International Council for the
Exploration of the Sea

Fish Capture Committe
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CODEND WITH SHORT LASTRIGDE ROPES TO IMPROVE SIZE SELECTIVITY IN FISH TRAWLS

By

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ABSTRACT

In recent years much effort has been conducted to improve the size selectivity in codends. Most of this effort has been concentrated on square mesh codends. In Norway this work has also included testing other mesh configurations. This report presents the results from testing of codends with two 12-15% shorter lastrigde ropes.

The roped codend maintained its selectivity properties better as the codend fills up with fish, and is thus less sensitive to the amount of catch than a conventional codend design. A codend of 135 mm meshes with lastrigde ropes has a selectivity comparable to a 150 mm conventional codend.

INTRODUCTION

An important key to resourse conservation is to avoid fishing mortality of juvenile and young fish. In the Barents Sea trawl fishery for cod and haddock such fishing mortality decreases the fishable stocks of these species considerably.

Mesh size regulations can only partly solve the small fish problem, as factors like catch rate, towing speed, etc., reduces the effect of mesh selectivity. To improve the selectivity of trawls, several methods have been introduced and tested in the recent years. In Norway selective properties in codends with long/short upper panels, codends with square meshes, and codends with mixed square/diamond meshes, were compared with standard codends (Isaksen and Valdemarsen 1986, Valdemarsen and Isaksen 1987). The general conclusion from these trials is that any codend construction that secures that the meshes just in front of the accumulated catch stay open when the codend fills up, will posess better selectivity than standard codends.

An obvious alternative to square mesh codends was to open the meshes in the upper and lower panel of a codend by means of lastridge ropes. Experiments with such codend design started with underwater observations in June 1988, and were continued in October-November 1988 by comparative fishing experiments.

MATERIAL AND METHODS

The observation trials were conducted with M/Tr "Anny Kræmer", 50,75 m l.o.a., with 2400 hp engine, on the Finnmarken coast off Northern Norway, in 50-100 m depth. Normal towing speed was 3,5-4,0 kn. The remote controlled underwater TV-vehicle (RCTV) Ocean Rover was used to observe codend performance and escapement behaviour from the different codend designs.

The 56 m l.o.a factory trawler M/Tr "Langvin" with 4000 hp engine was trial vessel when comparing size selectivity in codends with lastridge ropes 12-15 % shorter than the net with that of a standard codend, using the modified trouser trawl codend method. The experiments took place on various grounds in the Barents Sea and at the Bear Island, in water depths ranging from 150 to 350 m. Normal towing speed with this vessel was 4,5-5,5 kn, which is significant faster than "Anny Kræmer".

Both vessels used similar trawl designs, 2-panels of the Alfredo type, which is the most common trawl among larger Norwegian stern trawlers fishing codfish in northern waters.

Two codend designs, with and without lastridge ropes (24 mm dia. comb. rope), shortened 15 % are illustrated in Figure 1. In both codend the rear 2 m was without shortening of the ropes. Figure 2 illustrates how the standard codend and the experimental codend were attached to the extention piece (10 m), which again is divided into two equal parts by 60 mm vertical netting along its total length. The basic idea behind this technique is that equal numbers of fish will pass into each codend undependant of the drag in each of them. To study any side effect some hauls were taken with standard codends on both sides. During the experiments, the positions of the codends which were compared was shifted several times.

During the experimental period the 60 meshes codends were used i 25 hauls, where 5 had two standard codends, as the other 21 were comparisons between standard and codend with 12-15 % shorter lastridge ropes. 20 valid hauls were taken with the 90 mesh codends, of which 16 were comparisons between standard and roped codends.

4 valid hauls with small mesh inner cover (60 mm) in one of the standard codends were taken to establish a selection curve. A similar method was used in two hauls with lastridge ropes on the codend.

Representative samples of 4-500 fish from each codend were length measured in every haul. Mesh size was measured with ICES-gauch using 5 kg pressure.

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Observations

Codends with and without lastridge ropes were observed in two hauls. Fish density was poor in the experimental area, with maximum 150 kg catch after 4 hours towing.

The observations clearly demonstrated a difference in the performance of the two codend designs. The meshes of the roped codend were open along the whole length of the codend, as only 5-7 meshes just in front of the accumulated catch stayed open (< 50%) in the standard codend. The netting of the roped codend was slack, resulting in an undulating movement of the webbing. This movement of the webbing also seemed to stimulate escape behaviour of the fish.

Comparative fishing

Catch (cod) in both equal codends from 4 hauls with the 60 mesh codend and 3 hauls with the longer (90 meshes) codend is given in Table 1. Only small quantities of other species were caught, and are not included.

Length distribution of cod caught in standard and "roped" codends for the two codend types are shown in Figure 3 and 4, respectively. Selection curves for standard and "roped" codends based on the paralell codend method is illustrated in Figure 5. The difference in length distribution estimated from comparisons between standard and "roped" 60 mesh codend, is basis for the selection curve (3) for roped codend illustrated on the same figure. Selection factors of 3,9 and 4,3 were estimated for standard and roped codend, respectively. This means that adding 12-15 % shorter lastridge ropes to a 135 mm codend correspond to 149 mm mesh size with respect to the 50 % length. Corresponding selectivity intervalls (l_{75}-l_{25}) were 15,7 and 11,9 cm.

