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*ACOUSTIC ESTIMATES OF SAITHE IN THE NORTH SEA  
IN 1985 AND 1986.*

by

Odd M. Smedstad  
Institute of Marine Research  
Bergen, Norway.

ABSTRACT

This paper describes the results from a joint cruise in July 1985 with two vessels, and the results from one cruise in February 1986. The acoustic estimates agree fairly well with the estimates made by the North Sea Roundfish Working Group in March 1986. Especially the results from the cruise in February 1986 were encouraging. From this cruise a maturity ogive were also estimated.

INTRODUCTION

The only method used for assessing the saithe stock in the North Sea are the VPA. There is, however, a need to improve the tuning of the VPA, and also to obtain alternativ assessment methods.

Because of the good experiences with the acoustic method on demersal fish in the Barents Sea (Dalen and Smedstad, 1983), It was desided to start acoustic investigations on saithe in the North Sea (Smedstad, 1985).

This paper describes the results from a joint cruise in July 1984, and a cruise in February 1986.

METHODS

R/V "Eldjarn" and R/V "G.O.Sars" covered most of the northern North Sea during the period 15. - 28. July 1985. The survey tracks and the positions of the trawl hauls are shown for each vessel in Figures 1-2. The main purpose of the surveys were to collect data on abundance and

distribution of herring and 0-group gadoid fish (Lahn-Johannessen, 1986). However, data were also collected for other species as saithe.

During the period 3. - 21. February 1986 R/V "Håkon Mosby" covered the spawning grounds of saithe in the northern North Sea. Survey tracks and positions of trawl hauls are shown in Fig. 3.

Observations on distribution and abundance of saithe were made by echo integration and trawling. R/V "G.O.Sars" and R/V "Eldjarn" was equipped with 38 kHz Simrad EK-400 echosounder connected to a digital echointegration system developed at the Institute of Marine Research, Bergen (Blindheim et al., 1982). The vessel "Håkon Mosby" used an echo integrator of type Simrad QD in connection to a 38 kHz Simrad EK-400. The acoustic systems were calibrated according to the method described by Foote et al. (1983), and the integrator output were compensated for the instrument constant. Average integrator values were obtained every five nautical miles sailed. Contributions from traces considered to be saithe were separated. This separation was based on the trawl catches together with the pattern of the traces of the echogrammes.

The investigated area were divided into rectangles 30 minutes latitude by 60 minutes longitude. Within each rectangle we established an average integrator value, length frequencies and age frequencies from corresponding trawls together with observations on maturity. The number of saithe in each rectangle were calculated in the same way as in the Barents Sea (Dalen and Smedstad, 1979 and 1983). The target strength (TS) of saithe used to convert echo density to number of fish per area was the same as used for cod:

$$TS = 21.8 \log L - 74.9$$

where L is the length of the fish in cm. The VPA data are taken from the 1986 report of the North Sea Roundfish Working Group (Anon 1986).

## RESULTS AND DISCUSSION

Table 1 and Fig. 4 shows the abundance and distribution of saithe in the northern North Sea in July 1985. The highest abundances were found at Fladen Ground and at Utsira Ground, and the dominating yearclass was the 1982 yearclass making up about 57 % of the total number

estimated. The yearclasses 1981 and 1983 made up about 18 % and 16% respectively. Totaly it was estimated to about 360 millions saithe of age three years and older in the investigated area.

Table 2 and Fig. 5 - 8 shows the abundance and the distribution of different yearclasses of saithe in the northern North Sea in February 1986. The abundance of saithe age four years and older were estimated to be 162 millions, of which the 1982 yearclass amounted to about 49 % and the 1981 yearclass to 28 %. Fig. 9 shows the length distribution in the estimated stock.

The proportion of mature fish in each age group were estimated for each square. For the investigated area we found that 17.5 % of the four years old, 61,7 % of the five years old and 90.1 % of the six years old were mature (Table 2). However, the investigated area does not cover the hole distribution area of the four years old fish, so the proportion of mature fish of this age group is probably too high. The acoustic estimate of the five year olds are about 96 % of the VPA estimate. If the acoustic estimate of the four years old are adjusted to 96 % of the VPA, and we assume that all the extra fish are immature, the proportion of mature fish will be 15 %.

Table 3 shows a comparition between the acoustic estimates and the estimates made by the North Sea Roundfish Working Group in March 1986 (Anon, 1986). The acoustic estimates from February 1986 are in good agreement with the estimates from the VPA except for the year classes 1980 and 1979. However, the VPA operates with very high fishing mortalities for these year classes in 1985. The acoustic estimates from july 1985 gives too high values for the 1982 year class. This may be due to difficulties of allocating correct integratorvalues for saithe in areas with very high plancton concentrations. In 1984 the differences are bigger especially for the year classes 1980 and 1979.

By large the acoustic surveys agree fairly well with the VPA estimates, but the disagreement for the 1980 and 1979 year classes in all three years may indicate that the fishing mortality for those year classes were overestimated in 1985.

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Table 1. Abundance of different age groups of saithe in different areas in July 1985 estimated by acoustic method. Numbers in millions.

