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Selection of cod by bottom trawl codends in Southwest Greenland waters

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On the 100th cruise of FRV *Anton Dohrn* (27.9-30.10.1966) some trawl mesh selection experiments were carried out in the vicinity of Cape Thorvaldsen (ICNAF Div.1F).

Four codends of about the same wet knot breaking strength (115-124 kg) and mesh size (113-124 mm) were used. They were made from polyamide continuous, polyethylene monofilament, polypropylene continuous and polypropylene monofilament. The same codends have already been used on the 12th cruise of FRV *Walther Herwig* in November/December 1965 (Bohl, 1966).

During the trials, a total of 23 successful hauls was made; 13,665 cod were caught in the codend and 5,056 cod in the cover. The total length of each fish was measured to the nearest centimeter. Figure 1 shows the relative length composition of the total cod catches made between October 6 and 10 on the one hand and on October 18 and 19 on the other. It can be seen that the cod caught during the second part of the experiments were conspicuously smaller (mean length 46.6 cm) than those caught during the first part (mean length 49.1 cm).

The catches, ranging from 0.3 to 4.6 metric tons per 75-100 minutes' fishing time, were of uniform composition. Cod were clearly predominant; other fish (wolffishes, American plaice, skates, lumpsucker) and invertebrates (mainly holothurians) were caught in small quantities.

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

The selection factors calculated for combined hauls are as follows (the figures in brackets represent the selection factors obtained from the *Walther Herwig* trials in 1965):

Polyamide continuous	:	3.53	(3.51)
Polyethylene monofilament	:	3.40	(3.38)
Polypropylene monofilament	:	3.26	(3.22)
Polypropylene continuous	:	3.30	(3.28)

From this compilation it becomes obvious that the experiments conducted by *Anton Dohrn* off Cape Thorvaldsen in October 1966, and those conducted by *Walther Herwig* on Store Hellefiske Bank in November/December 1965 (Bohl, 1966), yielded practically the same selection factors. This striking conformity of the experimental findings claims attention, particularly as there are great differences in the design, size and fishing power of the two research vessels concerned. *Anton Dohrn* is an 850 h.p. side trawler with an average towing speed of 4 knots; *Walther Herwig*, however, is a large 2,000 h.p. stern trawler with a towing speed of about 4.5 knots. The conclusions to be drawn from the above-mentioned data would be more reliable if the trials had taken place simultaneously on the same fishing ground. From the evidence available, however, it is likely that the selectivity of bottom trawls is not appreciably influenced by the characteristics of the towing vessel.

In another ICNAF research document (Bohl, 1966) the results of the *Walther Herwig* trials have been compared with those of trials carried out previously in Subarea 1. Since the *Walther Herwig* data are in line with the recent *Anton Dohrn* data, it is not necessary to repeat such a comparison here. But, in view of the R&S Committee's task to keep the current mesh differentials under

(over)

control, it may be useful to review once more the upshot of the German experiments conducted in 1965 and 1966:

Compared to the selection factors determined for the polyamide codend, the corresponding factors for the polypropylene continuous and polypropylene monofilament codends were found in both years to be lower by 7% and 8% respectively. These differences are in accordance with previous results showing the selectivity of polypropylene similar to that of manila. In 1965 as well as in 1966 the selection factors for the polyethylene codend were only 3.7% lower than those for the polyamide codend. This small difference shows polyethylene to have selective properties similar to polyamide rather than to manila/polypropylene. It is remarkable that, in both years, no significant difference was found between the selectivity of the two types of polypropylene codends used. Theoretically, the monofilament codend made from relatively stiff twine should have yielded a markedly lower selection factor than the continuous codend made from relatively flexible twine.

Finally, it must be mentioned that 1,398 girth measurements were made off Cape Thorvaldsen in 1966. The relationship between maximum body girth (G) and total length (L) is described by the regression equation  $G = 0.49 L - 0.49$  cm (Fig. 3). In 1965, the regression  $G = 0.56 L - 2.46$  cm was obtained from 1,490 measurements on Store Hellefiske Bank (Bohl, 1966). These equations imply that cod of the 50% retention lengths (39-44 cm) were thinner in 1966 than in 1965 by 3.6-4.5%.

#### References

- Bohl, H. 1966. Selection of cod by bottom trawl codends on Store Hellefiske Bank. Annu. Meet. int. Comm. Northw. Atlant. Fish., Res.Doc. 66/67, Ser. No.1685.

