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Portuguese Research Report 1970

by

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In 1970, the Portuguese fishing fleet of side and stern trawlers (otter trawls) and dory vessels (line trawls) took cod from Subareas 1, 2, 3, and 4 in the amounts shown in Table 1 and Figure 1.

Table 1

Subareas	Line Dory Vessel	Side	Trawl Stern	Total	Total Line & trawl
1	5,229	801	2,677	3,478	8,707
2	-	25,024	16,989	42,013	42,013
3	25,337	57,983	7,554	65,537	90,874
4	205	18,582	2,274	20,856	21,061
Total	30,771	102,390	29,494	131,884	162,655

Total landings of 162,655 metric tons of cod were, once more, lower than in the preceding year (182,349 tons). The decrease by trawl was 569 tons and by line 9,126 tons. Except in Subarea 1, landings by the side trawlers were greater than by the stern trawlers.

Table 3 shows the landings by months, quarters and Subareas as well as the fishing efforts by the Portuguese line fleet. The total landings from the three Subareas where the dory vessels operated are also shown at the right of the table.

The trawlers operated in four Subareas but fished mainly in 3 and 2 over the four quarters of the year (Table 2, Figure 2). Dory vessels visited Subareas 1, 3 and 4 and made major catches in Subarea 3 (25,337 tons) as against only 5,434 tons from the other two Subareas. The trawlers fished best in Subareas 3 and 2, with 65,537 tons and 42,013 tons, respectively.

The best line fishery occurred in July and September (Subarea 3) and the best trawler fishing (side and stern) in April (Subarea 3). The highest trawler catch was in the 1st quarter, 46,022 tons (27,147 tons landed in Subarea 2).

Tables 2 and 4 show also that the side trawlers fished intensively in Subarea 3 (57,983 tons) with 42,574 tons in Div. 3L.

Table 4 presents data on the catches by ICNAF Divisions (trawl and dory vessel) where the Portuguese fleet operated during 1970. Fishing effort as hours fishing and dory-hours are also presented.

The present report in addition to reviewing the status of fisheries, presents also data on lengths, ages, maturity and probable age at first maturity obtained from random sampling on board commercial trawlers before discarding the undersized fish.

Detailed information on the samples for length and age are included in the ICNAF Sampling Yearbook.

Subarea 1

A - Status of the fisheries

The trawlers fished in Divisions 1B, 1C, 1D and 1E during the 2nd, 3rd and 4th quarters of the year with best catches in the 2nd quarter (3,243 metric tons). The highest catch was made in Div. 1C (1,290 tons) and the smallest in Div. 1F (190 tons). The dory vessels fished only in Div. 1B, 1C and 1D, mainly in Div. 1C (3,894 tons) during the 2nd and 3rd quarters of the year.

Subarea 2

A - Status of the fisheries

Only the trawlers fished in this Subarea (42,013 tons) with best catches from the side trawlers. Of the Divisions visited (2G, 2H and 2J) Div. 2J had the highest catches, 38,583 tons, against only 3,009 tons and 421 tons from Div. 2H and 2G, respectively.

Catches by quarters were best in the 1st quarter with 27,147 tons (15,971 tons from the side trawlers and 11,176 tons from the stern ones).

B - Special Research Studies

Samples for biological studies were collected from the trawler fleet in Div. 2J between 13 and 20 February. Several samples were obtained for measurements of the fishes and others for otoliths too. A total of 1,174 fishes were measured and 424 otoliths were collected of which 300 were studied. Fishing depths varied from 210 and 300 m. Mean length was 53.4 cm. and mean age 6.6 years. The ages ranged from 5 to 12 years (Fig. 3) and lengths ranged from the 40 to 79 3-cm classes (Fig. 3).

Growth is shown below (figures in brackets are numbers of fish):

Year-class	Age-group	Length (cm)	No. of fishes
1965	V	43.4	(34)
1964	VI	49.7	(111)
1963	VII	56.7	(117)
1962	VIII	63.4	(30)
1961	IX	67.9	(7)
1960	X	-	-
1959	XI	-	-
1958	XII	73.0	(1)

The majority of the fishes sampled in the Div. 2J (males and females) were in the resting or recovering and developing stages. Fish in the spawning stage were 22% males and only 1% females (Fig. 4).

The study of age at first maturity shows, as usual, a very high percentage of immature fish. Where it was possible to detect in some otoliths, age at first maturity was 6, 7 and 8 years, mainly in the females.

Subarea 3

A - Status of the fisheries

Total landings were as follows: dory vessels - 25,337 tons; side trawl - 57,983 tons; stern trawl - 7,554 tons.

