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Selection of cod by bottom trawl codends on
Store Hellefiske Bank

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On the 12th cruise of FRV WALTHER MERWIG (Nov./Dec. 1965) rather extensive trawl mesh selection experiments were carried out on the southern slope of Store Hellefiske Bank (northern edge of Holsteinsborg Deep, ICNAF Div. 1 B).

It was not possible to prepare a final report on these trials in due time. Since, however, the Greenland Cod Working Group has intimated that selection factors for Store Hellefiske Bank cod are urgently needed, no effort has been spared to complete at least this provisional paper.

Four codends of about the same wet knot breaking strength (115-124 kg) and mesh size (114-125 mm) were used. They were made from polyamide continuous, polyethylene monofilament, polypropylene continuous and polypropylene monofilament.

During all of the trials 34 successful hauls were made; 23,710 cod were caught in the codend and 9,466 cod in the cover. The total length of each fish was measured to the nearest centimeter. The relative length composition of the total catch is shown in Fig. 1.

The catches, ranging from about 0.7 to 6.4 metric tons per 65-75 minutes fishing time, were rather heterogeneously composed. Cod were only predominant in the catches made with the polyamide and polyethylene codends. The catches of the two polypropylene codends, however, contained on an average more by-catch (wolffishes, holothurians, American plaice, skates and Greenland halibut) than cod.

The selection curves shown in Fig. 2 for each codend, are based on smoothed percentages of retained fish (three-point moving averages). The curves are fitted by eye.

The selection factors obtained from combined hauls are as follows (compare the attached compilation of selection data):

- 3.51 for polyamide continuous (8 hauls)
- 3.38 for polyethylene monofilament (10 hauls)
- 3.28 for polypropylene continuous (8 hauls)
- 3.22 for polypropylene monofilament (8 hauls).

Previous German trials carried out during August 1957 in ICNAF Divisions 1 D, 1 E and 1 F (Southwest Greenland) have given markedly higher selection factors, namely 3.7 for manila, 3.9 and 4.0 for two polyamide codends and 3.9 for polyester (v.Brandt, 1957; ICES, 1964). It must, however, be taken into account that the 1957 trials have been conducted by FRV ANTON DOHRN, an 850 h.p. side trawler with an average towing speed of 4 knots, whereas the 1965 trials were conducted by a large 2000 h.p. stern trawler with a towing speed of about 4.5 knots. Moreover, in 1957, the catches have been smaller and the cod caught thinner than in 1965. The relationship between maximum body girth (G) and total length (L), obtained from 984 measurements in 1957, has been described by the regression equation $G = 0.42 L + 2.46$ cm (Messtorff, 1958), whereas the regression $G = 0.56 L - 2.49$ cm was obtained from 1490 measurements in 1965 (Fig.3). These equations imply that, in 1957, cod of the 50% retention lengths (47-53 cm) have been thinner than cod of the same lengths in 1965 by 8-10%.

Norwegian trials carried out during April 1964 in ICNAF Divisions 1 C and 1 D gave the following selection factors: 3.4 for manila, 3.3 for polypropylene and 3.2 for polyethylene (Bratberg, 1965). The value for polypropylene tallies with the recent German findings, while the value for polyethylene is somewhat smaller.

The four selection factors obtained from the WALTHER HERWIG trials didn't differ very much from each other. In comparison to the selection factor determined for the polyamide codend, the corresponding factors for the polypropylene continuous and polypropylene monofilament codends were found to be lower by 6.6% and 8.3%, respectively. These differences are in line with previous results showing the selectivity of polypropylene similar to that of manila.

In this connection it is noteworthy that, contrary to expectation, no significant difference was found between the selectivity of the both types of polypropylene codends used. The polypropylene monofilament codend made from relatively stiff twine should have, at least theoretically, yielded a markedly lower selection factor than the polypropylene

continuous codend made from relatively flexible twine.