Age	2	3	4	5	6	7	8+	Sum 85	Sum 84
A. Tampen	0.4	11.9	31.6	14.2	2.7	3.2	0.4	64.5	252
B. Norw. Deep	36.6	116.5	16.0	6.7	0.3	+	-	176.1	152
C. N.S. Plateau	30.2	113.1	28.3	5.9	1.9	2.5	4.0	185.8	226
<b>TOTAL 1985</b>	<b>67.2</b>	<b>241.4</b>	<b>75.9</b>	<b>26.8</b>	<b>4.9</b>	<b>5.7</b>	<b>4.4</b>	<b>426.4</b>	
<b>TOTAL 1984</b>	<b>167</b>	<b>268</b>	<b>107</b>	<b>62</b>	<b>22</b>	<b>3</b>	<b>1</b>		<b>630</b>

Table 2. Abundance of different age groups of saithe estimated on an acoustic survey in February 1986 compared with estimates from the VPA. Numbers in millions.

Age	VPA	Acoustic	% mature
	Jan. 86	Feb. 86	
3	152.8	8.6	0.0
4	95.0	78.9	17.5
5	46.6	44.8	61.7
6	8.8	18.9	90.1
7	4.1	14.8	100.0
8	3.7	3.8	
9	0.2	0.2	
10	0.3	0.2	
11+	0.9	0.4	
<b>Sum 4+</b>	<b>159.6</b>	<b>162.0</b>	

Table 3. SAITHE NORTH SEA. Acoustic estimates (AC) and estimates by VPA.

YEARCLASS YEAR	1982			1981			1980			1979			1978		
	VPA	AC	AC	VPA	AC	AC	VPA	AC	AC	VPA	AC	AC	VPA	AC	AC
1984 jan	326			227			63			25			22		
1984 jul			167			268			107			62			22
1985 jan	238			115			23			10			7		
1985 feb		58			62			23			20			10	
1985 jul			241			76			27			5			6
1986 jan	95			47			9			4			4		
1986 feb		79			45			19			15			4	

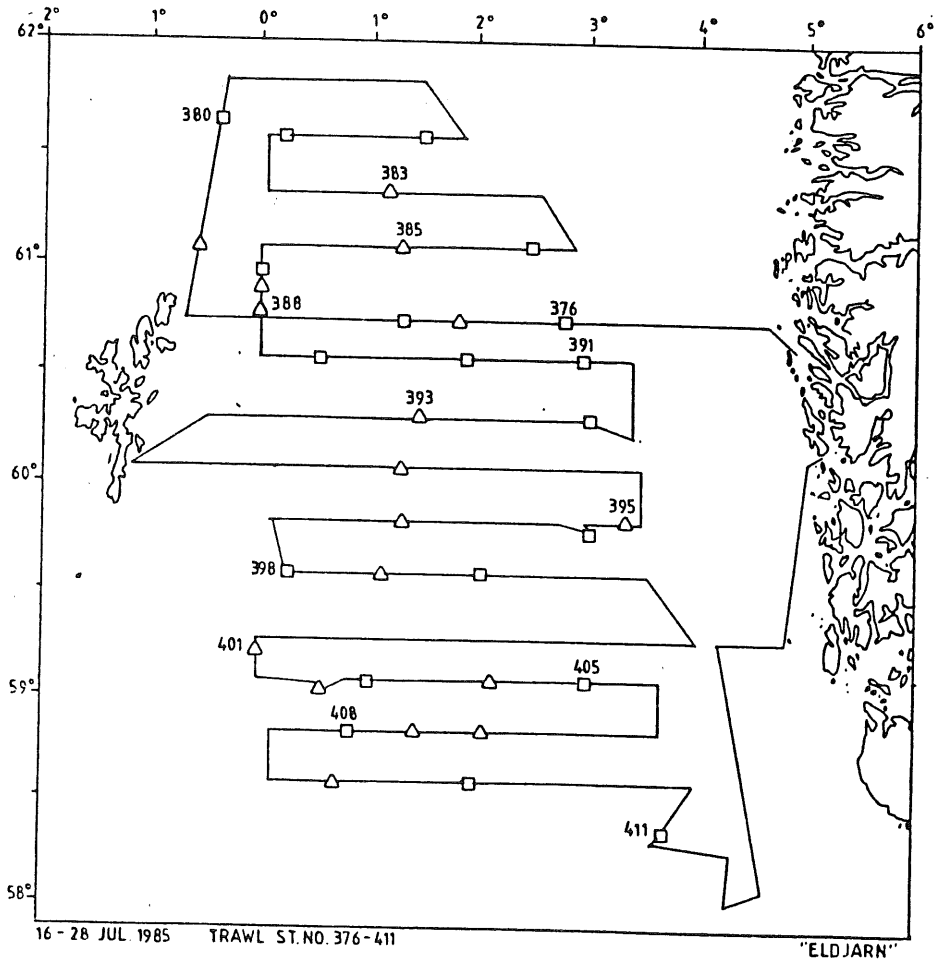


Figure 1. Survey track and stations. R/V "Eldjarn" 16-28 July 1985.

