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The Faroese Long Line Catches on Flemish Cap 1973 to 1979  
as an Indicator of Stock Abundance

by

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Introduction: Except from some few trips in 1916 and 1917 Faroese fishery in waters off Canada did not start until 1956, and became a favourite ground of the rapid expanding number of modern longliners built in the latter half of the fifties and early sixties. (Túni 1971). Faroese records on the exact fishing area are poor up to 1973, but it is known that a Faroese fishery on Flemish Cap really started in the early sixties and catch levels in the sixties were about 7 - 8000 tons.

In the seventies a reduction in the number of longliners in the Faroese fishing fleet has taken place, but a number of vessels have remained in the fishery in the Western Atlantic. Until the changes in fishing limits took effect in the seventies the trips involved fishery in several areas e.g. Gulf of St. Lawrence, on Grand Banks and Flemish Cap.

Since 1977 the Faroese long lining has virtually been restricted to Flemish Cap, with a small quota in the 2J-3KL cod stock as a supplement.

The larger boats with sheltered working decks usually perform 2 trips a year, starting fishery in January. The smaller with open working decks do not start fishery until April, May and June, and usually only perform one trip a year to these waters. The specialists on fishery on Flemish Cap in the Faroese fishing fleet are longliners with home port in Klakksvík. These larger boats have sheltered working decks and are about 400 GRT.

They make one set a day each time using about 24 000 hooks. The total length of the long line is about 24 miles on average.

The product is wet salted cod, landed either in the Faroes or directly abroad.

Database:

Since 1973 data on catch and effort by statistical squares has been compiled in the FISKHAG data bank from fishing logs (Hoydal 1973).

Further, by law, catches of wet salted cod have to be sorted by quality and size categories, when landed. Thus for each landing there is a certified account of the weight of 5 different size groups (see table 2), which can be recalculated to the following total length groups.

The 5 size categories recalculated are:	1	> 81 cm
	2	70-80 -
	3	59-69 -
	4	44-58 -
	5	37-43 -

These data, however, refer to a whole trip, so when fishery has taken place on several stocks it is not possible to make a split on stocks. For this reason it has only been possible to use these data, as referring to Flemish Cap, for aug.-oct. 1977 to jan.-apr. 1979.

It has to be born in mind, that the information on statistical rectangle (1/2° latitude X 1° longitude ~ 30 X 41 miles) probably gives the correct stock area, but with a set of 24 miles length, there is any chance that the fishery has taken place in at least two statistical rectangles, although only one is given in the log.

#### Catch and effort.

Catches, effort and catch per unit effort are given in table 1 for the years 1973 to 1978 and provisional data for the first trip in 1979. It is difficult to see any seasonal pattern in these data, but on a yearly basis the CPUE's range from 190 kilos by 1000 hooks to 513. There are two peaks in 1974 and 1977, respectively. There is a marked decline in 1978 compared to 1977, but there is an increase again in the data for the first trip in 1979. The seasonal distribution of effort by statistical rectangles are given in figs. 1a and 1b for 1977 and 1978. The summer fishery seems in both years to be placed somewhat more to the north than the winter fishery.

#### The length distribution according to commercial sizes.

Landings which according to log books were known to be taken on Flemish Cap only, were pooled into 4 data sets, aug.-oct. 1977, jan.-apr. 1978, aug.-oct. 1978, jan.-apr. 1979 (see table 2) and the percentage by weight in each size category calculated. A length - weight relationship was assumed ( $w = 3 \times 10^{-5}$ ) kg and an "Average weight" per commercial size group was calculated by using the class midpoint as length.

The number per 100 tons was then calculated for each commercial category (table 2) and the frequency calculated by dividing the numbers in each class by the class width in cm (table 2 and fig. 2).

In table 3 these data have been combined with the catch effort data, and the catch in numbers per 100 000 hooks by size group is given.