Ship	FRV ANTON DOERN, 62.3 m length o.a., 850 h.p.e.		
Gear	German standard roundfish bottom trawl, 140' groundrope		
Locality	Off Cape Thorvaldsen (ICNAF Div. 1 F)		
Depth range (m)	100 - 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	60		
Codend material	Polyamide continuous	Polyethylene monofilament	Polypropylene continuous
Runnage (m/kg)	252	153	204
R..tex	3962	6516	4905
Braiding			
Twine construction	119.5	115	122
Wet knot breaking strength (kg)	2.1	4.5	3.5
Twine diameter, wet (mm)			
Date	6.-9.10.1966	9.-10.10.1966	18.-19.10.1966
Greenwich mean time	09.00-18.25	08.45-25.20	11.15-21.40
No. of hauls	7	8	4
Av. duration of haul (min)	75	80	90
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)	123.7 ± 0.2	113.2 ± 0.2	119.8 ± 0.2
Range (mm)	106 - 130	104 - 126	113 - 153
No. of measurements	413 (= 7x59)	464 (= 8x58)	188 (= 4x47)
			119.9 ± 0.2
			113 - 127
			192 (= 4x48)

Compilation of selection data for grouped hauls (continued)

	Polyamide continuous	Polyethylene monofilament	Polypropylene monofilament	Polypropylene continuous
25 - 75% selection range (mm)	110	68	69	82
No. of cod in sel. range	544	702	351	1386
Total no. of cod	641	710	329	1287
Av. quantity of cod	2067	4160	1682	5756
of other fish <sup>2)</sup>	952	1273	730	2101
of invertebrates <sup>3)</sup>	7 1/2 (= 514 kg)	(= 754 kg)	7 3/4 (= 531 kg)	27 1/4 (= 1867 kg)
Range of tot. catch/tow	1 1/3 (= 91 kg)	(= 77 kg)	1 1/3 (= 91 kg)	4 2/3 (= 320 kg)
50% retention length (mm)	1 1/2	1 1/2	2	2 2/3
Selection factor	437	385	391	396
	3.53	3.40	3.26	3.30

1) The average net weight of one basket filled with cod is 68.5 kg

2) Anarhichas minor, A. lupus, A. denticulatus, Hippoglossoides platessoides, Raja spp., Cyclopterus lumpus and some few Hippoglossus hippoglossus and Sebastes