Tables 3 and 4 show that the dory fleet made better catches in Div. 3L with 21,782 tons almost the total landed in this Subarea. The trawlers fished mainly in this same Division with 65,537 tons landed, from which 57,983 tons were from side trawl. The best fishery by quarters occurred, for dory vessels and trawlers, in the 2nd and 3rd with 28,924 tons and 18,103 tons respectively (Tables 2 and 3).

The trawlers also operated yet in Div. 3K, 3M, 3N and 3P with somewhat poor landings; the dory vessels fished also in Div. 3M, 3N, 3O and 3P with small landings.

B - Special Research Studies

Samples for biological study were collected from the trawler fleet in Div. 3L and 3M as follows:

Div.	Samples	Date	Depth	Nº. lengths	Nº ages
3L	A	25-26 March	260	300	-
"	B	6-20 April	200-230	1724	350
"	C	5-23 May	145-250	997	225
"	D	6-10 June	200-270	1900	-
				4521	1050
3M	E	19-30 March	410	1150	

a) Length composition

Lengths (Fig. 5) ranged from 28 to 115 3-cm classes; mean lengths were in sample A - 57.8; B - 56.7; C - 58.3; D - 53.5; E - 58.8.

b) Age composition

Ages ranged from 3 to 30 years. Only one fish was 30 years old. The main range was from 3 to 16 years.

In April and May, VI and VII age-groups were dominant, in June the V and VI age-groups, with the VII age-group also important.

Mean ages were in sample B - 6.5; C - 6.6; D - 6.1.

c) Growth

Average length (cm) of cod caught by trawl, sampled during the 2nd quarter. (Figures in brackets are numbers of fish).

Year Class	Age-group	Division 3L Lengths (cm)			No. of fish
		April	May	June	
1967	III	37.0	37.0	37.0	(1)
1966	IV	43.0	42.8	42.6	(28)
1965	V	47.1	47.3	46.9	(178)
1964	VI	54.3	54.4	53.3	(331)
1963	VII	60.5	60.4	59.5	(333)
1962	VIII	66.3	66.5	65.2	(111)
1961	IX	72.1	73.3	71.9	(33)
1960	X	75.9	77.5	77.1	(15)
1959	XI	77.7	78.2	81.5	(6)
1958	XII	74.8	80.6	69.5	(6)
1957	XIII	99.5	100.2	103.0	(3)
1956	XIV	97.0	97.0	-	(1)
1955	XV	-	-	-	-
1954	XVI	103.0	103.0	103.0	(1)

1940	XXX	-	115.0	115.0	(1)

d) Stage of maturity

Figure 6 shows that most of the females observed during the 2nd quarter were in the resting or recovering stage; in April as well as in May and June, a small percentage were in the developing stage. The spawning stage was also observed, but only significantly in April and May. The males were in the resting or recovering stage; a low percentage were in the spawning stage; the post-spawning stage was observed in May (25%) and June (very small percentage).

e) Age at first maturity

Only a very low percentage of the males and females aged showed otolith rings of first maturity (mainly in the ages 7, 8 and 6 - Fig. 6). About 90% of the observations were from immature fish or from samples where it was not possible to decide, with a reasonable degree of certainty, the age at first maturity.

Subarea 4

A - Status of fisheries

Total cod landings from this Subarea amounted to 21,061 tons fished by trawlers and dory vessels as follows: Line fishery - 205 tons; Side trawlers - 18,582 tons; Stern trawlers - 2,274 tons.

The dory vessels only fished in Div 4R and 4S, landing 205 tons. Trawler landings were more important with 17,809 tons landed from Div. 4R and 2,326 tons from Div. 4Vn against only 721 tons from Div. 4S, 4T and 4Vs. Dory vessels landed only 11 tons in the 2nd quarter and 194 tons in the 3rd. The trawlers fished mainly during the 1st quarter (11,733 tons); other catches were not so significant (9,051 tons in the 2nd quarter and only 72 tons in the 3rd).

B - Special research studies

Samples for biological studies were collected from the trawlers in Div. 4R in March and April as follows:

Div.	Samples	Date	Depth	Nº. lengths	Nº. ages
4R	A	5-15 March	210-300	739	250
4R	B	2-4 April	160-205	221	-
				<u>960</u>	<u>250</u>

a) Length composition

The lengths (Fig. 7) ranged from 37 cm to 73 cm classes, and the mean length was 56.3 cm.

b) Age composition

The age-groups ranged from IV to VIII with the 1963, 1964 and 1962 year-classes predominant in Div. 4R (VII, VI and VIII years-group - Fig. 7) Mean age was 7.1 years.

c) Growth

Fish sampled in March in Div. 4R (figures in brackets are numbers of fish).

