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Trends in the cod fishery in the northeastern Gulf of St. Lawrence during 1953-65
(ICNAF Div. 4R & 4S)

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INTRODUCTION

The cod fishery along the west coast of Newfoundland and the north shore of the Gulf of St. Lawrence was traditionally based on inshore gears and, to a lesser extent, offshore line fisheries from Canadian dory vessels on parts of the north shore. However, in both Divisions 4R and 4S annual catches by inshore boats (less than 25 tons) have tended to decline in recent years and the dory vessels ceased operations in 1959. Otter trawling in the Northeastern Gulf of St. Lawrence was first undertaken in the early 1950's but at first only one or two ships, fishing for redfish, were involved.

The earliest otter trawl exploitation of cod was probably by French and Portuguese trawlers in 1954 and since this time otter trawl catches have gradually increased, with Portugal, France and Spain catching between them about 48% of the cod landed in Divisions 4R and 4S. It is difficult to estimate with accuracy to what extent increased otter trawl catches of cod in 4RS are due to the greatly increased redfish fishery which has expanded dramatically in the area since 1954 (Templeman, 1959), but it is probable that almost all effort by Canada, U.S.A. and Newfoundland was directed towards redfish rather than cod.

Whereas the north shore of the Gulf is traditionally a cod fishing region, on the west coast of Newfoundland lobsters are of more importance and many fishermen begin fishing for cod only at the end of the lobster season. Thus, the Northeastern Gulf of St. Lawrence is not generally regarded

as a good area for cod and despite the recent increases in otter trawl fishing, catches have not been large in comparison to those in the other ICNAF divisions around Newfoundland, (see Fig. 3; Templeman, 1962). The probable reason for this is that otter trawling since 1953 has mainly been at redfish depths; only France, and to a lesser extent Portugal and Spain, have fished for cod more or less regularly from year to year.

The stock of fish considered in this paper is a complex which, according to Templeman (1962), is restricted within the geographical boundaries shown in Fig. 1. Templeman (1962) suggests that the cod on the Newfoundland side of the area are separated to some extent from those on the Quebec north shore, west of the Strait of Belle Isle, at least in summer. These two partially separated sub-stocks are thus in essence confined to ICNAF Divisions 4R and 4S respectively and are best treated separately and in relation to statistics for Divisions 4R and 4S. In general terms the 4R component lies to the east of the Esquiman Channel and the 4S component to the west. However, the 4R and 4S components are not separate throughout the year since tagging returns (Templeman and Fleming, 1962) and the seasonal changes in the fisheries of the Quebec-West Newfoundland-Southern Newfoundland area indicate that cod from the Quebec north shore join the west Newfoundland stock and migrate southwards and out of the Gulf in winter and return northwards the following summer (Templeman, 1962). These extensive movements support a winter to early spring fishery off southwestern Newfoundland and a summer fishery along the Newfoundland west coast and the north shore of the Gulf of St. Lawrence and Strait of Belle Isle.

In the following account all statistics have been taken from ICNAF statistical bulletins, volumes 3-15, 1953-65, and Sampling Yearbooks, Volumes 2-10, 1956-65.

TRENDS IN LANDINGS 1953-65

In Table 1 the total and trawler cod landings, in metric tons round fresh weight for the years 1953-65 are given by countries for Divisions 4R and 4S. Offshore catches of all countries were taken by otter trawlers, except for very small amounts taken by Portuguese and Spanish dory vessels using line gears, and some caught by Canadian dory vessels during 1953-59. These dory vessel landings were combined and treated separately in Fig. 2 which shows the percentage contribution to the total cod landings of the major gear components during two periods, 1953-59 and 1960-65.

It is convenient to consider the two ICNAF divisions, 4R and 4S separately.

ICNAF DIVISION 4R

From 1953 to 1965 total cod landings fluctuated irregularly around a mean of about fifty-one thousand tons (Fig. 5). Annual variations in catches were largely due to fluctuations in otter trawl catches, particularly those by France. These offshore catches follow no discernible pattern, and are mostly a reflection of varying annual otter trawl effort by France and Portugal (see below).

The mean annual catch by otter trawlers for the period 1953-65 was about 25 thousand tons and during this time otter trawlers accounted for, on the average, about 54% of the total catches of cod in Division 4R. Most of the trawl caught cod was taken by France (28% of the total). Next in importance were Portugal (18%), Spain (4%) and Canada (Mainland) - 3%. Offshore catches by other countries were very small; U.S.A., U.K. and Newfoundland combined accounted for only about 1% of the total. Almost all the remaining cod was caught by Newfoundland inshore fishermen who accounted for about 41% of the total during 1953-65. About 1% of the catches were taken by Canadian Danish Seiners fishing for greysole (Glyptocephalus cynoglossus)

and Portuguese or Spanish dories fishing for cod. Canada (Mainland) dory vessel catches for 1956-59 averaged 7% of the total for this period and about 4% of the total for 1953-65. After 1959 however, Canada (Mainland) cod catches were by otter trawlers only.

Since ICNAF statistics were published by Subareas rather than by Divisions prior to 1953, the year in which otter trawling started in Division 4R is not known with certainty. The different fishing countries probably did not instigate otter trawling at exactly the same time, but before 1953 the amounts were negligible. The available data show that cod were taken on redfish trips by Canada (Mainland) and Newfoundland in 1953, on cod trips by Portugal and France in 1954 and on cod trips by Spain in 1955.

A Canadian otter trawl fishery for cod was not instigated in 4R until about 1965, when Newfoundland trawlers (less than 100 ft.) started to exploit the northeastern Gulf resource as part of a general expansion in trawler fishing and to compensate for declining catches per unit effort elsewhere around Newfoundland. The trawl cod fishery was not carried out by all participating countries on a regular basis until 1959 (Table 1). For example, Spain had no recorded catches for 1957, and U.S.A. took measurable amounts of cod (on redfish trips) only during 1954 and 1955 (7 and 35 tons). Britain caught 496 tons in 1960 but none in any other year and catches by other countries during the whole period were less than one ton, all caught in 1961. Thus although the trend in the offshore fisheries is an increase, at the present time an intense offshore cod fishery has not developed in 4R.

ICNAF DIVISION 4S

Total catches of cod in Division 4S have remained at a low level relative to catches in Division 4R (Table 1). From 1953 to 1958 total catches varied annually around a mean level of about 5300 tons per annum. During 1959-65 catches were somewhat higher than previously and averaged 12.8 thousand tons annually. The highest yearly catch was taken in 1960 when about 16.5 thousand tons were landed. After 1960, catches declined each year and by 1965 only about 8400 tons were caught.

Catches by otter trawlers were negligible before 1955 and in the period 1955-59 averaged only 580 tons per annum. In 1960 a large catch of 9300 tons was made but since then catches have gradually declined until they were at the low level of 3500 tons in 1964 and 4000 tons in 1965. The off-shore catch accounted for about 30% of the total (of 54% in Division 4R; see above).

Catches by the different countries fishing in 4S are given in Table 1. Canada (Mainland) accounted for over 96% of the total. Of the remainder, 2% was caught by Portugal, 1% by France, 0.6% by Spain and 0.3% by Newfoundland. About 57% of the Portuguese catches were taken by otter trawl and the remaining 43% by dory vessels, whereas 95% of the Spanish catches and all of the French catches were taken by otter trawlers. Roughly 70% of Newfoundland catches in 4S were by otter trawl, the remainder being caught by small long-liners. For Canada (Mainland) 74% was caught by inshore Quebec fishermen and 26% by trawlers.

Otter trawl fishing in 4S apparently started in 1954 when 36 tons were caught by Canadian vessels. European catches were first reported in 1955 but steadily decreased from about 750 tons in 1955 to about 350 tons in 1963 (Table 1).