To evaluate any effect of catch on the selectivity, the difference in mean length in standard and roped codend is plotted against catch in Figure 6. For smaller catches the data is not consistent, as when catches increases above 1500 kg this difference increases, indicating that the selectivity is less effected of the catch when using lastridge ropes.

To compare the selectivity of roped codends with that of square mesh codends, difference in catch in 5 cm length groups is plotted on Figure 7. From this figure it is clear that reduction of smaller cod is comparable in roped and square mesh codends.

DISCUSSION

Lastridge ropes are commonly used in trawl bellies aimed to reduce the tention in the netting when hauling. In the 60's and 70 s short lastridge ropes were also commonly used in codends in fisheries for cod, haddock and saithe. But when fishermen found that such roped codends reduced the catches, they stopped using them, with poorer selectivity as a result. Beside the positive effect such lastridge ropes have on selectivity, they also increase the codend strength. Codends made from thinner netting can be used, and thus reduce gear cost.

The comparisons between catches in the two standard codends demonstrate some variation between the two sides. 7 out of 8 hauls resulted in larger catch in the starboard codend. When comparing size distribution in codends with lastridge ropes with that of standard codends the shifting of side should compensate for such systematic differences. The difference observed between the two sides is, however, not yet well understood.

That the 90 mesh codend with lastridge ropes was less effective to reduce catch of smaller sized cod than the 60 mesh codend is neither fully understood as net material, twine dimension and shortening of the lastridge ropes were the same in both codends. The major difference between the codends was that the longest one was equipped with a big chafer of polyetylene which was more boyant, and thus could turn the codend upside down when fishing. This has been observed in earlier experiments when using underwater TV-vehicle. When the chafer covers the top of the codend, escapement is very much reduced.

Compared to square mesh codends, use of lastridge ropes in ordinary codends means low investment cost, but with similar gain in selectivity. Important to consider is the attachment of lastridge ropes to the codend. Ropes that are strong and stable is a must. Combination ropes seem to have such advantages, as the protecting rope prevents slippage, and the wire core make it quite stable when loaded.

Practical use should cause minor problems. Obligatory use of lastridge ropes will also be easy to check and enforce. Measurements of the rope length and the knot to knot mesh size, together with counting the meshes, are the nessesary controll parameters.

Whether codend with 12-15% shorter lastridge rope should be regarded as a solution to the selectivity problems in trawl fishing depends on the alternatives. Compared to square mesh codends our results seem convincing. On the other hand, a selectivity range of 12-15 cm is not satisfactory, and therefore other methods based on escapement through a system of grids in front of the codend should be considered. Results from the testing of such devices in Norway in 1990 are encouraging.

REFERENCES

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Valdemarsen, J.W. and B. Isaksen, 1987. Selectivity of codends with different mesh configurations. *ICES FTFB W.G. meeting in Hamburg, 1987.*

Table 1. Catch composition of cod in numbers in two parallel standard codends with 60 and 90 mm length.

Codend	Starboard	Port
60	910	1263
60	1856	2119
60	355	406
60	901	406
90	454	502
90	260	285
90	93	73

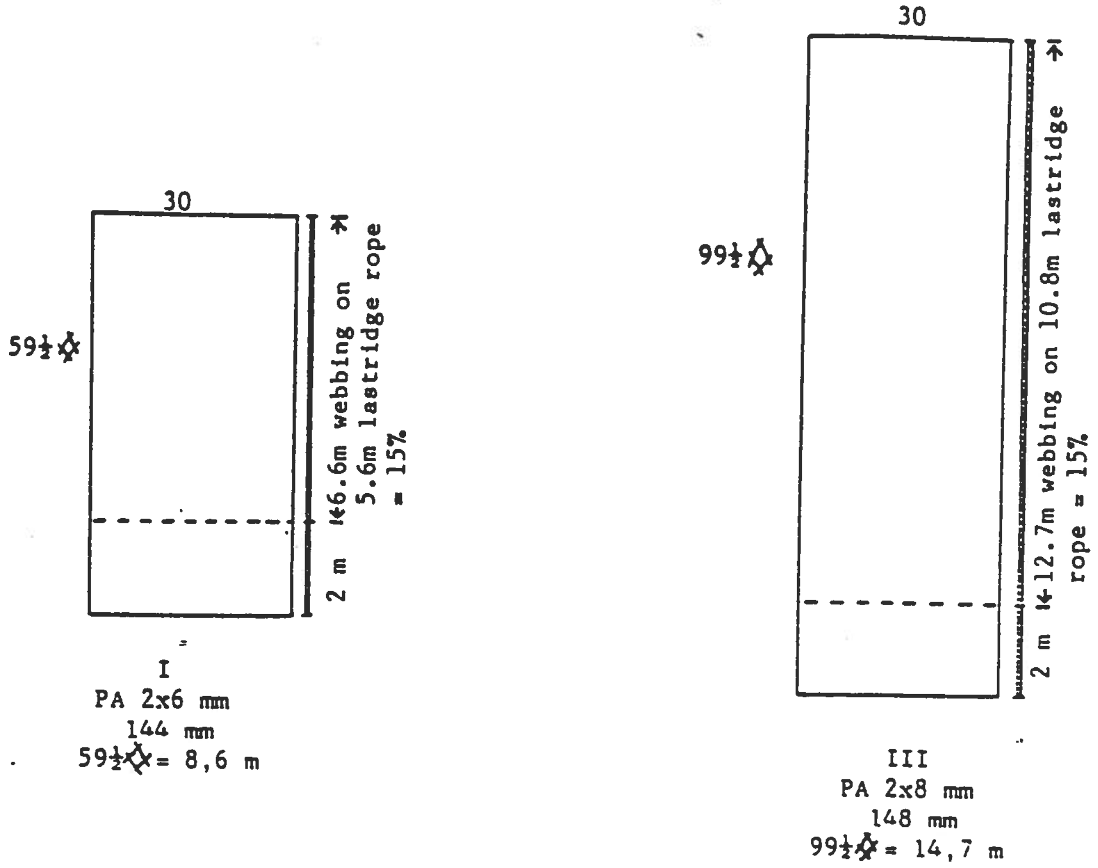

Figure 1. 60 and 90 mesh codends with lastridge rope used in the experiments.