Finally, it has to be mentioned that the selection factor for the polyethylene codend was found to be only 3.7% lower than that for the polyamide codend. This result which shows polyethylene to have selective properties similar to polyamide rather than to manila/polypropylene, is in contrast to the above-mentioned Norwegian results (Bratberg, 1965) on the one hand, and in conformity with Canadian results obtained during October 1960 in ICNAF Div. 4 T (ICNAF Sec., 1962; Parrish, 1963) on the other hand.

Thus, further information on the selectivity of polyethylene codends is urgently needed.

References

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- MeBtorff, J. 1958. Length-Girth Measurement of Cod and their Relationship to Mesh Selection. ICES Comparative Fishing Committee, Paper No. 23, 1958.
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Compilation of selection data for grouped hauls

Ship	FRV WALTHER HERWIG, length o.a. 83.3 m, 2000 h.p.e.			
Gear	German standard roundfish bottom trawl, 140' groundrope			
Date	21.11. - 5.12.1965 (day and night)			
Locality	Southern slope of Store Hellefiske Bank (66°35'N; 54°25'W)			
Depth range (m)	180 - 220			
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 material	Polyamide continuous	Polyethylene monofilament	Polypropylene continuous	Polypropylene monofilament
Runnage (m/kg)	252	153	204	208
R..tex	3962	6516	4905	4800
Braiding				
Twine construction			Double twine	
Wet knot breaking strength (kg)	119.5	115	124	122
Twine diameter, wet (mm)	2.1	4.5	3.6	3.5
No. of hauls	8	10	8	8
Av. Duration of haul (min)	65	65	70	75
Av. towing speed through water (kn)	4.4	4.5	4.6	4.4
Type of mesh gauge		ICES gauge	4 kg pressure	
Codend mesh size; mean ± s.e. (mm)	125.4 ± 0.2	114.4 ± 0.2	121.6 ± 0.2	121.6 ± 0.2
Range (mm)	103 - 133	104 - 128	114 - 130	114 - 136
No. of measurements	472	590	329	376

Compilation of selection data for grouped hauls (continued)

	Polyamide continuous	Polyethylene monofilament	Polypropylene continuous	Polypropylene monofilament
25 - 75% selection range (cm)	11.4	9.3	10.3	8.2
No. of cod in sel. range	1395	2044	1274	850
cover	1651	1867	1218	850
codend	4967	10229	4909	3605
cover	2765	3023	2015	1663
Av. quantity of cod	16 1/2 (= 1130 kg)	24 3/4 (= 1695 kg)	16 3/4 (= 1147 kg)	11 1/2 (= 754 kg)
cover	3 1/4 (= 223 kg)	2 1/4 (= 154 kg)	2 (= 137 kg)	1 1/2 (= 103 kg)
codend	7 1/2	6 3/4	14 1/4	5 1/4
cover	+	+	+	+
of wolffishes ²⁾	6 1/4	6 3/4	7 1/2	12 3/4
codend	3	2 1/4	1 3/4	5 3/4
cover	8 1/4 - 73 3/4	16 1/2 - 88	16 - 67	10 1/4 - 47 1/2
of other by-catch ³⁾	1 1/4 - 14 1/4	2 1/2 - 7 3/4	2 1/4 - 5 1/2	1 1/2 - 15
codend	440	387	599	391
cover	3.51	3.38	3.28	3.22
50% retention length (mm)				
Selection factor				

1) Large plastic baskets were used. The average net weight of one basket filled with cod was 68.5 kg.

2) Anarhichas denticulatus, A. minor and A. lupus.

3) Holothurians, Hippoglossoides platessoides, Raja spp. and Reinhardtius hippoglossoides.

