of indirect indices showing low viability of halibut specimens, escaped through the mesh. While visual analysing many specimens were with significant external damages. An attempt to carry out their mass tagging was undertaken. Towards this end all specimens of halibut from cover were put into the tank with running water on the deck and held aimed at revealing and selection of lacking viability specimens. A similar method is usually applied by us in the previous cruises in halibut tagging and completely justified itself. Many attempts intended at conduction of mass tagging of halibut specimens passed through the mesh were unsuccessful because all the specimens were the lacking viability ones. It is possible that their low viability was caused by greater depth of trawling (900 - 1 100 m) than that earlier observed by us while tagging halibut.

In relation to possible mass death of halibut specimens, passed through the mesh, to our opinion, before final studying of this question it is reasonable to consider a problem of partial limitation of trawl fishery on the shelf and even of their complete closure.

Conclusions

1. The investigations carried out on selectivity of codends with 117, 124, 127 and 133 mm mesh sizes showed the availability of escapement of halibut through the netting of codend.

2. Maximum lengths of escaped specimens while fishing by cod-

ends with 117, 124, 127 and 133 mm mesh sizes constituted 53, 49, 55 and 67 cm, respectively.

3. Considerable differences in size compositions of halibut on shelf and continental slope cause unequal instantaneous losses of catch. On the continental slope, where larger halibut inhabit, the losses of catch for codends with different mesh sizes are insignificant and constitute, on the average, by number of fish and by mass 6.1 and 2.1%, respectively. The losses of catches on the South Labrador shelf at the variations in codend mesh sizes from 117 to 127 mm were equal to 23.1 and 30.2% by number of fish and 7.7 and 10.1% by mass.

4. Regulation measures of the Greenland halibut fishery by means of variations in mesh sizes of codends are effective only on the shelf, where a great number of small-sized fish inhabit.

5. The use of a 120 mm mesh size in codends is the most optimum in the Greenland halibut trawl fishery both on shelf and continental slope.

6. Without revealing the viability of halibut escaped through the mesh it is impossible to consider the variations in mesh sizes in codends as measure of fishery regulation.

7. In relation to possible mass death of halibut specimens escaped through the mesh, to our opinion, before the final studying of this question it is reasonable to consider the problem of partial limitation of halibut trawl fishery on shelf or even of their complete closure.

References

Bowering W.R. 1977. Trends in the Greenland Halibut fishery in Subarea 2 and Divisions 3K and 3L. ICNAF Res.Doc. 77/VI/II, Serial No.5031.

Chumakov A.K. 1975. Localities of Greenland halibut stocks in the North-West Atlantic. Trudy PINRO, vyp.35, pp.203-209.

Chumakov A.K. 1979. Abundance and biomass of Greenland halibut in ICNAF Divisions 2J and 3K in November-December 1978. ICNAF Res.Doc. 79/VI/103. Serial No.5468, pp.16.

Table 1 Size composition of Greenland halibut in codend with a 117 mm mesh size and in cover by total examined trawlings on the South Labrador shelf (Div.2J), in specimens

Length of fish, cm	Retained fishes			Escaped fishes			Males & females caught in total
	males	females	total	males	females	total	
14-15	1		1				1
16-17							
18-19	9		9	5	8	13	22
20-21	12	9	21	3	7	10	31
22-23	20	12	32	9	8	17	49
24-25	26	29	55	39	20	59	114
26-27	75	61	136	92	62	154	290
28-29	105	73	178	127	72	199	377
30-31	88	64	152	136	69	205	357
32-33	147	81	228	124	61	185	413
34-35	130	81	211	102	45	147	358
36-37	122	84	206	70	33	103	309
38-39	126	86	212	22	17	39	251
40-41	99	57	156	12	5	17	173
42-43	138	79	217	6	1	7	224
44-45	141	74	215	2	1	3	218
46-47	219	97	316	4	2	6	322
48-49	238	108	346				346
50-51	165	76	241	1	1	2	243
52-53	134	93	227		1	1	228
54-55	86	44	130				130
56-57	57	35	92				92
58-59	54	38	63				92
60-61	31	32	51				63
62-63	26	25	36				51
64-65	22	14	30				36
66-67	4	26	27				30
68-69	4	23	21				27
70-71		21	28				21
72-73		28	29				28
74-75		29	27				29
76-77		27	19				27
78-79		19	19				19
80-81		19	17				19
82-83		17	20				17
84-85		20	6				20
86-87		6	4				6
88-89		4	4				4
90-91		4	4				4
92-93		5	5				5
94-95							
96-97		1	1				1
Total	2279	1601	3792	754	413	1167	5047