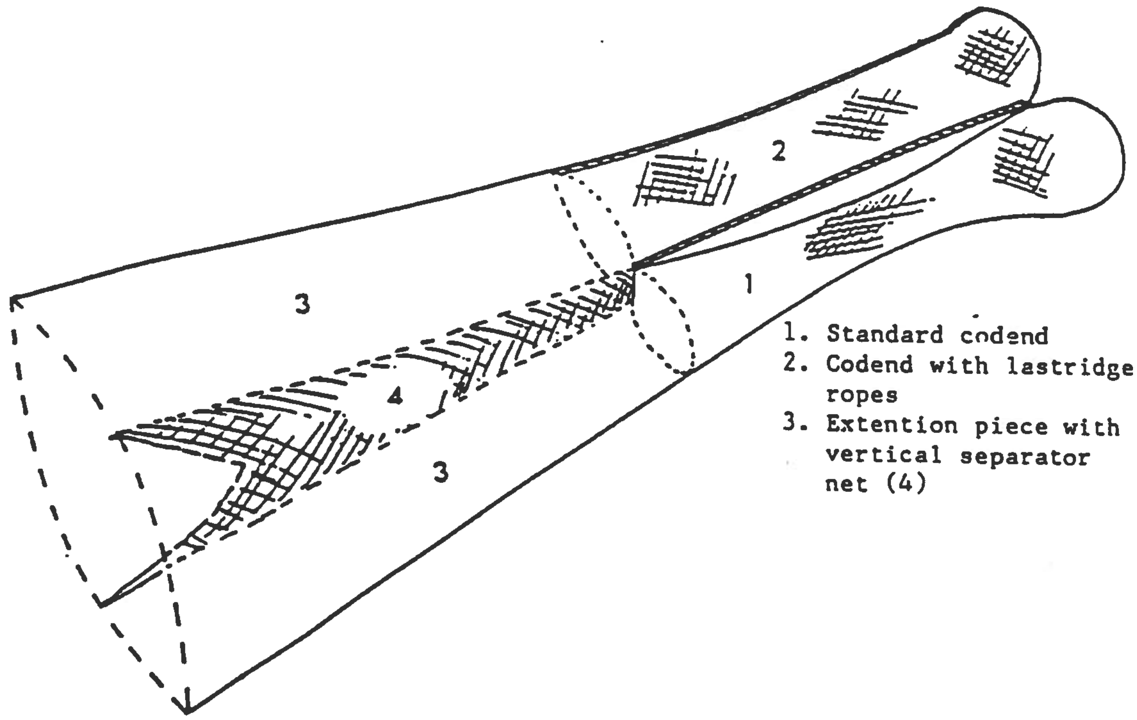

Figure 2. Illustration of experimental codends and extension piece with 10 m vertical separating net.

