

ANNUAL MEETING - JUNE 1964The selectivity of a flap-type topside chafer*

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1. Introduction

A form of topside chafer used by some British factory trawlers consists of a series of flaps of netting attached at intervals across the cod-end, in just the same way as netting or other material is attached to the lower side of the cod-end to prevent wear from contact with the sea-bed. This paper reports on the results of tests of the selectivity of cod-ends fitted with this kind of chafer. The trials were carried out during a cruise of R.V. ERNEST HOLT to West Spitsbergen in August, 1959.

2. Method

The chafing pieces were taken from used cod-ends. They were laced, along their upper edge only, across the full width of the top side of the cod-end from selvedge to selvedge. Fig. 1 shows the arrangement in diagrammatic form. Each piece was about ten meshes deep and was attached to the cod-end at intervals of about seven meshes, so that each overlapped about one-third of the adjacent chafer below. Four such chafing pieces were fitted, covering in all about two-thirds of the cod-end from the cod-line forwards.

The covered cod-end technique was employed for measuring selectivity, with the same cod-end and cover used throughout. The cover was of small-meshed (about 20 mm) nylon, shaped and rigged as described by Beverton (1958) except that it was made extra wide to avoid fouling the chafers. The mesh size of the cod-end averaged 119 mm, and this figure did not vary by more than a millimetre or so throughout the tests. Measurements were made of every third row across the full width of the cod-end for two-thirds of its length, starting at four rows up from the cod-line. The cod-end was measured in this way on five occasions during the tests.

* Note: This paper was presented in summary form to the ICES Comparative Fishing Committee at the 1959 ICES Council Meeting.

Mesh measurements were made with the Lowestoft fixed-load scissors gauge operating at a load of 3 kg (Beverton & Bedford, 1955). The performance of this gauge is closely similar to that of the ICES gauge, but the difference between them of 1 kg in operating load means that the mesh measurements given here are about 3-4 mm lower than would have been obtained with an ICES gauge.

To determine whether the flap-type chafer had any effect on selectivity, the cod-end was fished (a) without chafers, (b) with large-meshed (about 140 mm) chafers, and (c) with small-meshed (about 100 mm) chafers. Cod predominated in the catches, and catches ranged from 5 to 110 baskets (30 baskets = 1 metric ton, approximately); cod were sufficiently numerous in both the cod-end and cover to enable a selection factor to be estimated from most hauls individually. Some haddock were caught, for which approximate selection factors were obtained by grouping hauls made with each rig of the gear.

All fish caught were measured except from the largest hauls, when a sample of several hundred fish was measured. In such cases the total catch was obtained by basketing of all fish not measured, except on station 65 when only half of an estimated catch of 80 baskets was brought on board.

3. Results

(i) Cod.

The results are summarised in Table 1, the selection curves for individual hauls being shown in Fig. 2, arranged in order of increasing catch size (reading downwards). The first group of hauls (stations 42-53; Table 1) were made on Bellsund Bank with the cod-end fitted with large-meshed chafers; these gave an average selection factor of 3.75, which is substantially higher than was obtained on later hauls on Hornsund Bank some 30 miles to the south. Comparison of the effect of chafers is therefore restricted to the Hornsund Bank hauls, which gave the following average selection factors:-

<u>Gear</u>	<u>Average selection factor</u>
No chafers	3.37
Large-meshed chafers	3.26
Small-meshed chafers	3.25

On this evidence alone it would appear that the presence of chafers reduced the selection factor by about 3%, but inspection of Table 1 shows that the no-chaffer group of hauls were those with the smallest average catch. Fig. 3 shows selection factor plotted against total catch (all species combined, but predominantly cod), the various rigs being distinguished according to the key shown in the figure. There is evidence here of a decrease of selection factor with catch size, amounting to about 0.1 per 35 baskets (from the fitted regression, excluding the Bellsund Bank hauls), which is significant at the 0.05 level and is in harmony with Hodder's (in press) findings using the alternating haul technique. There was also a tendency for the hauls made with chafers to be of shorter duration than those without, but there is no clear trend of selection factor with haul duration.

