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Report on the Cruise Carried out by the Spanish Vessel "Mistral" in the Waters off Newfoundland, June-July, 1954, by Dr. Olegario Rodriguez Martin and Dr. Alfonso Rojo Lucio.

Introduction

This report deals with the second scientific cruise carried out by Spain in the waters off Newfoundland, in accordance with the Research Program elaborated by ICNAF.

Dr. Olegario Rodriguez Martin, Biologist of the Direccion General de Pesca Maritima, and Dr. Alfonso Rojo Lucio, Biologist of the Empresas Bacaladeras, were in charge of the investigations.

The area investigated is on the southern part of the Grand Banks of Newfoundland (Subarea 3), between the northern latitudes $44^{\circ}25'$ to $44^{\circ}40'$ and between the western longitudes $50^{\circ}00'$ and $50^{\circ}18'$.

The cruise took place in the months of June and July 1954.

The otter trawler "Mistral" was used for the investigations. This vessel has a length of 64 metres. Its loading capacity is about 850 tons of salted fish. It is equipped with radio-telegraph, radiotelephone, goniometer and echo sounder.

The trawl used during the research work was a Vigneron-Dahl trawl with slight modifications. The meshes of the trawl were measured during the cruise; a calibrator with a pressure of 12 lbs. was used. The following results were obtained:

Dimensions of Meshes		
	Wings	Cod-end
Trawl new and dry	133 mm. (5 3/16")	127 mm. (5")
Trawl used and wet	117 mm. (4 9/16")	113 mm. (4 7/16")
Percentage of Decrease	12.4%	11%

These means were found for a series of measurements of 10 consecutive meshes. The calibrator used had rounded edges. The measurements taken refer to the interior of the mesh.

The mouth of the trawl has an opening of 40 metres.

The Cod - *Gadus callarias* L., and the haddock - *Melanogrammus aeglefinus* (L.), were the object of study.

The gear used for the scientific researches (depth thermometers, measuring boards, calibrators, etc.) were generously put at our disposal by the Newfoundland Fisheries Research Station

in St. John's. We beg the Director of that station, Dr. W. Templeman, to receive our most cordial thanks for this help.

Temperature of Water and Yield of Fishery

It was considered of great importance to compare the relation between water temperature and the yield of fishery during the summer.

In the first Spanish research cruise (March-April 1953), it was found that 2°-3° C. was the optimum temperature for the cod, and 5°-6° the optimum temperature for the haddock.

This second cruise was, as mentioned, carried out in the summer (June-July 1954). The surface waters now had temperatures of 14° C. or more. However, at the bottom, where the cod lives and where the fishery is carried out, the temperatures varied between 3.9° and 4.2° C., that is, they varied only three tenths of a degree.

Thus, according to these observations, the so-called "cod water" has a temperature between 2° and 4° C. in winter as well as in summer.

This observation was of special importance, as it showed the captains of the fishing vessels the advantages which they could get by using a depth thermometer in their fishing, about which they had been sceptical until now. Several of the vessels already carried depth thermometers, but they were not often used, because the captains were not convinced of the importance of the temperature for the distribution of the cod schools.

Conversion Factors

In the recommendations by the Committee on Research and Statistics, it has been stated that it is important for the proper compilation of ICNAF statistics that further experiments on conversion factors be carried out within the Convention Area. In accordance with this recommendation, the following studies of conversion factors to be used for the cod and haddock caught by Spanish fishing vessels have been carried out during our summer cruise of 1954 (June-July).

The researches cover the cod and the haddock.

The following weighings were carried out on individual specimens of various sizes or on whole samples:

- (a) Weight of fish round fresh immediately after capture;
- (b) Weight of fish beheaded;
- (c) Weight of fish beheaded, eviscerated, washed and with part of the backbone removed;
- (d) Weight of fish landed - i.e. after salting and storing in hold.

(a), (b) and (c) were made on board the vessel; (d) after landing.

All fish in these experiments were marked with a metal tag bearing a number.

From these data, the following have been determined:

- (A) Percentage of loss in weight through beheading;
- (B) Percentage of loss in weight through beheading, eviscerating, removing part of backbone and washing;
- (C) Percentage of total fish recovered and salted in the hold of the vessel;
- (D) Conversion Factor I. The factor to convert the weight of the fish as ready for salting (without head, entrails, vertebral column and washed) to the round fresh weight;
- (E) Percentage of loss in weight through salting (in the hold of the vessel);
- (F) Percentage of loss in weight of fish from the moment of capture until landed;
- (G) Percentage of the total weight landed as salt cod;
- (H) Conversion Factor II. This is the factor to convert the landed weight of the fish to the round fresh weight.

These data are given in Table 1.

The mean values of Conversion Factor II calculated from all the experiments are: for cod - 2.73; for haddock - 2.82.

There is a considerable difference in the conversion factors found in the two Spanish campaigns.

	<u>March-April 1953</u>	<u>June-July 1954</u>
Cod	3.5	2.73
Haddock	3.10	2.82

Explanation of the Difference

The first cruise (March-April 1953) was carried out at the beginning of the fishing season, thus

- (a) the fishes had not yet spawned; therefore, their voluminous gonads and testes represented a considerable weight which was lost during eviscerating;
- (b) the fish which were the object of the weighings were placed in the bottom of the hold and stayed there for five months subjected to the pressure of the fish later placed on top of them.

The second cruise (June-July 1954) was carried out towards the end of the fishing season and

- (a) most of the fish, especially the cod, had already spawned;
- (b) as the hold was nearly full, the specimens that were weighed were placed in the upper part of the hold. Thus, they were not subjected to the pressure of large quantities of later incoming fish, and they remained only one month in the vessel before being landed.

The loss of weight and, following that, the size of the conversion factor, is influenced by the length of time the fish are

in the hold. The longer they are in the hold the greater the weight loss and so the larger the conversion factor. The loss of weight also depends on the position of the fish in the hold.