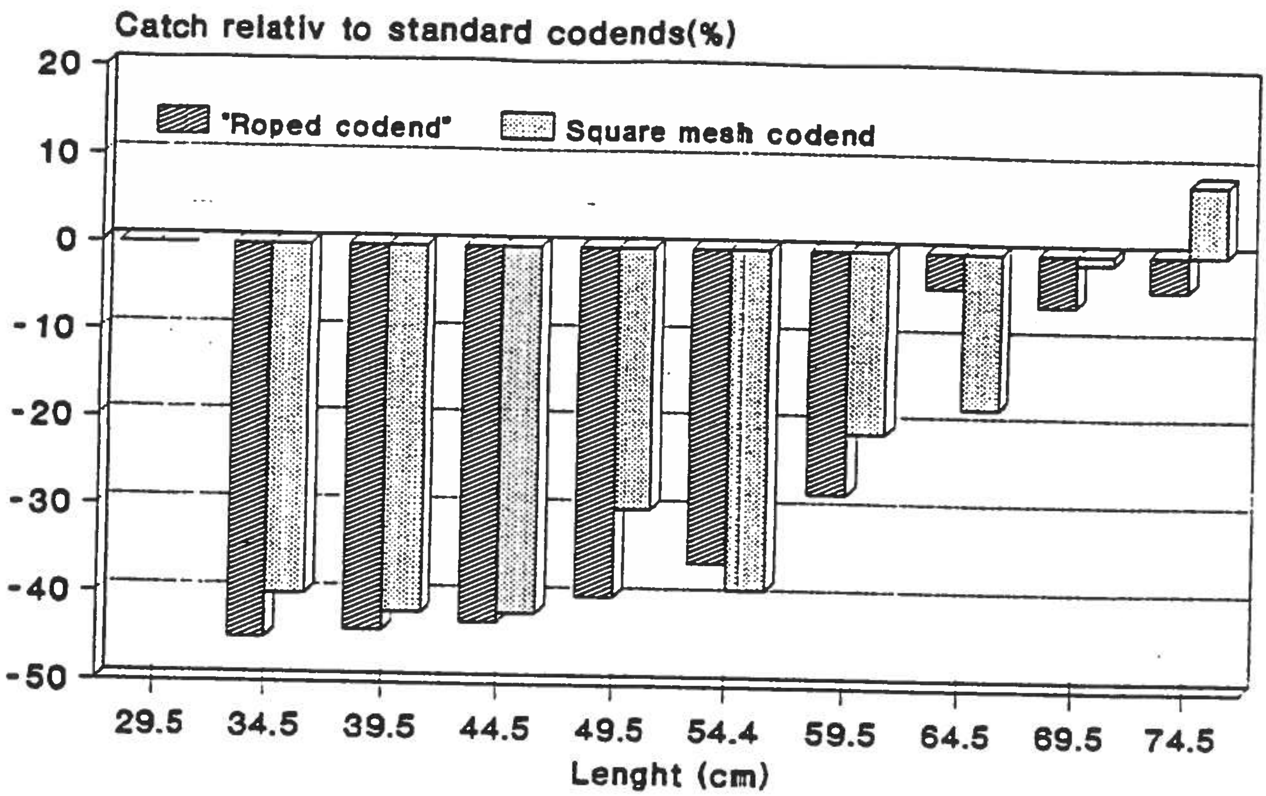

Figure 7. Comparison of length/catch distribution of cod caught in roped/ square mesh codend (zero line = catch in standard codend).

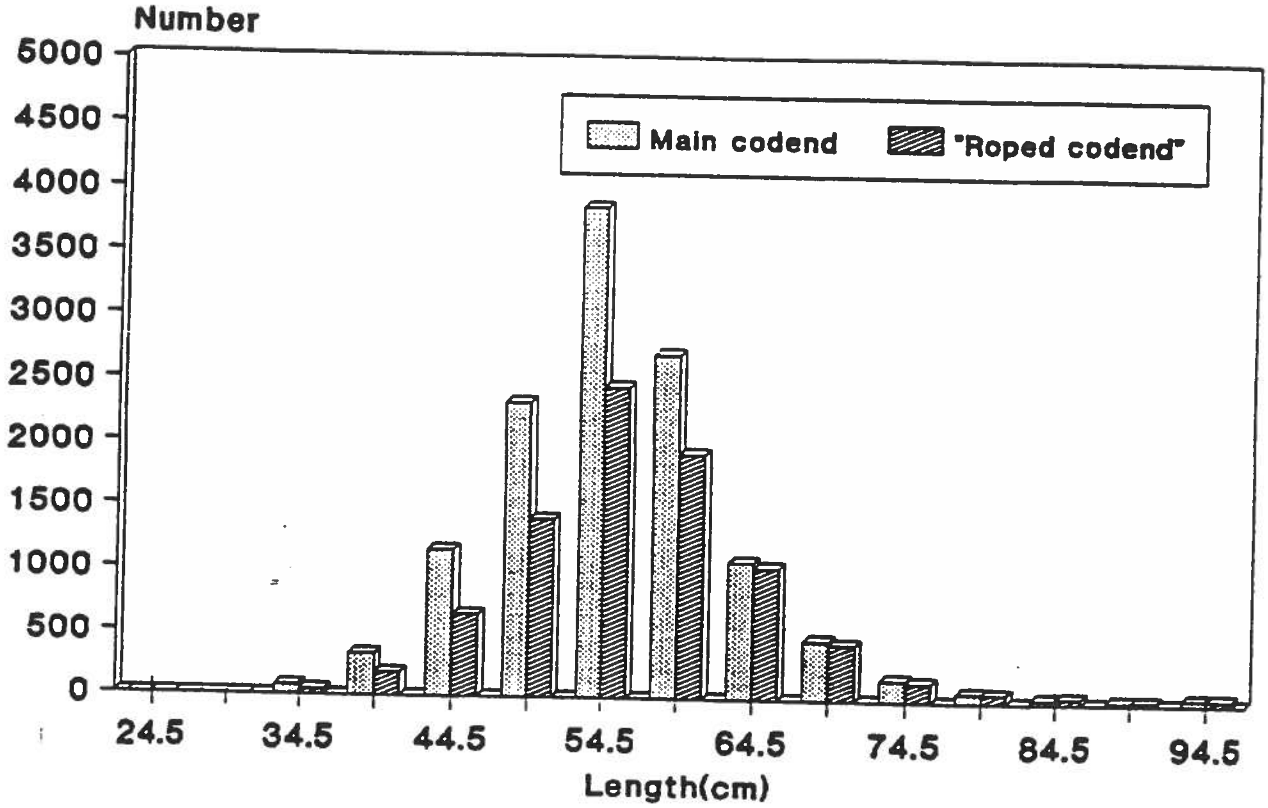

Figure 3. Length distribution of cod. Standard codends (59 1/2✧ - 135 mm) with and without short lastridge ropes (12-15%)