Table 2 Size composition of Greenland halibut in codend with a 127 mm mesh size and in cover by total examined trawlings on the South Labrador shelf (Div.2J), in specimens

Length of fish, cm	Retained fishes			Escaped fishes			Males & females caught in total
	males	females	total	males	females	total	
I4-I5	I		I				I
I6-I7		2	2				2
I8-I9	I		I	2		2	3
20-2I	I	2	3	2	I	3	6
22-23	5	I	6	7	I	8	I4
24-25	I2	8	20	II	I3	24	44
26-27	I7	I8	35	37	34	7I	I06
28-29	20	23	43	54	33	87	I30
30-3I	22	I7	39	5I	35	86	I25
32-33	39	20	59	65	53	II8	I77
34-35	44	2I	65	40	33	73	I38
36-37	29	26	55	4I	35	76	I3I
38-39	32	I7	49	30	20	50	99
40-4I	28	I8	46	II	7	I8	64
42-43	49	34	83	I8	7	25	I08
44-45	64	33	97	4	6	I0	I07
46-47	75	36	III	6	2	8	II9
48-49	I35	57	I92	3	4	7	I99
50-5I	84	37	I2I				I2I
52-53	80	I9	99				99
54-55	24	I8	42				42
56-57	28	25	53				53
58-59	I8	I9	37				37
60-6I	I6	5	2I				2I
62-63	I7	I5	32				32
64-65	I4	II	25				26
66-67	6	2I	27				27
68-69	8	2I	29				29
70-7I	I	I8	I9				I9
72-73	I	I8	I9				I9
74-75		22	22				22
76-77		I0	I0				I0
78-79		24	24				24
80-8I		I7	I7				I7
82-83		7	7				7
84-85		9	9				9
86-87		I	I				I
88-89		5	5				5
90-9I		2	2				2
92-93		2	2				2
94-95		2	2				2
96-97		4	4				4
Total	87I	665	I536	382	284	666	2203

Table 3 Size composition of Greenland halibut in codend with a 127 mm mesh size and in cover by total examined trawlings on the shelf of Division 3K, in specimens

Length of fish, cm	Retained fishes			Escaped fishes			Males & females in total
	males	females	total	males	females	total	
14-15	2	1	3				3
16-17							
18-19	4	1	5	1	2	3	8
20-21	18	25	43	9	6	15	58
22-23	27	25	52	7	14	21	73
24-25	31	16	47	11	9	20	67
26-27	68	75	143	38	39	77	220
28-29	86	108	194	87	78	165	359
30-31	97	68	165	77	61	138	303
32-33	82	70	152	69	73	142	294
34-35	84	89	173	86	49	135	308
36-37	58	61	119	45	51	96	215
38-39	71	64	135	52	44	96	231
40-41	70	89	159	32	35	67	226
42-43	110	108	218	36	44	80	298
44-45	154	156	310	32	51	83	393
46-47	198	199	397	21	23	44	441
48-49	195	218	413	8	15	23	436
50-51	162	173	335	4	2	6	341
52-53	79	116	195	1	1	2	197
54-55	31	63	94				94
56-57	11	51	62				62
58-59	8	18	26				26
60-61	2	17	19				19
62-63	2	10	12				12
64-65		7	7				7
66-67		9	9				9
68-69		5	5				5
70-71		10	10				10
72-73		1	1				1
74-75		5	5				5
76-77		2	2				1
78-79		5	5				2
80-81		1	1				5
82-83		1	1				1
84-85		1	1				1
86-87		2	2				1
88-89							2
90-91		1	1				1
92-93							1
94-95							
96-97							
Total	1650	1872	3522	616	597	1213	4735

Table 4 Size composition of Greenland halibut in codend with a 124 mm mesh size by total examined trawlings on the Central Labrador continental slope (Div.2H) and the Baffin Land continental slope (Area0), in spec.