These observations show us that it will be necessary to repeat the experiments several times before a definite and proper conversion factor can be decided on.

Yield of the Fishery

One of the problems to which special attention was paid during the cruise was the varying yields of the fishing. To study this problem, data on catches and efforts were collected. From this data, calculations of the catch per trawl hour were made:

- (a) Yield per trawl hour during day fishing, from 6 o'clock in the morning to 8 o'clock in the evening;
- (b) Yield per trawl hour during night fishing, from 8 o'clock in the evening to 6 o'clock the following morning;
- (c) Yield per trawl hour during the whole day and night (24 hrs.).

The results are given in Tables 2 and 3, and are shown graphically in figs. 1 and 2.

The unit used for the calculations of yield per effort has been the cesto, which equals 87.5 kilos of fresh round fish or 35 kgs. of salted, landed fish.

We have used the conversion factor which is used by ICNAF (2.5). In the 1954 cruise we found another - somewhat higher - conversion factor, but we have not found it expedient to use it in these calculations.

The average yields per hour's trawling were calculated for each daylight, night and 24-hour period. They are shown in figure 2. The extreme values are given in the table below:

	Range of Yield per Hour's Trawling in Kgs. (to nearest Hundred)		
	Minimum	Maximum	Range
Day	800 (3 July)	2,600 (30 June)	2,000
Night	1,500 (2 July)	3,500 (5 July)	2,000
24-hr. period	1,000 (3 July)	2,600 (9 July)	1,600

On the 3rd July a steep fall is observed in the average yield per hour for the 24 hours and for the daylight catches, coinciding with a smaller rise in the night yield per hour. During the summer season the cod migrate generally towards the north. On this date, the 3rd of July, a decrease was observed in the size of the cod caught (compare Fig.5). It is possible that this decrease in average length is caused by an influx of small cod which could not be used commercially for salting, and which therefore were discarded and thus not included in the figures of the catch.

A comparison of the graphs shows an agreement between the daily yield of the fishery with the frequency of sizes (Fig.5).

Thus, for example, on the 28th June a notable increase in average size is found compared to the previous day, and corresponding to this increase there is an increase in the yield per hour of about 1,000 kilos. We have already mentioned that the decrease in average size on the 3rd July coincided with a decrease in yield per unit of effort on that day. On the 6th July again, the sizes increased and so did the yields.

Owing to the scarcity of haddock in the catches, the figures for this species cannot be considered as reliable as those referring to the cod. The data of the haddock and cod catches are given separately in figure 1. In fig 2, which shows the difference between night and day catches, only the totals for the two species are shown. As, however, the haddock catch is so small compared to the cod catch, the variations in the figures can mainly be attributed to the cod.

Cod

Size

2,500 specimens of cod taken at random were measured just after their capture. The measurements were taken from the extreme anterior point of the snout to the central point of the hind margin of the tail fin. The results of the measurements are shown in the following graphs:

- a. In 1 cm. groups - Fig.3
- b. In 5 cm. groups - Fig.4
- c. In 5 cm. groups by successive dates - Fig.5.

From these graphs, it is seen that the maximum frequencies of sizes are found within the 51-55 cm. group. If these observations are compared with those from the cruise in March-April 1953 (see fig.7), an increase of 10 cm. is observed in the average size of the cod caught.

The real difference is a little more than the 10 cm. found, as in 1953 the measurements were taken to the extreme posterior margin of the caudal fin, whereas in this cruise, in order to comply with the norms used by the member countries of ICNAF, the measurements were made to the central point of the hind margin.

The minimum commercial size of the cod is around 40 cm. During our stay on board the boat, only two percent by number of the cod caught were below that size and therefore discarded. This would be a considerably smaller percentage by weight.

Age

We have used the otoliths for the study of the age. The results are shown in Table 4. When grouped by year classes (Fig.6), we find that during the fishing campaign of 1954 the 5 year old fish are dominant, making up 32.7% of the total catch. The 5 year olds are those born in 1949.

In 1953 this year class was second in importance, making up 18% of the total catch. The fact that this year class is an abundant one in both years tends to explain the 10 cm. increase in average size of the cod caught.

Stage of Maturity

By the end of June, the major part of the cod had already

spawned. This fact appears from the figures in Table 5, where those having spawned (Stage VI) predominate, with 55 specimens against only 3 being in the act of spawning (Stage V). In this sample - of 233 specimens - there were equal proportions of males and females, respectively 116 and 117 specimens. The same equal distribution of males and females was observed in a big number of specimens when they were being eviscerated. Here we found 286 males and 285 females.

Food

Stomachs of various specimens were collected to carry out a study of the food. The results are shown in the following table:

No. of specimen	Size in cms.	Weight of stomach in grams	No. of capelin in stomach
1	-	-	9
2	-	190	9
3	-	220	8
4	-	188	7
5	-	228	10
6	30	7	1
7	32	-	3
8	32	42	4
9	29	22	2
10	30	19	1
11	29	30	3

The stomachs of the cod were found to be filled with capelin, which at this time are completely mature and in spawning schools. This is in contrast to what was found last year (March and April) when there was a great variety in the food of the cod.

Haddock

Size

The haddock were measured, as were the cod, from the extreme point of the snout to the central point of the caudal fin. 1,045 specimens, chosen at random, were measured. The distribution of sizes is shown in Figures 8 and 9, in Fig. 8 by centimetres and in Fig. 9 by 5 cm. groups. These graphs show the greatest abundance of individuals to be within the size group 41-45 cm. These are five year olds.

The minimum commercial size is, as for the cod, 40 cm. 20% by number were discarded (the dark zone in Fig. 9). This corresponds to a considerably lower percentage by weight.

It is necessary to stress that this 20% discarded was registered at the end of the fishing campaign when the holds were nearly full of fish, and when the captains would be more particular as to size than at the beginning of the campaign.

