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CODEND SELECTIVITY OF THE DANISH SEINE
INVESTIGATED BY THE TROUSER TRAWL METHOD

By

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ABSTRACT

During June 1986 codend selectivity of the Danish seine was measured using both diamond mesh codends and square mesh codends. Comparisons between different codends were made by the trouser trawl method, having two parallel 12 m codends with either different meshshape or different meshsize. A special construction ("trousers") with an 8 m long vertical panel in front were used for dividing the extension piece/rear belly into two equal parts.

The square mesh codends gave improved selectivity for both cod and haddock. The selection factor for cod was measured to 4.7 in the square mesh codend, compared to 4.5 in the diamond mesh codend. The selection range (75%-25%) was 8.5 cm in the square mesh codend, compared to 13.5 cm in the diamond mesh codend.

A considerable reduction in number of undersized fish was achieved when using the square mesh codends. The catches with a 120 mm diamond mesh codend contained 14.3% (in numbers) undersized fish, compared to 3.4% in the 120 mm square mesh codend.

The results and the practical experiences with the trouser trawl method were satisfactory, and this method has a number of advantages compared to both the covered codend method and the alternate haul method.

INTRODUCTION

In the early 80-ies the mesh size in trawl and Danish seine was increased in the areas north of N 62°00'. While the increase in trawl mesh size was 10 mm, from 125 to 135 mm, the mesh size in Danish seine increased with as much as 25 mm, from 110 to 135 mm. This led to a drop in the seine catches, especially in times with moderate and poor fishing. On the other hand, and especially in shallow waters in spring time, the seine netters could get big catches of haddock in 135 mm codends, and these catches very often contained a too high percentage of fish below the legal size.

On this background it was decided to perform a series of selectivity experiments to look for possibilities to improve the selectivity of Danish seine. A possible solution was the use of square mesh codends that had proven to give both a higher 50%-retention length and a narrower selection range than normal codends with diamond meshes (Robertson, 1984). The meshes in the square mesh codends had also proven to stay open in the whole length of the codend and were not influenced by catch and/or hauling speed (Larsen 1984).

Compared to trawl, the selectivity period in Danish seine, at least at the bottom, is very short. It is therefore of

crucial importance that the selection can take place in the whole length of the codend, and not as in normal trawl codends where the main selection takes place during the whole haul and over a short range of the codend at a given time.

MATERIAL AND METHODS

Two methods of comparing the selectivity of the codends were used:

A. "Alternate haul method".

Two identical Danish seines were equipped with codends of different mesh configuration but same meshsize, and fished alternatively.

B. "Trouser trawl method".

While using this method there is a chance that the entrance area of the two codends could be different. To avoid the influence of such a difference, an eight metre long vertical separation net was mounted into a special made extension piece (Fig. 1), thus dividing the sampling area into two equal halves and well in front of the codends (Figure 2).

The following comparisons were made (twin codends):

1. Square mesh codend, 120mm - Diamond mesh codend, 120mm.
2. Square mesh codend, 120mm - Small mesh codend, 60mm.
3. Square mesh codend, 120mm - Diamond mesh codend, 135mm

Data on different codends are given in Figure 3 and Table 1. The small mesh codend (60 mm) had an overall length and width like the 120 mm diamond mesh codend.

The experiments were conducted onboard the chartered commercial Danish seiner M/S "Karl-Viktor" (60 ft, 365 HP), 12 - 26 June, 1986, off the Finnmarken coast.

RESULTS

Already after one day of experiments, it was experienced that the alternate haul method would not provide sufficient data. Tidal current shifts caused changes in accessibility of fish, and accidental hooking of the gear on fasteners resulted in very few parallel and good comparisons. Catch rate and composition did also vary to a great extent from haul to haul.

It was therefore decided to try the "trouser trawl" method, and this set up was used for the rest of the cruise. Apart from the stern man who had to throw two codends clear of the gear instead of one, it was not experienced any difficulties with the twin codend system.

The catch distribution of cod and haddock in the 120 mm square and diamond mesh codends is given in Figure 4. Although there was a difference in catch and length distribution for cod, the major difference between the two codends was for haddock. In all hauls but two the square mesh codend gave a significantly higher mean length for haddock, and for the same species (<39 cm) the square mesh codend retained only 10% of that in the diamond mesh codend (Table 1).