To make 1977 comparable with the data for 1978 and 1979, it has is assumed that the size distribution is the same for both trips 1977, and using the catch per unit effort estimate for jan.-apr. period a dataset for jan.-apr. 1977 has been constructed (table 3). Thus there is established a 3 years series catches in commercial size groups for the jan.-apr. fishery.

In figs. 3 a, b, c the size frequencies per 100 000 hooks have been compared to the age-length distributions given by Wells (1979). In order to make the 1977 aug.-oct. data for Faroese distributions comparable to Wells jan.-febr. age data the Faroese 1977 distribution has been shifted 4 cm the left. 4 cm seems, according to Wells, to be the likely growth increment for the dominant age-groups, during the year

In table 4 an estimate has been made of the proportions of 1973 years class in each size group, judged from the curves given by Wells (fig. 3, 4 and 6 in this paper).

The age data given in Wells report are used directly on a yearly basis although these data show a very high variability in growth rates between year-classes.

#### Discussion

The Faroese material is perhaps not very conclusive by its own right. But it should allow some check of the estimate derived by other sets of data. Some points are worth making about using the Faroese long line data as stock indices.

1. There is no known change in gear technology through the period. Much the same vessels, using the same gears in the same way have operated throughout. They should all be assumed to be experienced to this fishery.
2. The competition-for-gear-effect seen in many long line fisheries (see Rothschild 1967) should be negligible in this fishery. The Faroese long liners perform an almost "clean" cod fishery on Flemish Cap.
3. Discarding is not known to take place. Landings should therefore really reflect catches.
4. No clear seasonal pattern emerges from the data in table 1. Analysis of data for Faroese long line fishing in other areas e.g. the Faroe Area (Report of the Faroe WG 1979, table 3.2), show a very clear seasonal pattern connected with spawning, main feeding period and pre-spawning migrations. One of the observations is, that during the main feeding period, the baited hooks may not be able to "compete" with food in the environment e.g. sandeel. This is seen from the fact, that trawls will take large catches in areas where long line almost has no catches. In order to make the data-sets comparable in this analysis, comparison has only been made between the same seasons or/and trips in different years.

Concludingly there seem not to be serious known bias in the Faroese CPUE data as stock indices.

More tricky is the business of using the commercial data for estimating sizes and ages. An attempt to this has been done in table 4.

The proportions by length group of each age have been estimated from the length-age curves given by Wells directly. The basic age-length keys would of course be of better use here. But another problem would not be solved by this. That is the estimation of length distribution inside each commercial category. It is in this analysis assumed that the numbers are the same for all cm groups inside a commercial category.

This is of course not true, and this assumption introduces a bias into the estimate of each age in the commercial group, and by the way total number, in each commercial group, too, because, to get a "average weight per commercial group" the class midpoint has been used. If the distribution inside the commercial group is very skewed this could introduce a serious bias into the estimate of number per group.

The figures given in table 4 should therefore be taken with some care.

With these precautionary remarks in mind, conclusions however can be made:

1. The estimates of numbers caught of the 1973 year class in the three years 1977, 1978 and 1979, seem not to indicate a very high fishing mortality.
2. The upward trend in the CPUE in jan.-apr. 1979 seems not to indicate fishery on a reduced stock.
3. The catches jan.-apr. 1979 seem to indicate a reasonable recruitment to the stock by yearclasses after 1973, or to put it another way, the fishery seems not to be dependent on a single yearclass.