Age

The scales were used for the study of the age. Table 6 shows the age and size distribution of 200 haddock. Growth curves based on these figures are shown in Fig. 10. Male and female growth curves are shown separately. However there are no appreciable differences between them.

Three year old haddock are about 35 cm., five year olds are around 46 cm., seven year olds around 56 cm. and those of nine years about 61 cm.

A histogram showing the abundance of age groups and year classes is given in fig.11. This is based on the ages of 200 specimens. Age group V (year class 1949) is dominant with 30%, closely followed by age group VI (year class 1948) with 25.5%. By applying the age/size distribution (shown in Table 6) to the length frequency data (fig.8), the age frequency of the sample measured (1,045 specimens) has been calculated. This is shown in fig.12. The two distributions are analogous, but the proportions of the age groups are considerably different.

Stage of Maturity

Unlike the cod which were nearly all spent, the haddock were in full spawning. The size (in 5 cm. length groups), sex and stage of maturity is shown for 204 specimens in Table 7. There is a slight dominance of the males. This was confirmed by determining the sex of a further sample of 759 specimens; this gave 400 males and 359 females.

Food

A study of the stomach contents of various specimens showed that the food preferred by the adults at this time of the year was the capelin. Great quantities of fish roe mixed with sand were found in the smaller specimens.

- THE END -

Table 1. Data on Conversion Factors for Various Sizes of Cod and Haddock

COD

Size (cm.)	No. of Spec.	--Weight in Kilograms--			Expressed as Percentage of Whole Wt.			As % of		Conversion Factors	
		Whole	Without Head	Ready for Salting	Landed	Lost by Beheading	Ready for Salting % Lost	Landed Wt. % Lost	ready for Salting wt. % Lost during Storage	From Ready for Salting Wt.	From Landed Weight
45-55	25	39.0	32.0	19.5	13.0	18.0	50.0	50.0	33.3	2.00	3.00
50-55	30	50.0	42.0	31.0	17.0	16.0	38.0	62.0	45.2	1.61	2.94
55-65	25	50.0	41.0	27.0	16.1	18.0	54.0	54.0	40.2	1.85	3.10
87	1	7.0	5.5	4.0	2.7	21.4	42.9	57.1	31.3	1.75	2.55
99	1	8.5	6.7	5.0	3.3	21.2	41.2	58.8	35.0	1.70	2.62
100	1	9.0	7.2	5.5	3.5	20.0	38.9	61.1	36.4	1.64	2.57
108	1	11.5	9.0	6.5	4.7	21.7	43.5	56.5	26.9	1.77	2.42
110	1	11.5	9.0	6.7	5.0	21.7	41.7	58.3	25.4	1.72	2.30
110	1	10.5	8.2	6.0	4.3	21.9	42.9	57.1	29.2	1.75	2.47
124	1	20.5	16.0	10.0	6.3	22.0	51.2	48.8	37.5	2.05	3.28
Mean Values:						20.2	44.4	55.4	34.0	1.78	2.73

HADDOCK

40-55	32	46.0	37.0	29.0	15.8	19.6	37.0	63.0	65.8	34.2	1.59	2.92
45-60	26	39.0	30.0	28.0	14.6	23.1	28.2	71.8	63.2	36.8	1.39	2.72
Mean Values:						21.4	32.6	67.4	64.5	35.5	1.49	2.82

TABLE 2.

DAILY CATCHES

Date	I No. of Cestos ¹⁾			II Salted Wt. (in plant) (I x 35 kgs.)			III Weight, round fresh (II x 2.5)		
	Cod	Had-dock	Total	Cod	Had-dock	Total	Cod	Had-dock	Total
1954									
26-IV	205	29	234	7,175	1,015	8,190	17,937.5	2,537.5	20,475.0
27	200	15	215	7,000	525	7,525	17,500	1,312.5	18,812.5
28	300	73	373	10,500	2,555	13,055	26,250	6,387.5	32,637.5
29	321	80	401	11,235	2,800	14,035	28,087.5	7,000	35,087.5
30	367	40	407	12,845	1,400	14,245	32,112.5	3,500	35,612.5
1-VII	412	50	462	14,420	1,750	16,170	36,050	4,375	40,425
2	245	100	345	8,575	3,500	12,075	21,437.5	8,750	30,187.5
3	140	27	167	4,900	945	5,845	12,250	2,362.5	14,612.5
4	250	33	283	8,750	1,155	9,905	21,875	2,887.5	24,762.5
5	400	48	448	14,000	1,680	15,680	35,000	4,200	39,200
6	451	30	481	15,785	1,050	16,835	39,462.5	2,625	42,087.5
7	215	11	226	7,525	385	7,910	18,812.5	962.5	19,775.0
8	370	46	416	12,950	1,610	14,560	32,375	4,025	36,400
9	444	40	484	15,540	1,400	16,940	38,850	3,500	42,350
10	-	26	26	-	910	910	-	2,275	2,275

The following figures are the means, not including the fishing on the last day, which lasted only some few hours:

308.6 44.4 353.0 - - 12,355 - - 30,887.5

1) 1 cesto = 87.5 kgs., round fresh = 35 kg. landed weight

TABLE 3. YIELDS PER TRAWL HOUR
BY 24-HOUR PERIODS, BY DAYS AND BY NIGHTS - KGS.