Data from two hauls (pooled) with 120 mm square mesh and 60 mm diamond mesh (Fig. 5), together with the comparison of 120 mm square/120 mm diamond, gave selection curves for cod and haddock as shown in Figure 6. The square and diamond mesh codends gave selection factor of 4.7 and 4.5 and selection ranges of 8.5 cm and 13.5 cm, respectively.

Due to very few haddock above 50 cm, it was not possible to establish the whole selection curve for this species, but the curve progress indicates a selection factor for haddock well above 4.0 for the square mesh codend.

A few hauls comparing the 120 mm square mesh codend and the 135 mm diamond mesh codend, gave a high loss of marketable cod (>42 cm) and hardly no haddock less than 50 cm in the bigger mesh codend (Fig. 7).

DISCUSSION

The "trouser trawl" method turned out to be advantageous compared to the alternate haul method, where the fishing were conducted by two identical seine nets equipped with different codends. The alternate haul method gave large variations, both in catch rate and composition. On the other hand, the "trouser trawl" method worked very well and each successful haul gave a valid comparison.

This method has often been criticized, often correctly (Pope et al. 1975). Differences in meshsize and configuration have partly given unequal water flow (speed) or sampling area in the entrance of the two codends, thus leading to a different catch of fish, especially above the selection range, in the two legs of the system. By inserting the vertical separation net in front of the codends, this influence should be reduced to a minimum. If the gear is handled properly, it is most likely that the vertical separation net would split the catch into two roughly equal halves, both with regard to number and composition. In these trials the number of cod above the 75% retention point, was about the same in the two legs with 120 mm mesh size (359 against 337 in 5 hauls).

By calculating the selection factor for cod in the square mesh codend, it was supposed that the amount of fish entering the two legs was about the same. The data were therefore treated as with covered codend results, where the amount of fish in the small mesh codend did represent the total catch, and the fish in the other leg the retained fish. In spite of relatively few data, the calculated S.F. for cod in the diamond mesh codend is not very different from that found by

the alternate haul method (S.F.=4.3, Jakobsen, 1985). Both these values are substantial higher than for the covered codend method (Jakobsen, 1983, S.F.=3.6). This difference may be due to a masking effect of the cover, but it may also be due to the hauling procedure of the seine net itself. No strain on the codend and cover could give the released fish a chance to swim neither in nor out of the codend, especially when fishing in shallow waters, where the fish are still very much alive when brought to the surface.

These experiments have confirmed earlier results of the good selective properties of square mesh codend, especially for haddock, when compared to ordinary diamond mesh codends. Hopefully, this difference is due to a better selection in the fishing depth where the escaped fish should have the best chance to survive.

LITERATURE

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Table 1. Catch distribution and mean length for cod and haddock in the 120 mm square and diamond mesh codend.
 \bar{l} = meanlength, p = significance level.

Haul no.	COD						HADDOCK							
	Diamond 120 mm			Square 120 mm			Diamond 120 mm			Square 120 mm				
	Measured	Total	\bar{l}	Mea- sured	Total	\bar{l}	P=	Measured	Total	\bar{l}	Mea- sured	Total	\bar{l}	P=
7								275	791	42,2	153	153	45,1	0,000
8	124	124	54,6	119	119	58,7	0,000	98	98	42,0	20	20	44,6	0,05
9								182	551	43,9	116	116	46,2	0,000
17	54	54	55,1	43	43	63,8	0,000	217	451	44,7	146	146	47,0	0,000
18	72	72	53,2	119	119	56,2	0,0086	188	188	45,2	63	63	47,7	0,000
22	167	167	59,6	124	124	59,8	0,92	97	97	47,3	15	15	48,5	0,1330
23	159	159	59,1	118	118	59,2	0,98	50	50	47,5	5	5	50,2	
Total material	576	576	57,2	523	523	58,9	0,0005	1107	2226	43,7	518	518	46,3	0,0000
No. of illegal sized fish	10 (> 42 cm)			3 (< 42 cm)				393 (< 39 cm)			33 (< 39 cm)			