Canadian otter trawl catches (Maritimes, Quebec and Newfoundland), which commenced in 1954, remained steady

around 235 tons per annum until 1960 when a relatively high catch of about 8800 tons was made. Since 1960 however, catches gradually declined and were around 3000 tons in 1965. As in 4R, the extent to which offshore cod catches have been incidental to redfish catches is not precisely known, particularly during the 1950's, but it is likely that at least up to 1960 offshore effort was concerned primarily with redfish. The available evidence in ICNAF statistical bulletins suggests that, since 1960, only 25% of trips made by Canada (Mainland) were primarily for cod.

TRENDS IN EFFORT AND CATCH PER UNIT EFFORT

OTTER TRAWLERS

When considering changes in catches in a fishery it is necessary to distinguish the effects of changes in the amounts of effort from effects of changes in catch per unit effort. In this paper the methods used to analyze trends in effort and catch per unit effort (C/E) are similar to those used by Hodder (1965).

Among the different nations reporting effort in hours fished, Portugal fished most consistently and most heavily during 1954-65. Hence the Portuguese otter trawler hour was selected as the unit of effort. In a few half yearly periods no Portuguese effort was expended and to fill these gaps catch and effort data for Spanish trawlers were used after conversion of Spanish effort to the standard Portuguese otter trawler hour. For Division 4R, this conversion was effected by comparing graphically half yearly values of C/E for Spain with corresponding half yearly values for Portugal.

Fig. 3 shows this comparison where a line going through the origin was fitted by eye to the data points, the slope of the line being 0.9. In 4S there were so few Spanish data that these were simply combined with corresponding Portuguese

half yearly catch and effort data. In both 4R and 4S there were no catches by Portugal or Spain in a few half yearly periods. Since Canada (Mainland) had catches in these periods, these effort data were used after conversion to the standard Portuguese-Spanish otter trawl hour values for the appropriate half yearly periods. The conversion factors were calculated by comparing Canadian catch per unit effort values with Portuguese-Spanish values in those periods when catches were made by all three countries. The comparisons are shown in Fig. 4. The slope of the line was very close to 0.1 in 4R and 0.08 in 4S. Trawl catches and effort for Spain, Portugal and Canada (Mainland) were next combined for 4R after adjusting Spanish effort by 0.9 and Canadian effort by 0.1; in 4S, Spanish effort was used without conversion but Canadian effort was adjusted by 0.08. The average standard catch per hour (C/E) in each half yearly period from 1954-65 was then calculated by dividing the combined catches of Spain, Portugal and Canada by the adjusted effort. Effort for cod by all trawlers in each period was derived by dividing the total semi-annual trawler catches by the C/E value for that six month period.

DIVISION 4R

Total cod catches from 1954 to 1965 fluctuated irregularly on an annual basis from a low of about 17 thousand tons in 1953 to a record high of about 72 thousand tons in 1958 (Fig. 5). The variations were largely due to changes in both otter trawler catches, which were at a low of 45 tons in 1953 and reached peaks at 49 thousand tons in 1958 and 1960, and otter trawler effort which was only about 8 thousand hours in 1953 but reached high levels of 29 and 23 thousand hours in 1958 and 1960 respectively. Catch per hour declined from about 2 tons in 1954 to 1.7 tons in 1958 but increased during 1959-65 to an average of about 2.5 tons.

On a semi-annual basis (Fig. 5), most of the cod were caught in the first half of the years 1954-65. For 1954-58 C/E values for January to June declined from 2.3 to 1.7 tons per hour but from 1959 to 1965 rose to about 3 tons. On the other hand, in the second half of these years, for 1954-58 C/E values increased from 0.1 to 1.4 tons but during 1959-65 declined from about 2.5 tons in 1959-61 to about 1 ton in 1964-65. Trawler effort remained relatively stable in both semi-annual periods, with isolated increases during January to June of 1958, 1960 and 1964 producing increased catches in the first halves of these years.

DIVISION 48

Annual and semi-annual trends in catches, effort and C/E for trawlers are shown in Fig. 6. Total catches of cod rose steadily from about 3 thousand tons in 1954 to 10 thousand tons in 1959 mostly as a result of increasing catches in the inshore cod fishery. In 1960, relatively high otter trawler catches of about 9 thousand tons contributed largely to a high total catch of 16.5 thousand tons. During 1961-65 a decline in total catches occurred, due to decreases in both inshore and trawler catches. However, since trawler effort steadily increased during 1956-65 from less than one thousand hours in 1954-55 to about 4.5 thousand hours in 1965, the standard trawler C/E increased from 1954 to 1960 but declined from 1960 to 1965.

Most trawler effort was expended during the July-December period resulting in larger catches for this half of each year. Variations in annual C/E values were thus mainly due to semi-annual fluctuations in catches per hour which rose from 0.25 to 0.5 tons during the second half of the years 1954-59, reached a peak of 2.7 tons in 1960 and gradually declined to about 0.6 tons by 1965. Changes in C/E for the first halves of the years 1954-65 were irregular, with isolated high values in 1955 and 1958, but they remained relatively high after 1960.

THE INSHORE FISHERY

In Division 4R, the inshore cod fishery is carried on exclusively by Newfoundland fishermen, and in Division 4S by Quebec fishermen. In both divisions a variety of gear is used including cod traps, jiggers, handlines, longlines and gillnets, so that an estimate of effort in terms of the amounts of gear used is very difficult to obtain. The best available indicator of relative annual effort is the number of inshore cod fishermen. In Newfoundland, at least, changes in numbers of men does not necessarily result in corresponding changes in total fishing effort in terms of amounts of gear used (Templeman, 1966) but even so such data are of value in indicating trends if a sufficient number of years are considered. In Newfoundland, the Canada Department of Fisheries has obtained estimates of numbers of inshore cod fishermen (on boats of 25 tons or less), by settlement, for a number of years. For Quebec, numbers of inshore groundfish fishermen are available annually by district in the Dominion Bureau of Statistics, Industry Division publication "Fisheries Statistics-Quebec". In this paper it has been assumed that "groundfish" fishermen of Quebec were essentially fishing for cod in those districts within Division 4S, since statistics for these districts show that landings of species other than cod were relatively small.

In Fig. 7 are shown the trends in catch, number of men and catch per man for the inshore cod fishery in Division 4R from 1956 to 1965 and in Division 4S from 1953 to 1964. In Division 4R, catches were relatively steady, averaging around 20 thousand tons per annum with a minimum of 15 thousand tons in 1956 and 1961 and a maximum of 26 to 27 thousand tons in 1959 and 1963. The number of men increased from 1512 in 1956 to 2810 in 1965. Since inshore catches did not generally increase, catch per man declined from 10.1 tons per man in 1956 to 5.9 tons in 1965.

In Division 4S from 1953 to 1964, inshore cod landings fluctuated irregularly, averaging about 6300 tons per annum. There was a decline of about 2.8% per annum in the number of fishermen, which resulted in the loss of about 300 men over the period 1953-64. Thus catch per man has tended to vary erratically with a period of decline from 1953 to 1956, followed by an increase from 1956 to 1961 and a decline from 1961 to 1964. The recent decline in C/E is a marked one, since annual values fell from about 13 tons per man in 1961 to 7.3 tons in 1964.

STANDARDIZATION OF TOTAL EFFORT

In order to analyze the data for Divisions 4R and 4S with a view to assessing the combined effort of the major gears, it is necessary to combine catch and effort data for trawlers of the different countries with that from the inshore fishery. This was done by first graphically comparing annual catch per man values with the corresponding standard C/E for all trawlers as calculated previously (Figs. 5 & 6). Fig. 8 shows the comparisons where lines fitted to the data and passing through the origins gave conversion factors of 3.9 and 6.9 in Divisions 4R and 4S respectively. The effort data (number of fishermen) for the inshore fisheries in 4R and 4S were then adjusted by the appropriate factor and added to corresponding estimates of effort by trawlers to give an estimate of total effort in standard otter trawler hours for the whole fishery in each division. Fig. 9 shows the trends in total cod landings, estimated standardized effort and resultant standard C/E values, all relative to standard trawler effort units, in 4R during 1956-65 and 4S during 1953-64.