Date 1954	Total Catch in Kgs. Round Fresh	Total No. of Hours Trawled	YIELD PER 1 TRAWL HOUR		
			in the 24 hours	by Day	by Night
26-VI	20,475.0	8h. 20	2,457.0	2,284.4	1,761.3
27	18,812.5	16h. 30	1,140.1	1,001.2	1,689.1
28	32,637.5	16h. 20	1,998.2	2,070.8	2,070.8
29	35,087.5	17h.	2,064.0	2,202.6	2,013.7
30	35,612.5	14h. 10	2,513.8	2,756.3	1,909.1
1-VII	40,425.0	15h. 45	2,566.6	2,436.8	1,711.6
2	30,187.5	16h. 25	1,838.8	1,852.1	1,485.8
3	14,612.5	15h. 15	958.1	814.1	1,778.6
4	24,762.5	14h. 55	1,660.0	1,468.1	1,922.5
5	39,200.0	16h. 05	2,437.3	2,476.2	3,486.0
6	42,087.5	16h. 45	2,512.7	2,447.2	2,143.7
7	19,775.0	12h.	1,647.9	1,050.0	1,604.2
8	36,400.0	15h. 15	2,386.9	2,700.0	3,402.0
9	42,350.0	15h. 55	2,660.7	1,725.0	2,857.0
10	2,275.0	1h. 30	1,516.6	-	-

The following figures are the mean values of the whole period, excluding the last day.

30,887.5 2,060.2 1,948.9 2,131.1

TABLE 4. COD. AGE AND LENGTH

Years	3	4	5	6	7	8	9	10	11	12	13	16	17	Total
Cms. 36	2	-	-	-	-	-	-	-	-	-	-	-	-	2
38	2	1	-	-	-	-	-	-	-	-	-	-	-	3
39	1	4	-	-	-	-	-	-	-	-	-	-	-	5
40	2	4	1	-	-	-	-	-	-	-	-	-	-	7
41	-	2	1	-	-	-	-	-	-	-	-	-	-	3
42	-	-	1	-	-	-	-	-	-	-	-	-	-	1
44	-	3	1	-	-	-	-	-	-	-	-	-	-	4
45	-	2	3	1	-	-	-	-	-	-	-	-	-	6
46	-	6	1	1	-	-	-	-	-	-	-	-	-	8
47	-	1	3	1	-	-	-	-	-	-	-	-	-	5
48	-	5	2	1	-	-	-	-	-	-	-	-	-	8
49	-	2	8	1	-	-	-	-	-	-	-	-	-	11
50	-	2	8	2	-	-	-	-	-	-	-	-	-	12
51	-	2	7	3	-	-	-	-	-	-	-	-	-	12
52	-	3	10	5	1	1	-	-	-	-	-	-	-	20
53	-	-	10	3	-	-	-	-	-	-	-	-	-	13
54	-	2	7	3	-	-	-	-	-	-	-	-	-	12
55	-	1	9	9	1	-	-	-	-	-	-	-	-	20
56	-	1	6	4	-	-	-	-	-	-	-	-	-	11
57	-	-	2	3	1	-	1	-	-	-	-	-	-	7
58	-	-	2	7	7	1	-	-	-	-	-	-	-	17
59	-	-	2	5	2	1	-	-	-	-	-	-	-	10
60	-	-	3	4	-	-	-	-	-	-	-	-	-	7
61	-	-	1	6	3	-	-	-	-	-	-	-	-	10
62	-	1	-	3	2	-	-	-	-	-	-	-	-	6
63	-	-	1	3	2	-	-	-	-	-	-	-	-	6
64	-	-	1	1	2	-	-	-	-	-	-	-	-	4
65	-	-	1	1	2	-	-	-	-	-	-	-	-	4
66	-	-	-	2	2	-	-	-	-	-	-	-	-	4
67	-	-	-	-	1	-	-	-	-	-	-	-	-	1
68	-	-	-	1	1	-	-	-	-	-	-	-	-	2
69	-	-	-	1	-	1	-	-	-	-	-	-	-	2
70	-	-	1	1	-	1	-	-	-	-	-	-	-	3
71	-	-	-	1	3	2	-	-	-	-	-	-	-	6
72	-	-	-	-	1	1	1	-	-	-	-	-	-	3
73	-	-	-	1	-	1	-	-	-	-	-	-	-	2
74	-	-	-	-	1	1	-	-	-	-	-	-	-	2
75	-	-	-	-	1	2	1	-	-	-	-	-	-	4
76	-	-	-	-	-	1	-	-	-	-	-	-	-	1
77	-	-	-	-	-	1	-	-	-	-	-	-	-	1
78	-	-	-	-	-	1	1	-	-	-	-	-	-	2
80	-	-	-	-	-	-	-	1	-	-	-	-	-	1
81	-	-	-	-	1	-	-	-	-	-	-	-	-	1
84	-	-	1	-	-	-	-	-	-	-	-	-	-	1
85	-	-	-	-	-	-	1	-	1	-	-	-	-	2
87	-	-	-	-	-	1	-	-	-	-	-	-	-	1
88	-	-	-	1	-	-	-	-	-	-	-	-	-	1
102	-	-	-	-	-	-	-	1	-	1	-	-	-	2
103	-	-	-	-	-	-	-	-	1	-	-	-	-	1
104	-	-	-	-	-	-	-	-	-	1	-	1	-	2
106	-	-	-	-	-	-	-	-	-	-	1	-	-	1
107	-	-	-	-	-	-	-	-	1	-	-	-	-	1
110	-	-	-	-	-	-	-	1	-	-	1	-	-	2
124	-	-	-	-	-	-	-	-	-	-	-	-	1	1
TOTAL	7	42	93	75	34	16	5	3	3	2	2	1	1	284

TABLE 5. COD. SIZE, SEX AND STAGE OF MATURITY

5 cm. Cms.	Stage of Maturity and Sex Groups		Immature		I		II		III		V		VI		Total No. of Spec.
	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	
36-40		2	9	6											17
41-45		1	8	2											11
46-50	5	5	12	12	2										36
51-55	8	7	13	19	10	1			1	1			1	5	66
56-60	3	4	8	11	4	1	2		1				4	5	43
61-65		3	3	3	2	1	2						3	7	24
66-70			1			1	1						2	3	8
71-75	1	1			2								5	6	14
76-80													2	2	4
81-85														2	2
86-90														1	1
96-100													1	1	2
101-105													1	1	2
106-110														3	3
	16	23	54	53	21	4	4	0	2	1			19	36	233
	39		107		25		4		3				55		

TABLE 6.