% of illegal sized fish : Diamond mesh codend $\frac{(393 + 10) \cdot 100\%}{2802} = 14,3 \%$

Square mesh codend $\frac{(33 + 3) \cdot 100\%}{523+518} = 3,4 \%$

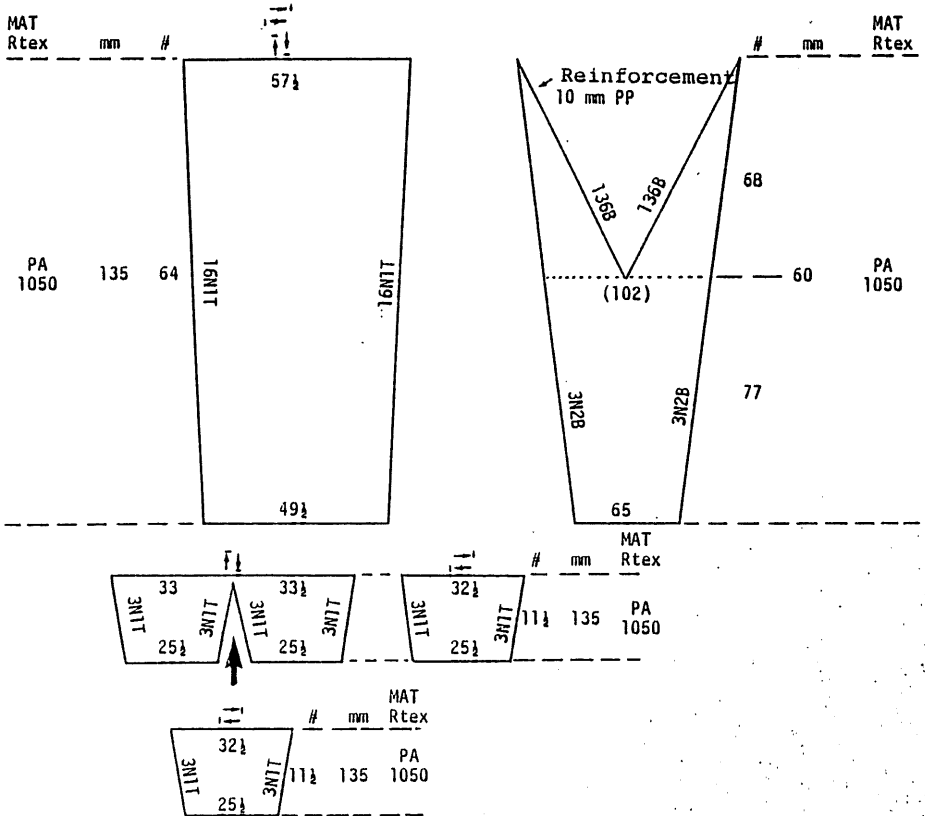


Figure 1. Special made extension piece for the "trouser trawl" experiments in Danish seine.