Length of fish, cm	Division 2H			Area 0		
	Retained	Escaped	Caught	Retained	Escaped	Caught
20-2I	I		I			
22-23	I		I			
24-25	3		3	I		I
26-27				3	2	5
28-29	I	I	2	8	7	I5
30-3I	2		2	24	I3	37
32-33	I	2	3	72	I9	9I
34-35	I	5	6	9I	37	I28
36-37	I0	5	I5	I24	46	I70
38-39	4	8	I2	I77	38	2I5
40-4I	24	7	3I	2I8	34	252
42-43	39	I0	49	I79	9	I88
44-45	40	3	43	I25	I	I26
46-47	85	I	86	I27	I	I28
48-49	I00	2	I02	I06	2	I08
50-5I	I29	I	I30	I49		I49
52-53	II2		II2	I28		I28
54-55	98		98	II9		II9
56-57	II0		II0	I32		I32
58-59	96	I	97	I34		I34
60-6I	I27		I27	I3I		I3I
62-63	I35	I	I36	67		67
64-65	72		72	49		49
66-67	77		77	5I		5I
68-69	52		52	27		27
70-7I	30		30	29		29
72-73	2I		2I	20		20
74-75	I0		I0	I3		I3
76-77	I2		I2	9		9
78-79	I6		I6	6		6
80-8I	II		II	8		8
82-83	I9		I9	8		8
84-85	I0		I0	2		2
86-87	6		6	8		8
88-89	I7		I7	3		3
90-9I	7		7	4		4
92-93	7		7	4		4
94-95	7		7	2		2
96-97	6		6	3		3
98-99	7		7	3		3
I00-I0I	3		3	I		I
I02-I03	2		2			
I04-I05	I		I			
I06-I07				I		I
I08-I09	I		I			
II0-III	I		I			
II2-II3	I		I			
Total	I5I5	47	I562	2366	209	2575

Table 5 Size composition of Greenland halibut in codend with a 127 mm mesh size and in cover by total examined trawlings on the Baffin Land continental slope (Area 0), in specimens

Length of fish cm	Retained fishes			Escaped fishes			Caught fishes
	Males	Females	Total	Males	Females	Total	males + females
28-29	2	4	6		2	2	8
30-31		6	6	4	2	6	12
32-33	5	8	13	6	4	10	23
34-35	31	17	48	22	10	32	80
36-37	47	26	73	30	22	52	125
38-39	70	49	119	27	21	48	167
40-41	98	46	144	40	23	63	207
42-43	86	80	166	29	16	45	211
44-45	133	71	204	22	9	31	235
46-47	147	92	239	12	9	21	260
48-49	175	68	243	9	3	12	255
50-51	201	112	313	4	1	5	318
52-53	265	105	370	1	1	2	372
54-55	302	110	412	1		1	413
56-57	300	134	434				434
58-59	244	146	390				390
60-61	159	150	309				309
62-63	120	169	289				289
64-65	49	180	229				229
66-67	24	136	160				160
68-69	11	159	170				170
70-71	5	117	122				122
72-73		46	46				46
74-75	1	62	63				63
76-77		19	19				19
78-79		18	18				18
80-81		18	18				18
82-83		11	11				11
84-85		7	7				7
86-87		2	2				2
88-89		2	2				2
90-91		2	2				2
92-93		2	2				2
94-95							
96-97							
98-99		4	4				4
100-101							
102-103		2	2				2
Total	2475	2180	4655	207	123	330	4985

Table 6 Size composition of Greenland halibut in codend with a 133 mm mesh size and cover by total examined trawlings on the Baffin Land continental slope (Area O), in specimens

Length of fish, cm	Retained fishes			Escaped fishes			Caught fishes, males + females
	males	females	total	males	females	total	
28-29	I	I	2				2
30-3I	I		I	3		3	4
32-33	6	2	8	8	3	II	I9
34-35	7	5	I2	30	I4	44	56
36-37	27	5	32	45	25	70	I02
38-39	36	I6	52	75	27	90	I42
40-4I	65	66	I3I	73	27	I00	23I
42-43	57	4I	98	55	I9	82	I8I
44-45	97	58	I55	37	22	56	2II
46-47	I82	92	274	37	I3	59	333
48-49	220	67	287	I8	8	3I	3I8
50-5I	392	I4I	533	20	2	28	56I
52-53	463	I64	627	9	5	II	638
54-55	649	I99	848	6	4	II	859
56-57	748	278	I026	I0	2	I4	I040
58-59	722	340	I062	6	3	8	I070
60-6I	43I	330	76I	2	I	5	766
62-63	348	370	7I8	I		2	720
64-65	I54	37I	525	2	2	2	527
66-67	70	283	353			2	355
68-69	2I	362	383				383
70-7I	I3	323	336				336
72-73	4	I6I	I65				I65
74-75		I59	I59				I59
76-77		I07	I07				I07
78-79		57	57				57
80-8I		55	55				55
82-83		35	35				35
84-85		I7	I7				I7
86-87		I8	I8				I8
88-89		9	9				9
90-9I		6	6				6
92-93		6	6				6
94-95		9	9				9
96-97							
98-99							
I00-I0I							
I02-I03							
Total	47I4	4I53	8867	437	I92	629	9497

Table 7 O Main results of codends selectivity while fishing Greenland halibut on the shelf and continental slope.