HADDOCK. AGE AND LENGTH

Years	1	2	3	4	5	6	7	8	9	Total
Cms. 22	1	-	-	-	-	-	-	-	-	1
26	-	2	-	-	-	-	-	-	-	2
27	-	1	-	-	-	-	-	-	-	1
28	-	4	-	-	-	-	-	-	-	4
29	-	1	-	-	-	-	-	-	-	1
30	-	-	-	-	-	-	-	-	-	-
36	-	-	-	2	-	-	-	-	-	2
37	-	-	1	1	-	-	-	-	-	2
38	-	-	-	2	1	-	-	-	-	3
39	-	-	-	-	1	-	-	-	-	1
40	-	-	-	4	6	-	-	-	-	10
41	-	-	-	3	2	-	-	-	-	5
42	-	-	-	5	4	-	-	-	-	9
43	-	-	-	2	7	1	-	-	-	10
44	-	-	-	1	4	-	-	-	-	5
45	-	-	-	-	1	-	-	-	-	1
46	-	-	-	-	4	-	-	-	-	4
47	-	-	-	-	4	3	-	-	-	7
48	-	-	-	-	2	4	-	-	-	6
49	-	-	-	-	3	7	-	-	-	10
50	-	-	-	-	4	5	-	1	-	10
51	-	-	-	-	4	4	-	-	-	8
52	-	-	-	-	3	5	1	-	-	9
53	-	-	-	-	4	3	1	-	-	8
54	-	-	-	-	3	9	4	-	-	16
55	-	-	-	-	1	4	4	-	-	9
56	-	-	-	-	-	3	6	1	2	12
57	-	-	-	-	-	1	2	5	2	10
58	-	-	-	-	-	2	2	1	1	6
59	-	-	-	-	-	-	-	3	3	6
60	-	-	-	-	-	-	1	7	2	10
61	-	-	-	-	-	-	5	-	1	6
62	-	-	-	-	-	-	-	-	1	1
63	-	-	-	-	-	-	-	1	-	1
64	-	-	-	-	-	-	-	-	1	1
65	-	-	-	-	-	-	-	1	-	1
66	-	-	-	-	-	-	-	-	1	1
67	-	-	-	-	-	-	-	-	1	1
TOTAL	1	8	1	20	58	51	26	20	15	200

TABLE 7. HADDOCK. SIZE, SEX AND STAGE OF MATURITY

5 cm. Cms.	Stage of Maturity and Sex Groups		Immature		I		II		III		V		VI		Total No. of Spec.
	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	
21-25		1													1
26-30	4	3	1												8
36-40	2		5	7			2		1		1	1			19
41-45		1	1	15			3	1	2		4	1		2	30
46-50						2		1	1		11	2	12	8	37
51-55							1		3		10	8	15	15	52
56-60									2		8	6	12	15	43
61-65											1	2	2	8	13
66-70														1	1
	6	5	7	24			6	2	9	0	35	20	41	49	
	11		31			8		9			55		90		204

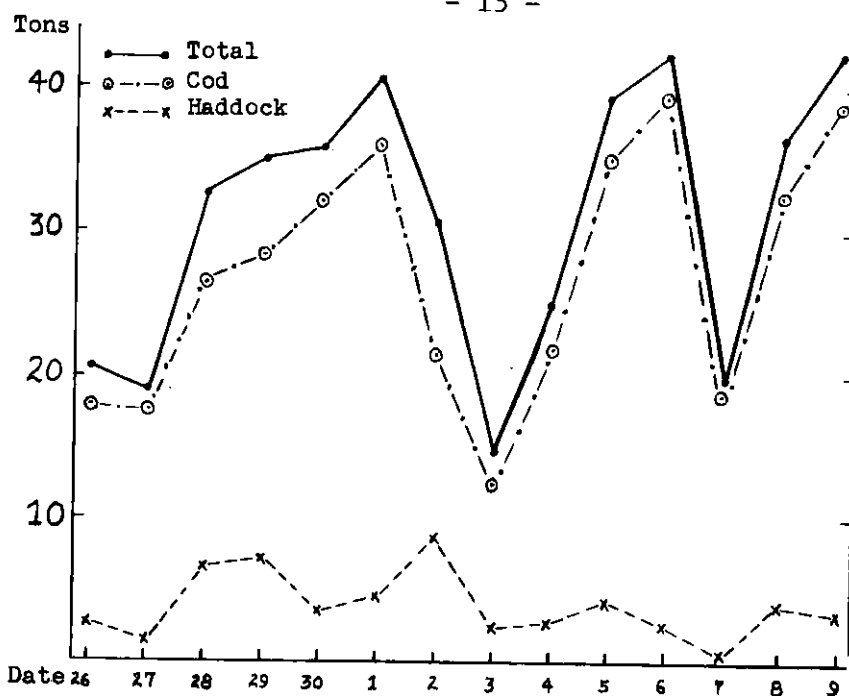


Fig. 1 Catch in tons on each day, 26 June to 9 July, of cod, haddock, and total catch Grand Bank, "Mistral", June-July, 1954.