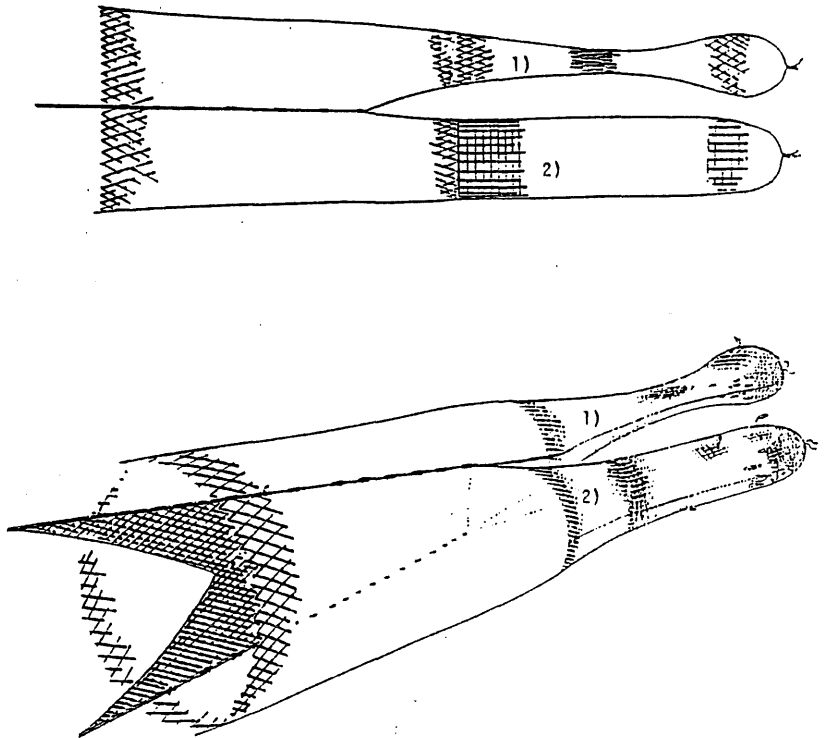


Figure 2. Shape of the special made extension piece used during the selectivity experiments by the "twin-codend" method. (1- ordinary codend, 2-square mesh codend).

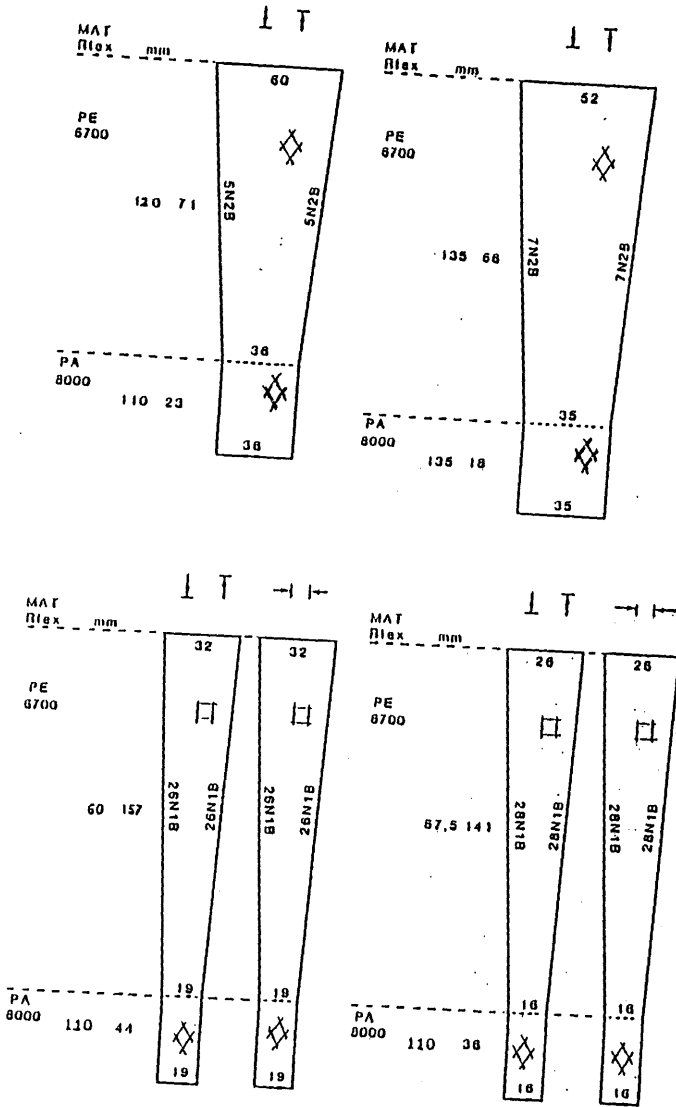


Figure 3. Codends used during the Danish seine selectivity experiments.