Division 4R

Year class	Age-group	March - Length (cm)	No. of fish
1966	IV	39.8	(4)
1965	V	45.0	(33)
1964	VI	50.4	(83)
1963	VII	57.2	(88)
1962	VIII	60.4	(22)
1961	IX	65.5	(9)
1960	X	66.7	(4)
1959	XI	65.6	(3)
1958	XII	72.3	(2)
1957	XIII	67.3	(2)

d) Stage of maturity

Figure 8 shows that females studied were in the resting or recovering and developing stages (60% and 40% respectively). The males were over 40% in the stages resting or recovering and developing and about 20% in the spawning stage.

e) Age at first maturity

The males and females observed were almost in the immature stage, and the study of the rings of maturity in the otoliths could not be made. Nevertheless, it was possible to observe some otoliths showing ages at first maturity of 6, 7 and 8 years.

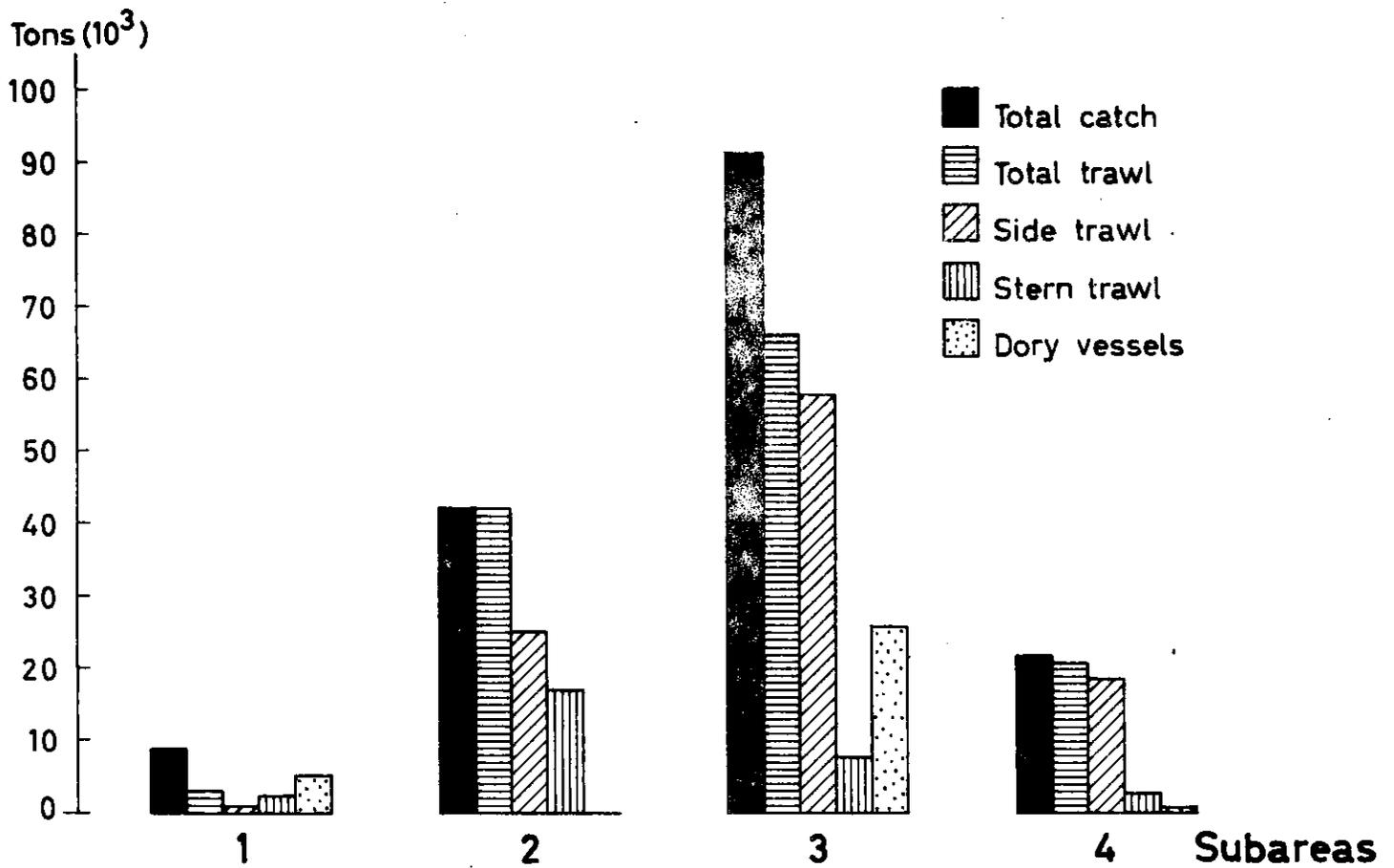


Fig. 1 - Cod catches (in tons) of Portuguese fishery fleet by subareas, 1970

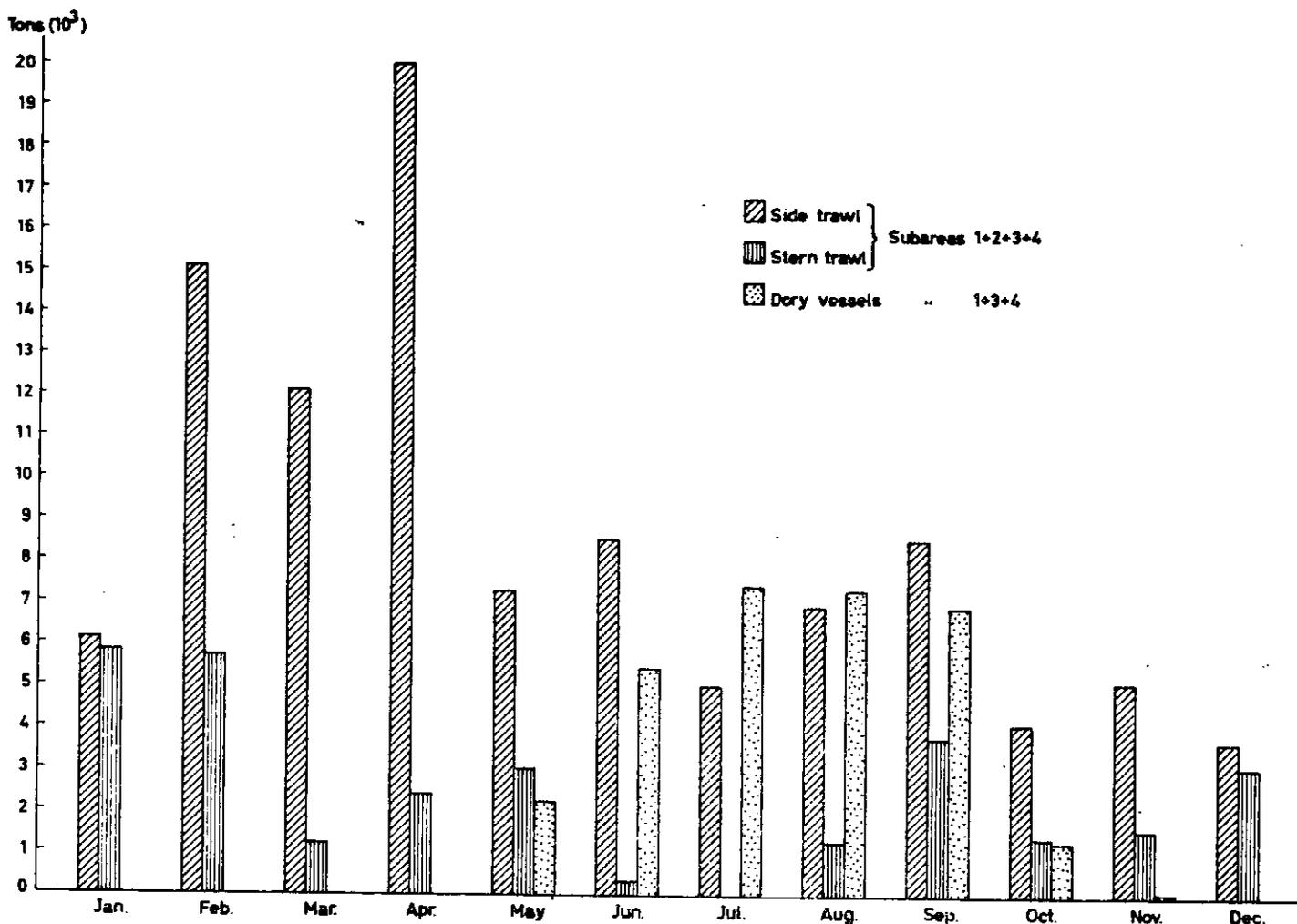


Fig. 2 - Total catches of cod (in metric tons) of Portuguese fishery fleet (trawlers and dory vessels) by months, 1970