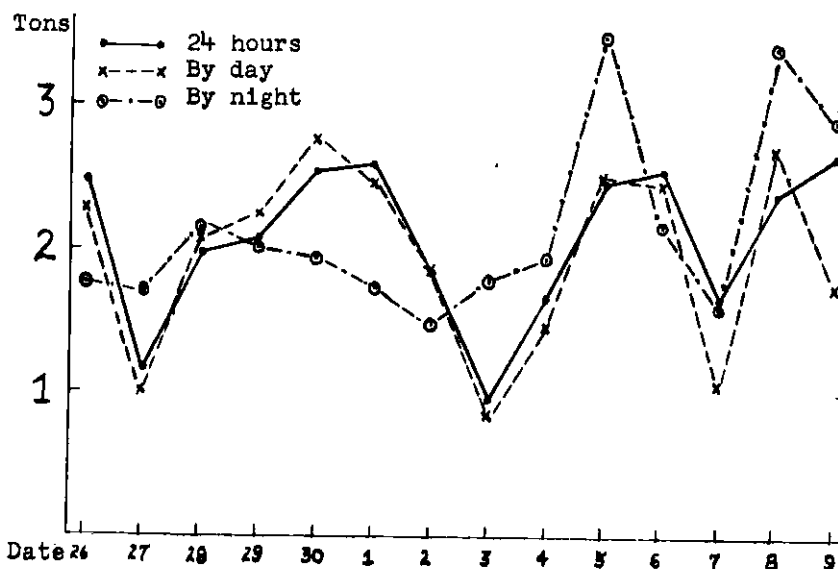


Fig. 2 Yields (cod + haddock) per 1 hour's trawling on each day 26 June - 9 July, in the 24 hours, by day, and by night.

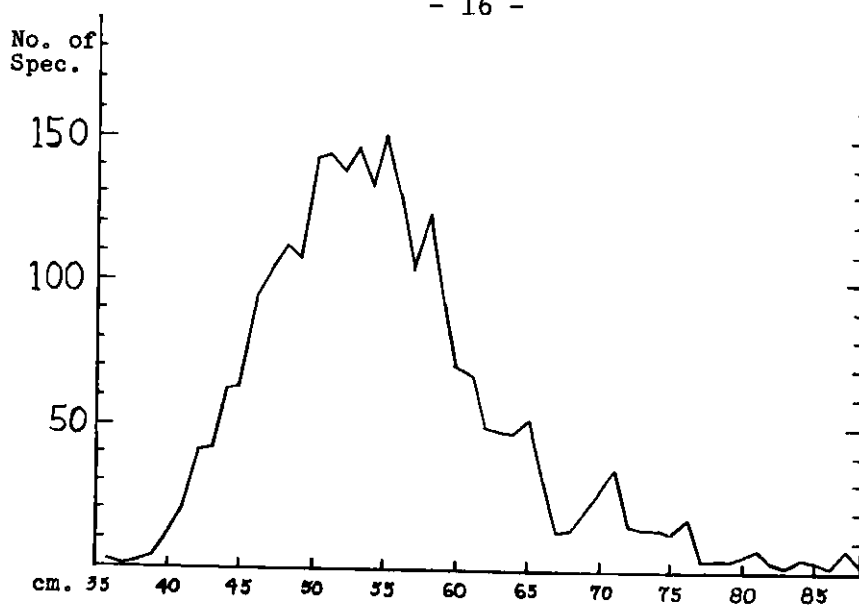


Fig. 3 Cod. Length frequency curve (by cms) Grand Bank. "Mistral", June - July 1954, 2,590 specimens.

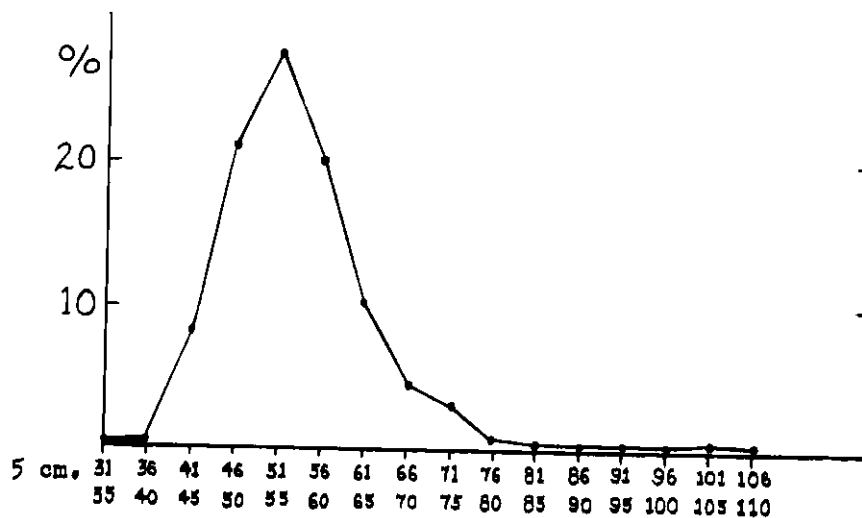


Fig. 4 Cod. Length frequency curve (by 5cm groups) Grand Bank, "Mistral", June - July 1954, 2,590 specimens.