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Table 1 Cod 3M. Faroese long liners 1973-1979  
 Y = landings in tons, E = effort = 1000 hooks, CPUE = kg/1000 hooks

	1973		1974		1975		1976		1977		1978		1979 x)	
	Y	E CPUE	Y	E CPU										
January	-	-	-	-	-	-	-	-	226	813	423	839	391	1009
February	121	311	166	447	374	699	227	1066	119	643	877	2993	730	2097
March	529	1679	315	758	426	977	171	1336	86	610	928	3802	857	2329
April	1410	2803	503	918	298	164	162	1165	125	473	876	3946	894	2776
May	1504	2806	536	28	27	55	237	748	802	2785	1160	5249	221	
June	1373	2998	458	45	712	1000	340	1172	391	672	446	2877	155	
July	1198	1100	1089	133	128	348	38	334	858	1474	870	4833	180	
August	832	4727	176	398	308	1217	220	1095	1614	2686	1271	6355	200	
September	647	5392	120	142	507	1179	260	2031	1163	2504	832	4923	169	
October	-	-	-	-	143	701	181	943	283	535	239	729	328	
November	140	2333	60	-	308	1375	243	1397	-	-	-	-	-	
December	-	-	-	36	58	472	123	-	-	-	-	-	-	
Total	7754	24150	321	1871	3289	8187	402	2139	5664	13195	7922	36548	217	2872
				1871	3644	513	190	429	217	8211	35			

x) provisional

Table 2. COD, FLEMISH CAP, SIZE DISTRIBUTION BY COMMERCIAL SIZE CATEGORIES IN FAROESE LANDINGS

Faroese commercial categories wetsalted	Lower class limit cm	total length	1977		1978		D 1979 jan-apr	Est x Av. weight kg	Estimated number by 100 tons catch				Frequency = Number divid by class width % see fig	
			A 1977 aug-oct	B 1977 jan-apr	C 1978 aug-oct	D 1978 jan-apr			A	B	C	D		
over 22"	81	14.6	12.8	10.1	10.3	7.298	2003	1756	1385	1413	0.19	0.19	0.14	0.15
19-22"	70	10.0	13.4	11.7	19.1	4.219	2370	3176	2773	4527	0.39	0.59	0.48	0.81
middle	59	24.2	31.5	33.0	27.4	2.746	8813	11471	12017	9978	1.46	2.12	2.10	1.79
small	44	47.5	41.2	42.8	40.4	1.327	35870	31047	32329	30445	4.36	4.21	4.14	4.00
handfish	37	3.7	1.1	2.3	2.8	0.640	5781	1719	3594	4375	1.51	0.5	0.99	1.23
total							54837	49169	52098	50738				

x class midpoint cubed x 10<sup>-5</sup> kg

Table 3. CATCH IN NUMBERS IN COMMERCIAL SIZE GROUPS  
per 100.000 hooks

Lower class limit	1977	1978		1979
	aug-oct	jan-apr	aug-oct	jan-apr
81	1070	471	270	495
70	1266	851	541	1584
59	4706	3074	2343	3492
44	19155	8321	6304	10656
37	3087	461	701	1531
Total	29284	13117	10159	17758
Catch. kg/1000 hooks	534	268	195	350

Constructed dataset for jan-apr 1977 ( see text)

Lower class limit	1977 jan-apr
81	439
70	519
59	1930
44	7856
37	1266
Total	12010
Catch kg/ 1000 hooks	219

Table 4. Index of catches of 1973 yearclass Faroese catches  
in numbers by sizegroup split by reading the age-  
length curves given by Wells (1979).

Proportion in size group of 1973 year class

	jan.-apr. 1977	jan.-apr. 1978	jan.-apr. 1979
size group 2	0	0	0.15
3	0.25	0.48	0.63
4	0.85	0.87	0.59
5	1.00	0.50	0.03

Estimated total numbers caught of 1973 year class by Faroese long liners

	jan.-apr. 1977 age 5	jan.-apr. 1978 age 6	jan.-apr. 1979 age 7
size group 2	-	-	238
3	483	1476	2200
4	6678	7239	6287
5	<u>1266</u>	<u>231</u>	<u>46</u>
total	<u>8427</u>	<u>8946</u>	<u>8771</u>