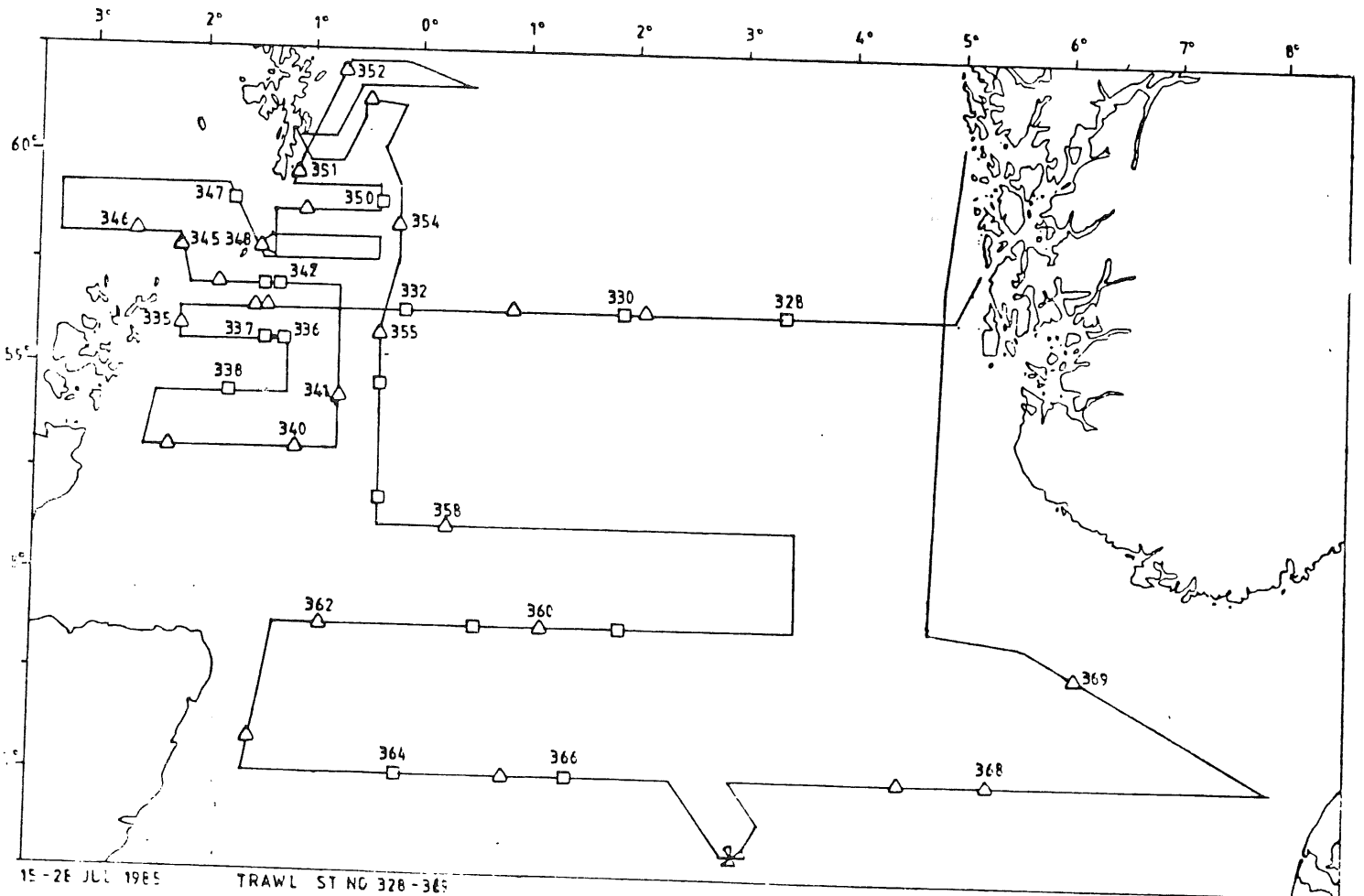


Figure 2. Survey track and stations. R/V "G.O. Sars" 15-28 July 1985. "G O SARS"