3) Mainly holothurians

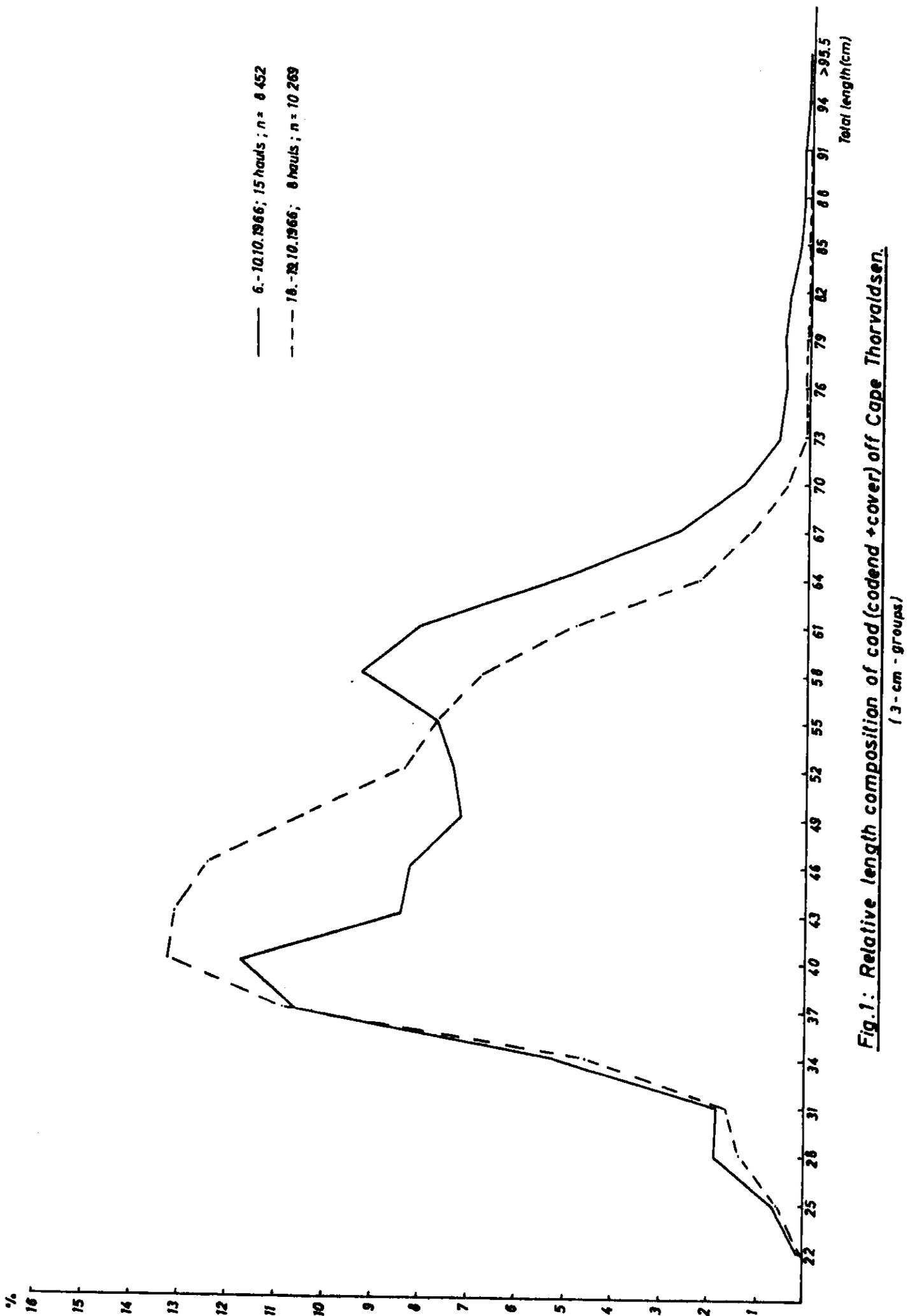


Fig.1: Relative length composition of cod (codend + cover) off Cape Thorvaldsen (3-cm-groups)

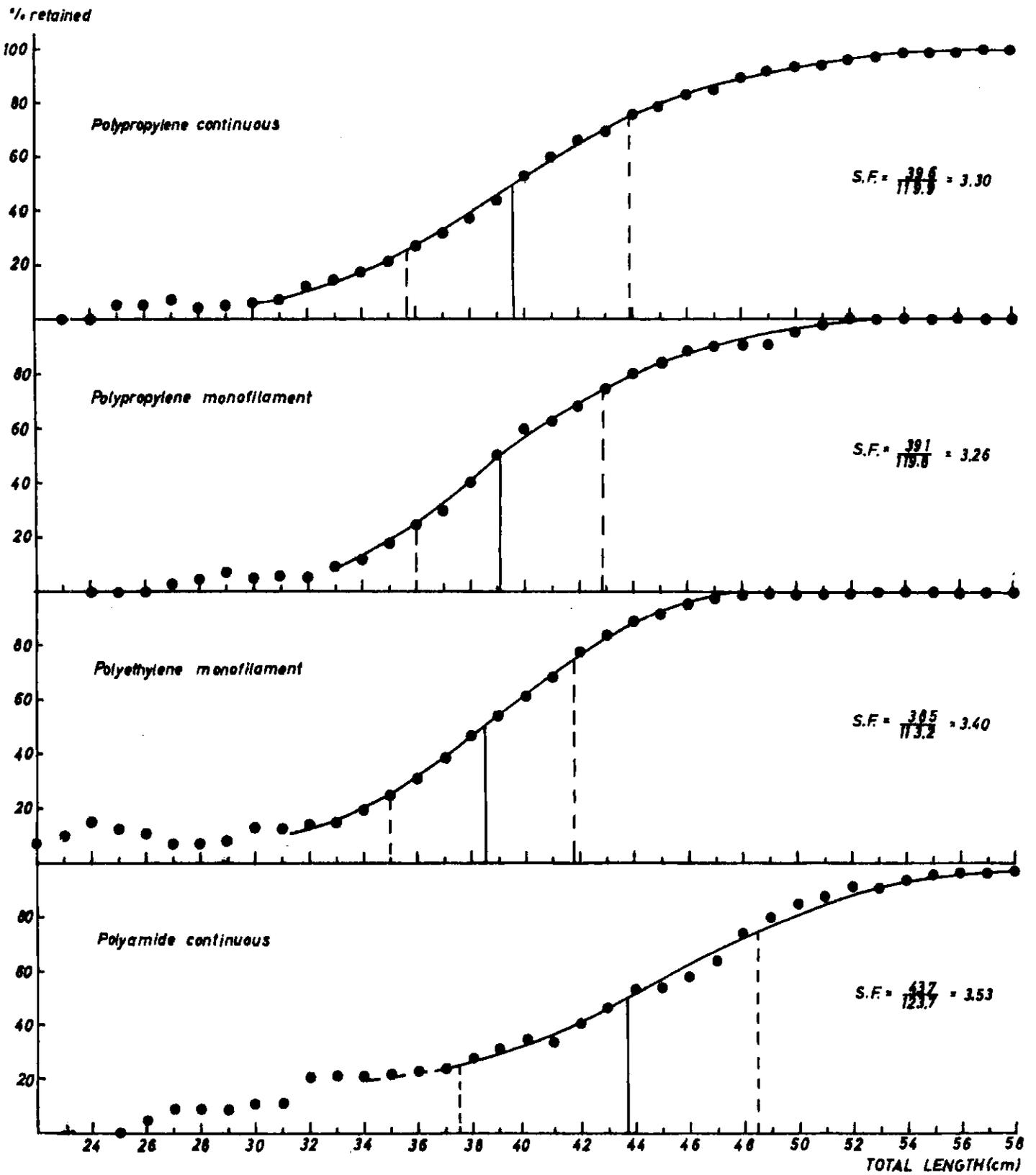


Fig.2: Cod selection curves for combined hauls.