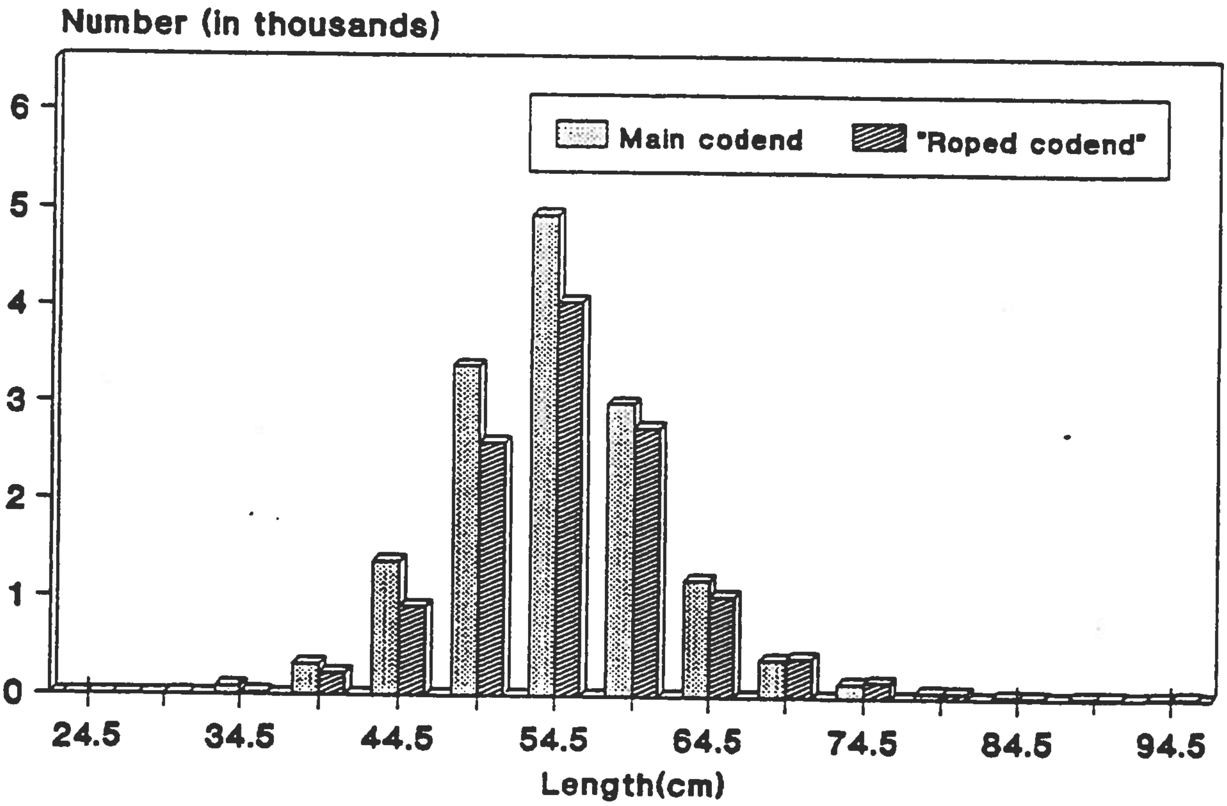

Figure 4. Length distribution of cod. Long codends (99 1/2✧ - 135 mm) with and without short lastridge ropes (15%).

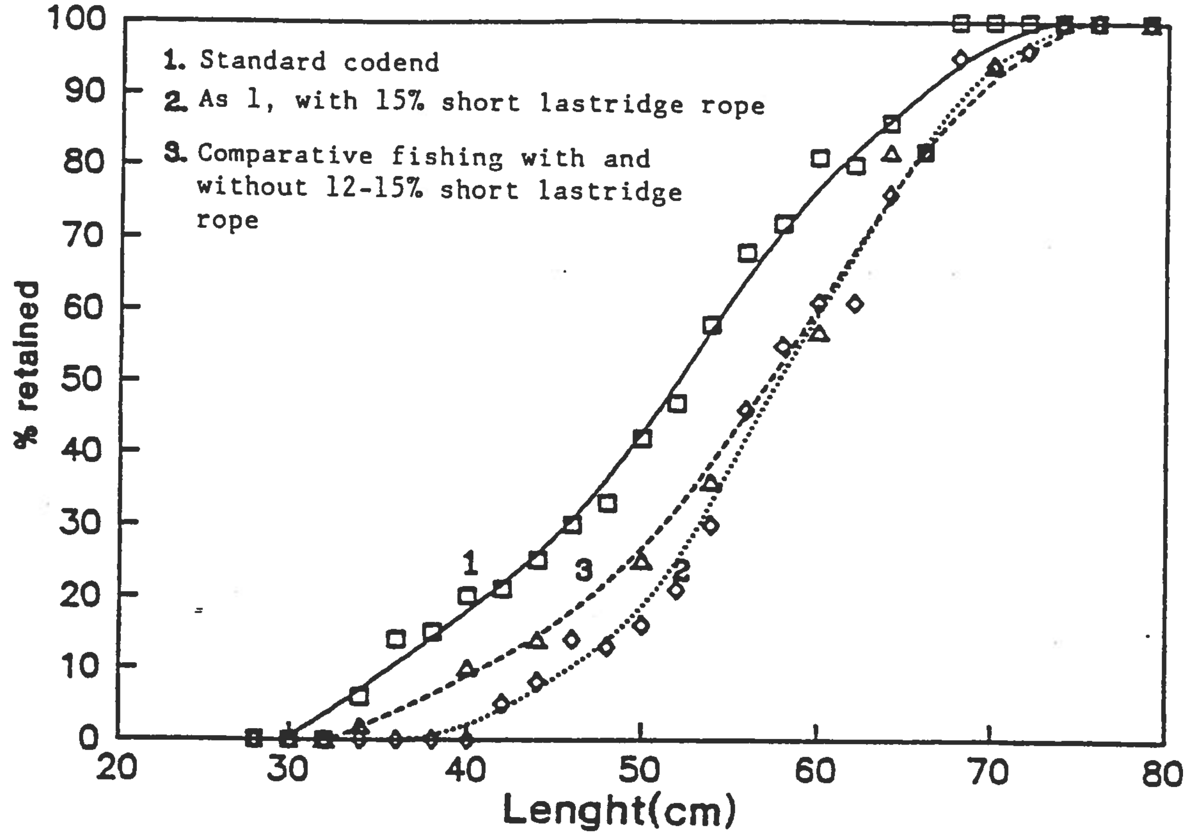

Figure 5. Selection curves for cod in 135 mm codends with and without lastridge ropes.