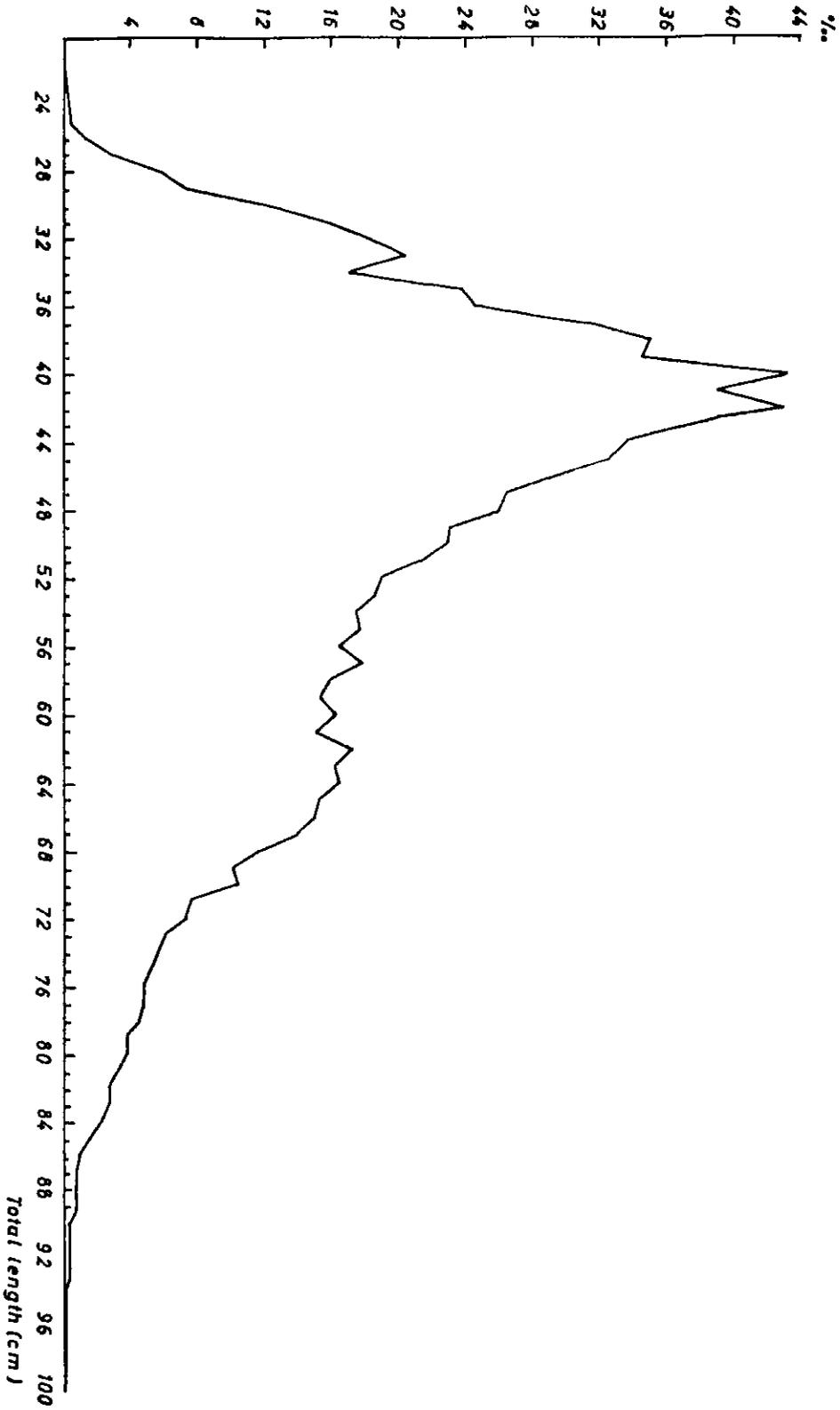


Fig. 1: Relative length composition of cod (codend + cover)