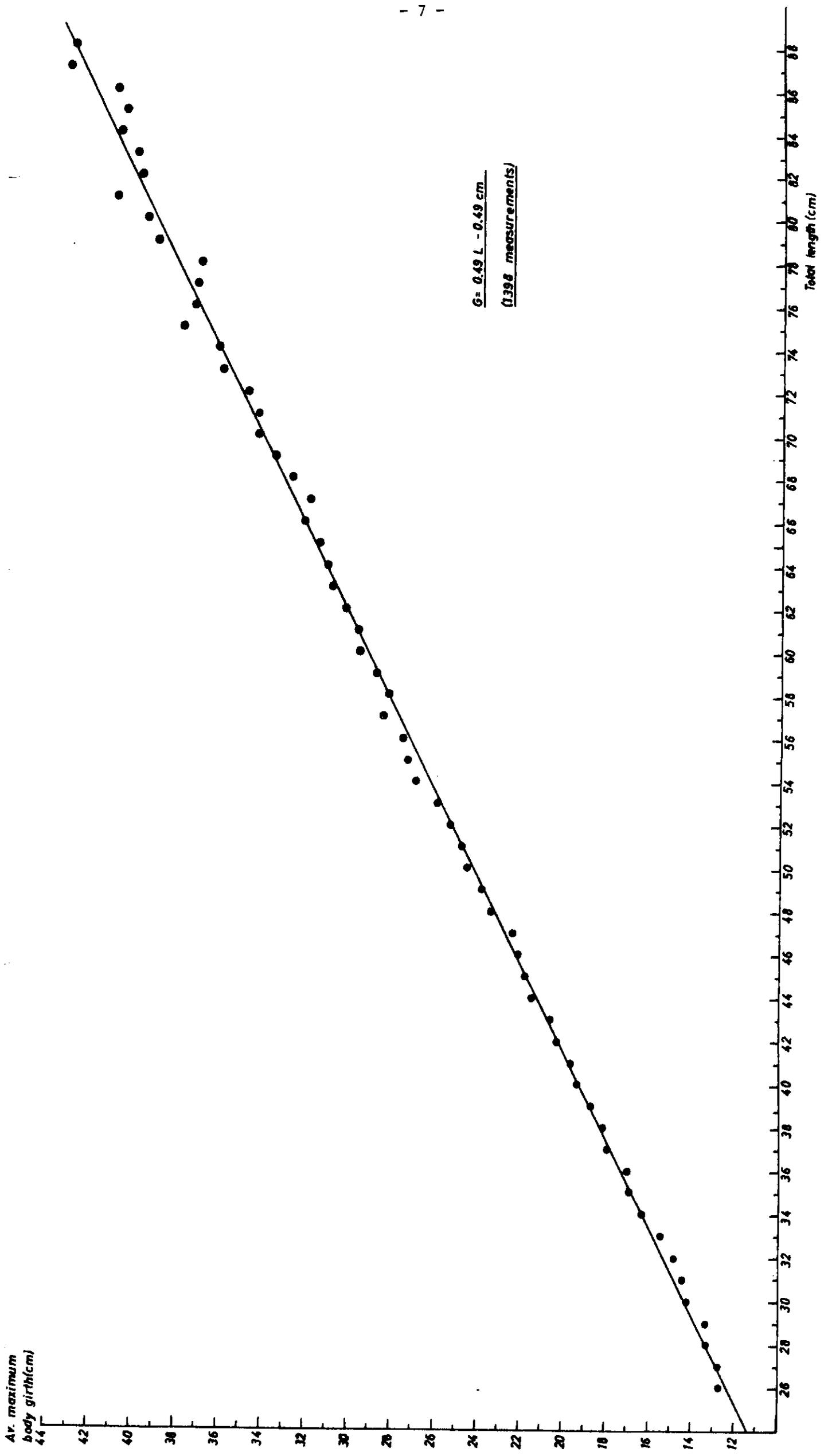


Fig.3.: Cod girth/length relationship at Cape Thorvaldsen in October 1966.