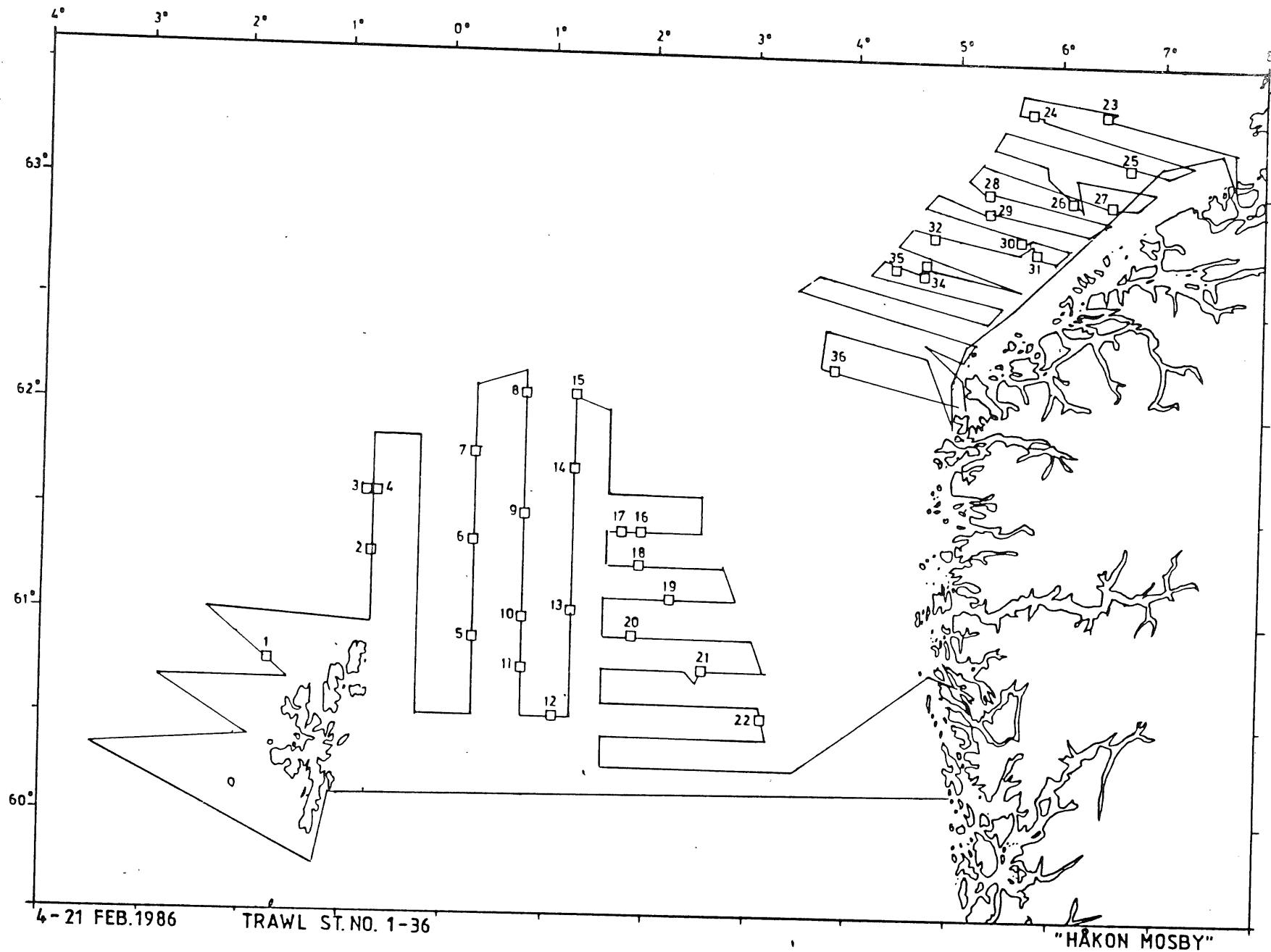


Fig.3. Survey track and trawl stations. R/V "Håkon Mosby", 4 - 21 February 1986.