It may therefore be concluded that the small difference noted above between average selection factors with and without chafers can probably be accounted for by variation in catch size. Presumably the chafing pieces, being attached only along their upper side, extended sufficiently far from the cod-end while the trawl was being towed to permit fish freely to escape between and around them. If, instead, fish were escaping through the meshes of the chafing pieces, the presence of small-meshed chafers should have reduced the selection factor (calculated as before with reference to the same cod-end mesh size) to about 2.7, which is clearly incompatible with the observations. This is of practical significance, since the usual commercial practice is to use old pieces of cod-end netting for chafers, in which the mesh size may be appreciably less than in the cod-end proper through shrinkage.

Despite the close similarity in average selection factors there is considerable haul-to-haul variation which cannot be accounted for by catch size, as is shown by the individual haul selection curves of Fig. 2. The selection range, measured as the span of length between the 25% and 75% retention points, is no less variable, ranging from 5.5 to 11.5 cm. Contrast, for example, the range on hauls 74 and 75, made with the same gear in the same locality within three hours and

giving almost the same selection factor, but a range of 10 cm compared with 6.5 cm. There seems, however, no clear relation between range and catch size (Fig. 4; $p = 0.6$). Selection factors for cod in the range of 3.2 to 3.3 are on the low side, and this is doubtless due to the fact that fish on Hornsund Bank were feeding very heavily (on euphausiids). In contrast, the Bellsund Bank fish were feeding only moderately, which probably accounts for their higher selection factors. Comparative girth measurements were attempted but were abandoned because the stomachs of the Hornsund Bank fish were too soft and distended to permit of consistent measurement. Nevertheless, the fact that an average selection factor as high as 3.75 was obtained for the Bellsund Bank fish shows that the cover was not causing any undue masking of the cod-end, even in the presence of chafers. This conclusion is supported by the "normal" selection factor of 3.4 found for haddock, whose feeding was only light to moderate (see below).

(ii) Haddock

The selection curves for haddock are shown in Fig. 5. Only that for hauls made with large-meshed chafers is based on enough fish to enable a selection curve to be drawn with any precision, giving a 50% retention length of 40.5 cm and a selection factor of 3.4. The dotted curves shown on the diagrams for hauls without chafers and with small-meshed chafers are the large-meshed chafer curve displaced by ± 3 cm. These enclose most of the points in the selection ranges, from which it may be concluded that if the presence of a flap-type chafer influences cod-end selectivity for haddock at all, it is unlikely to do so by more than about $\pm 7\%$ of selection factor.

4. Summary

(a) Results are given of the selectivity of a cod-end fitted with a flap-type topside chafer. This consists of a series of overlapping flaps of netting fastened along their top edge across the width of the cod-end.

(b) A reduction of selection factor for cod of about 0.1 (specifically from 3.37 to 3.25) was found on hauls in which the cod-end was fitted with chafers, but this small difference could reasonably be accounted

for by the effect of catch size on selectivity.

(c) It is therefore concluded that on these tests, which included hauls ranging from 5 to 110 baskets, cod-end selectivity was for all practical purposes unaffected by the presence of flap-type chafers. This result was obtained with chafers having mesh sizes both larger and smaller (by about 20 mm) than the cod-end mesh size.

(d) Data on haddock were too few to give a precise test of the effect of chafers on cod-end selectivity; but if there was an effect it is unlikely to have exceeded about 7% of selection factor.

Bibliography

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TABLE 1. Selection data for cod