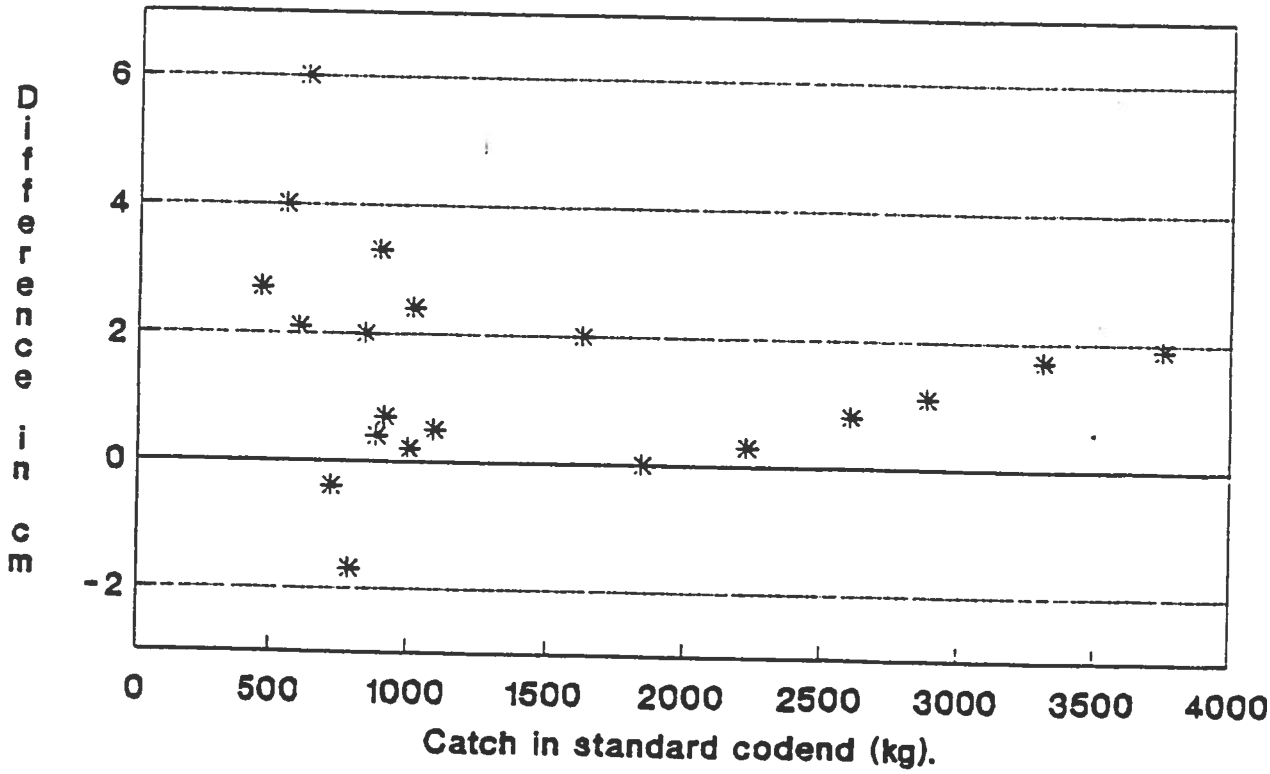

Figure 6. Difference in mean length of cod in codends with and without short lastridge ropes (12-15%) as a function of catch.

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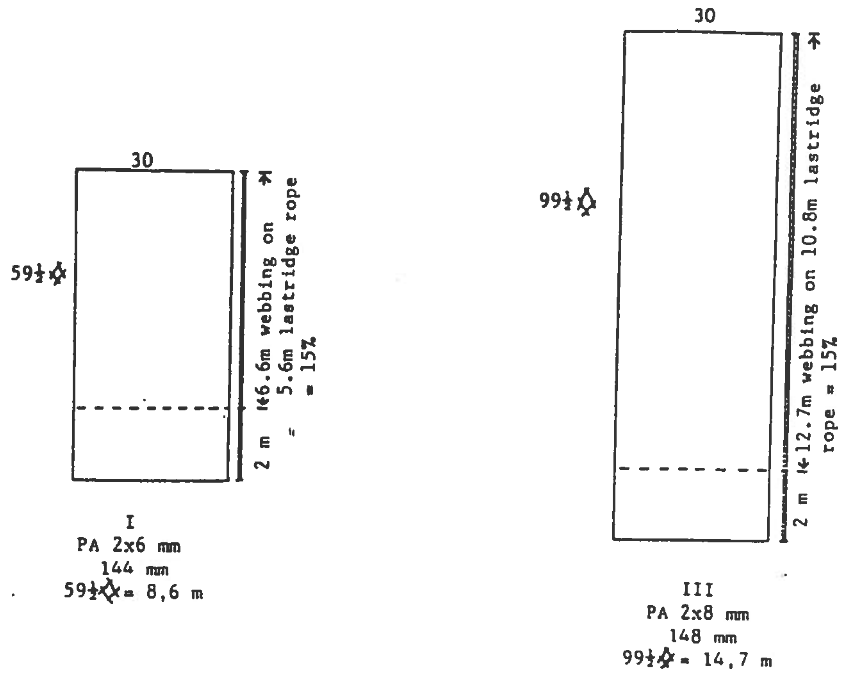