Main characteristics	Shelf			Continental slope			
	2J		3K	2H	0	0	0
	117 mm mesh size	127 mm mesh size	127 mm mesh size	124 mm mesh size	124 mm mesh size	127 mm mesh size	133 mm mesh size
Minimum length of fishes caught, cm	I4	I4	I4	20	25	28	28
Maximum length of fishes caught, cm	97	97	93	II9	I07	I03	95
Mode position in size frequency, cm	32-33	48-49	46-47	62-63	50-5I	56-57	58-59
Mean length of fish, cm — Caught	4I,60	44,0I	40,42	58,I7	48,55	54,29	57,72
Mean length of fish, cm — Retained	44,27	48,83	42,34	58,83	49,60	55,29	58,78
Mean length of fish, cm — Escaped	3I,05	32,86	34,78	40,77	36,57	40,I4	42,66
Minimum length of retained fishes, cm	I4	I4	I4	20	25	28	28
Maximum length of escaped fishes, cm	53	49	53	5I	49	55	67
Retainment of fish in relation to fishes caught in total, % by No	76,9	69,8	74,4	97,0	9I,9	93,4	93,4
by mass	92,3	89,9	84,5	99,3	97,3	97,6	97,5
Retainment of fish in relation to number over length range of escaped fishes, % — by number of fish	73,0	57,7	72,9	90,3	85,7	87,7	92,3

Table 8 Results of determination of the Greenland halibut retainment (% equalized) while assessment of codends selectivity by total examined trawlings

Size groups of fish, cm	Shelf			Continental slope			
	2J		3K	2H	0	0	0
	117 mm mesh	127 mm mesh	127 mm mesh	124 mm mesh	124 mm mesh	127 mm mesh	133 mm mesh
I4-I5	I00	I00					
I6-I7	60,0	77,6					
I8-I9	69,5	6I,3	78,9				
20-2I	58,0	42,0	69,3	I00			
22-23	60,4	46,0	7I,8	I00			
24-25	53,5	40,4	68,2	I00	I00		
26-27	47,4	37,6	63,0		60,0		
28-29	45,6	32,4	57,0	50,0	53,3	75	I00
30-3I	48,3	32,5	53,2	I00	64,9	60,5	55,7
32-33	52,2	37,2	54,0	33,3	79,I	55,5	29,5
34-35	60,3	40,8	54,4	I6,7	7I,I	58,3	3I,6
36-37	70,I	46,2	56,6	66,7	72,9	63,2	29,8
38-39	80,5	54,5	6I,4	33,3	82,3	66,4	4I,6
40-4I	90,5	66,I	67,3	72,I	85,9	73,I	49,I
42-43	95,2	79,8	74,I	83,3	93,6	78,3	6I,4
44-45	97,9	86,8	80,7	90,4	97,9	85,8	69,9
46-47	98,9	93,4	87,8	96,6	98,8	9I,3	82,0
48-49	99,I	96,5	94,3	98,7	99,I	95,2	89,2
50-5I	99,6	I00	97,3	99,2	I00	97,7	94,5
52-53	99,6		99,0	I00		99,2	97,3
54-55	I00		I00			99,8	98,5
56-57						I00	98,8
58-59							99,2
60-6I							99,6
62-63							99,7
64-65							I00
66-67							

Table 9 Total number of escaped fish to each size, in %

Size groups of fish, cm	Shelf			Continental slope			
	2J		3K	2H	0	0	0
	117 mm mesh	127 mm mesh	127 mm mesh	124 mm mesh	124 mm mesh	127 mm mesh	133 mm mesh
I4-I5							
I6-I7							
I8-I9	I,I	0,3					
20-2I	I,9	0,7	I,5				
22-23	3,4	I,9	3,2				
24-25	8,4	5,6	4,8				
26-27	2I,6	I6,2	II,2		I,00		
28-29	38,6	29,3	24,8	2,2	4,3	0,6	
30-3I	56,2	42,2	36,2		I0,5	2,4	0,47
32-33	72,0	59,9	47,9	6,7	I9,6	5,4	2,2I
34-35	84,6	70,9	59,0	I7,8	37,3	I5,2	9,2
36-37	93,4	82,3	66,9	28,9	59,3	3I,0	20,4
38-39	96,7	89,8	74,8	46,7	77,5	45,4	34,7
40-4I	98,I	92,5	80,3	62,I	93,8	64,6	50,6
42-43	98,7	96,2	86,9	84,3	98,I	78,2	72,5
44-45	98,9	97,7	93,7	90,9	98,6	87,6	8I,9
46-47	99,4	98,9	97,3	93,I	99,I	93,9	86,8
48-49	99,6	99,9	99,2	97,5	I00	97,5	9I,3
50-5I			99,7	99,7		99,0	93,0
52-53			99,9			99,6	94,8
54-55						99,9	96,9
56-57							98,2
58-59							99,0
60-6I							99,4
62-63							I00
64-65							
66-67							