In Division 4R, catches varied irregularly around a mean level of about 51 thousand tons largely as a result of corresponding fluctuations in total effort which averaged

about 22.5 thousand standard otter trawler hours per year. As a result standard annual C/E values showed no definable trend, averaging 2.3 tons per otter trawler hour. In Division 4S, catches rose from about 4.5 thousand tons in 1953-56 to a peak of about 16.5 thousand tons in 1960 but declined during 1961-64 to around 10 thousand tons in 1964. The overall trend in catches was upward whereas effort increased only marginally over the period, averaging about 8000 otter trawl hours per year. C/E values followed the trend in total landings, declining from 0.9 to 0.3 tons per hour during 1953-56, doubling from 0.9 to 1.8 tons during 1957-61 and then declining to about one ton per hour by 1964. The mean C/E in 4R during 1956-65 was 2.26 tons per hour compared with 1.08 tons in 4S during 1953-64.

LENGTH AND AGE COMPOSITIONS OF CATCHES

THE TRAWL FISHERY

Length and age compositions of samples of commercial catches are published annually in the ICNAF Sampling Yearbook. Both length and age frequency data are available from 1956 for Division 4R, but only length data for Division 4S. For both divisions monthly length frequencies of the different countries were generally similar within any one year. Since, in Division 4R, no one country reported trawler data each year during 1956-64, data from different months and countries were combined on a yearly basis to provide a suitably long series. In Division 4S, Canada (Maritimes) and Canada (Quebec) provided frequencies for certain months in each year from 1960 to 1964 and these were combined on an annual basis. Portuguese data for 1956 were included to extend the series.

Before monthly frequencies of any one country were combined for each year, their per mille figures were converted to actual numbers and then adjusted proportionately according

to the ratio between that country's monthly landing and the smallest monthly landing by that country for which a frequency was given. The adjusted numbers of all countries were then totalled on an annual basis and totalled adjusted numbers converted to per mille figures to produce composite annual length frequencies. Age frequencies were fewer in number; Portuguese data for 1956-58 were combined for each year after conversion of per mille frequencies to actual numbers aged, addition of these numbers and final calculation of a composite per mille distribution. In Fig. 10 are shown the adjusted length frequencies of trawler cod catches based on Portuguese, Spanish, Canadian (Mainland) and French data of 1956-64 for Division 4R, and, for Division 4S, Canadian (Mainland) data of 1960-64 and Portuguese data of 1956.

These data show that in 4R length compositions were similar during 1956-60, having modes at 61 cm. and the majority of fish within the range 45-65 cm. However, there is an indication that larger fish became less plentiful over this period. After 1960 the fish were grouped around a mode of 52-55 cm. and the trend for comparative scarcity of larger fish continued. In Fig. 11 (a), to indicate more clearly the reduction in modal size in recent years, a composite length frequency for 1956-60 is compared with one for 1961-64.

In Division 4S a difference is evident between the length composition for 1956, having a mode at 58 cm. and a large proportion of fish between 50 and 88 cm., and those for 1960-64 which have modes of 48-55 cm. and a smaller range of predominant sizes (45 to 65 cm.). The greatest reduction is apparent in the larger size groups over about 65 cm. To illustrate this trend, in Fig. 11 (a) a composite frequency for 1960-64 is compared with the length frequency for 1956.

Also included in Fig. 11 are Division 4R age frequencies for Portugal in 1956-58 and for Portugal and France in 1961. This indicates that during 1956-58 there was a reduction of fish aged 12 and above followed by a reduction of 9-11 year old cod after 1958. Portuguese data also demonstrate a progressive drop in the dominant age group from 8 years in 1956 to 5 years in 1961. The differences in age compositions of catches by Portugal and France in 1961 are probably due to differences in mesh sizes (114 and 120 mm. respectively), but data by both countries are included to emphasize the low proportion of fish aged 9 and above in this year. However, the actual decline in older fish is probably not as great as indicated in Fig. 11 (b). An unusually large 1955 year class appeared in most areas of the Northwest Atlantic and could be elevating the numbers of 6 year olds caught in 1961. Since the age distribution in Fig. 11 (b) is plotted from per mille values, which are relative and not absolute, the effect of a strong year class is to reduce the proportion of older fish.

THE INSHORE FISHERY

A sufficiently long series of length or age composition data on cod in Division 4S is not available for reliable conclusions on trends to be drawn. In 4R, since 1962 regular sampling of cod trap catches has been carried out by the St. John's Biological Station along the Northern Shore of Belle Isle Strait in the vicinity of Red Bay. The length frequency data are published in Sampling Year-books and May (M.S. 1967) gives the age composition data for these samples. In Fig. 12 are shown length frequency compositions of cod trap landings for the period 1962-66. These data show that the trap fishery is dependent on 4 year old cod with a mean length of about 40 cm., May (MS, 1967). May attributes the larger average size in 1962 to a strong 1957 year class (relatively more age 5 fish).

There has been a decline in the relative proportion of older fish during 1962-66, particularly for ages 11 and above which were virtually absent from the 1965-66 samples (May MS, 1967). The decreased abundance of older and larger fish is possibly due to increased offshore trawler effort since 1960 in the northeastern part of the Gulf of St. Lawrence and particularly within Division 4S.

SUMMARY AND CONCLUSIONS

Statistics for the period 1954-65 show that cod catches by trawlers from the northeastern Gulf of St. Lawrence varied somewhat but generally increased relative to inshore catches since 1960, particularly in Division 4S. Whereas effort by trawlers increased since 1960 in the first half of the year in Division 4R, similar upward trends in effort in 4S occurred in the second half of the year. Thus, in Division 4R C/E values for January to June varied but tended to rise in 1960-65 while those for July to December declined. In 4S, on the other hand, July to December C/E values decreased and January to June values were variable. On an annual basis, C/E values in 4R increased since 1960 whereas those in 4S declined showing that effects of increased trawler effort on the stock have been most marked in Division 4S.

For the inshore fishery in 4R, catches remained relatively stable during 1956-65 while annual catch per man declined due to increasing numbers of fishermen. In 4S during 1953-64, catches rose while number of men declined and this resulted in an improved annual catch per man up to 1961. From 1962 to 1966 however, catch per man declined, probably as a result of stock depletion by increased trawler catches.

Trends in the whole fishery were determined by converting inshore effort to standard trawler hours based on statistics of Portuguese and Spanish otter trawlers. This treatment

showed that annual catches, effort and C/E values fluctuated irregularly in 4R during 1956-65, whereas in 4S increased catches and effort resulted in improved C/E values from 1956-61 but a decline in C/E during 1961-64 which may be due to increased trawler effort since 1960.

Length and age composition data for trawlers indicate a trend towards smaller and younger fish in the catches and, in particular, decline in the oldest age groups. For the inshore trap fishery in Division 4R, older fish became less abundant but average size of fish did not alter appreciably. However, these data do not span a large number of years and do not sample those parts of the stock complex which inhabit the main portion of the Northeastern Gulf of St. Lawrence (where most cod fishing is done). Thus, they may not represent the trap fisheries of the Quebec north shore or Newfoundland West coast. It is unfortunate that data for gears other than trap are not available.

Up to 1965, any effect of increased trawler landings and effort occurred only on that part of the stock complex being fished within Division 4S. In Division 4R no marked changes in the cod fishery were detectable.