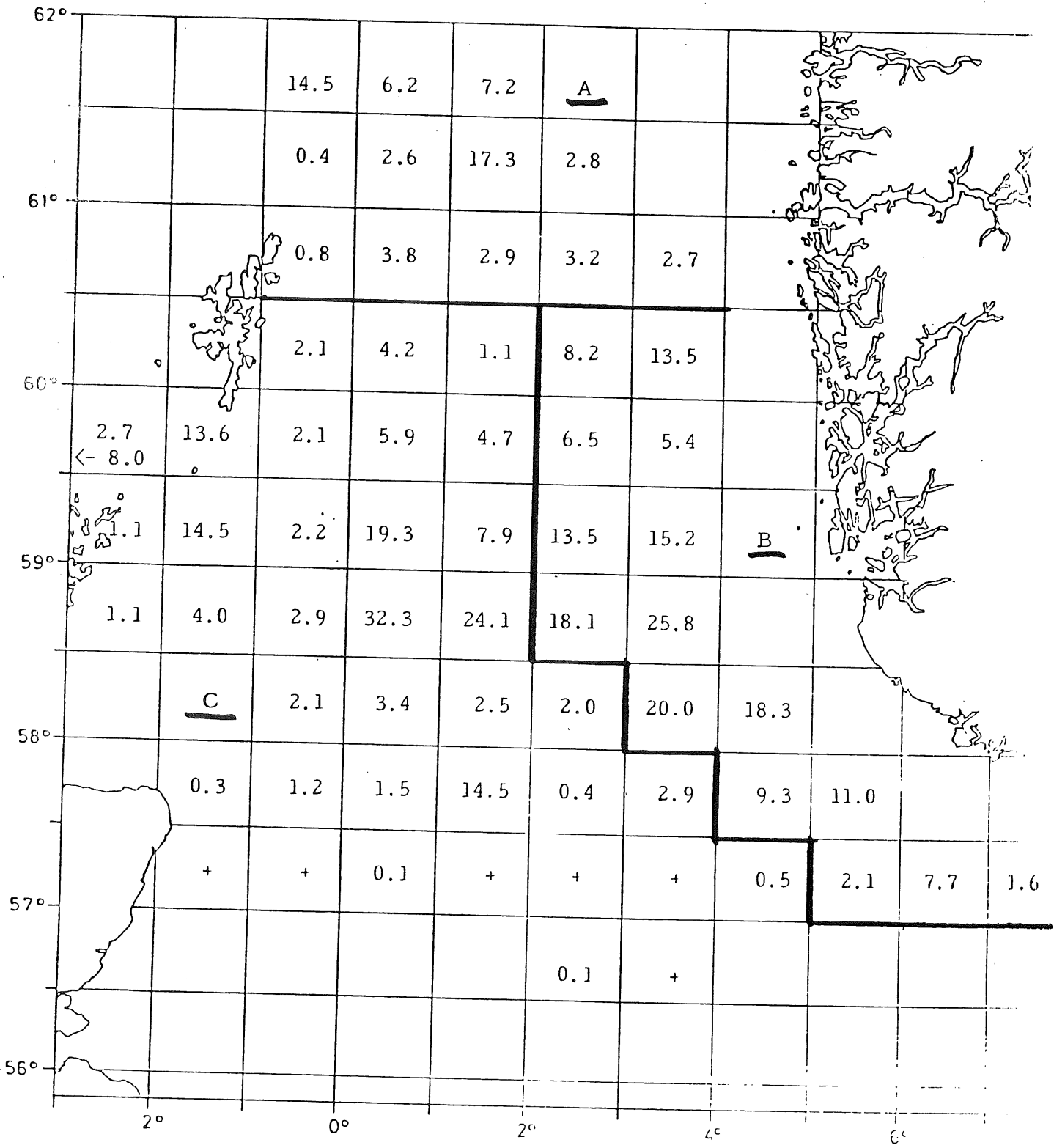


Figure 4 .

Distribution and abundance of saithe in July 1985. Numbers in millions.



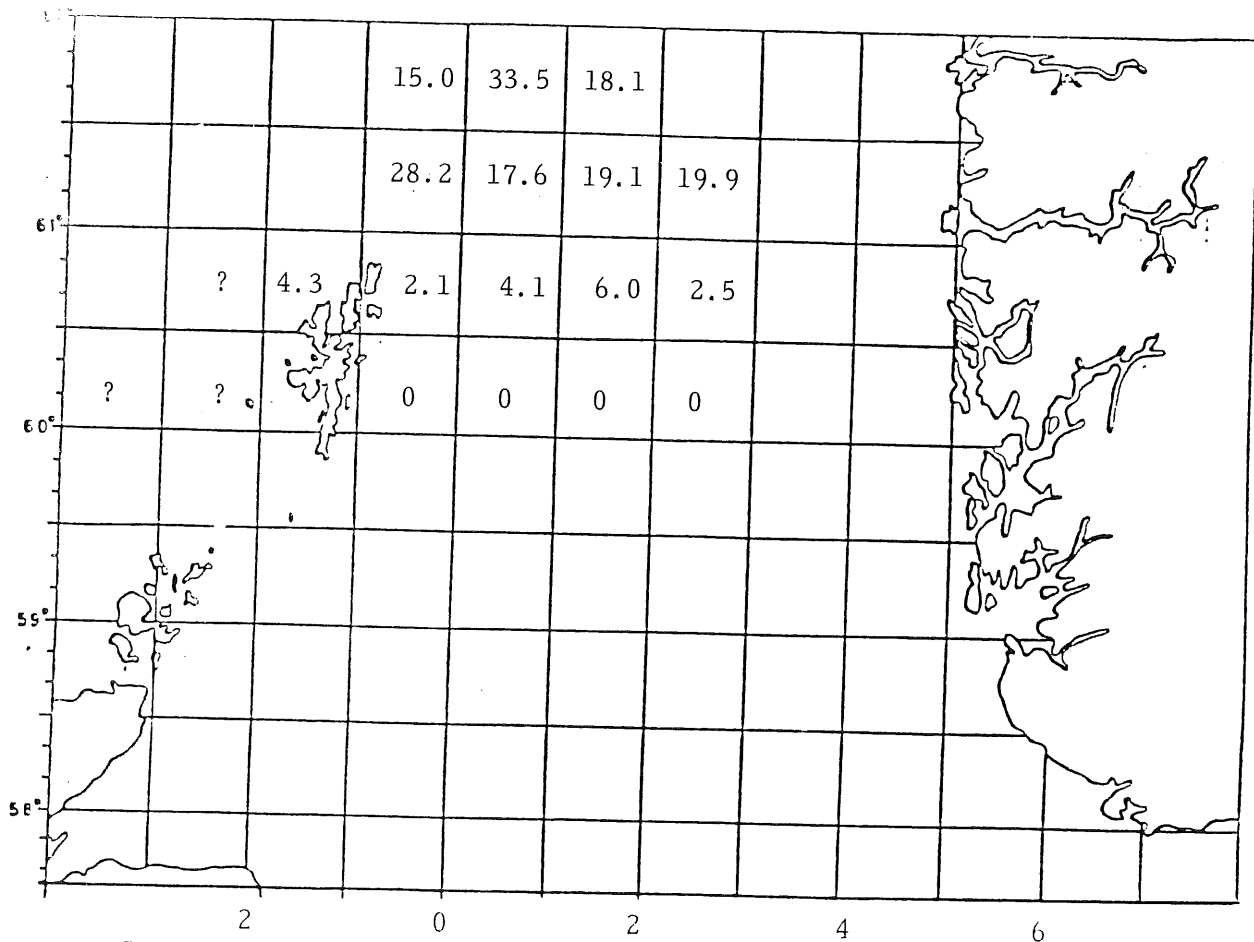


Fig. 5. Abundance of saithe. Numbers in millions.