Stn.	Gear	Mean cod- end mesh (mm)	Duration of haul (hr.)	Total catch (baskets)	50% retention length (cm)	Selection factor	25%-75% range (cm)	No. of fish in selection range (25%-75%)	
								Cod-end	Cover
42-43	Large mesh chafers (141 mm)	118	1.5 (mean)	5 (mean)	42.0	3.56	7.0	24	24
46			1.5	11	47.0	3.98	6.0	40	48
51			1.5	5	41.0	3.48	6.5	31	30
52			1.5	9	44.5	3.77	8.5	66	67
53			1.5	26	47.0	3.98	9.5	138	179
Mean			1.5	11	44.3	3.75	7.5	60	70
56	No chafers	120	1.5	8	43.0	3.58	5.5	20	8
57			1.5	75	39.0	3.25	11.5	345	230
59			1.5	26	39.0	3.25	7.0	99	59
60			1.5	14	41.0	3.42	9.0	33	67
61			1.5	7	42.0	3.50	8.5	43	40
68-70			0.8 (mean)	17 (mean)	38.0	3.22	10.5	145	129
Mean			1.4	24	40.3	3.37	8.7	114	89
62	Small mesh chafers (100 mm)	119	1.1	60	35.5	2.98	7.5	407	216
63			0.7	10	39.0	3.28	8.5	42	32
64			0.7	30	41.0	3.45	7.5	152	128
65			0.5	(80)	36.0	3.03	6.5	302	199
66			1.0	26	42.0	3.53	6.0	79	79
Mean			0.8	41	38.7	3.25	7.2	196	131
74	Large mesh chafers (141 mm)	119	1.0	110	39.0	3.28	10.0	835	555
75			0.5	94	38.5	3.24	6.5	427	288
Mean			0.75	102	38.75	3.26	8.3	631	421

Cod-end twine: (double manila; untreated; 4 ply
 { runnage 50 yds./pound
 Other data Towing speed: { 3-3½ knots
 Depth range: { 50-70 fathoms

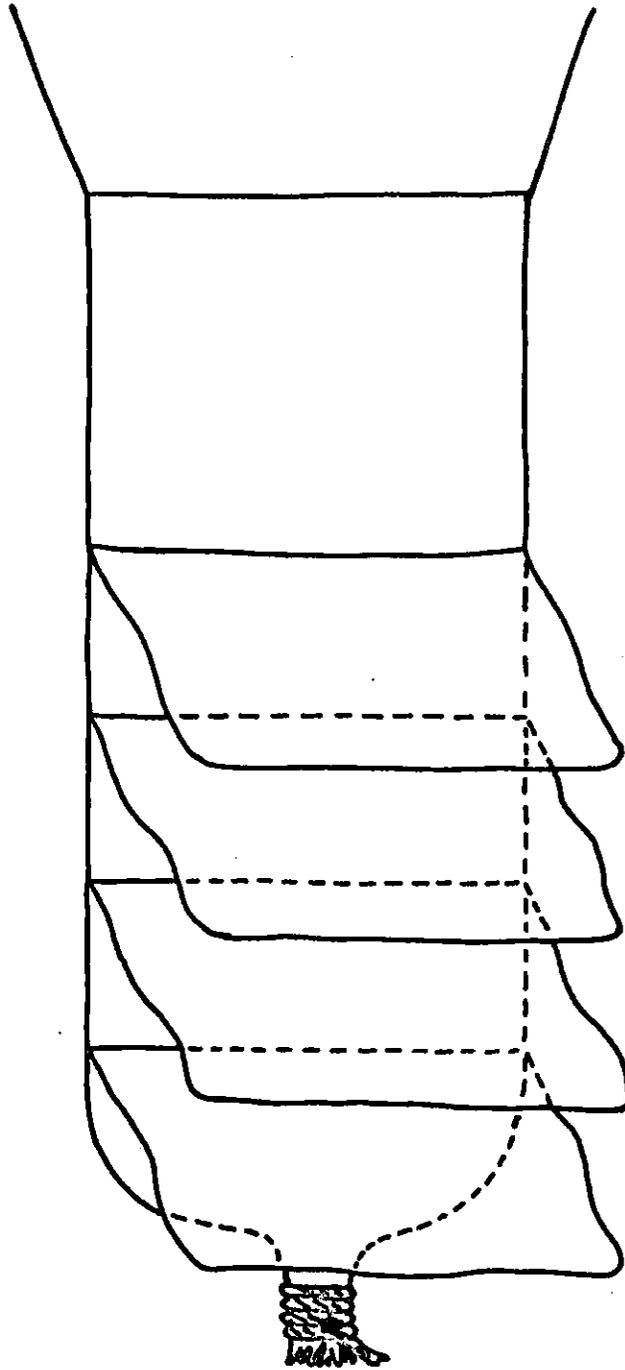


Fig. 1. Diagram showing attachment of flap-type chafers to cod-end.