ACKNOWLEDGEMENTS

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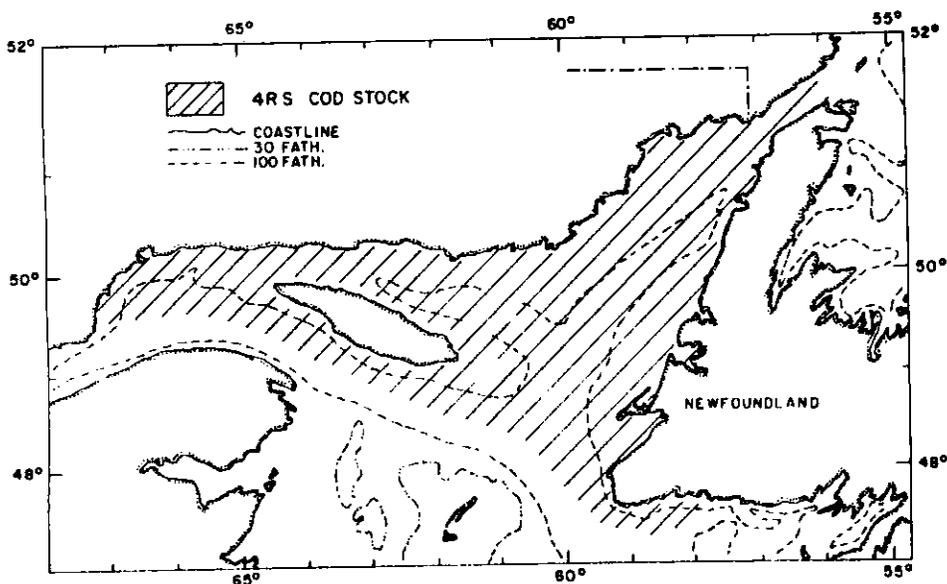


Fig. 1. Distribution of the Northeastern Gulf of St. Lawrence Cod Stock (adapted from Templeman, 1962).

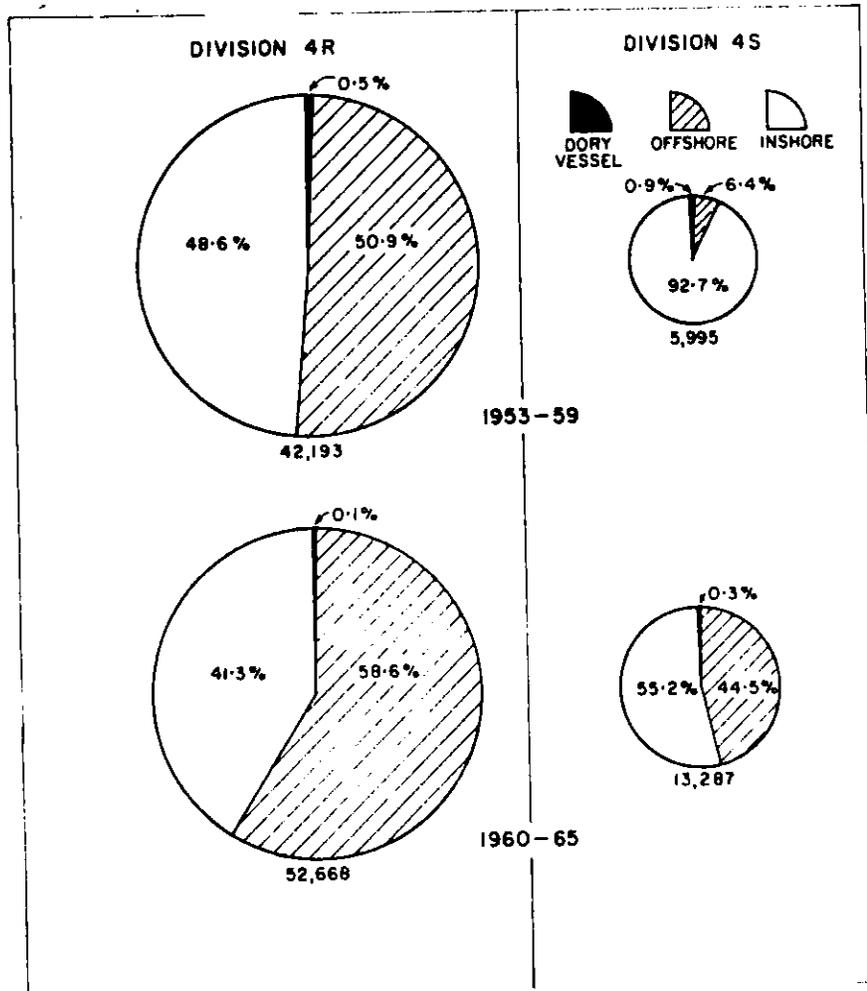


Fig. 2. Average percentage composition of cod catches in Divisions 4R and 4S during 1953-59 and 1960-65. The average annual catch in metric tons during each period is given below the circles.

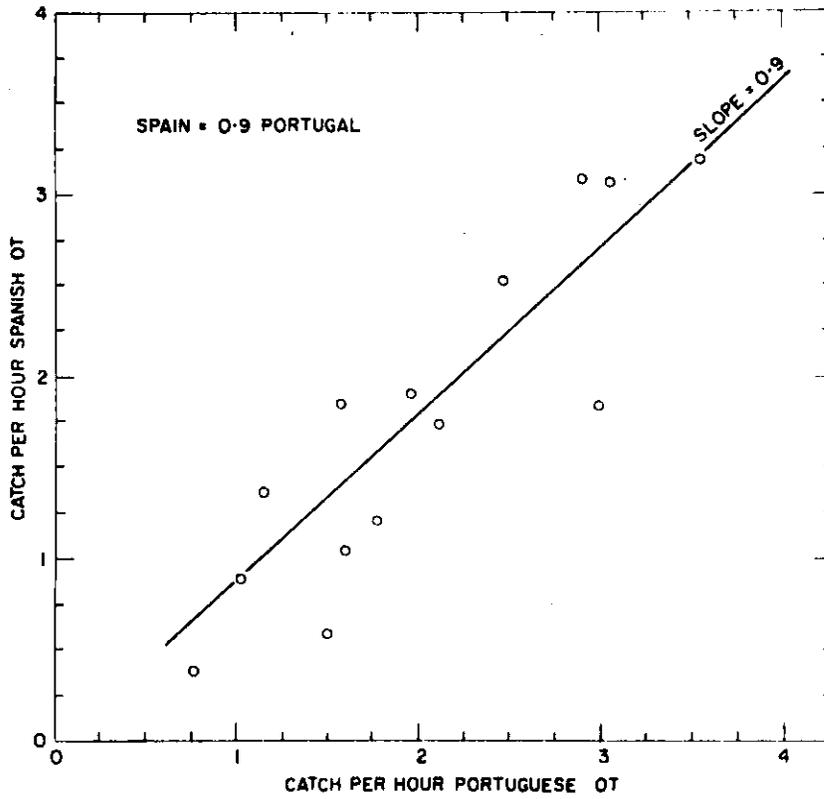


Fig. 3. Relation of cod catches per hour fished (averaged on a semi-annual basis) by Spanish otter trawlers and the corresponding catches per hour of Portuguese otter trawlers in Division 4R, 1954-65.