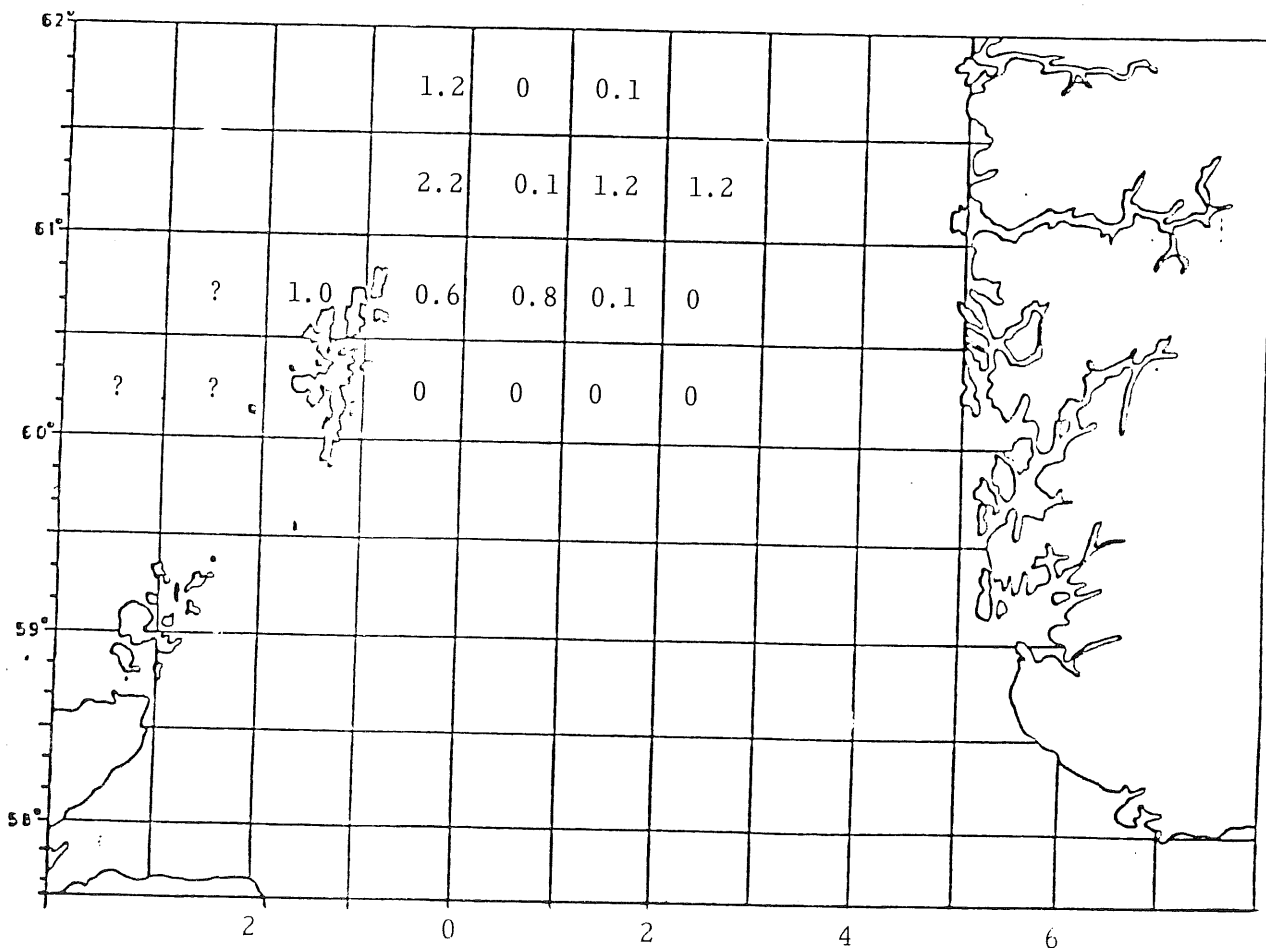


Fig. 6. Abundance of 3 years old saithe. Numbers in millions.