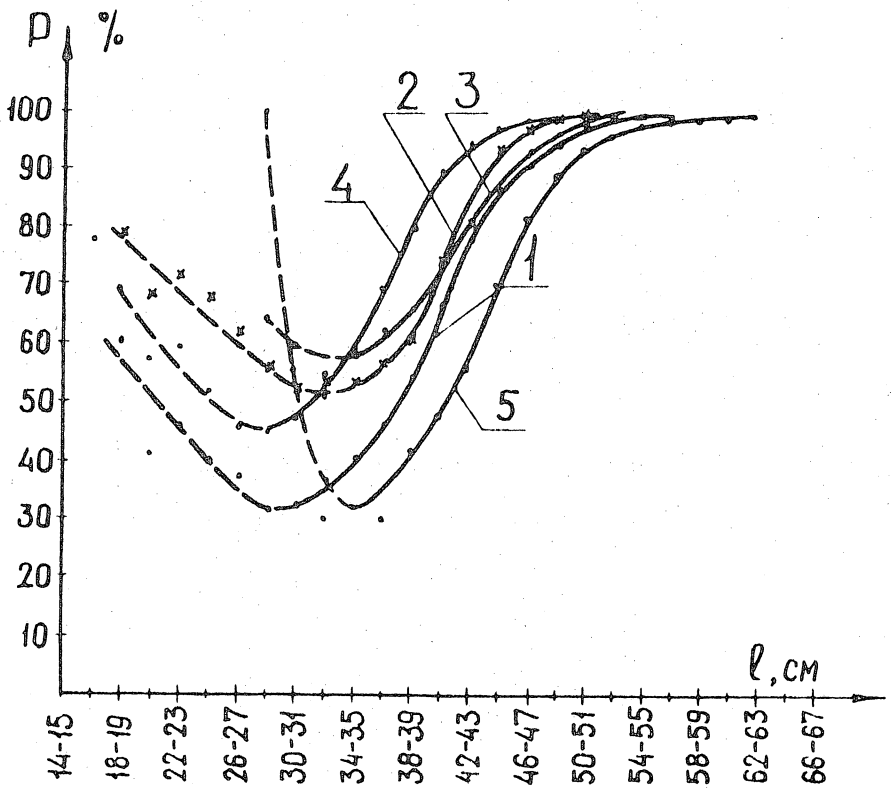

Fig. 1. Selectivity of Greenland halibut with 127-mm mesh codend on Div. 2J shelf (1), on Div. 3K shelf (2), on Subarea 0 continental slope (3), with 117-mm mesh codend on Div. 2J shelf (4), and with 133-mm codend on Subarea 0 continental slope (5).