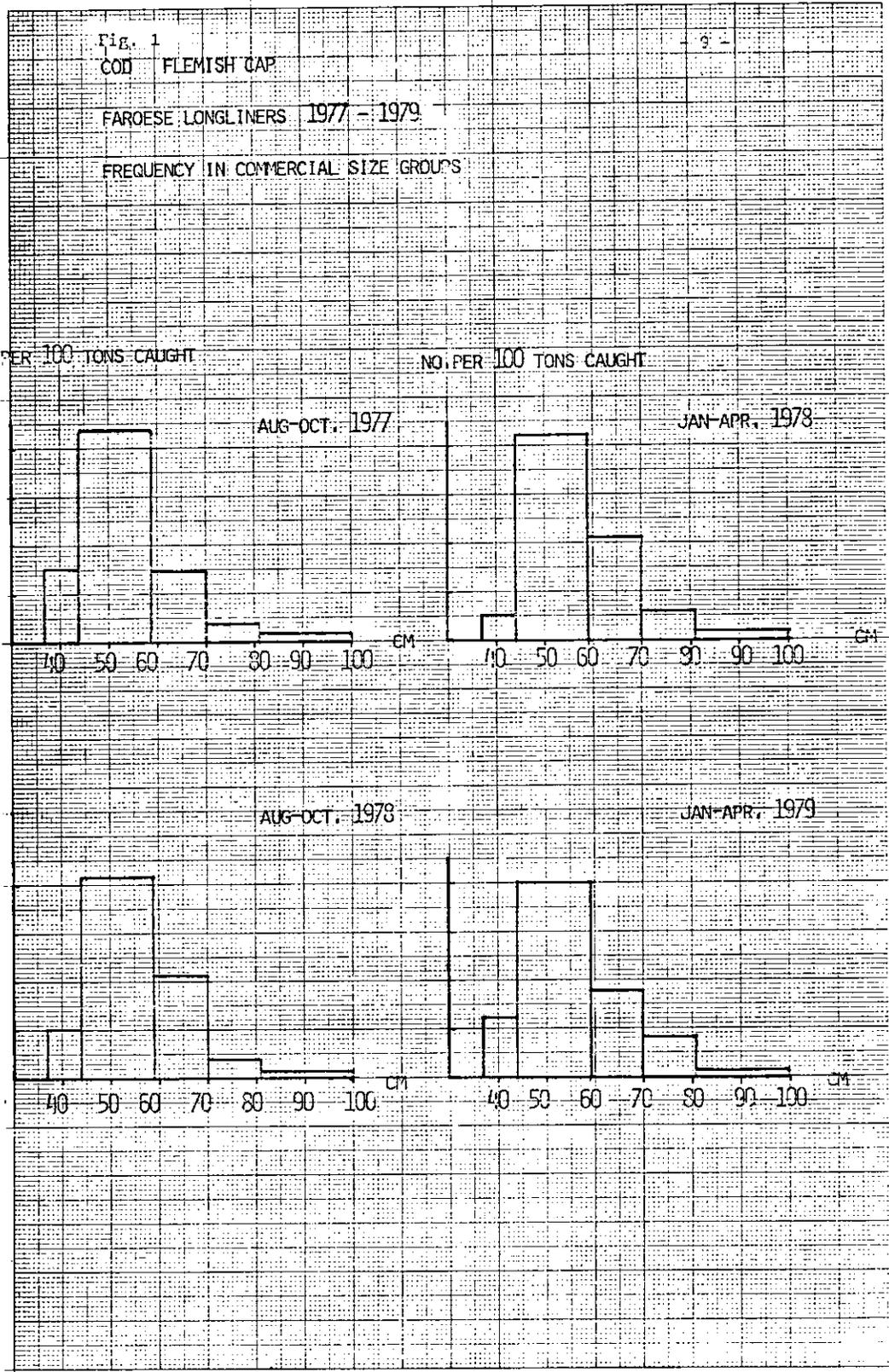


Fig. LONG LINE EFFORT (1000 hooks) FAROESE VESSELS 1977-3M COD, from log books

Seasonal distribution of fishery on Flemish Cap.