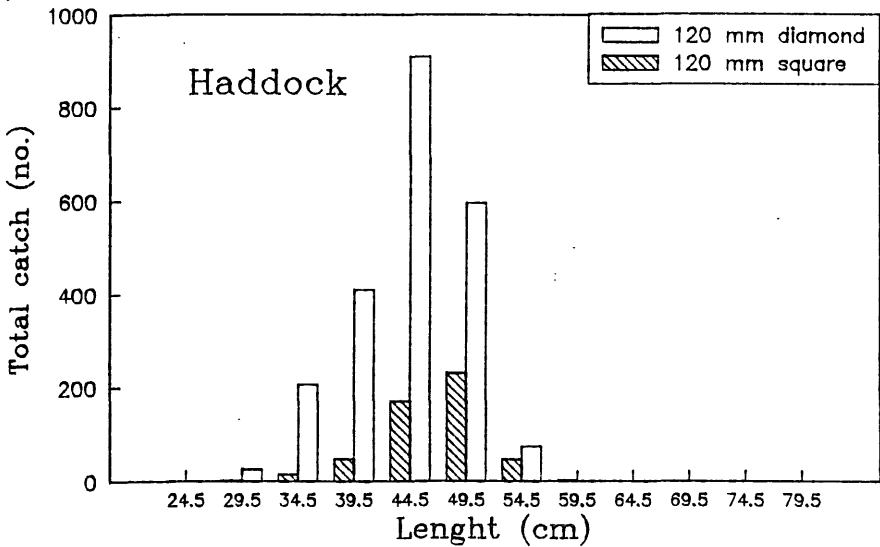
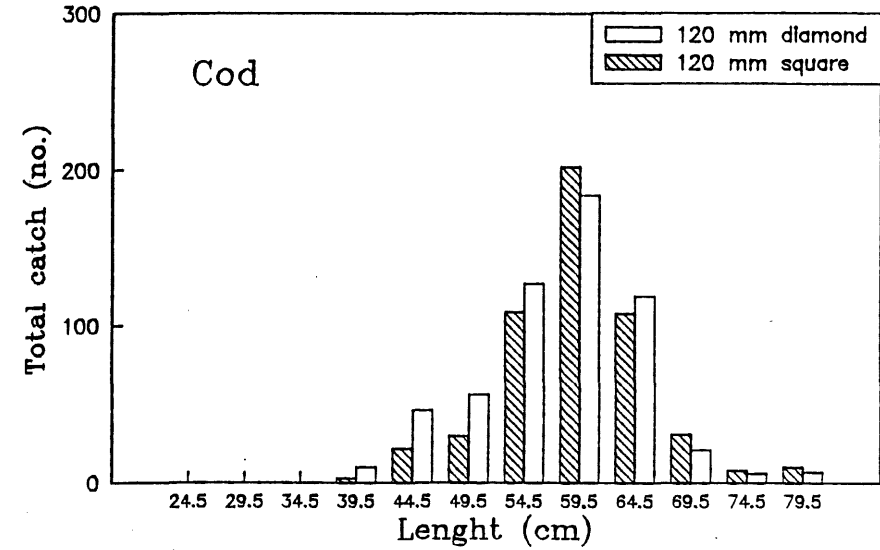


Figure 4. Catch distribution of cod and haddock in square and diamond mesh codend.