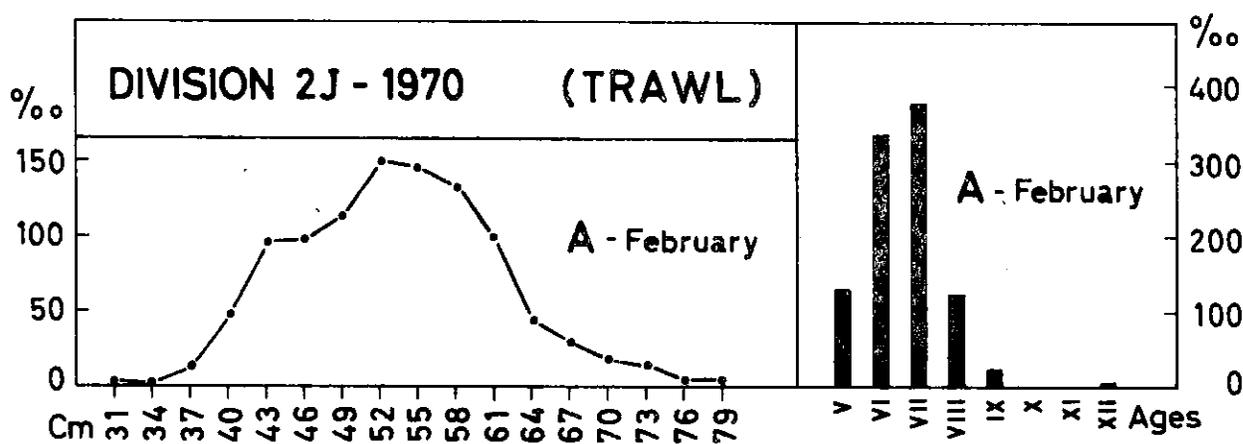
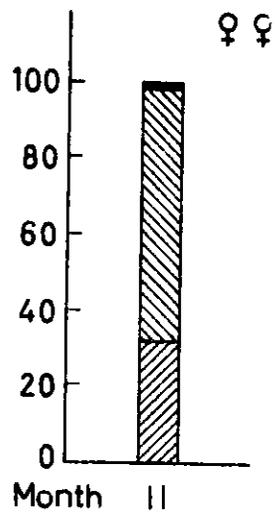
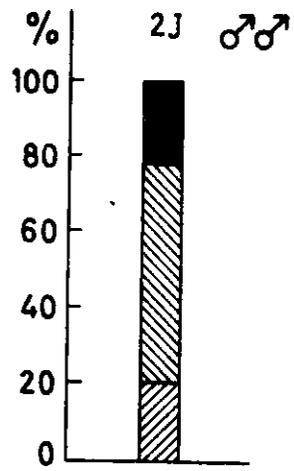


