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Gear and Behaviour Committee

Preliminary results of German mesh selection experiments on cod off Bear Island

by

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On the 116th cruise of FRV ANTON DOHRN (July 2nd - August 2nd, 1968) some trawl mesh selection experiments were carried out off the southwest coast of Bear Island.

Five cod-ends of about the same wet knot breaking strength (108-124 kp) and mesh size (114-122mm) were used. They were made from polyamide continuous, polyethylene monofilament, polypropylene continuous, polypropylene monofilament and polypropylene splitfibre. The first four cod-ends have already been used on the 12th cruise of FRV WALTHER HERWIG (Nov./Dec. 1965) in west Greenland waters (Bohl, 1967a) and on the 100th cruise of FRV ANTON DOHRN (Oct. 1966) in southwest Greenland waters (Bohl, 1967b). The selectivity of the last-mentioned cod-end was studied for the first time on a German research vessel in 1968.

During the experiments of this year a total of 40 successful hauls was made; 32,350 cod were caught in the cod-ends and 8,961 cod in the covers. The total length of each fish was measured to the centimetre below. Figure 1 shows the length composition of the total catch of cod (cod-end plus cover). It can be seen that large fish of more than 70.5 cm were sparsely represented. The bulk of the catch consisted of fish between about 30.5 and 67.5 cm in length. Within this range the length frequency polygon shows two maxima separated from each other by a minimum at 53.5 cm, namely a very pronounced peak at 42.5 cm (year class 1964, according to A. Meyer's age determination 57% of the total catch, mean length 41.6 cm) and a secondary peak at 58.5-60.5 cm (year class 1963, 37% of the total catch, mean length 57.5 cm).

The catches, ranging from 0.7 to 4.6 metric tons per 1-2 hours' fishing time, were of rather uniform composition. Cod were always clearly predominant; other fish (mainly wolffishes, long rough dab, skates and rays) were caught in small quantities.

The selection curves shown in Figure 2 for combined hauls are based on smoothed percentages of retained fish (three-point moving averages). The curves are fitted by eye.

The experimental details and the results of the trials are summarized in the attached compilation of the selection data.

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The selection factors and selection ranges found in 1968, 1966 and 1965 for the same cod-ends are as follows:

Selection factors and, in brackets, selection ranges for cod

Cod-end	ANTON DOHRN VII 1968 Bear Island (this paper)	ANTON DOHRN X 1966 ICNAF Div. 1F (Bohl, 1967b)	WALTHER HERWIG XI-XII 1965 ICNAF Div. 1B (Bohl, 1967a)
Polyamide continuous	3.54 (11.4 cm)	3.53 (11.0 cm)	3.51 (11.4 cm)
Polyethylene monofilament	3.32 (7.2 cm)	3.40 (6.8 cm)	3.38 (9.3 cm)
Polypropylene continuous	3.25 (8.2 cm)	3.30 (8.2 cm)	3.22 (10.3 cm)
Polypropylene monofilament	3.20 (8.0 cm)	3.26 (6.9 cm)	3.28 (8.2 cm)
Polypropylene splitfibre	3.19 (6.3 cm)	- (-)	- (-)

From these data it becomes obvious that the three experiments yielded practically the same results. The selection factors for each cod-end do not differ by more than 0.08. This striking conformity of the data is in contrast to previous findings showing the cod selection factors for West Greenland to be significantly lower than those for the north-east Arctic waters. Thus, the assessments carried out by the North-East Arctic Working Group are based on cod selection factors of 3.7 for manila and 4.1 for polyamide (Anon., 1968), whereas a selection factor of 3.3 for manila is used for the assessments made by the Greenland Cod Working Group (Anon., 1967; Gulland, 1967; Horsted, 1967).

In the light of the new evidence given in this paper, the selection factors applied to the north-east Arctic cod (i.e. 3.7 for manila and 4.1 for polyamide) are clearly too high. It does hardly alter this fact that the cod caught in July 1968 off Bear Island wereunusually well-fed.[x]) The good physical condition of the fish alone does not suffice to explain fully the extremely low selection factors obtained from this year's trials.