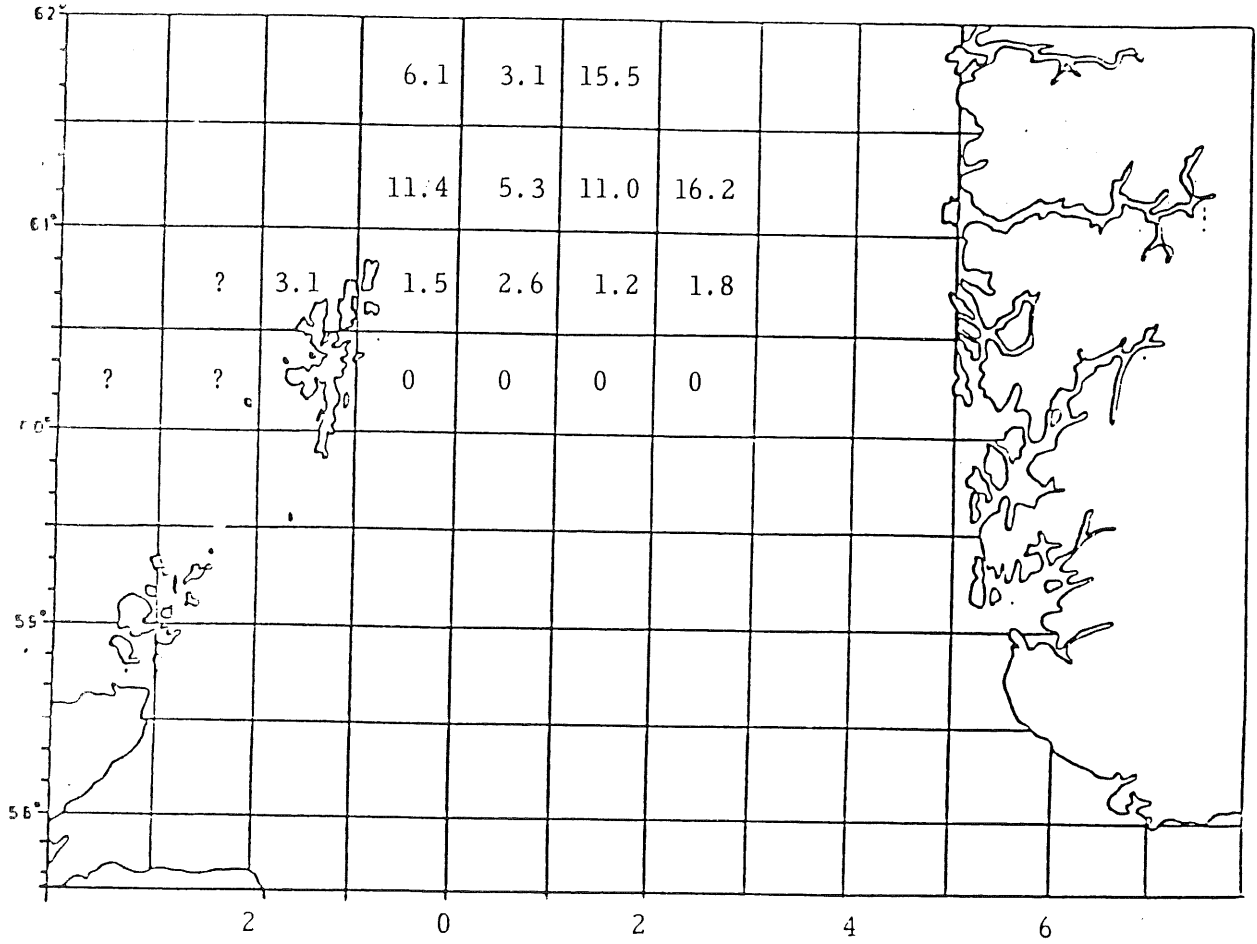


Fig. 7. Abundance of 4 years old saithe. Numbers in millions.