Fig. 3



- ▣ Post-spawning
- Spawning
- ▨ Developing
- ▧ Resting or recovering

Fig. 4

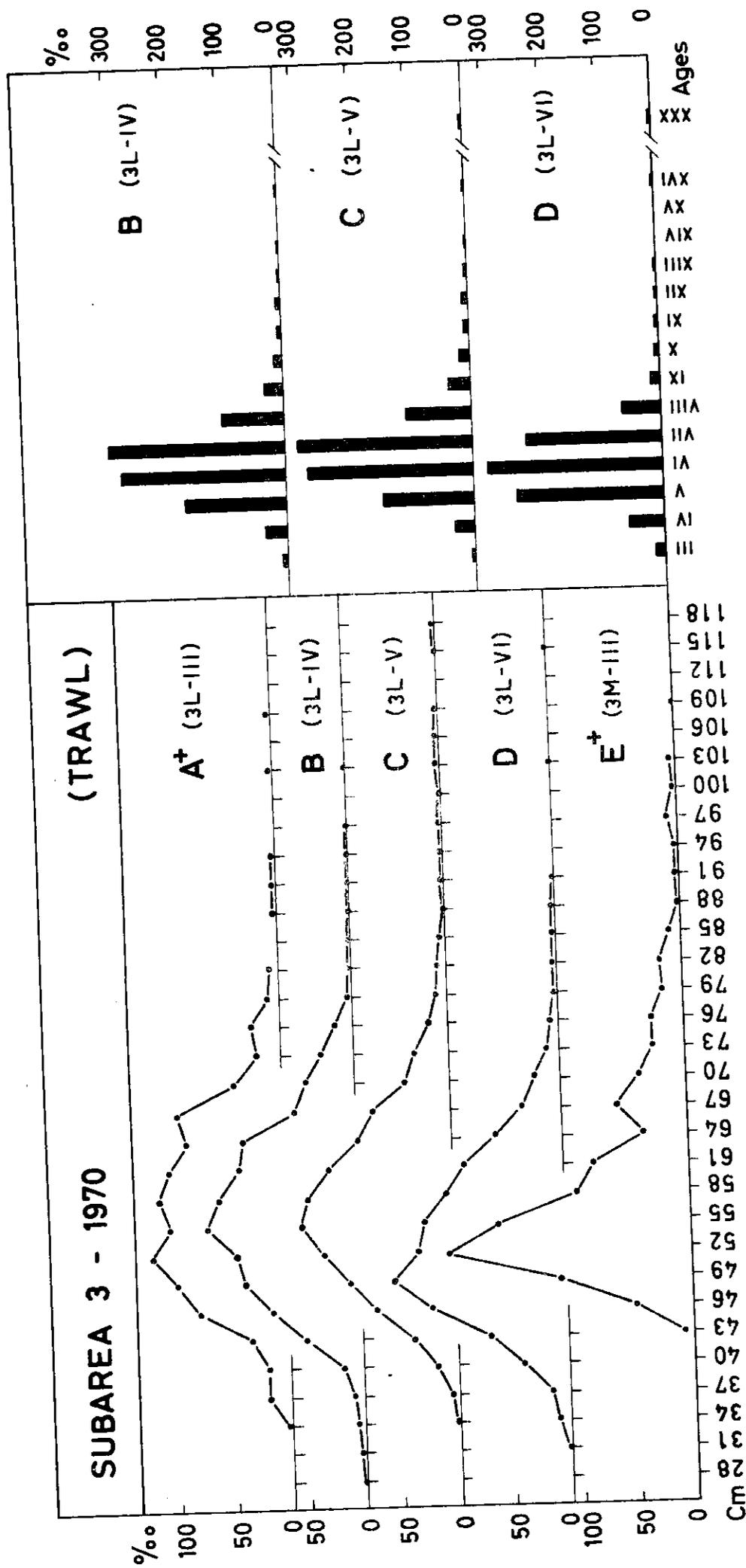


Fig. 5

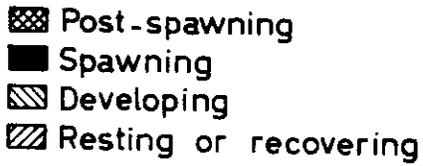
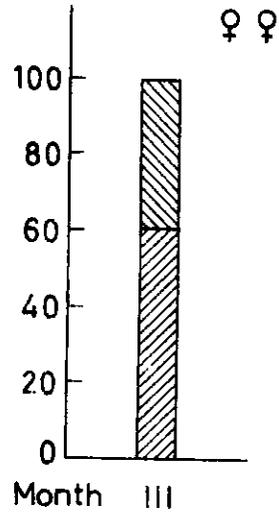
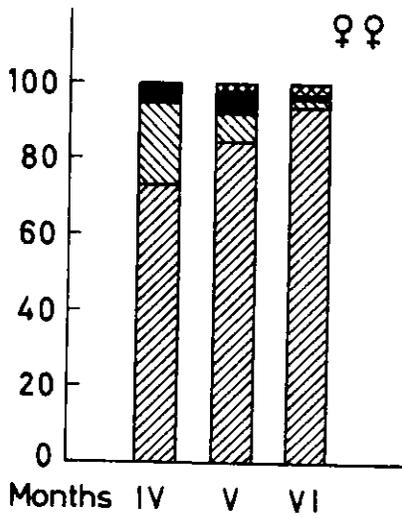
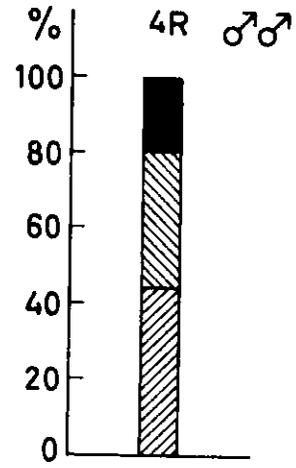
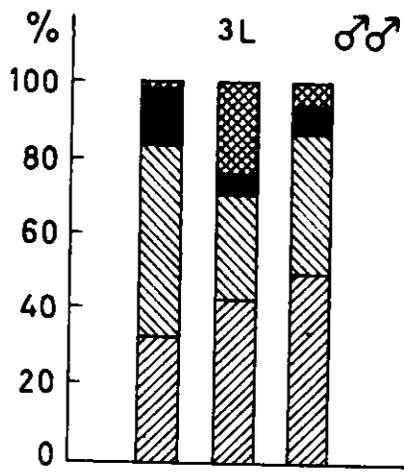


