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Selection experiments with a large-meshed topside chafer

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At the 1966 Annual Meeting, the results of experiments on the effect of large-meshed topside chafers, as designed in Poland, were presented and discussed (Strzyzewski, 1966). The Standing Committee on Research and Statistics informed the Commission that, from the scientific evidence available, it seems that the Polish type of chafer, having a mesh size at least twice as large as the codend mesh size and a width at least as great as that of the codend, has a negligible effect on codend selectivity. The Committee, furthermore, recommended "that selectivity experiments with topside chafers of the Polish type should be continued" (Rec.17, Redbook 1966, Part I, p.21).

Following this recommendation, some appropriate experiments were conducted during the 100th cruise of FRV *Anton Dohrn* in Southwest Greenland waters. Fishing was carried out in October 1966 between Cape Farvel and Banana Bank, but suitable sizes of cod, although in rather low abundance, were only found in the vicinity of Cape Thorvaldsen (ICNAF Div.1F).

During the trials a double braided polyamide codend of 118 mm mesh size, 54 meshes long and 48 meshes wide, was used. To the upper panel of this codend was attached a double braided polyamide chafer with meshes about twice as large as those of the codend (224 mm). The chafer, having approximately the same length and width as the codend, was carefully laced knot by knot along the selvedges and along the second and last but one row of codend knots. The rigging of the chafer is shown schematically in Fig. 1.

The first three successful hauls of the experiments were carried out with a chafer having a length of 26 1/2 meshes and a width of 24 meshes. This chafer proved to be a bit too short since, whenever the catch was hauled on deck, the weight of the catch was observed to strain the chafer whereas the upper panel of the codend was hanging loosely. As a result the chafer was lengthened in the rear by one mesh and the rear edge again fixed to the last but one row of codend knots. This lengthening was obviously sufficient; during the next hauling operations the strain of the catch seemed to be distributed equally on the chafer and the upper codend panel. Four successful hauls were made with the lenghtened chafer. Then three hauls were carried out without chafer in order to find out whether the large-meshed codend protection had had any effect on the selectivity.

In the course of the experiments, a total of 5,048 cod were caught in the codend and 3,923 cod in the cover. The total length of each fish was measured to the nearest centimeter. Fig. 2 shows the relative length composition of the total cod catch in 3 cm groups. Most abundant were cod between 34 and 61 cm in length. Fish of more than 70 cm were very sparsely represented.

The material collected with the chafered codend was rather scanty. The total catches made with the chafer, as rigged initially, ranged between 9 1/2 and 11 1/2 baskets (av. 10 3/4 baskets) and those with the lengthened chafer between 9 3/4 and 24 1/2 baskets (av. 15 2/3 baskets) per 1 1/2 hours' fishing time. The catches obtained from the unchafered codend were larger; these varied between 21 1/2 and 46 1/2 baskets (av. 36 baskets) per 1 3/4 hours' fishing time.

All the catches were of uniform composition. Cod were always clearly predominant; other fish (mainly wolffishes) and invertebrates (holothurians) were caught in small quantities.

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The details of the experiments mentioned so far and further interesting particulars are summarized in the attached compilation of selection data. The selection curves, which are based on smoothed percentages of retained fish (three-point moving averages), are shown in Fig. 3. Owing to the scanty material some of the selection factors and selection ranges could not be determined precisely. In the tables and figures these unreliable data are designated by question marks.

The results obtained from the experiments were, at first glance, rather unexpected. The presence of the large-meshed topside chafer did not handicap the process of codend mesh selection; quite the contrary, the tows with chafer gave markedly higher selection factors (4.08 and 3.91) than those without chafer (3.70).

It is thought reasonable to connect these findings with the dimensions of the chafer used. The chafer, as rigged initially (26 1/2 meshes long and 24 meshes wide), was certainly somewhat shorter than the chafered part of the codend. Thus, during fishing, the pulling forces were only acting on the chafer. This implies that the upper panel of the codend was not under strain, and that again leads to the assumption that cod escaping from the codend were enabled to adapt the mesh shape to their body shape.

This assumption is supported by the fact that the ratio

$$\frac{\text{maximum body girth at 50\% ret. length}}{\text{av. internal perimeter of codend mesh}} = \frac{231 \text{ mm}}{240 \text{ mm}}$$

is equal to 0.96. That is a very high value which could never be obtained if the meshes had been in a rigid condition.