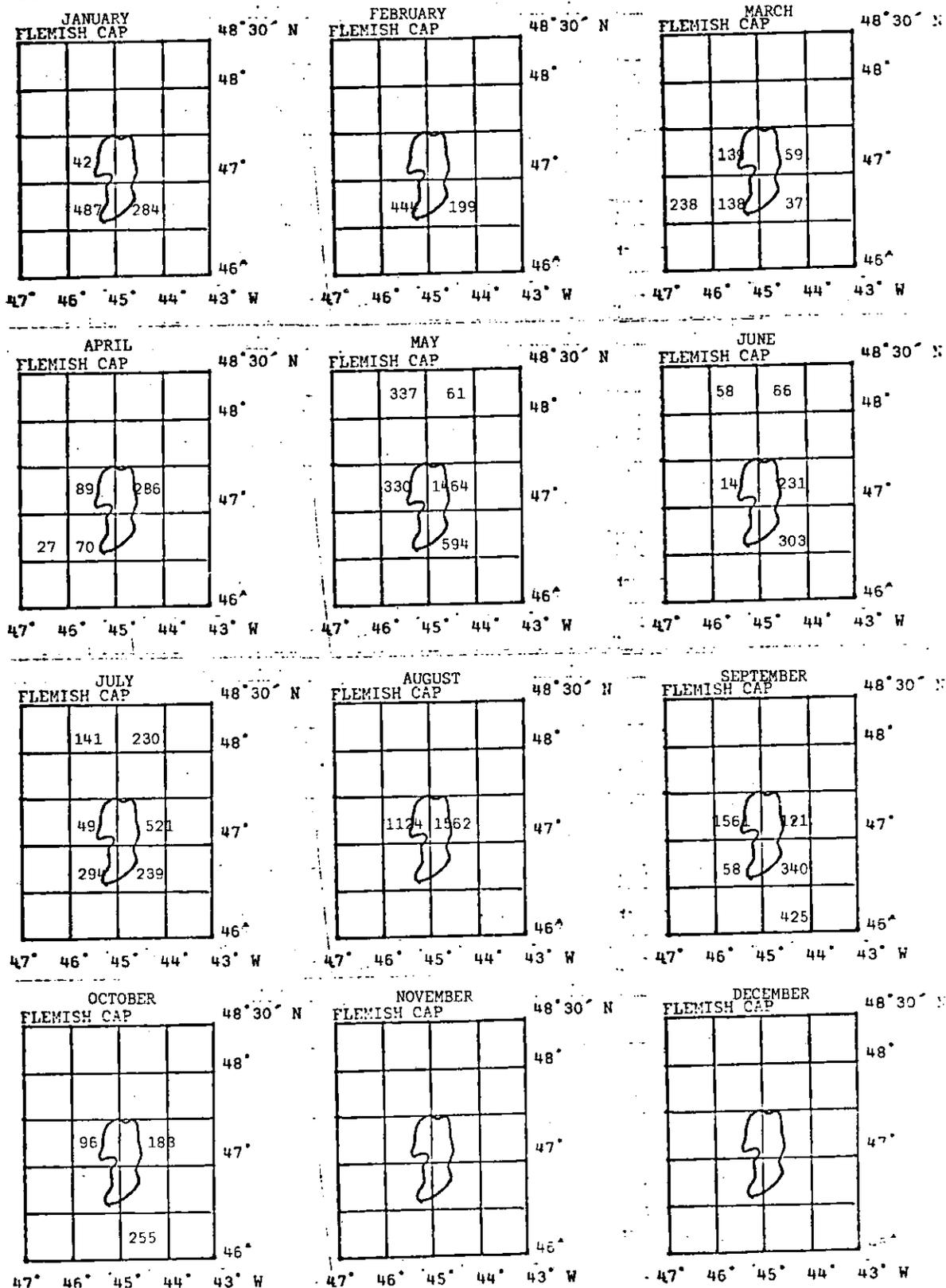


Fig. 2b. LONG LINE EFFORT (1000 hooks) FAROESE VESSELS 1978: 3M COD, from log books