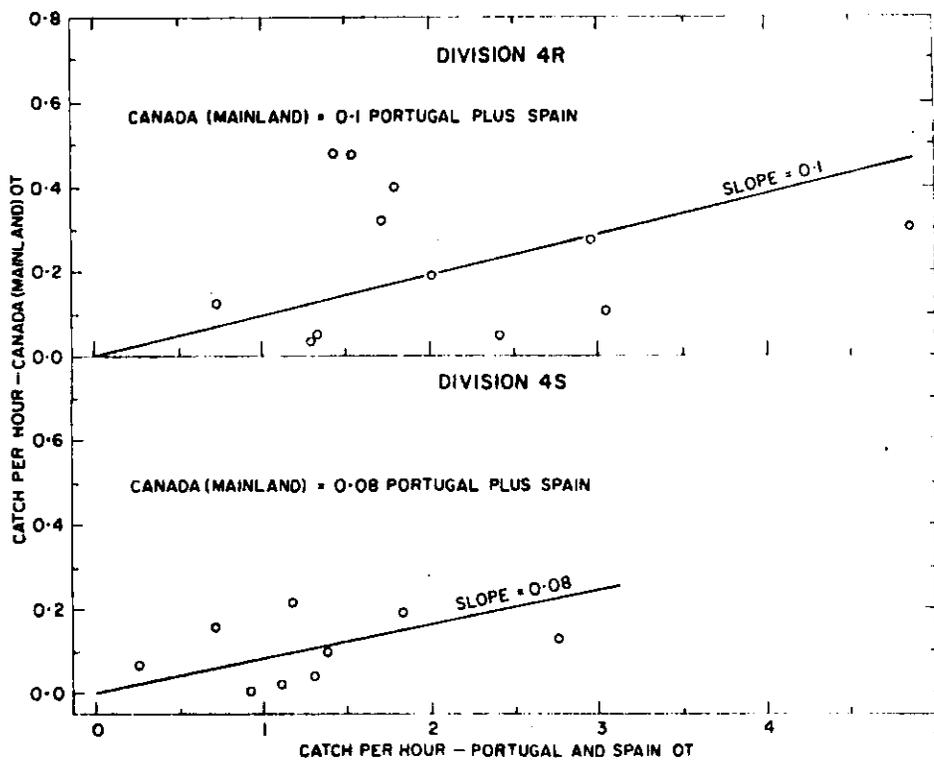


Fig. 4. Relation of cod catches per hour fished (averaged on a semi-annual basis) by Canadian (Mainland) otter trawlers and the corresponding catches per hour of Portuguese and Spanish otter trawlers in Divisions 4R and 4S, 1954-65.

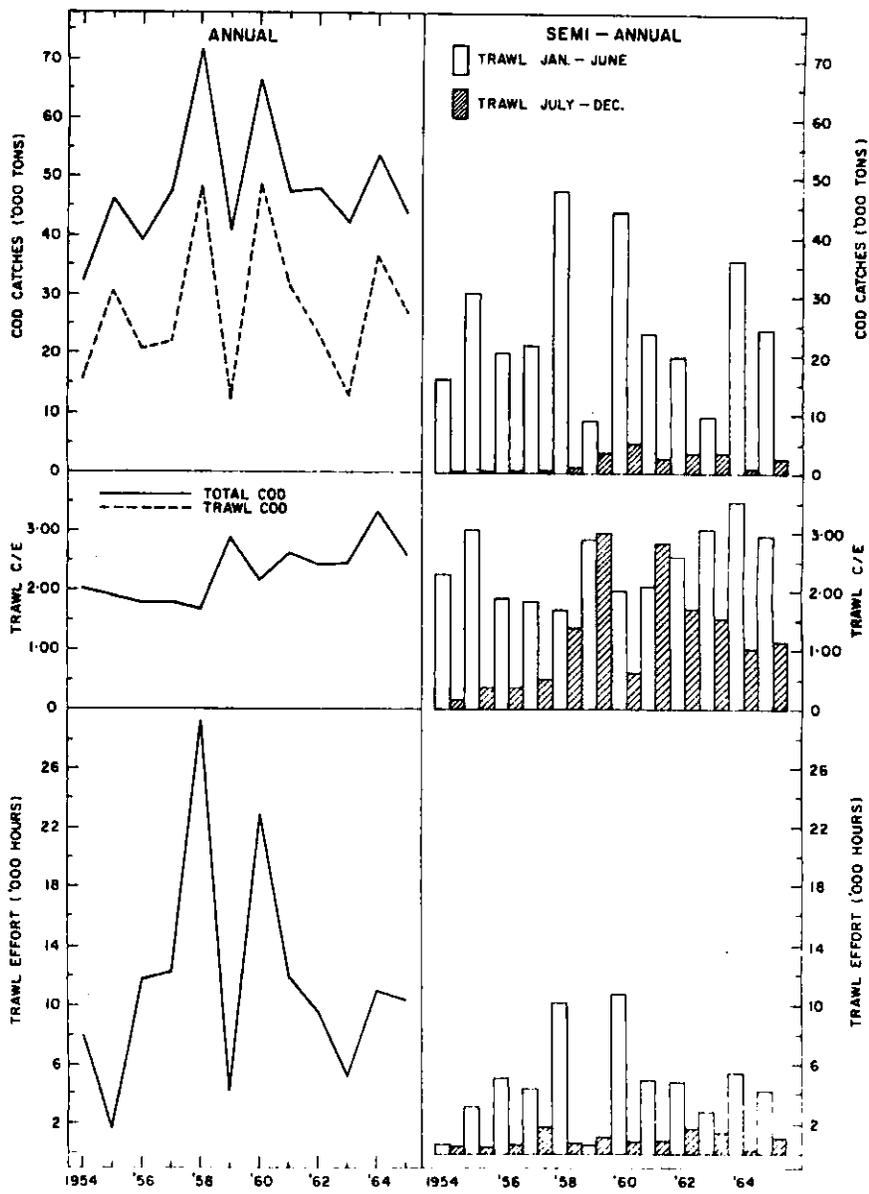


Fig. 5 Trends in catches, effort and catches per unit effort by trawlers in Division 4R, annually and semi-annually, 1954-65.

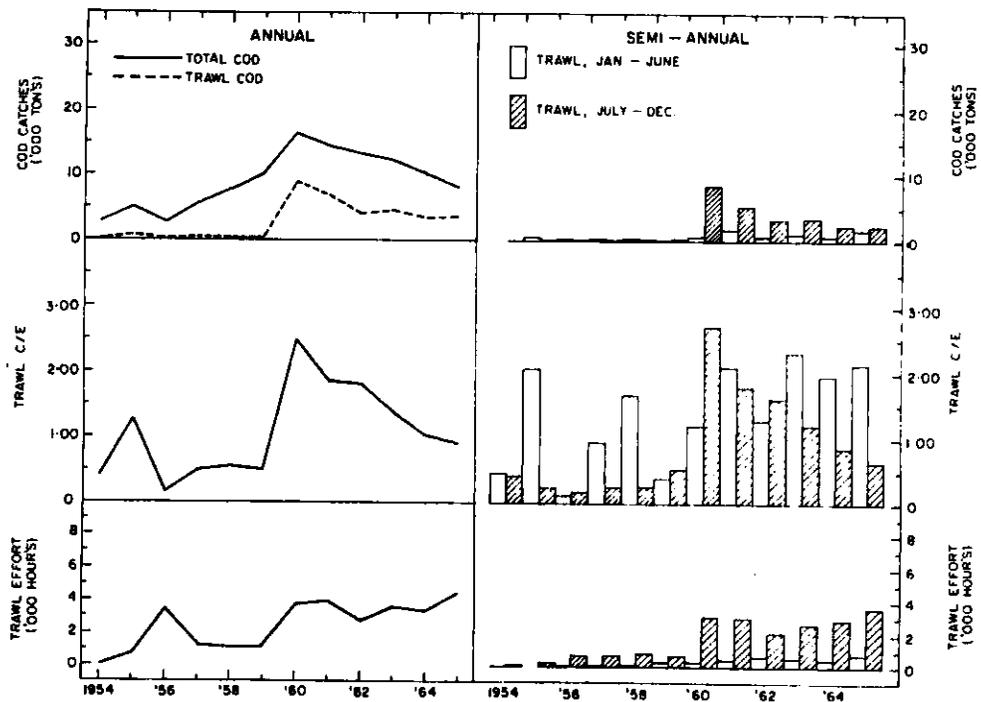


Fig. 6. Trends in catches, effort and catches per unit effort by trawlers in Division 4S, annually and semi-annually, 1954-65.