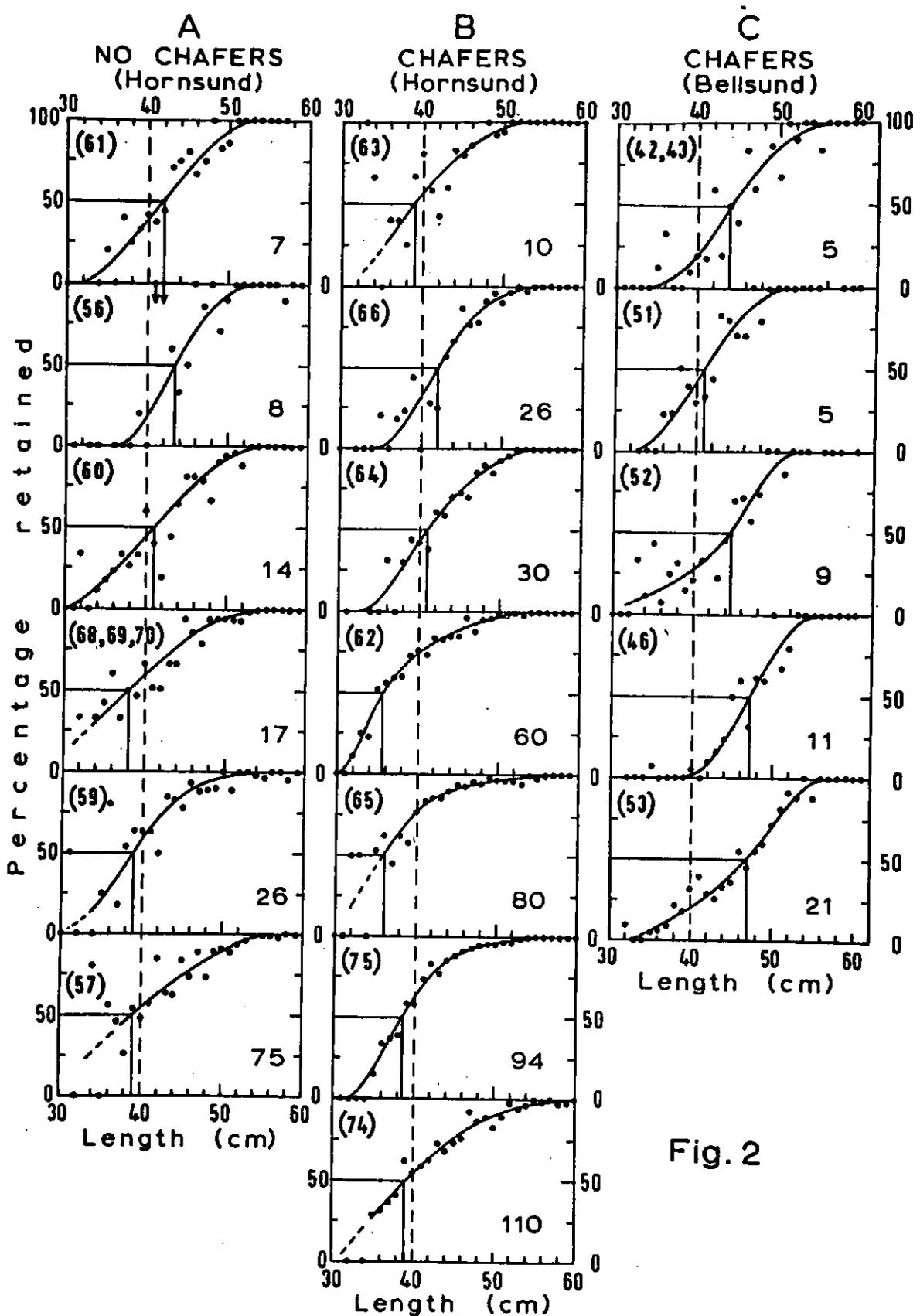


Fig. 2

Fig. 2. Selectivity curves for cod.

Group A. No chafers, Hornsund Bank

Group B. Chafers, Hornsund Bank.

Group C. Chafers, Bellsund Bank.

