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OBSERVATIONS FROM THE BARENTS SEA IN SPRING 1973 ON THE DISCARDING OF COD  
AND HADDOCK CAUGHT IN BOTTOM AND MIDWATER TRAWLS FITTED WITH DOUBLE COD ENDS

by

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#### INTRODUCTION

Discarding of Arcto-Norwegian cod and haddock from hired Norwegian commercial trawlers fishing along the Finnmark Coast and in the Bear Island area with slightly different chafer was studied by Hysten (1965, 1967). Similar studies were made in the beginning of April and June 1973 off the East Finnmark Coast.

#### METHODS AND MATERIAL

A Norwegian trawler was hired for the period 2 - 9 April and another for the period 9 - 19 June 1973. Commercial bottom and midwater trawls made of polypropylene with a mesh size of 130 mm in the cod ends were used. A chafer of the double cod end type with the same mesh size as the cod end was used in some of the hauls. It was fastened to the anterior part of the cod end. The number of hauls with the different gears are given in Table 1.

Observers from the Marine Research Institute, Bergen had the responsibility of the sampling program. They measured a representative part of the fish used for human consumption and discarded from as many hauls as possible. The total number of fish in these two categories were estimated for each haul by raising the length frequencies of the samples to the total. Total weight of each species caught in the observed hauls was calculated from the length compositions and the length/weight relationship.

## RESULTS

Discarding rates of cod from catches taken in April with bottom trawl without chafer were estimated to 34% by numbers and 13% by weight (Table 1). Corresponding figures for the hauls with bottom trawl fitted with double cod end were 26 and 11% respectively. The discarding from the bottom trawl catches in June were of the same order. Experiments with midwater trawl with single and double cod end gave discarding rates of 34 and 39% by numbers and 18 and 22% by weight respectively.

The smallest cod retained in the bottom and midwater trawls fitted with double cod end was 17 and 28 cm respectively, while the smallest fish caught in bottom and midwater trawl with single cod end was 26 and 32 cm respectively (Table 2).

According to market demand most of the cod 39 cm and less were discarded. The 50% selection length for landing were 41 - 43.5 cm in the bottom trawl catches and 40 cm for the midwater trawl catches (Table 3). All fish more than 44 cm were landed for human consumption.

Discarding rates for haddock in bottom trawl catches were in the order of 3 - 9% by weight, while no discarding was observed from the midwater trawl catches. Since haddock was much less abundant in the catches than cod, both in April and in June, the estimated rates may be less significant (Table 1). Haddock as small as 16 cm were retained in the bottom trawl with double cod end, while the smallest fish caught in the midwater trawl was 37 cm (Table 4). Fish up to 44 cm was discarded, but few more than 39 cm.

It is of interest in this connection to get an idea of the loss of cod and haddock if a higher effective mesh size would have been used in the experiments. This can be estimated by knowing the selection ogive for the species and the gear. The selection ogive, characterized by the selection factor and the selection range between the 25 - 75% and 5 - 95% retention length, are known from many selection experiments with bottom trawl in the Barents Sea, Bear Island and Spitsbergen area (Anon. 1964, 1971). Grand mean selection factor for Arcto-Norwegian cod in trawl made of polypropylene is 3.67 (Anon. 1971). Experiments with a double cod end chafer and the same mesh size in both cod ends have shown a reduction in the selection

factor for cod up to 40% (Anon. 1967). Applying a reduction in the selection factor of 20% would give an effective mesh size of 104 mm. The length composition which would have been obtained with a single cod end and a mesh size 130 mm or 145 mm could then be estimated. Applying the same selection for landing as estimated from the described experiments would have given immediate losses by weight for the April experiment of 21.2 and 41.4% respectively (Table 5). Corresponding losses for the June experiment would have been 8.4 and 21% respectively. By landing all the fish caught with the higher effective mesh sizes, the immediate losses would be smaller.

Higher effective mesh sizes in the cod end would have reduced the discarding of small fish. Mesh sizes of 130 or 145 mm and single cod end in the April experiment would have lead to discarding of 6.2 or 0.2% of the recorded discarding by numbers. Corresponding figures for the June experiment would have been 14.1 or 0.5% respectively.

Similar calculation for the midwater trawl catches have not been made because of lack in our knowledge of the selectivity in this gear.

A comparison of the length composition of catches taken in April with bottom trawl and midwater trawl show that cod less than 25 cm and more than 79 cm were represented only in the bottom trawl catches (Table 2 and 6). However, the length groups 35 - 59 cm were more abundant in the midwater trawl catches. A relatively high number of haddock 15 - 34 cm were caught in bottom trawl. length groups which were missing in the midwater trawl catches. However, the length groups 35 - 49 cm were more abundant in the midwater trawl than in bottom trawl catches.

#### SUMMARY

Discarding practise of cod and haddock was studied on board two Norwegian trawlers hired for fishing off the East Finnmark Coast, one in the period 2 - 9 April and one in days 9 - 19 June 1973. Bottom and midwater trawls with double and single cod ends were used. The cod end and the chafer were made of polypropylene and had a mesh size of 130 mm.

Discarding of cod caught in bottom trawl fitted with double cod end was in the order of 27% by numbers and 11% by weight. Corresponding figures for midwater trawl catches were 39% by numbers and 22% by weight.

Discarding of haddock from the same bottom trawl hauls was 3 - 7% by weight and no discarding was observed from the midwater trawl catches.