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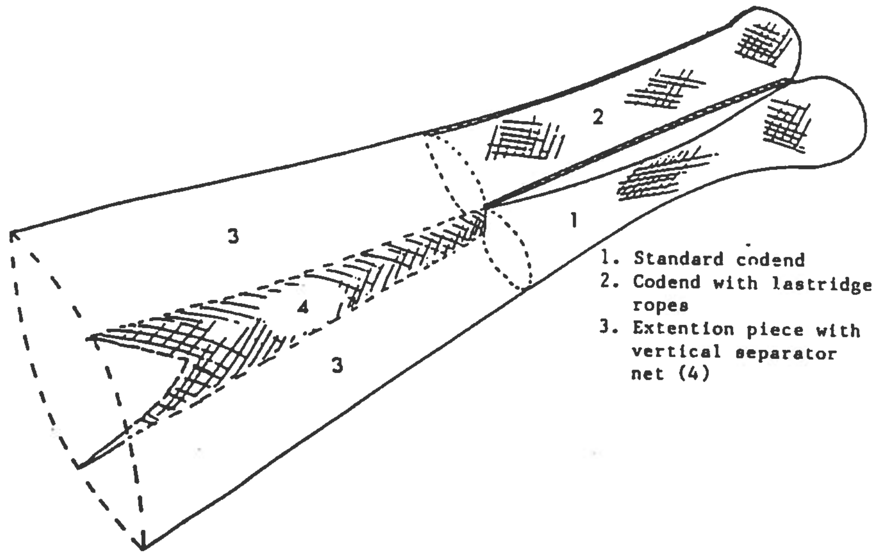

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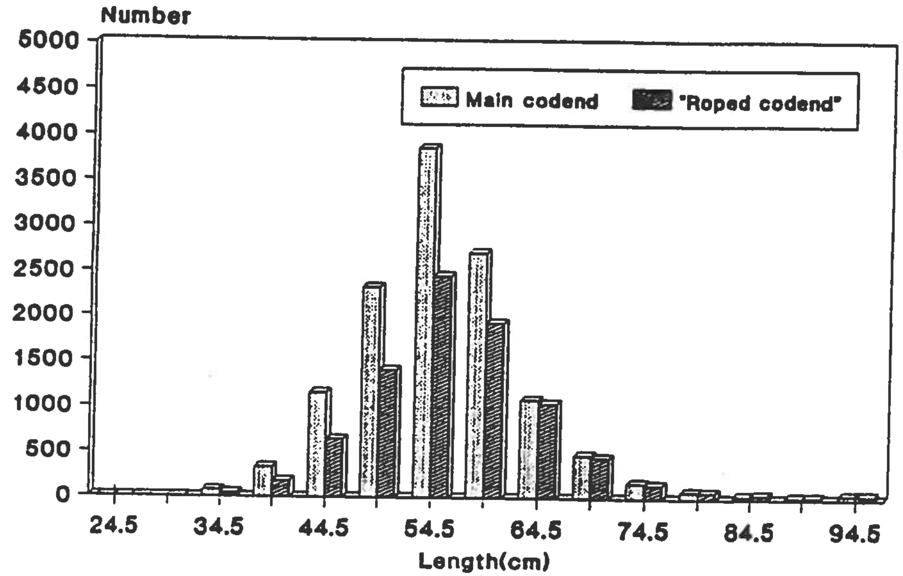

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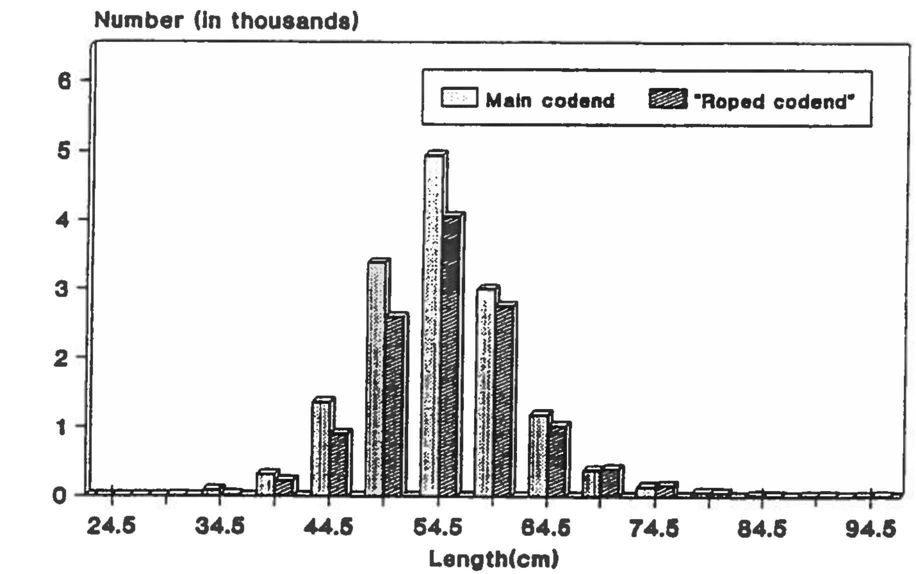