Seasonal distribution of fishery on Flemish Cap

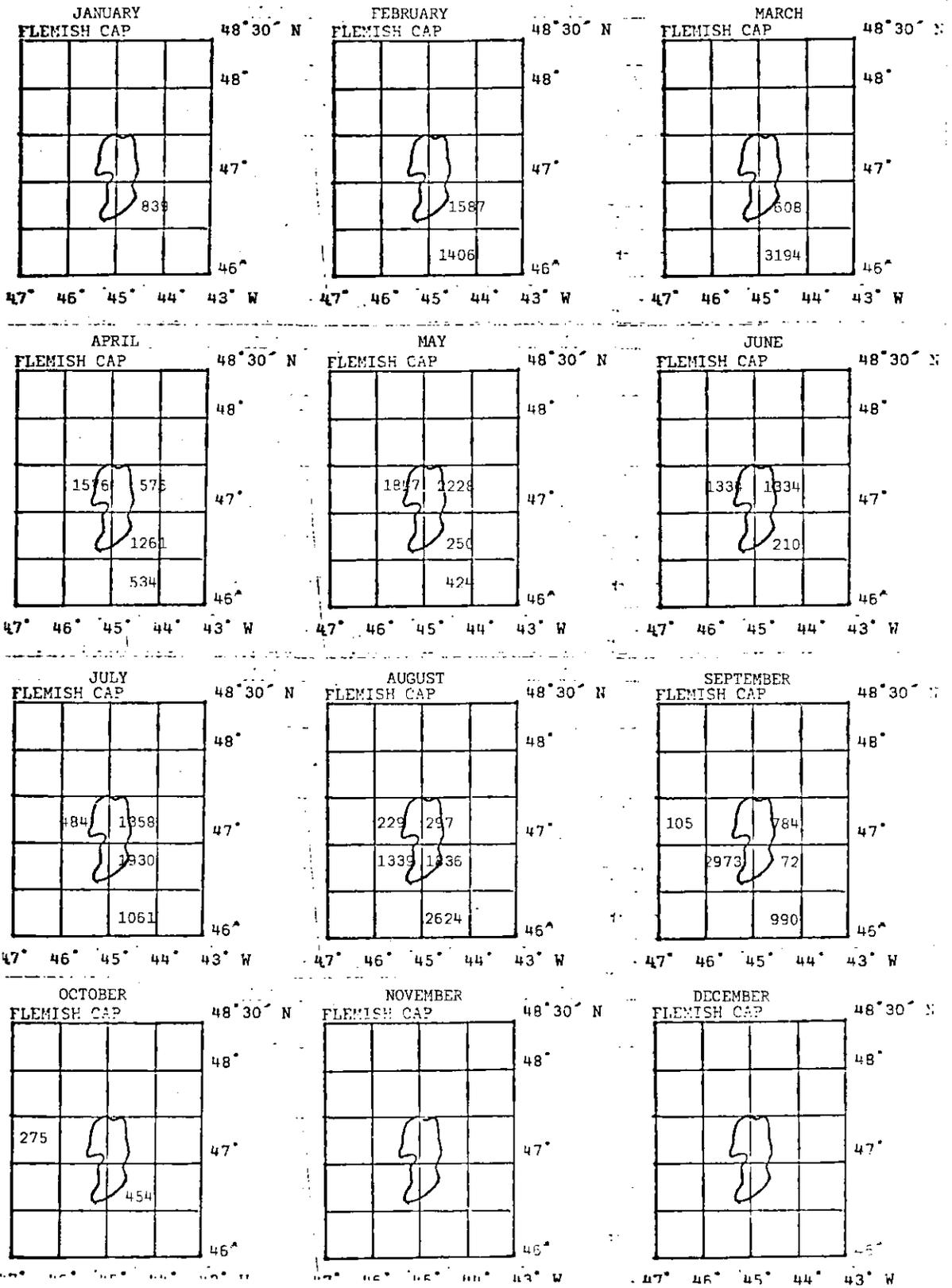


Fig. 3 a & b

Faroese Catches in numbers by commercial size group superimposed on the length-age curves given by Wells (1979)