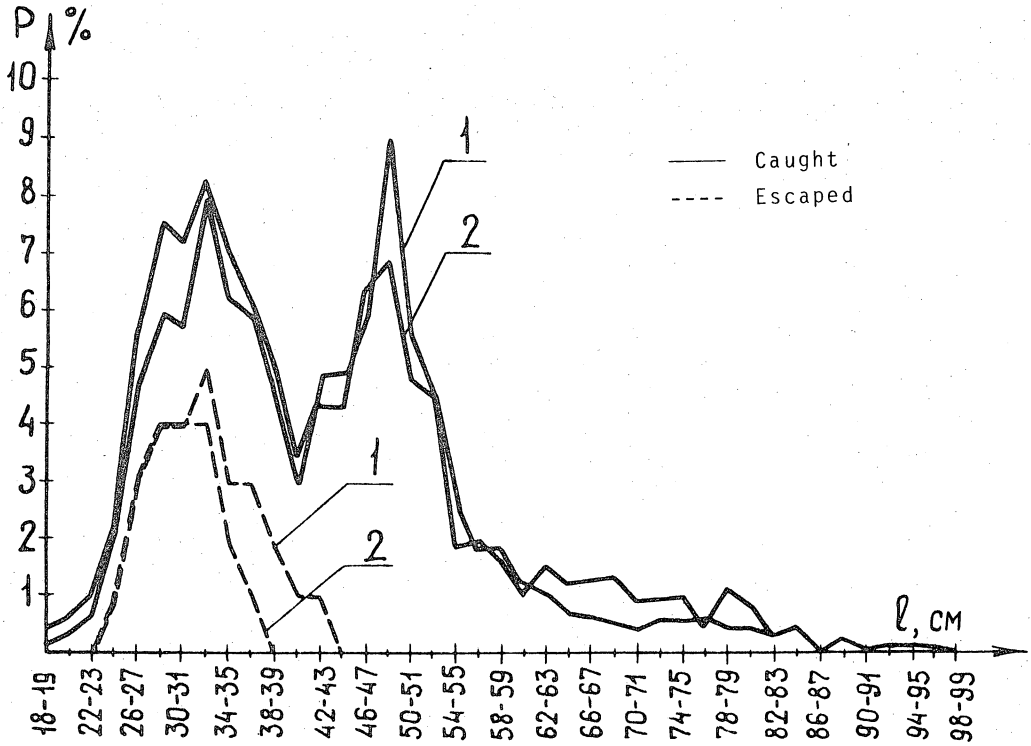

Fig. 2. Size composition of Greenland halibut caught and escaped, for 127-mm mesh codend (1) and 117-mm codend (2) on the shelf in Div. 2J.

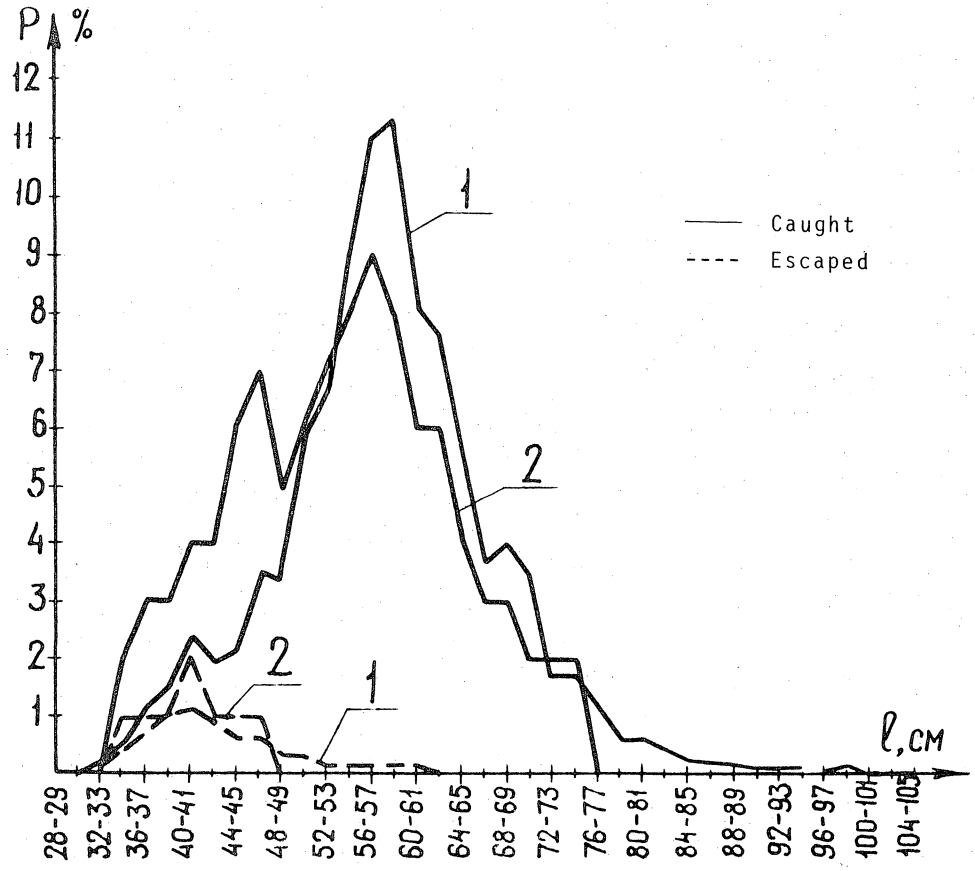

Fig. 3. Size composition of Greenland halibut caught and escaped, for 133-mm mesh codend (1) and 127-mm mesh codend (2) on the continental slope in Subarea 0.