A single cod end in the experiments with bottom trawl fitted with double cod end would have reduced the discarding of cod to 1/5 - 1/7 by numbers. A single cod end and a mesh size of 145 mm would have given negligible discarding.

#### REFERENCES

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Table 1. Discarding of Arcto-Norwegian cod and haddock caught by hired Norwegian trawlers off the East Finnmark Coast.

Gear	Date	No. of Hauls	Landings		Discard		Per cent discarded	
			No.	Weight (kg)	No.	Weight (kg)	No.	Weight (kg)
<b>COD</b>								
Bottom trawl single cod end	2 - 9 April 1973	2	1 118	1 814	560	262	34	13
" " double " "	" " "	13	25 073	35 268	7 511	3 887	26	11
Midwater trawl single cod end	" " "	2	3 528	4 513	1 919	1 068	34	18
" " double " "	" " "	4	19 125	21 187	11 914	5 840	39	22
Bottom trawl double cod end	9 - 19 June 1973	7	23 871	44 018	9 197	5 509	28	11
<b>HADDOCK</b>								
Bottom trawl single cod end	2 - 9 April 1973	2	343	572	120	60	26	9
" " double " "	" " "	13	541	578	52	16	9	3
Midwater trawl single cod end	" " "	2	486		0		0	
" " double " "	" " "	4	9 407		0		0	
Bottom trawl double cod end	9 - 19 June 1973	7	-	678	179	52	-	7

Table 2. Length compositions of Arcto-Norwegian cod caught by hired Norwegian trawlers off the East Finnmark Coast.

Length (cm)	2 - 9 April 1973						9 - 19 June 1973		
	Bottom trawl			Midwater trawl			Bottom trawl		
	Single cod end		Double cod end	Single cod end		Double cod end	Double cod end		
	Landed	Discarded	Landed	Discarded	Landed	Discarded	Landed	Discarded	
10 - 14				39				5	
15 - 19				110					
20 - 24				13					
25 - 29		48		76			84	16	
30 - 34		160		1 354			4 236	598	
35 - 39	2	288	68	4 157	135	77	5 935	3 924	
40 - 44	99	64	3 488	1 756	771	7 109	1 659	4 501	
45 - 49	162		7 461	6	717	4 762		153	
50 - 54	269		3 819		700	3 059			
55 - 59	302		5 434		703	2 791			
60 - 64	181		3 232		366	1 036			
65 - 69	55		1 052		86	240			
70 - 74	15		262		48	44			
75 - 79	9		131		2	7			
80 - 84	9		51						
85 - 89	4		35						
90 - 94	9		6						
95 - 99	2		18						
100 - 104			10						
105 - 109			6						
Total	1 118	560	25 073	7 511	3 528	19 125	11 914	23 871	9 197

Table 3. Percentage retained for landing by length of cod caught by hired Norwegian trawlers off the East Finnmark Coast.

Length (cm)	2 - 9 April 1973			9 - 19 June 1973
	Bottom trawl double cod end	Midwater trawl		Bottom trawl double cod end
		Double cod end	Single cod end	
7	2.5		6.8	
8		1.5		
9	5.0	5.5	21.6	
40	27.8	52.1	15.5	2.8
1	47.5	78.4	31.9	3.5
2	68.2	84.6	65.8	14.9
3	85.6	92.0	100.0	32.1
4	95.5	98.7	92.8	73.8
45	99.7	100.0	100.0	85.7
6	100.0			96.4
7				100.0

Table 4. Length compositions of Arcto-Norwegian haddock caught by hired Norwegian trawlers off the East Finnmark Coast.

Length (cm)	2 - 9 April 1973					9 - 19 June 1973	
	Bottom trawl				Midwater trawl		Bottom trawl double cod end
	Single cod end		Double cod end		Single cod end	Double cod end	
	Landed	Discarded	Landed	Discarded	Landed	Landed	Discarded
15 - 19				5			9
20 - 24				11			34
25 - 29				12			62
30 - 34		40		13			48
35 - 39	1	80	3	7	2	120	26
40 - 44	58		181	4	89	2 883	
45 - 49	150		211		257	4 812	
50 - 54	103		108		109	1 358	
55 - 59	15		32		22	194	
60 - 64	12		6		7	32	
65 - 69	1					8	
TOTAL	340	120	541	52	486	9 407	179

Table 5. Estimated loss (%) in landings of cod from the bottom trawl catches if a higher effective mesh size in the cod end had been used.

Date	Same discarding practice				No discarding			
	130 mm mesh		145 mm mesh		130 mm mesh		145 mm mesh	
	N	W	N	W	N	W	N	W
2 - 9 April 1973	30.8	21.2	54.8	41.4	29.0	20.3	54.7	41.4
9 - 19 June 1973	14.8	8.4	56.4	21.0	9.3	6.4	56.8	20.9

Table 6. Relative length compositions of cod and haddock caught in April 1973 by bottom and midwater trawl with double and single cod ends. Mesh size in cod end and double cod end 130 mm.

Length (cm)	Single cod end		Double cod end	
	Bottom trawl	Midwater trawl	Bottom trawl	Midwater trawl
COD				
10 - 29	2.9	-	0.7	0.3
30 - 49	46.2	65.0	56.1	76.6
50 - 110	50.9	35.0	43.2	23.1
HADDOCK				
15 - 34	8.7	-	6.9	-
35 - 49	62.8	71.6	68.5	83.1
50 - 69	28.5	28.4	24.6	16.9