The numerator of the above fraction is derived from the regression equation $G = 0.49\ L - 0.49$ cm, which describes the relationship between maximum body girth (G) and total length (L) as found for cod off Cape Thorvaldsen in October 1966 (Bohl, 1967). The denominator corresponds to twice the average codend mesh size (2 x 118 mm) plus twice the thickness of the jaws of the ICES gauge (2 x 2 mm).

The selection factor for the codend with the lengthened chafer (3.91) was markedly lower, but still unusually high. It must, therefore, be assumed that even this chafer, contrary to visual impression, was somewhat shorter than the chafered part of the codend.

The results of the Polish experiments on the effect of large-meshed topside chafers (Strzyzewski, 1966) have been confirmed meanwhile by appropriate English and Norwegian trials (Blacker, 1966; Hylen, 1966; Olsen, 1966). All these tests have shown that chafers with a mesh size about twice as large as the codend mesh size do not impair the codend selectivity appreciably. The recent German investigations, however, reveal another fact, namely that large-meshed chafers of the above specifications improve the selectivity.

References

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Hylen, A. 1966. Selectivity experiments with a large-meshed topside chafer. ICES, Comparative Fishing Committee, C.M. 1966/F: 13.

Olsen, St. 1966. Experiments with a topside chafer of double mesh-size. ICES, Comparative Fishing Committee, C.M. 1966/F: 1.

Strzyzewski, W. 1966. The effect of the use of chafing gear on selection factor. Annu. Meet. int. Comm. Northw. Atlant. Fish., Res.Doc. 66/21, Ser. No.1620.

Compilation of selection data for grouned hauls

	With chafer 26 1/2 x 24 meshes	With chafer 27 1/2 x 24 meshes	Without chafer
Ship		FRV ANTON DOHRN, 62.3 m length o.a., 850 h.p.e.	
Gear		German standard roundfish bottom trawl, 140' groundrope	
Date	15.10.1966	16./17.10.1966	17./18.10.1966
Greenwich mean time	15.25 - 19.40	08.45 - 16.45	16.45 - 23.50
Locality		Off Cape Thorvaldsen ($60^{\circ}20'$N, $47^{\circ}23'$W)	
Depth range (m)	110 - 120	110 - 120	110 - 135
Species studied		Cod	
Experimental method		Topside cover	
Cover		ICES specification	
Material		Nylon continuous	
Runnage (m/kg)		1200	
Tex		23 tex x 11 x 3	
Braiding		Single twine	
Twine construction		Twisted	
Mesh size (mm)		60	
Codend and chafer material		PERLON continuous	
Runnage (m/kg)		200	
R..tex		R 5000 tex	
Braiding		Double twine	
Twine construction		Twisted	
Number of hauls	3	4	3
Av. duration of haul (min)	90	90	105
Av. towing speed through water (kn)	4.0	4.0	4.0
Type of mesh gauge		ICES gauge - 4 kg pressure	
Codend mesh size; mean ± s.e. (mm)	118.0 ± 0.2	118.2 ± 0.2	118.0 ± 0.3
Range (mm)	110 - 125	109 - 126	108 - 126
No. of measurements	159 (= 3 x 53)	212 (= 4 x 53)	159 (= 3 x 53)
Av. chafer mesh size (mm)	224	224	224

<u>Compilation of selection data for grouped hauls</u> (continued)

			With chafer		Without chafer
			26 1/2 x 24 meshes	27 1/2 x 24 meshes	
25 - 75% selection range (cm)			12.2 ?	9.5 ?	7.3
No.of cod in selection range	codend		160 ?	313 ?	612
	cover		293 ?	418 ?	693
Total no. of cod	codend		612	1386	3050
	cover		816	1054	2053
Av.quantity of cod	codend	(baskets[1])	4 1/2 (= 308 kg)	8 1/2 (= 582 kg)	21 3/4 (= 1490 kg)
	cover	(baskets[1])	2 1/2 (= 171 kg)	2 1/2 (= 171 kg)	6 (= 411 kg)
other fish[2])	codend	(baskets)	2 3/4	3	4 1/3
	cover	(baskets)	+	+	+
invertebrates[3])	codend	(baskets	3/4	1	1 1/2
	cover	(baskets)	1/4	2/3	2 1/3
Range of tot.catch/tow	codend	(baskets)	7 1/2 - 9 3/4	7 1/4 - 20 1/2	18 - 33
	cover	(baskets)	2 - 4	2 1/2 - 4	3 2/3 - 11 1/2
50% retention length (mm)			481 ?	462	436
Selection factor			4.08 ?	3.91	3.70

1) Average net weight of one basket filled with cod : 68.5 kg.