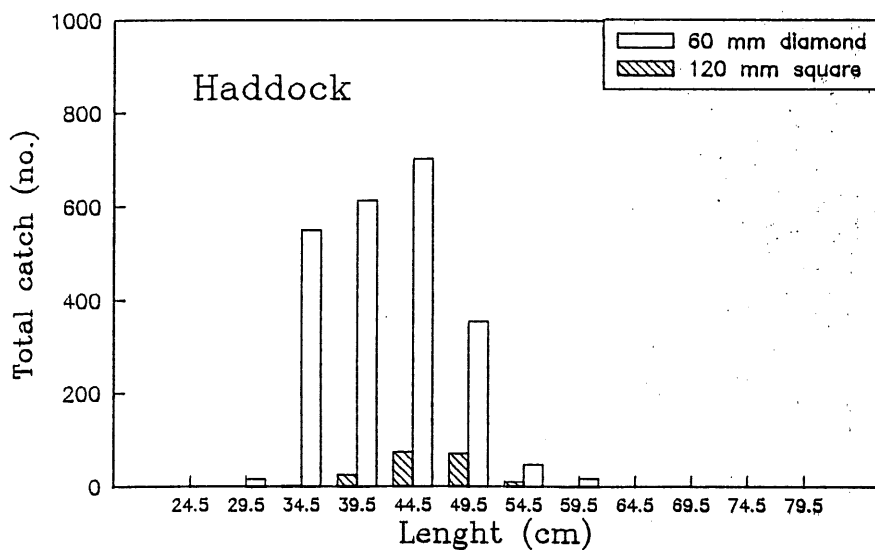
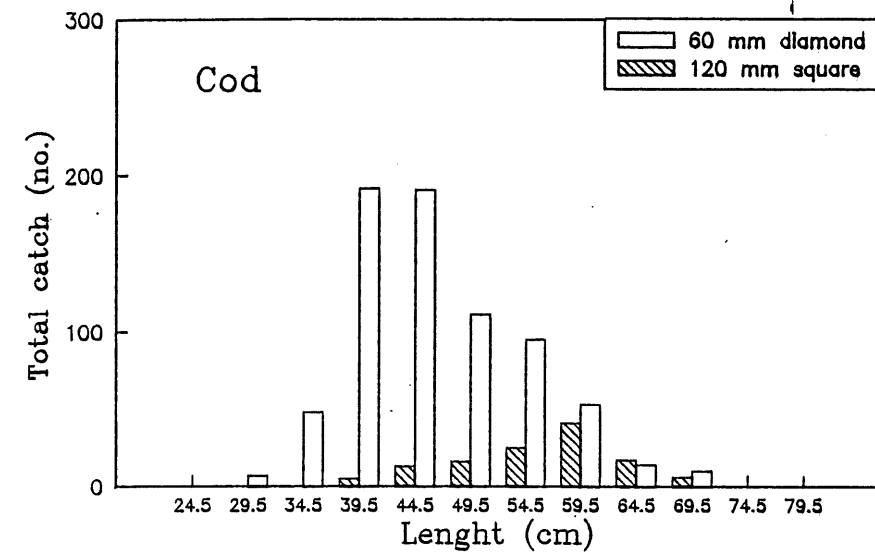


Figure 5. Catch distribution of cod and haddock in 120 mm square and 60 mm diamond mesh codend.

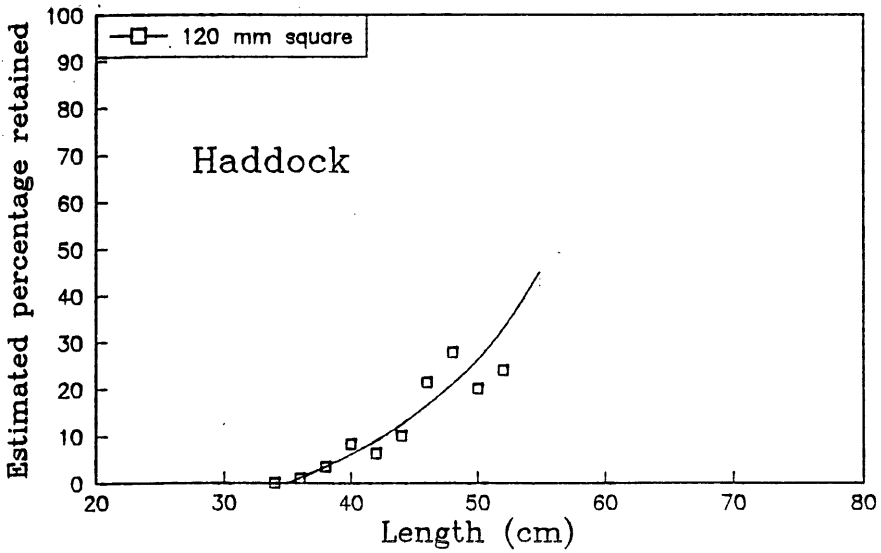
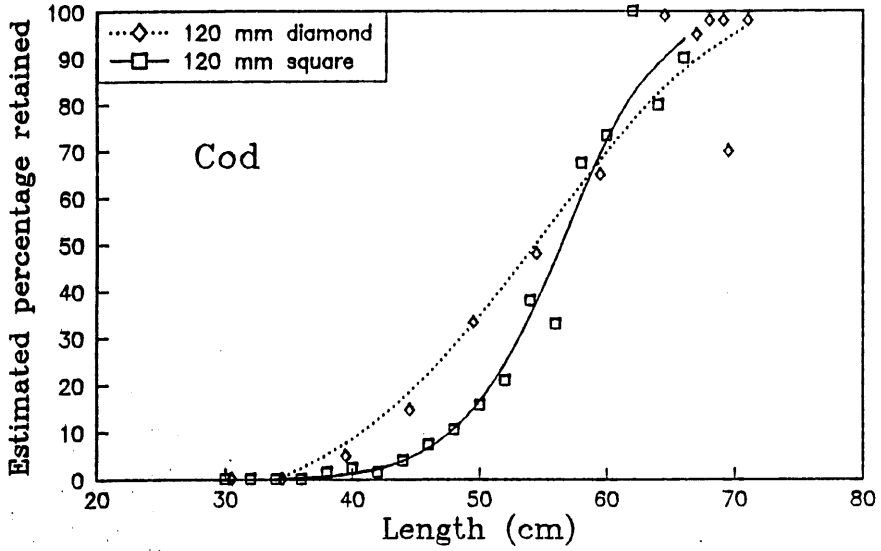