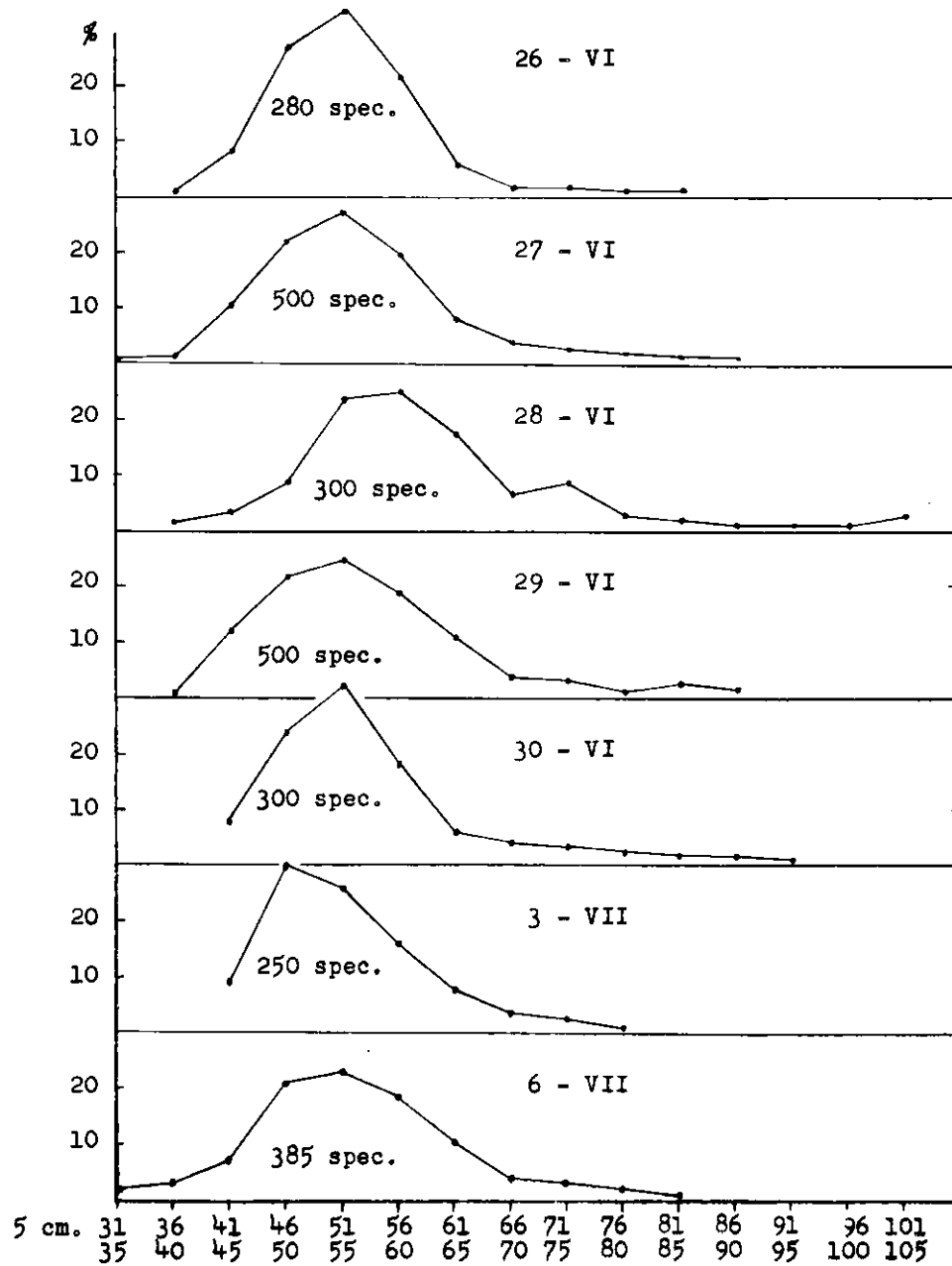


Fig. 5 Cod. Length frequency curves by 5 cm groups for different dates Grand Bank, "Mistral", June - July 1954.

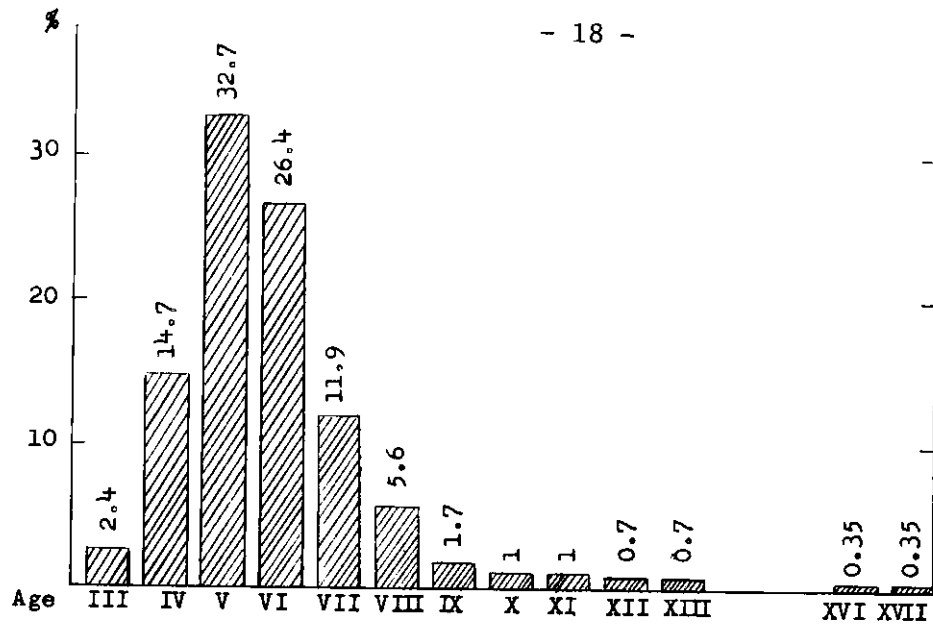


Fig. 6 Cod. Age distribution in frequency percentages, Grand Bank, "Mistral", June-July 1954. 284 specimens.