Within each group hauls are arranged in order of increasing catch size, reading downwards. Station numbers are shown in parenthesis, top left; catch (baskets) is shown bottom right. Note that hauls 74 and 75 are with large-meshed chafers, the remaining ones of group B being with small-meshed chafers. All hauls in group C are with large-meshed chafers.

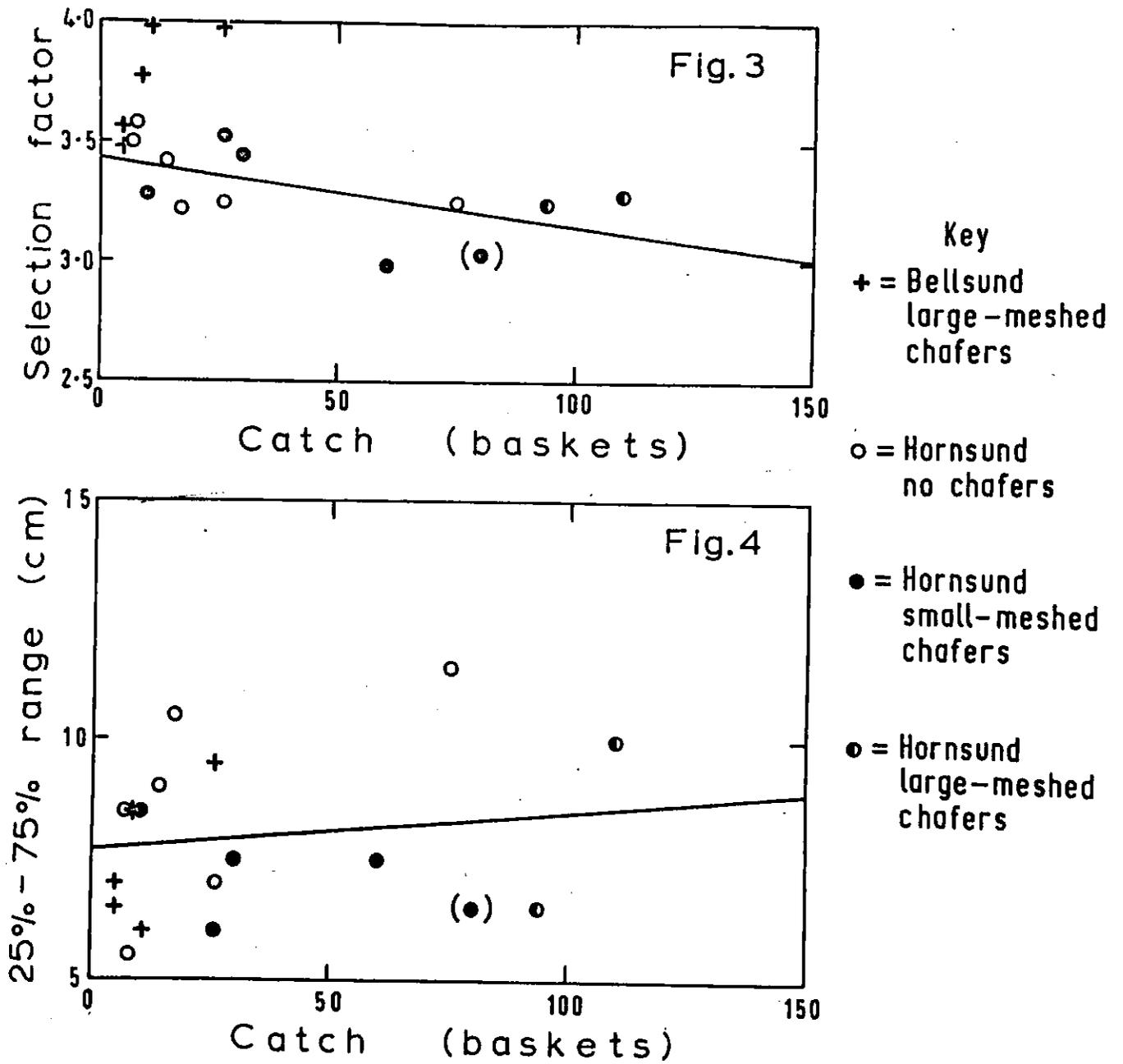


Fig. 3. Plot of selection factor against catch size for cod.