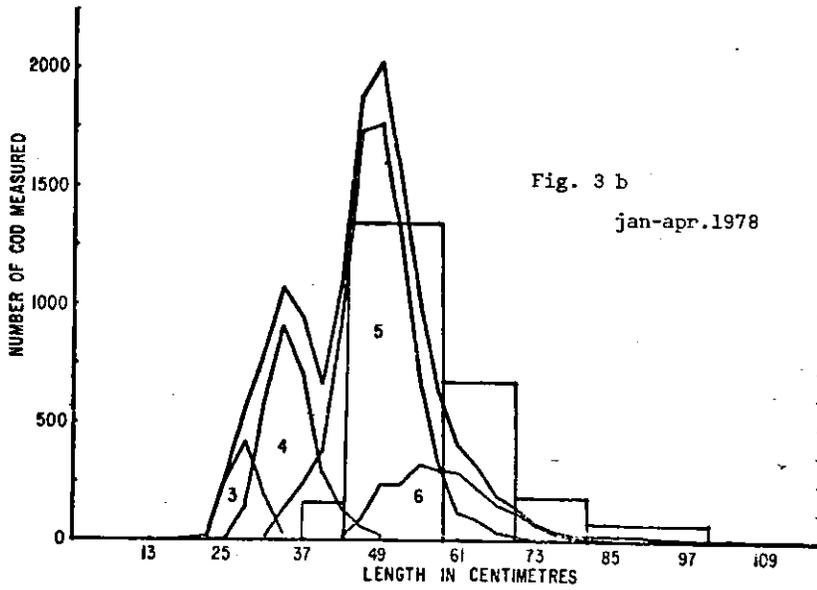
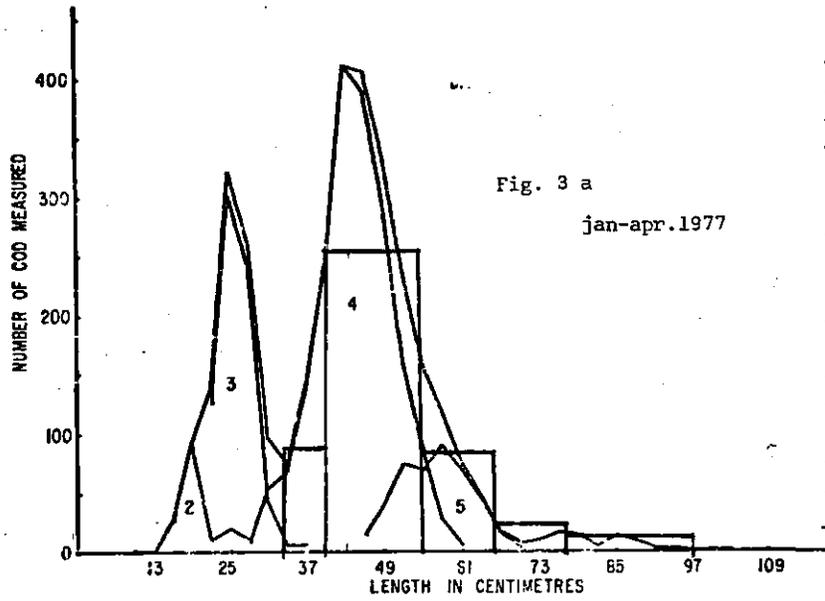


Fig. 3 c

Faroese Catches in numbers by commercial size group superimposed on the length-age curves given by Wells (1979)

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