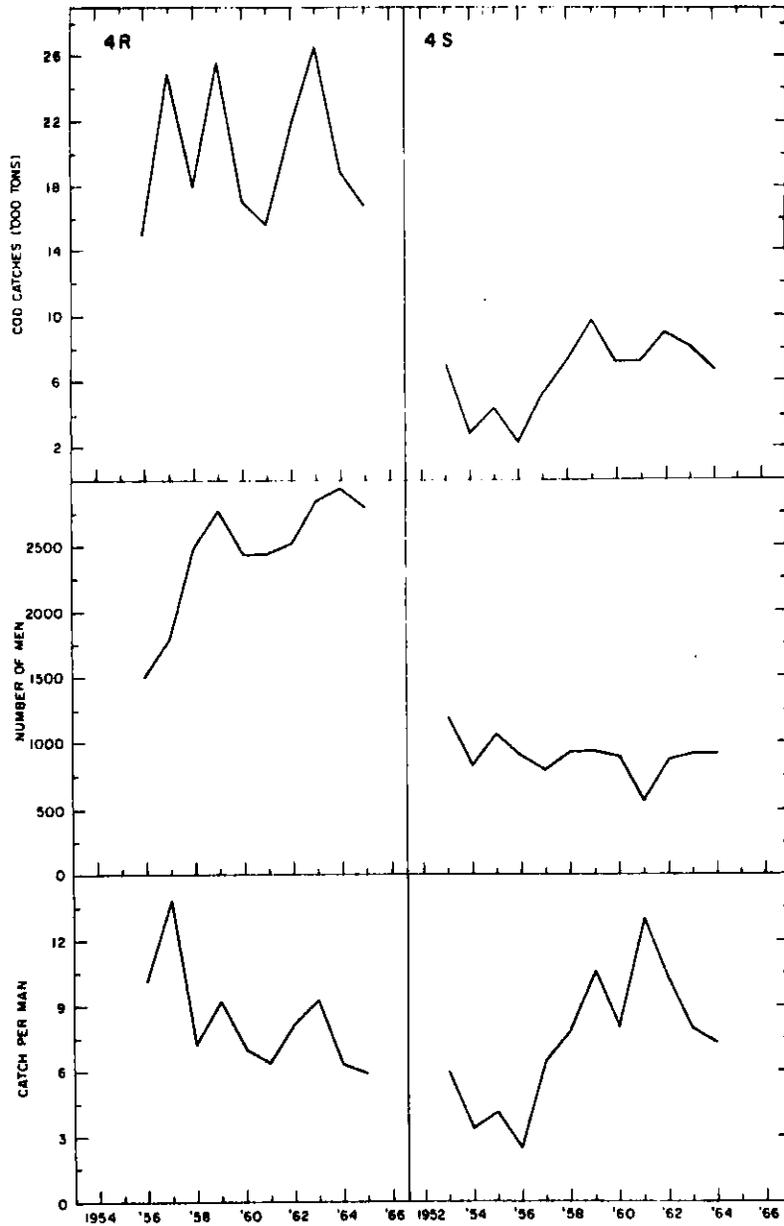


Fig. 7. Trends in catches, effort and catch per man for the inshore cod fishery in Division 4R during 1956-65 and in Division 4S during 1953-64.

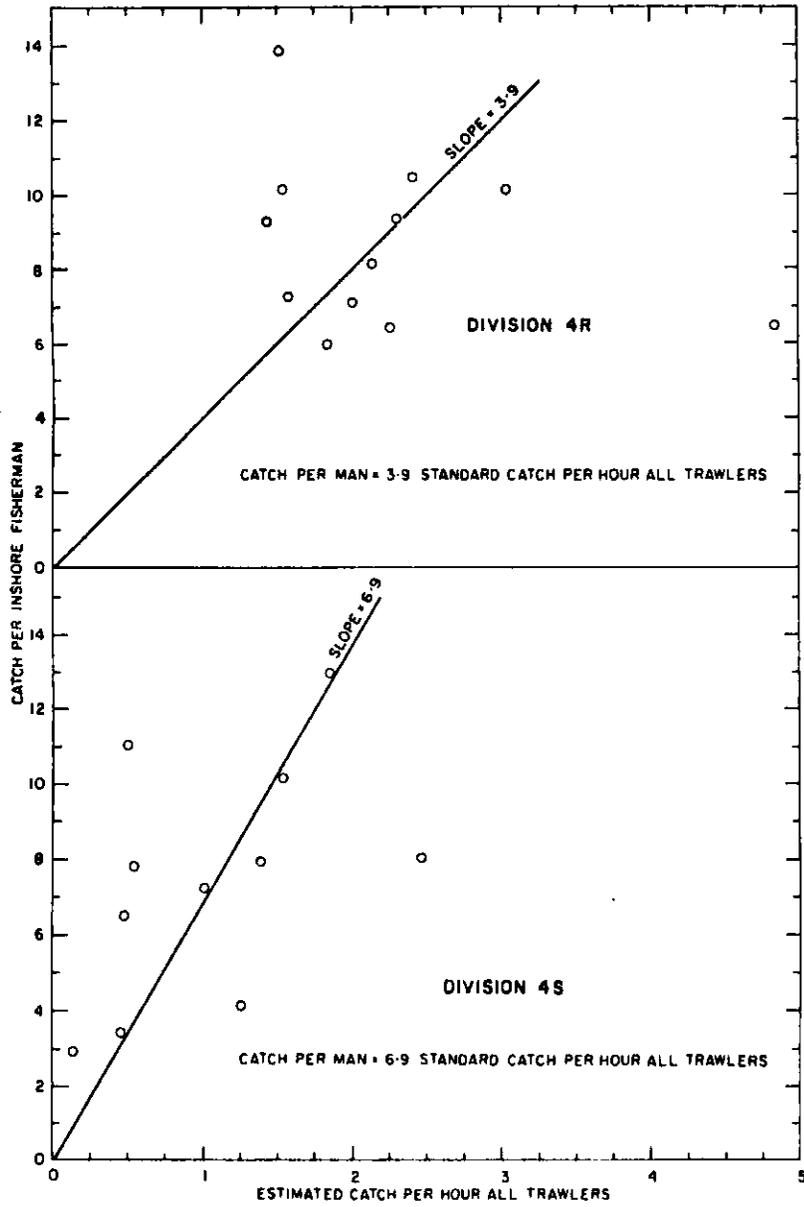


Fig. 8. Relation of annual catch per inshore fisherman and the corresponding catch per hour (averaged on an annual basis) by all trawlers in Divisions 4R and 4S during 1954-65.