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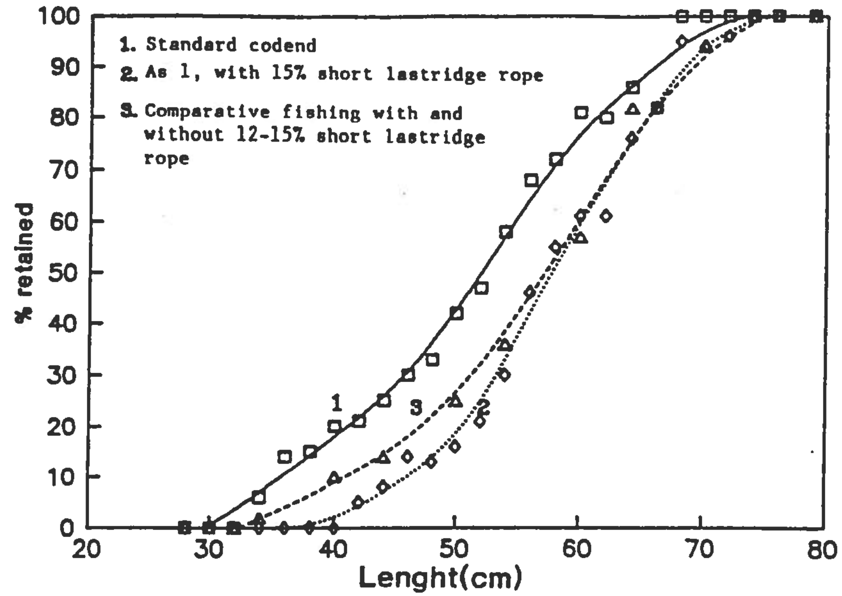

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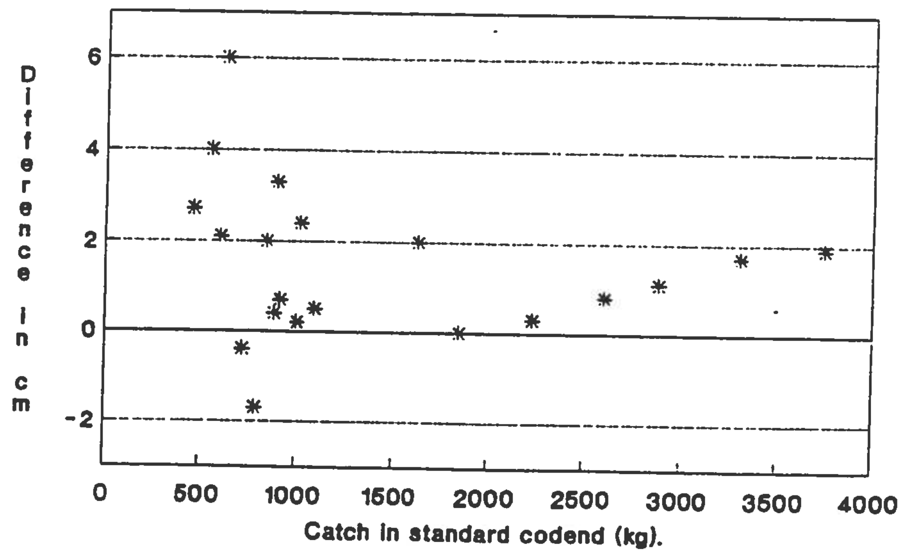

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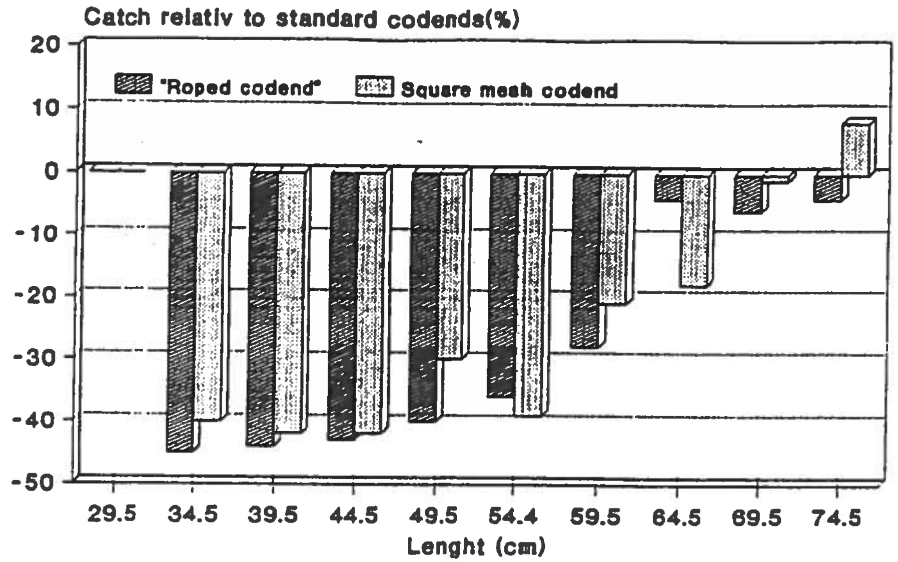

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