2) <u>Anarhichas lupus</u>, <u>A.minor</u>, <u>A.denticulatus</u> and small quantities of <u>Hippoglossoides platessoides</u>, <u>Reinhardtius hippoglossoides</u>, <u>Hippoglossus hippoglossus</u>, <u>Cyclopterus lumpus</u>, <u>Raja spp</u>. and <u>Sebastes</u>.

3) Holothurians.

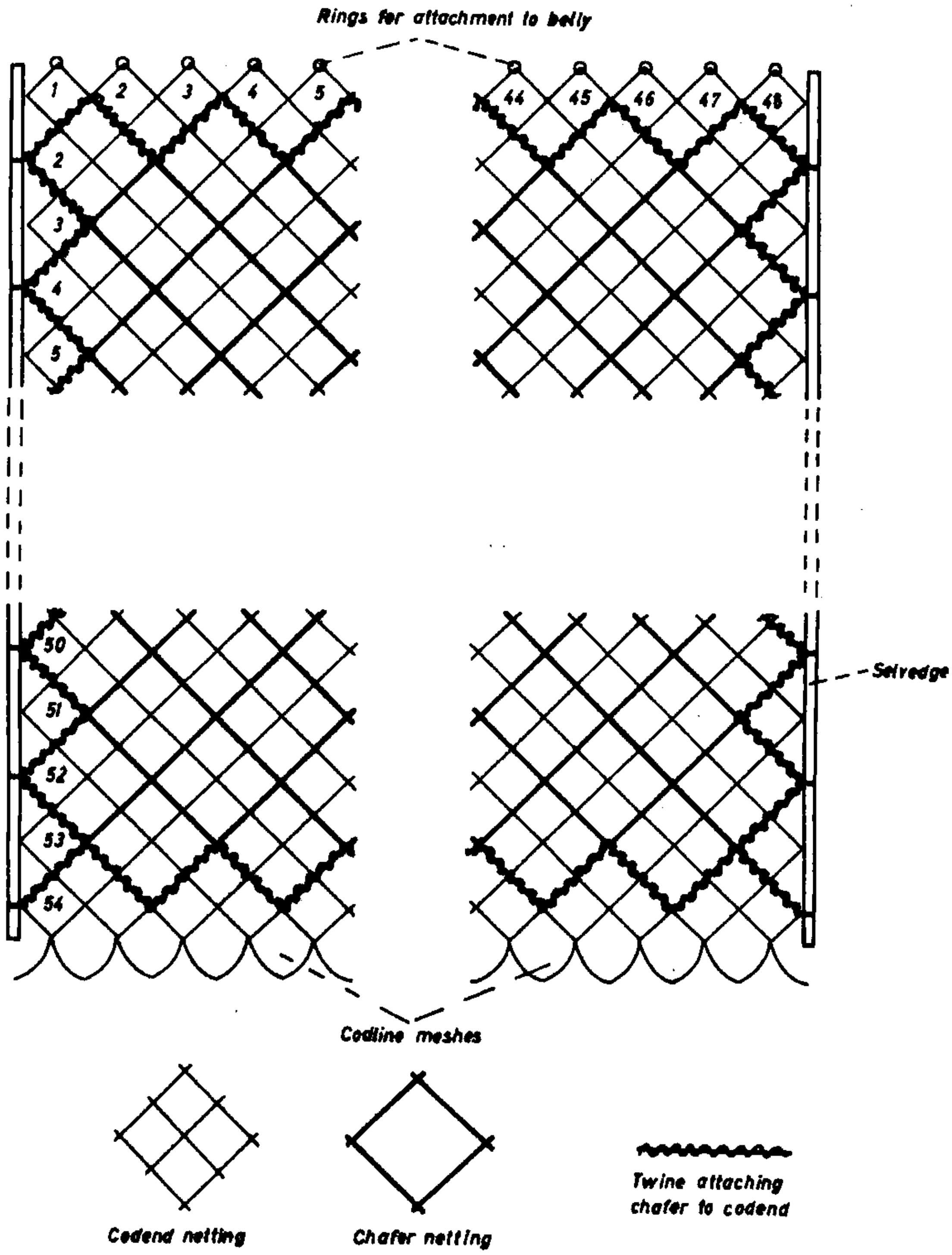


Fig.1 : Rigging of the chafer.