Fig. 6

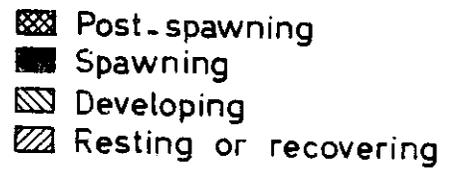


Fig. 8

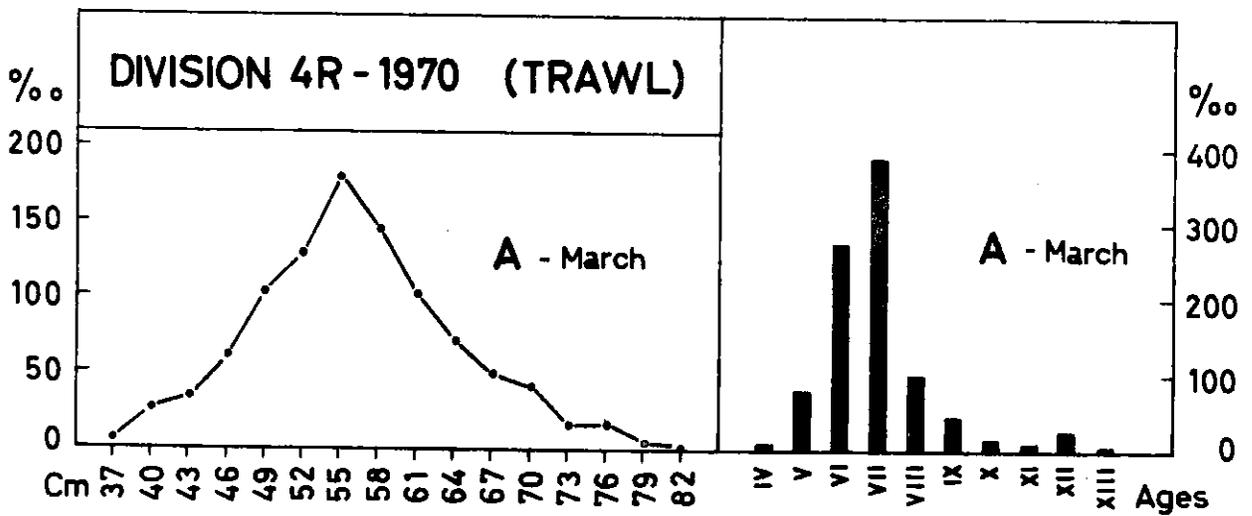


Fig. 7

TABLE 2 - GOD LANDINGS AND EFFORTS TRAWL FLEET 1970

Months Trawl	SUBAREAS								TOTAL		
	1		2		3		4		Tons	Hours fishing	
	Tons	Hours fishing	Tons	Hours fishing	Tons	Hours fishing	Tons	Hours fishing	Tons	Hours fishing	
Jan.	Side	-	-	5 675	2 786	430	199			6 105	2 985
	Stern	-	-	5 841	2 336					5 841	2 336
	Total			11 516	5 122	430	199			11 946	5 321
Feb.	Side	-	-	9 719	3 316	146	78	5 226	1 416	15 091	4 810
	Stern	-	-	5 256	1 549			459	157	5 715	1 706
	Total			14 975	4 865	146	78	5 685	1 573	20 806	6 516
Mar.	Side			577	516	6 013	3 884	5 511	3 303	12 101	7 703
	Stern			79	78	553	445	537	338	1 169	861
	Total			656	594	6 566	4 329	6 048	3 641	13 270	8 564
1 st Qu.	Side			15 971	6 618	6 589	4 161	10 737	4 719	33 297	15 498
	Stern			11 176	3 963	553	445	996	495	12 725	4 903
	Total			27 147	10 581	7 142	4 606	11 733	5 214	46 022	20 401
Ap.	Side	-	-	45	41	12 165	4 149	7 845	3 671	20 055	7 861
	Stern	-	-			1 163	501	1 206	578	2 369	1 0
	Total			45	41	13 328	4 650	9 051	4 249	22 424	8 940
May	Side	801	459	266	186	6 209	6 096			7 276	6 741
	Stern	2 442	1 008			520	504			2 962	1 512
	Total	3 243	1 467	266	186	6 729	6 600			10 238	8 253
Jun.	Side					8 546	8 514			8 546	8 514
	Stern					323	319			321	319
	Total					8 867	8 833			8 867	8 833
2 nd Quarter	Side	801	459	311	227	26 920	18 759	7 845	3 671	35 877	32 116
	Stern	2 442	1 008			2 004	1 324	1 206	578	5 650	2 910
	Total	3 243	1 467	311	227	28,924	20,083	9 051	4 249	41 529	26 026
Jul.	Side					5 004	5 486			5 004	5 486
	Stern									5 004	5 486
	Total					5 004	5 486			5 004	5 486
Aug.	Side			2 341	1 979	4 519	4 764			6 860	6 743
	Stern	188	216	505	506	615	415			1 308	1 137
	Total	188	216	2 846	2 485	5 134	5 179			8 168	7 880
Sep.	Side			2 681	2 061	5 778	5 057			8 459	7 118
	Stern			1 502	1 071	2 187	1 593	72	61	3 761	2 725
	Total			4 183	3 132	7 965	6 650	72	61	12 220	9 843
3 rd Quarter	Side			5 022	4 040	15 301	15 307			20 323	19
	Stern	188	216	2 007	1 577	2 802	2 008	72	61	5 069	3 862
	Total	188	216	7 029	5 617	18 103	17 315	72	61	25 392	23 209
Oct.	Side			1 343	1 973	2 752	4 136			4 095	6 109
	Stern	42	51	516	497	818	826			1 376	1 374
	Total	42	51	1 859	2 470	3 570	4 962			5 471	7 483
Nov.	Side			395	517	4 747	4 279			5 142	4 796
	Stern	5	15	636	258	924	1 031			1 565	1 304
	Total	5	15	1 031	775	5 671	5 310			6 707	6 100
Dec.	Side			1 982	1 437	1 674	1 736			3 658	3 173
	Stern			2 654	1 218	453	477			3 107	1 695
	Total			4 636	2 655	2 127	2 213			6 765	4 868
4 th Quarter	Side			3 720	3 927	9 173	10 151			12 893	14 078
	Stern	47	66	3 806	1 973	2 195	2 334			6 048	4 373
	Total	47	66	7 526	5 900	11 368	12 485			18 941	18 451
Total Side Trawl		801	459	25 024	14 812	57 983	48 378	18 582	8 390	102 390	72 039
" Stern "		2 677	1 290	16 989	7 513	7 554	6 111	2 274	1 134	29 494	16 040
TOTAL TRAWL		3 478	1 749	42 013	22 325	65 537	54 489	20 856	9 524	131 884	88 087