34 hauls, n = 33 176

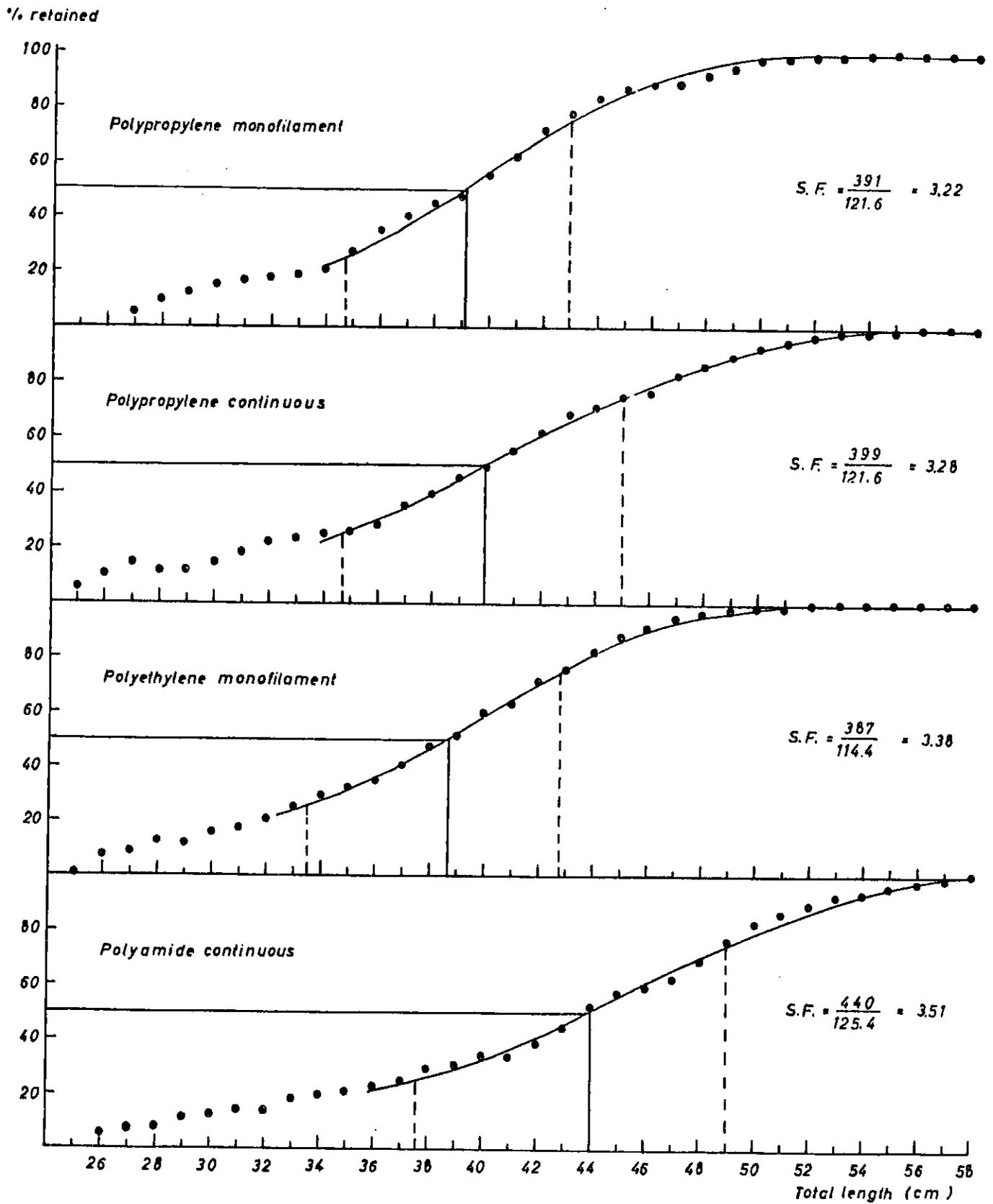


Fig. 2: Cod selection curves for combined hauls