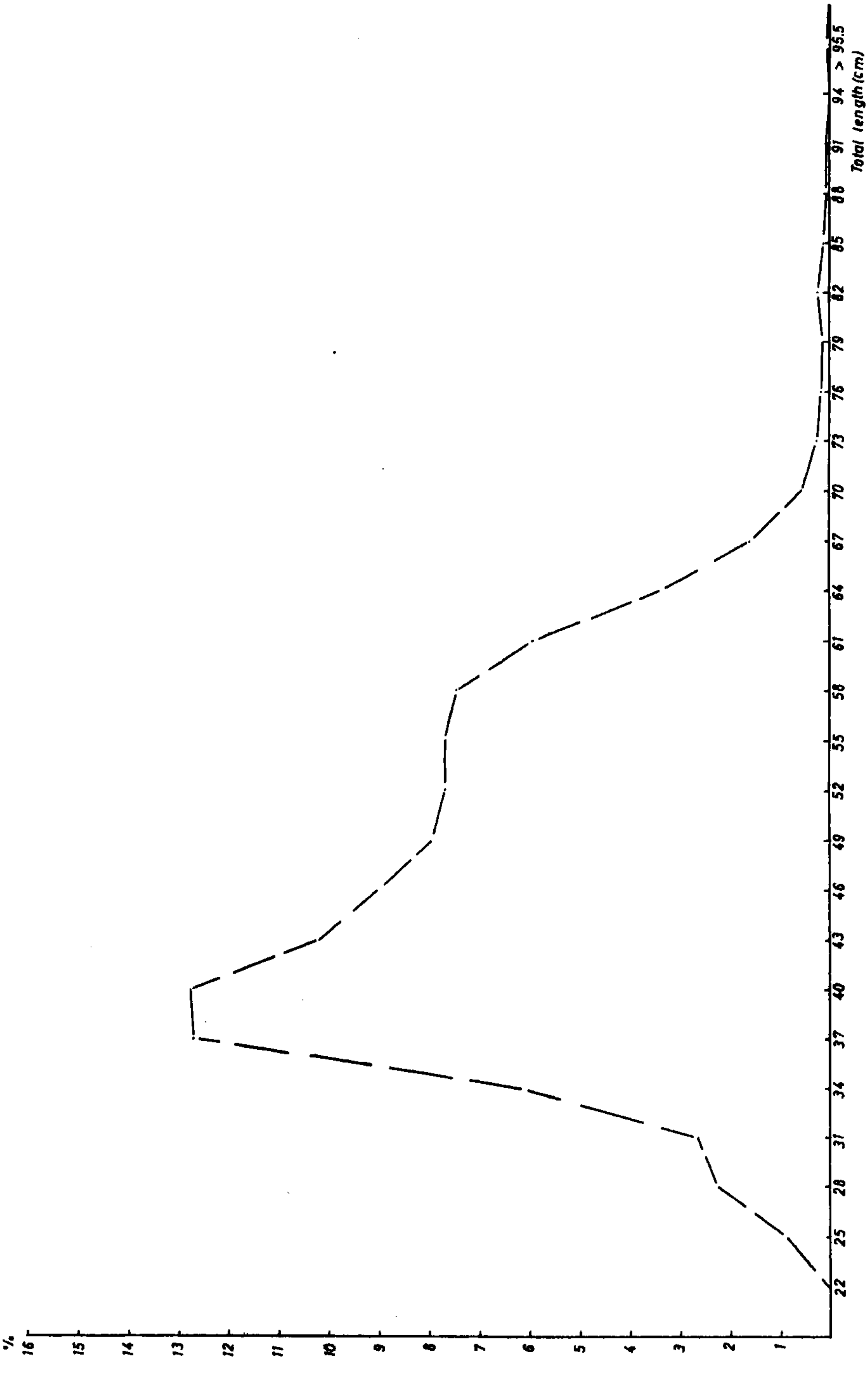
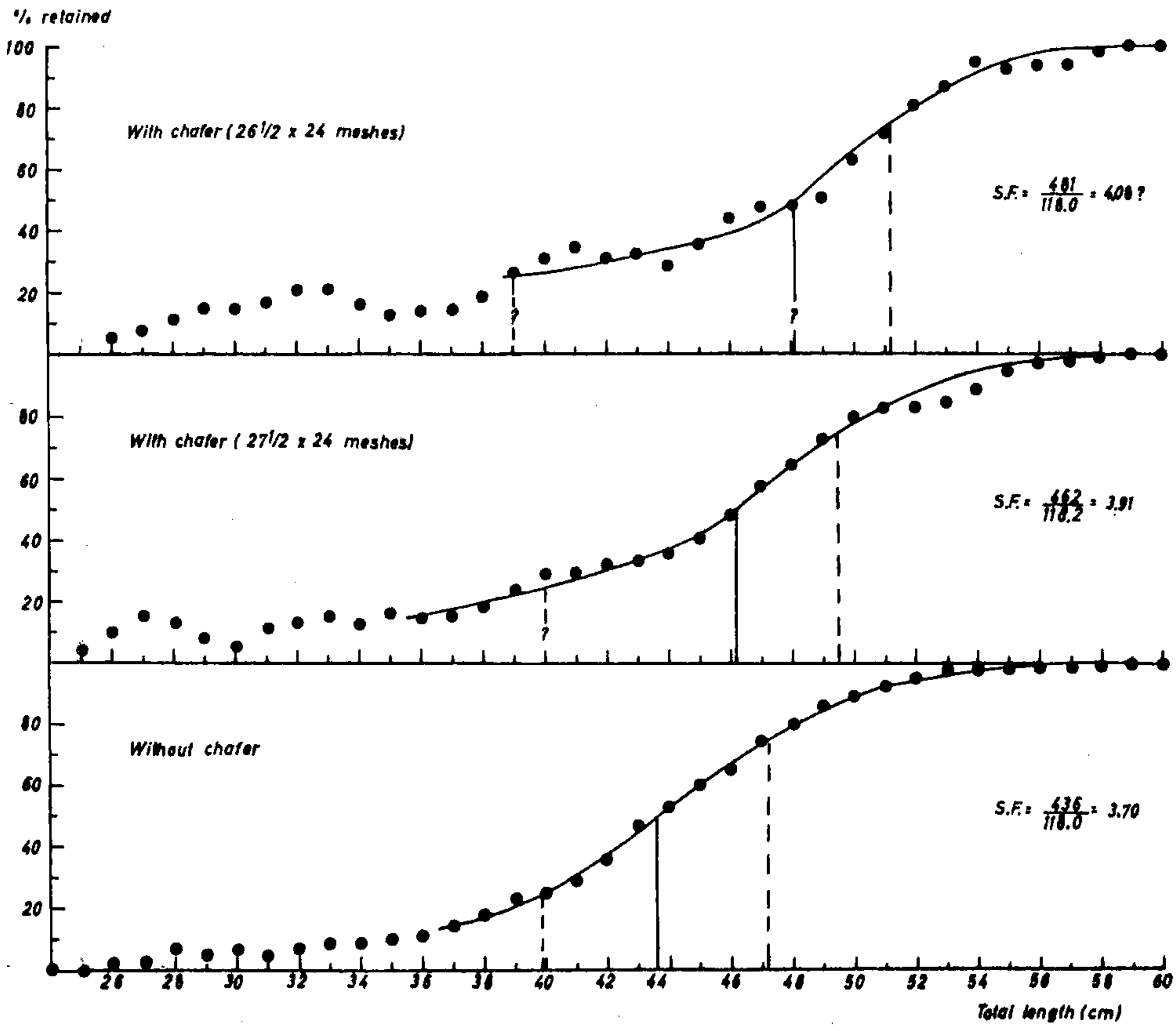


Fig. 2.: Relative length composition of cod (codend + cover) in 3-cm-groups

10 hauls, n = 8 971



<u>Fig.3: Cod selection curves for combined hauls.</u>