Figure 6. Selection curves for cod and haddock.

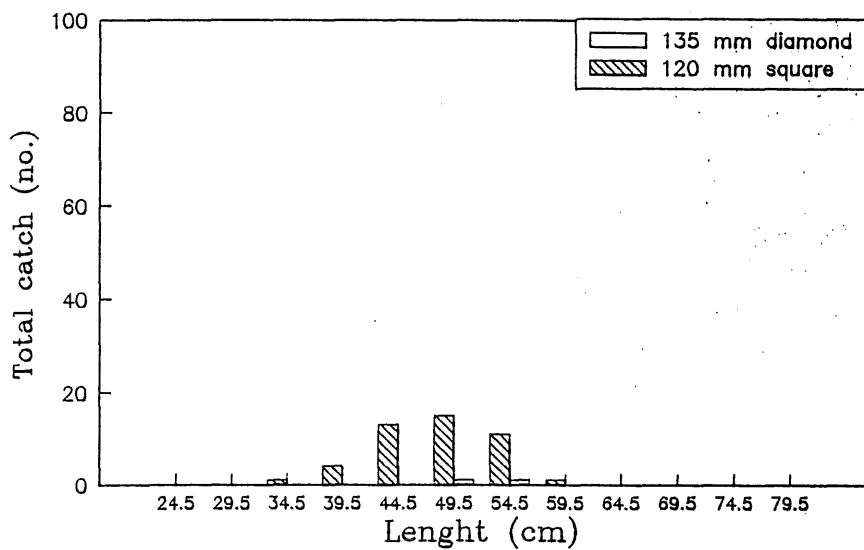
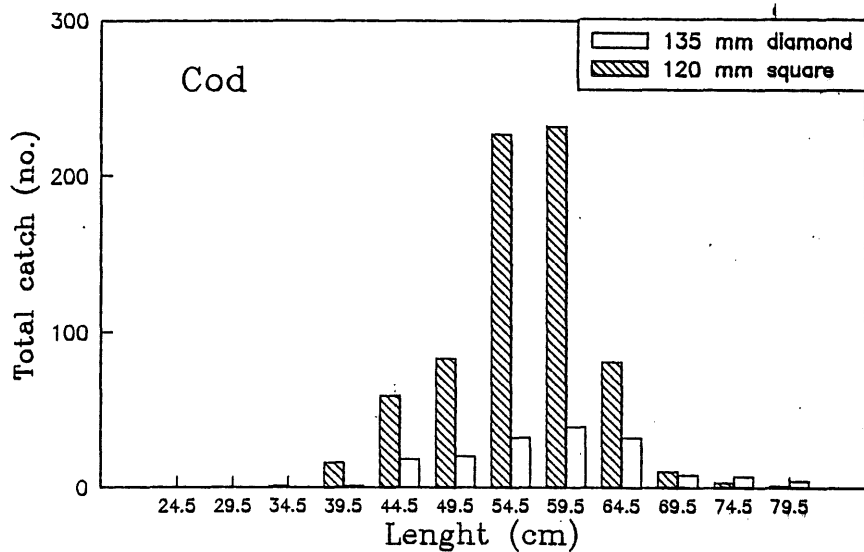


Figure 7. Catch distribution of cod and haddock in 135 mm diamond and 120 mm square mesh codend.