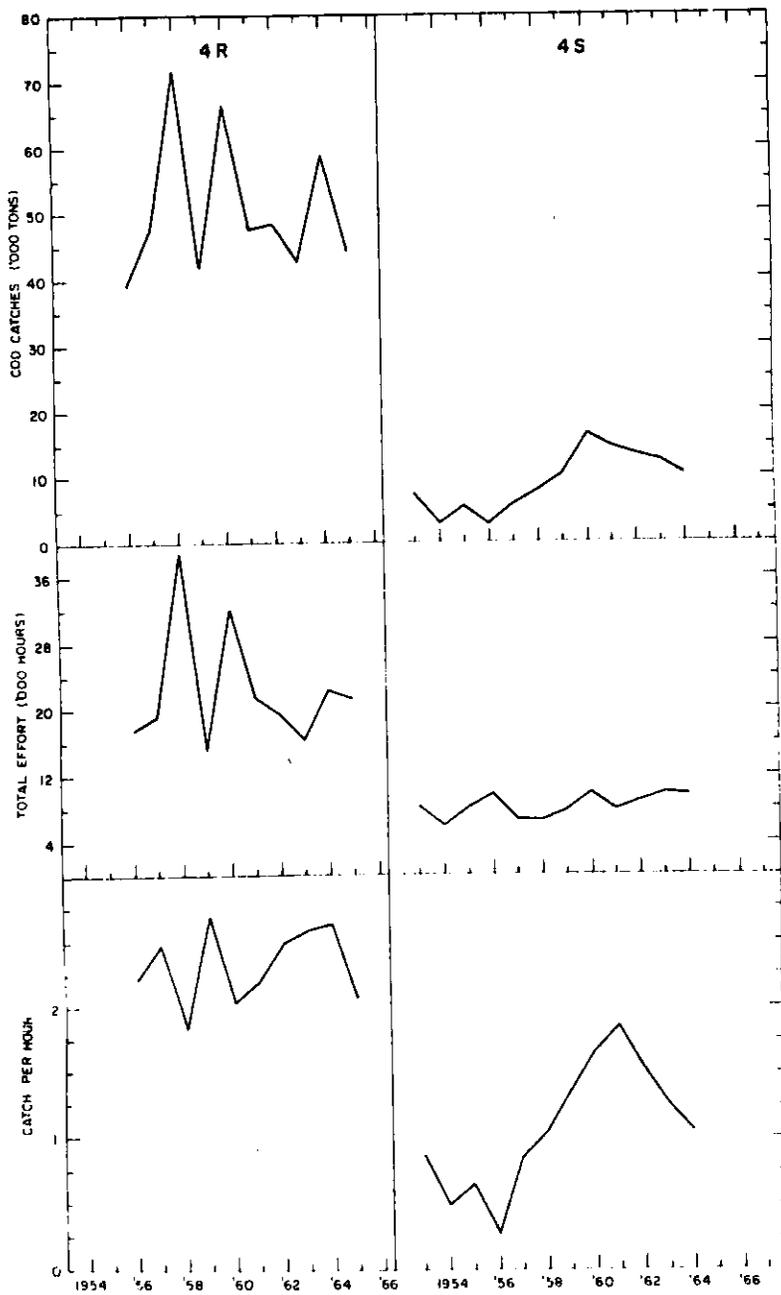


Fig. 9. Trends in total catches, effort and catches per unit effort in standard trawler units for the cod fishery in Division 4R during 1956-65 and in Division 4S during 1953-64.

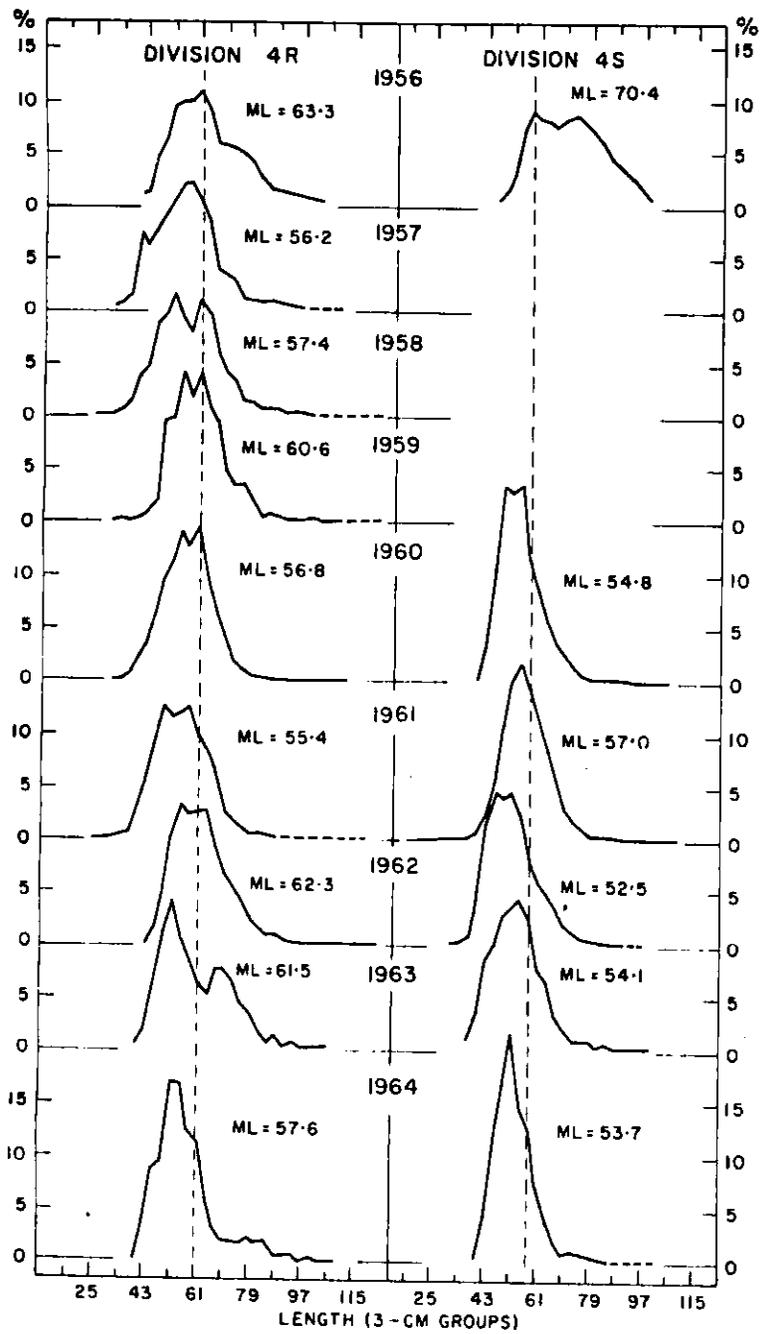


Fig. 10. Trends in length composition of cod caught by otter trawlers in Division 4R during 1956-64 and Division 4S in 1956 and 1960-64. The vertical broken line for 4R represents the average mode in 1956-60 and that for 4S the mode in 1956.