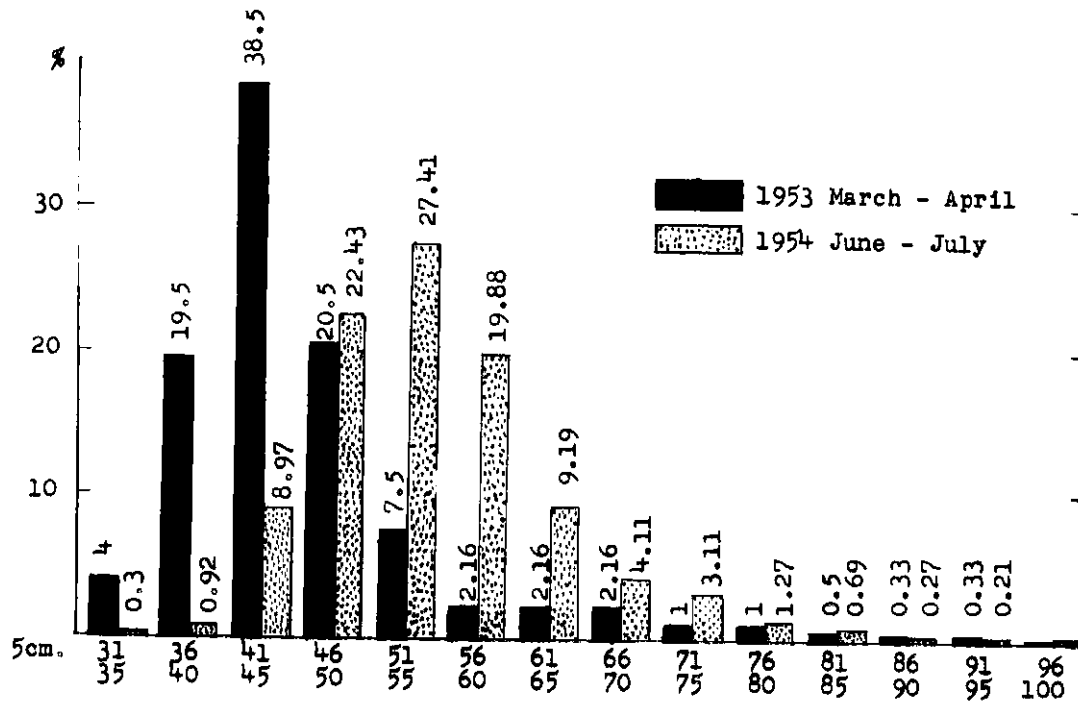


Fig. 7 Cod. Length frequency curves for March-April 1953 and June-July 1954.

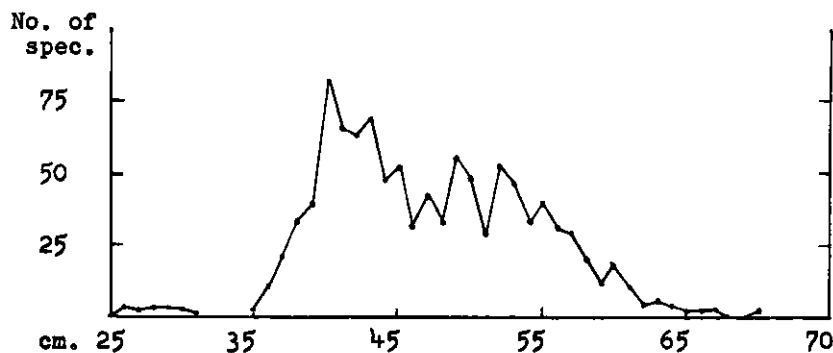


Fig. 8 Haddock - Length frequency by cm. Grand Bank, "Mistral", June-July 1954, 1,045 specimens.

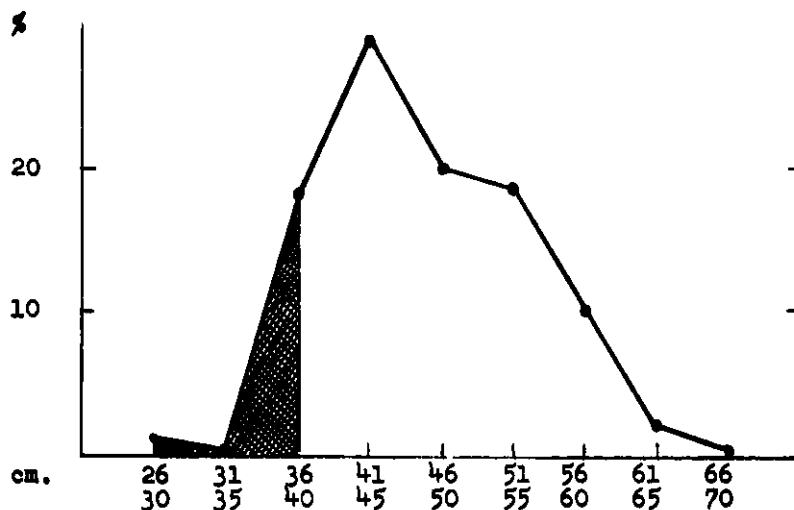


Fig. 9 Haddock - Length frequency by 5 cm. groups. Grand Bank, "Mistral", June-July 1954.

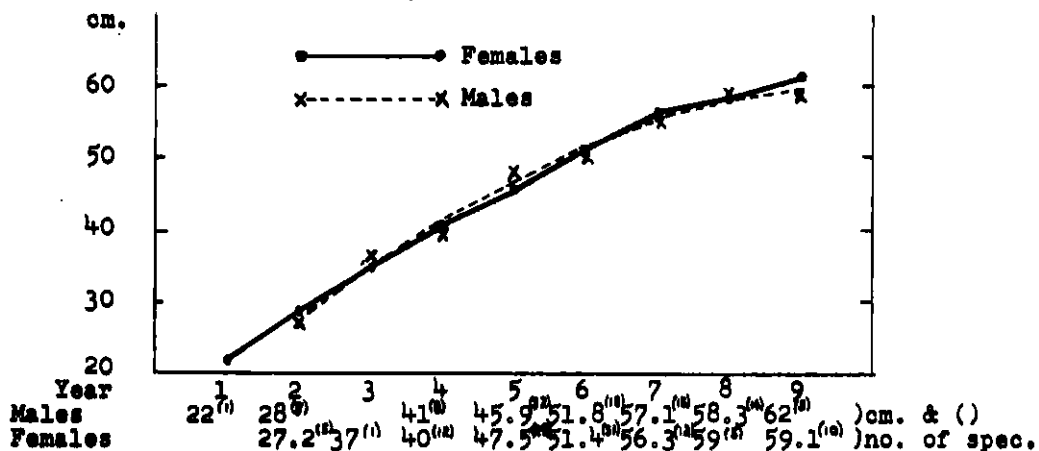


Fig. 10 Haddock - Growth curves for males and females. Grand Bank, "Mistral", June-July 1954.