Compared to the selection factor for polyamide (3.54), the corresponding factors for the three types of polypropylene were found in 1968 to be lower by 8.2% (continuous), 9.6% (monofilament) and 9.9% (splitfibre). These differences are in line with previous results showing the selectivity of polypropylene similar to that of manila.

In this connection it has to be stressed that no significant difference was found between the selectivity of polypropylene splitfibre on the one hand and that of polypropylene continuous and polypropylene monofilament on the other. A Norwegian experiment conducted with a polypropylene splitfibre cod-end in September 1966 off the Finnmark coast led to the same conclusion (Hylen, 1967). Since, moreover, the German trials in 1965, 1966 and 1968 resulted in very similar selection factors for polypropylene continuous and polypropylene

[x]) The results of 1,259 girth measurements and 824 weight determinations are not yet available.

monofilament, it seems to be sufficiently proved that the very different physical properties of the three known types of polypropylene netting twines have no appreciable influence on the selectivity.

During the Council Meeting 1967 the Gear and Behaviour Committee decided that "in view of the rather variable estimates of selection factor reported for polyethylene, member countries be requested to carry out further experiments with polyethylene to establish more precisely the mesh differential for this material" (C.Res.1967/4:2). Thus, it should be of particular interest that, in 1968, the selection factor for the polyethylene cod-end was found to be 6.2% lower than that for the polyamide cod-end. In 1965 and 1966, however, the corresponding difference was only 3.7%.

References

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Compilation of selection data for grouped hauls

Ship	FRV ANTON DOHRN, 62.3 m length o.a., 850 h.p.e.
Gear	German standard roundfish bottom trawl, 140' groundrope
Locality	Southwest of Bear Island, between 73°55'-74°22'N and 17°11'-18°45'E
Depth range (m)	120 - 210, mainly 150-180
Species studied	Cod
Experimental method	Topside cover
Cover	ICES specification
Material	Polyamide continuous
Runnage (m/kg)	1200
Tex	23 tex x 11 x 3
Braiding	Single twine
Twine construction	Twisted
Mesh size (mm)	60

Cod-end material	Polyamide continuous	Polyethylene monofilament	Polypropylene continuous	Polypropylene monofilament	Polypropylene splitfibre
Runnage (m/kg)	252	153	204	208	174
R...tex	3962	6516	4905	4800	5756
Braiding			Double twine		
Twine construction	Plaited	Plaited	Plaited	Plaited	Twisted
Wet knot breaking strength (kp)	119.5	115	124	122	107.5
Twine diameter, wet (mm)	2.1	4.5	3.6	3.5	3.2
Date	8.-10.7.68	25.-27.7.68	13.7.-15.7.68	22.-24.7.68	15.-22.7.68
Number of hauls	7	9	6	10	8
Av. duration of haul (minutes)	73	107	85	120	94
Av. towing speed through water (kn)	4.0	4.0	4.0	4.0	4.0
Type of mesh gauge	ICES gauge ; 4 kg pressure				
Cod-end mesh size; mean (mm)	122.2	113.6	122.0	121.1	122.4
Range (mm)	104-130	103-128	113-129	114-135	116-128
No. of measurements	413 (=7x59)	522 (=9x58)	276 (=6x46)	460 (=10x46)	456 (=8x57)

Compilation of selection data for grouped hauls (continued)

	Polyamide continuous	Polyethylene monofilament	Polypropylene continuous	Polypropylene monofilament	Polypropylene splitfibre
25-75% selection range (mm)	114	72	82	80	63
No. of cod in selection range					
cod-end	1089	1082	1485	865	1081
cover	1132	1078	1299	869	1232
Total no. of cod					
cod-end	2683	12104	6349	5434	5780
cover	1744	1793	2117	1397	1910
Av. weight of cod (kg)					
cod-end	510	2165	1360	815	925
cover	160	90	210	75	130
Av. weight of by-catch*) (kg)					
cod-end	265	310	285	375	360
cover	55	40	70	65	60
Range of total catch/tow (kg)					
cod-end	570-970	1525-4085	580-4040	960-1460	720-2350
cover	135-310	65- 205	105- 515	80- 190	120- 345
50% retention length (mm)	433	377	396	388	391
Selection factor	3.54	3.32	3.25	3.20	3.19

*) Anarhichas denticulatus, A. minor, A. lupus, Hippoglossoides platessoides, Raja spp. and small quantities of Reinhardtius hippoglossoides, Hippoglossus hippoglossus, Sebastes, Cyclopterus lumpus, Melanogrammus aeglefinus and invertebrates.