Fig. 4. Plot of selection range (25%-75%) against catch size for cod.

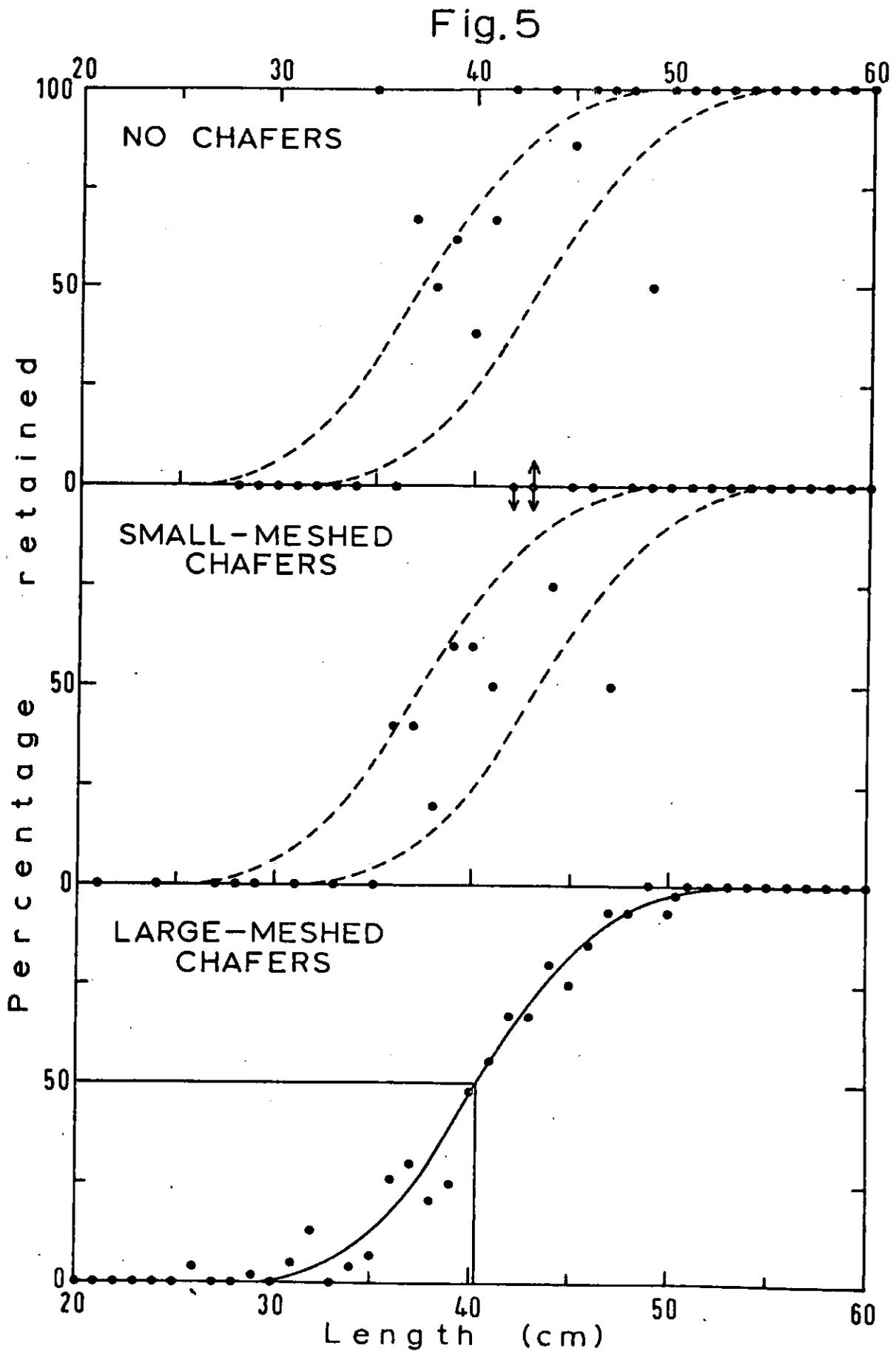


Fig. 5. Selection data for haddock based on grouped hauls (see text).