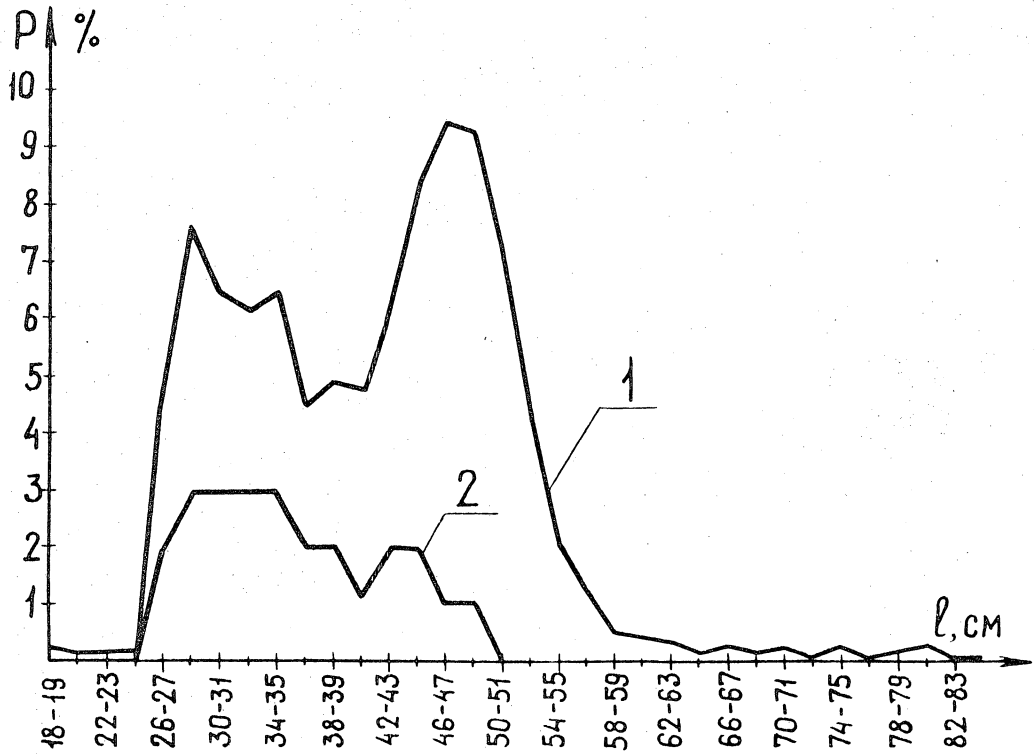

Fig. 4. Size composition of Greenland halibut caught (1) and escaped (2), for the 127-mm mesh codend on the shelf in Div. 3K.

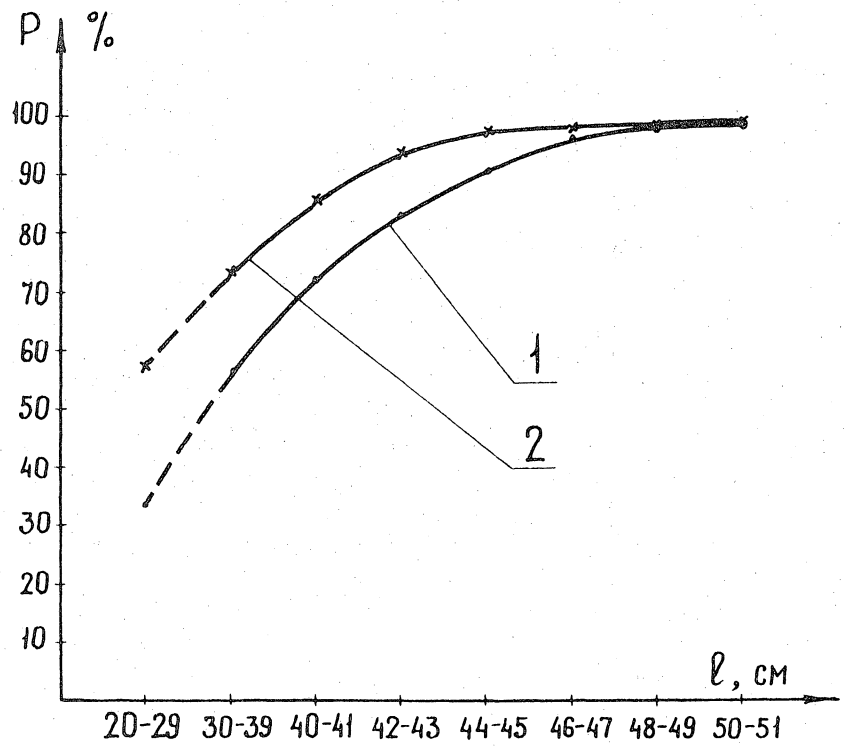

Fig. 5. Selectivity of Greenland halibut with 124-mm mesh codend on the continental slope in Div. 2H (1) and Subarea 0 (2).