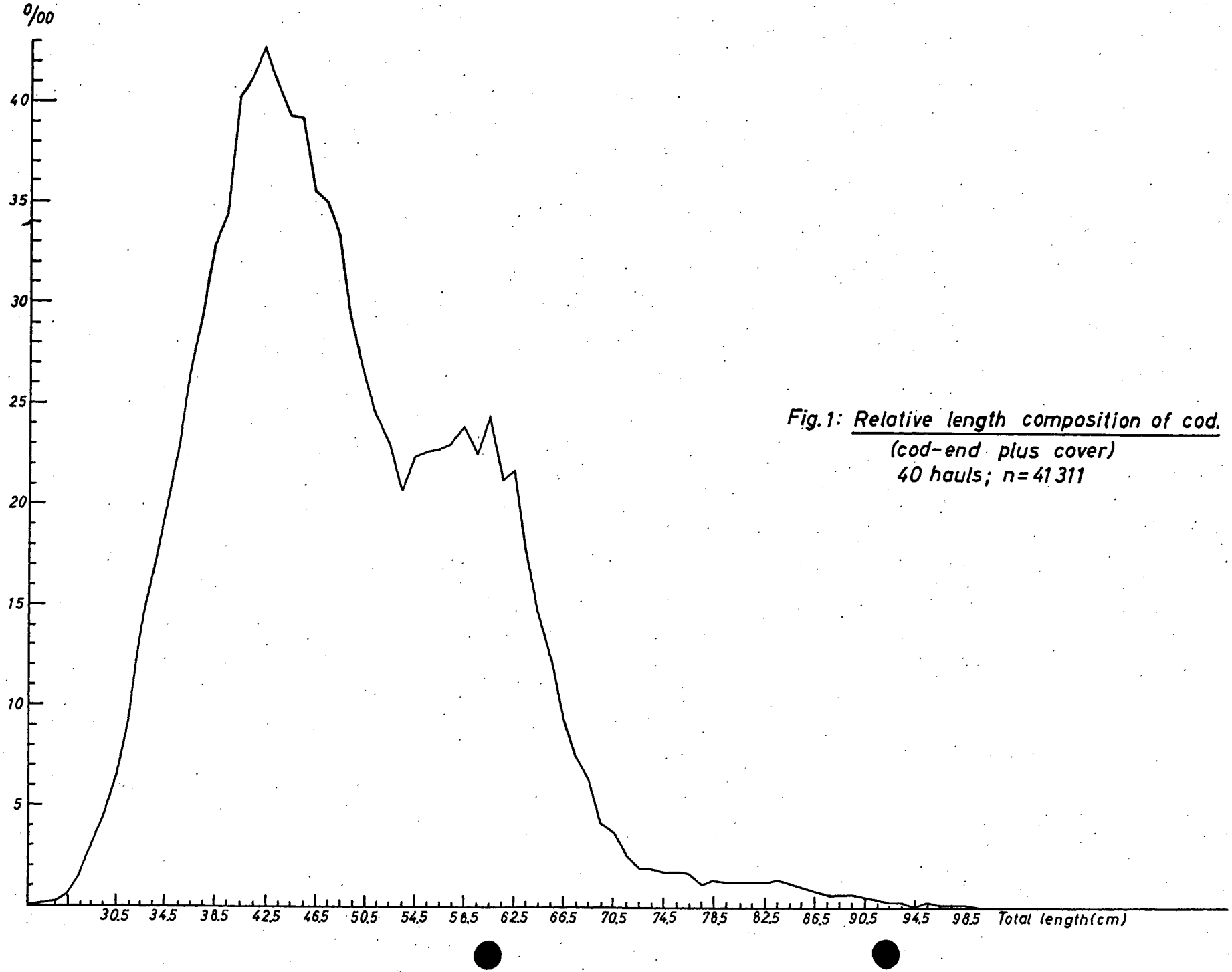

Fig. 1: Relative length composition of cod.
(cod-end plus cover)
40 hauls; n = 41 311