Table 3- Cod landings and efforts of Portuguese line fleet (1970)

Months	S U B A R E A S							
	1		3		4		1+3+4	
	Tons	Dory hour	Tons	Dory hour	Tons	Dory hour	Tons	Dory hour
April			9	511			9	511
May	671	25932	1502	86636			2173	112568
June	2532	65082	2885	111494	11	2844	5428	179420
2 nd Quarter	3203	91014	4396	198641	11	2844	7610	292499
July	414	10578	6806	347655	194	11696	7414	369929
August	1367	46746	5889	193471			7256	240217
September	245	11820	6658	227555			6903	239375
3 rd Quarter	2026	69144	19353	768681	194	11696	21573	849521
October			1310	63313			1310	63313
November			278	7094			278	7094
December								
4 th Quarter			1588	70407			1588	70407
TOTAL 1970	5229	160158	25337	1037729	205	14540	30771	1212427

Table 4 - Cod landings (in metric tons) and efforts of Portuguese fishery fleet by divisions (1970)

Divis	DORY VESSEL		T R A W L				TOTAL TRAWL		DORY VESSEL + TRAWL	
	Tons	.Dory hours	Side Tons	Hours fishing	Stern Tons	Hours fishing	Tons	Hours fishing	Tons	.Hours fishing
1B	424	16574							424	16574
1C	3894	119753	243	199	497	316	740	515	4634	120268
1D	911	23831	422	220	870	500	1292	720	2203	24551
1E8			136	40	1120	256	1256	296	1256	296
1F					190	218	190	218	190	218
Total	5229	160158	801	459	2677	1290	3478	1749	8707	161907
2G					421	298	421	298	421	298
2H			201	144	2808	937	3009	1081	3009	1081
2J			24823	14668	13760	6278	38583	20946	38583	20946
Total			25024	14812	16989	7513	42013	22325	42013	22325
3K			7227	6800	588	401	7815	7201	7815	7201
3L	21782	876606	42574	35269	5528	4706	48102	39975	69884	916581
3M	257	8980	8170	6272	1420	993	9590	7265	9847	16245
3N	2071	101136	7	29	15	8	22	37	2093	101173
3O	1092	47663							1092	47663
3P	135	3344	5	8	3	3	8	11	143	3355
Total	25337	1037729	57983	48378	7554	6111	65537	54489	90874	1092218
4R	184	12908	15885	7046	1924	948	17809	7994	17993	20902
4S	21	1632	277	99			277	99	298	1731
4T					148	58	148	58	148	58
4Vn			2124	1097	202	128	2326	1225	2326	1225
4Vs			296	148			296	148	296	148
Total	205	14540	18582	8390	2274	1134	20856	9524	21061	24064
TOTAL	30771	1212427	102390	72039	29494	16048	131884	88087	162655	1300514