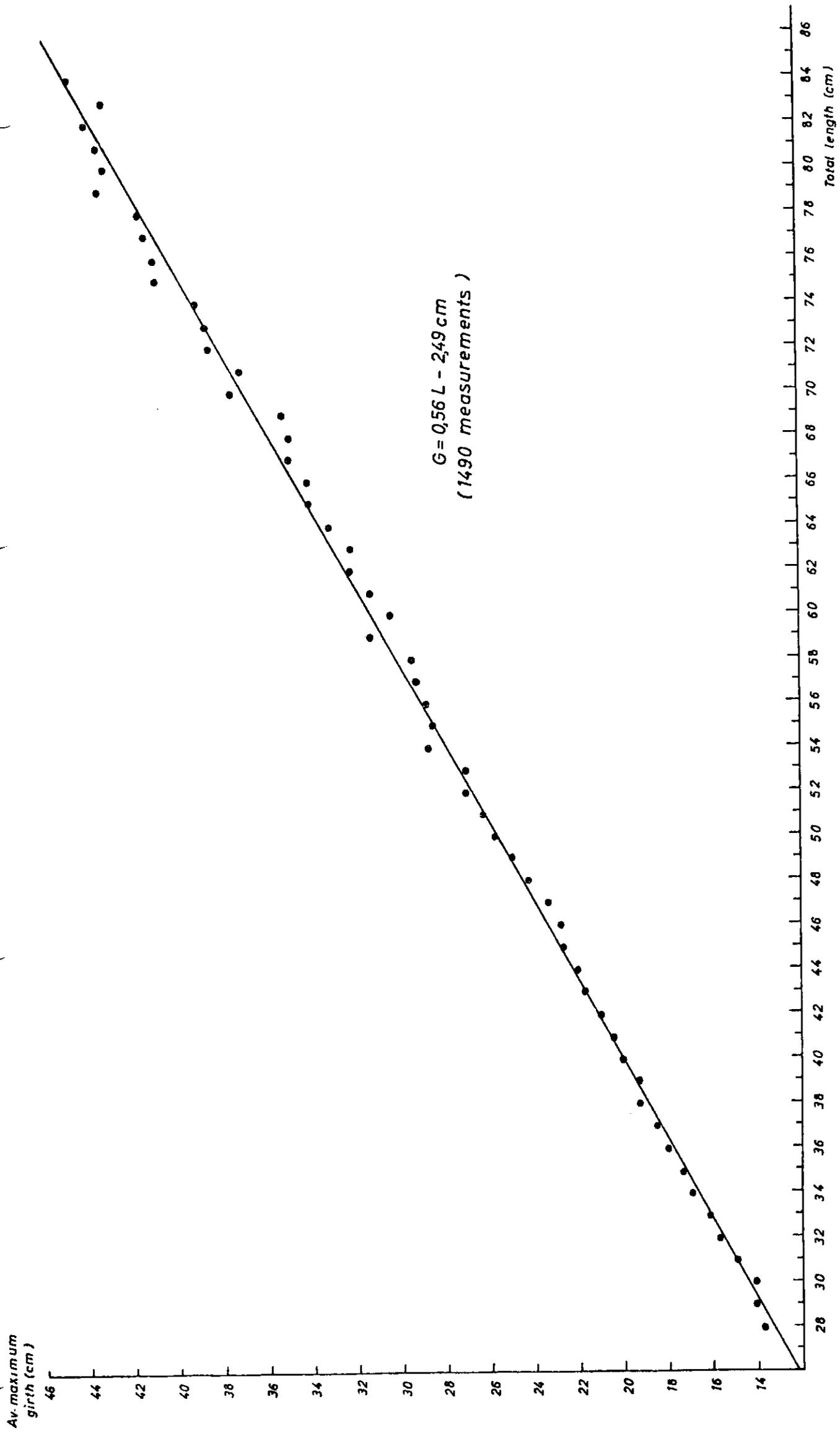


Fig. 3 : Cod girth/length relationship at Holsteinsborg in Nov. - Dec. 1965