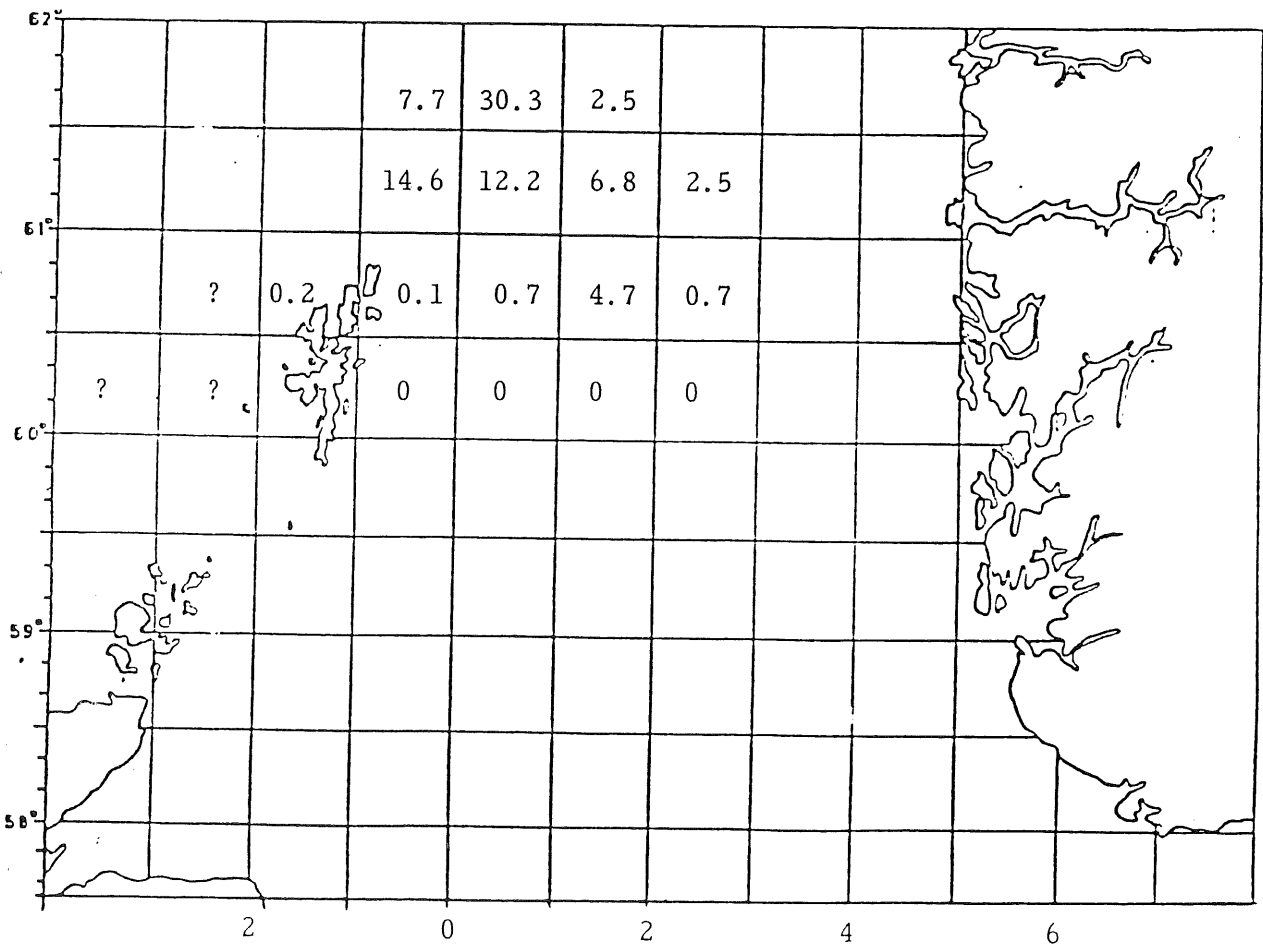


Fig. 8. Abundance of 5 years and older saithe. Numbers in millions.

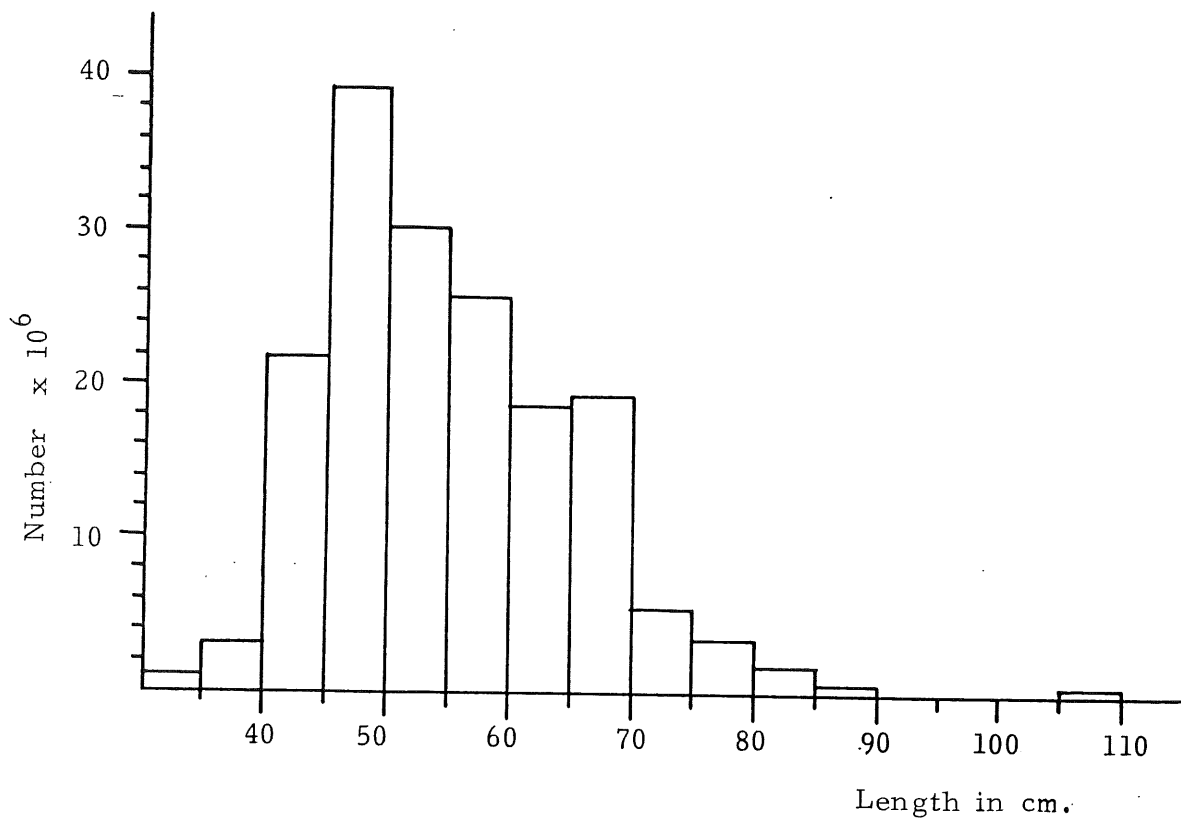


Fig.9. Estimated length distribution of saithe in the northern North Sea in February 1986.