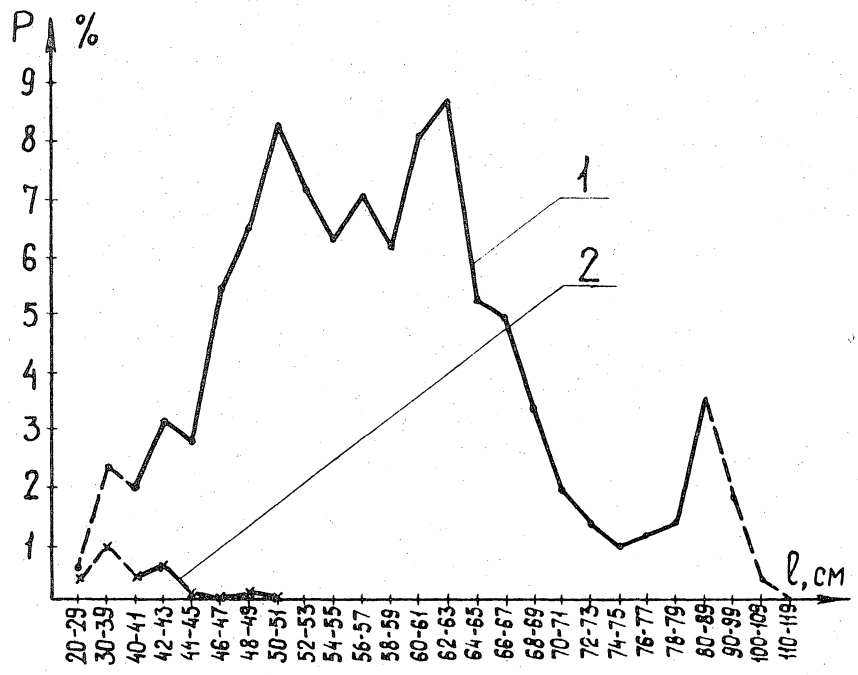

Fig. 6. Size composition of Greenland halibut caught (1) and escaped (2), for the 124-mm mesh codend on the continental slope in Div. 2H.

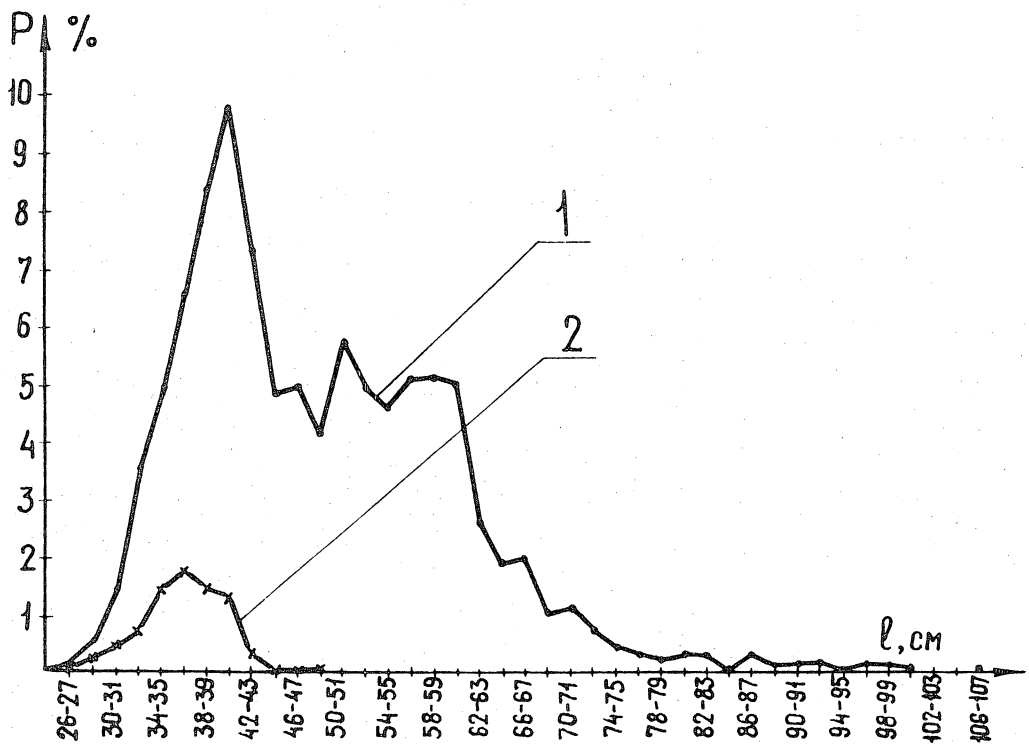

Fig. 7. Size composition of Greenland halibut caught (1) and escaped (2), for the 124-mm mesh on the continental slope in Subarea 0.