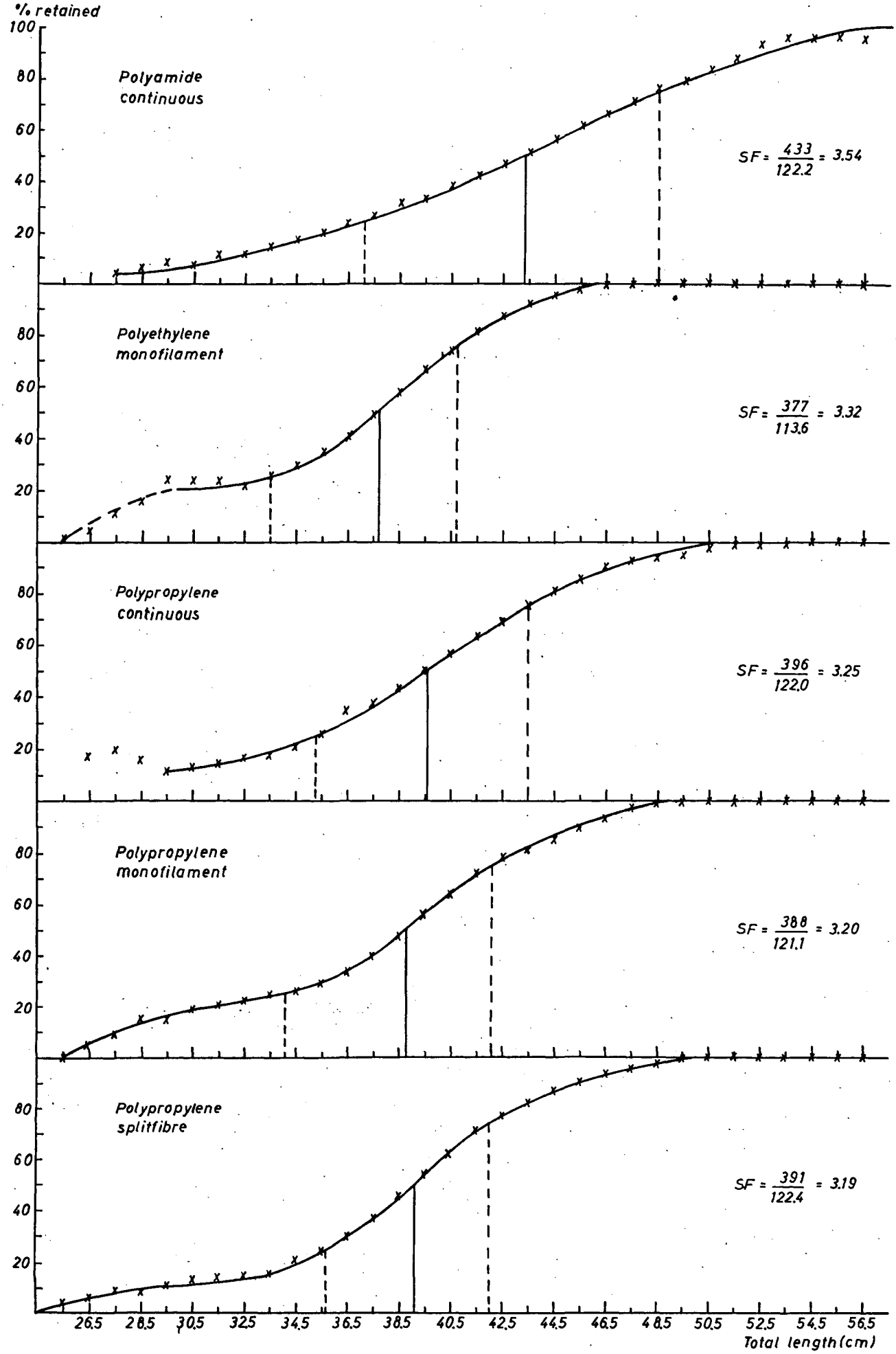

Fig. 2: Cod selection curves for combined hauls.