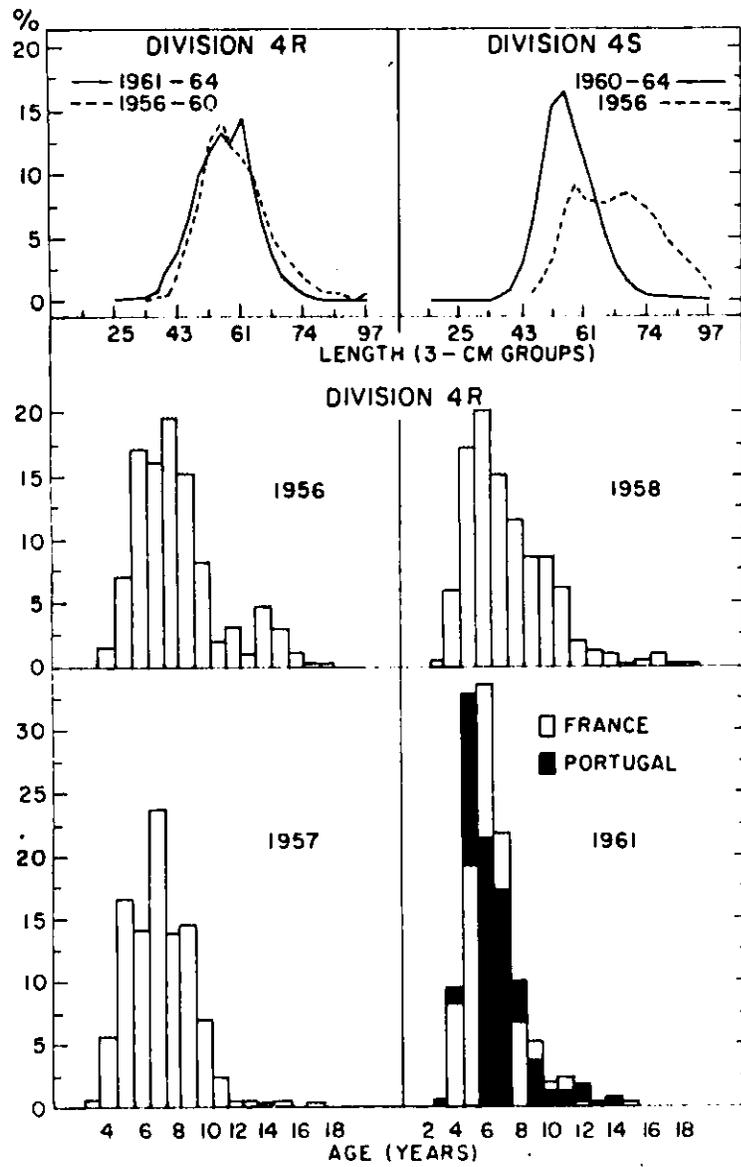


Fig. 11. (a) Comparison of length compositions of cod caught by otter trawler, averaged for 1956-60 and 1961-64 in Division 4R and 1956 and 1960-64 in Division 4S. (b) Trends in age composition of cod caught by otter trawlers in Division 4R by Portugal in 1956-58 and Portugal and France in 1961.

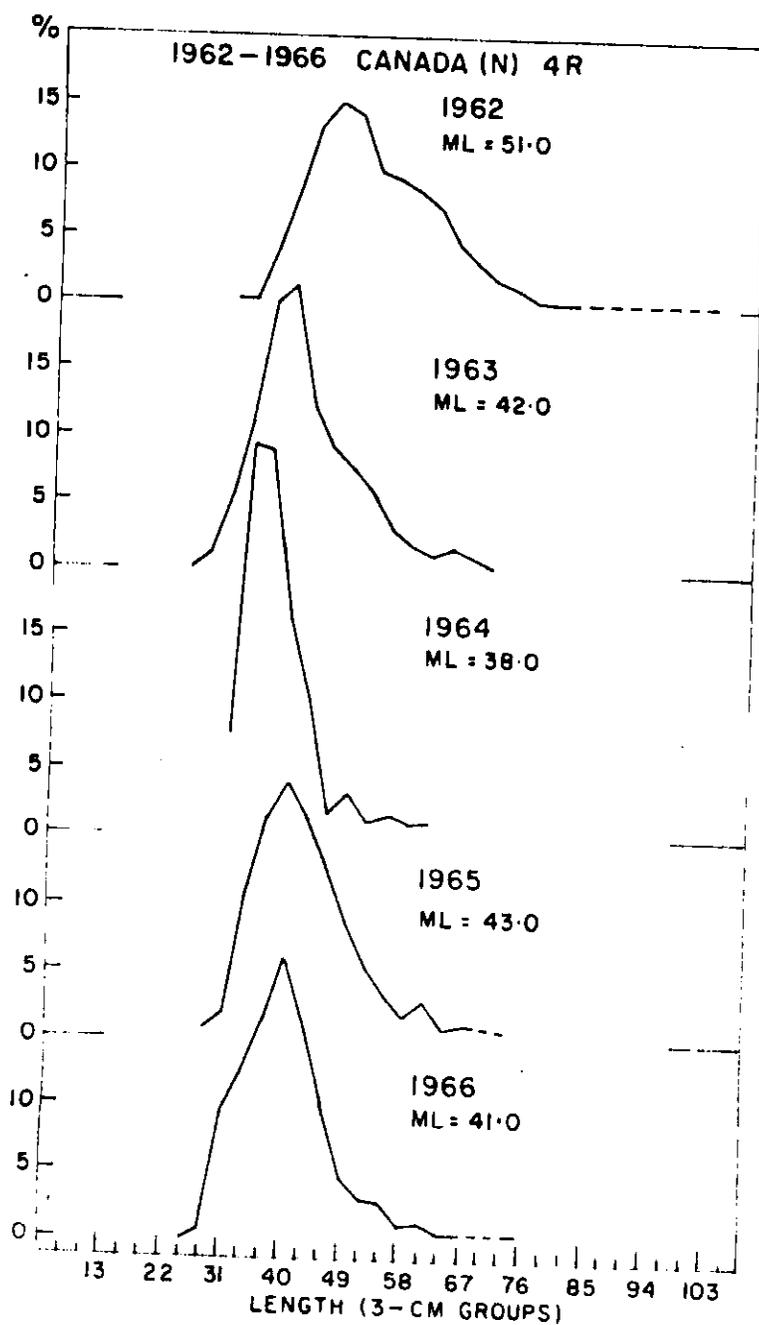


Fig. 12. Trends in length composition of cod caught in the inshore trap fishery, Division 4R, during 1962-66.

Table 1. Cod catches (metric tons) by countries and major gear components for ICNAF Divisions 4R and 4S during 1953-65.

Year	4R ALL GEARS						OTHER TRAWL							
	Nfld.	Can (M)	Port	Spain	France	Others	Totals	Nfld.	Can(M)	Port	Spain	France	Others	Totals
1953	17338	36	—	—	—	—	17374	9	36	—	—	—	—	45
1954	16000	571	1598	—	14050	7	32226	48	110	1598	—	—	—	15813
1955	15631	252	9628	46	20642	35	46234	11	197	9628	46	20642	35	30559
1956	15635	4076	8737	14	10568	32	39062	323	1015	8737	14	10568	32	20689
1957	25133	1974	7252	—	13512	1	47872	117	1179	7252	—	13512	—	22061
1958	18832	7139	15334	314	30037	—	71656	575	2441	15334	314	30037	—	48701
1959	26099	7174	166	392	7099	—	40930	180	4598	94	392	7099	—	12363
1960	17302	5937	13418	7331	21974	604	66566	172	5824	13418	7331	21974	604	49319
1961	15737	2904	7626	2374	18706	—	47347	92	2725	7276	2374	18706	—	31173
1962	21984	3482	10142	5451	7043	—	48102	451	—	10142	5450	7043	—	23086
1963	26799	2984	7936	3019	1628	—	42366	126	—	7936	3019	1628	—	12709
1964	20162	3197	12492	6806	16264	39	58960	1245	—	12492	6806	16264	—	36807
1965	20037	1715	11714	219	10084	70	43839	3175	1613	11714	219	10084	—	26805
Totals	256689	41441	106043	25966	171607	788	602534	6524	19738	105621	25965	171603	679	330130
4S ALL GEARS														
1953	—	7171	—	—	—	—	7171	—	—	—	—	—	—	—
1954	—	2928	—	—	—	—	2928	—	36	—	—	—	—	36
1955	1	4487	717	—	30	—	5235	1	64	717	—	30	—	812
1956	11	2318	—	—	319	—	2648	11	121	—	—	319	—	451
1957	23	5417	119	—	254	—	5813	23	200	119	—	254	—	596
1958	157	7597	20	—	38	—	7812	157	376	20	—	38	—	591
1959	7	10224	—	126	—	—	10357	7	432	—	126	—	—	565
1960	—	16057	—	428	18	—	16503	—	8861	—	428	18	—	9307
1961	1	13814	61	74	495	—	14445	1	6617	61	74	495	—	7248
1962	—	13171	—	—	—	—	13171	—	4259	—	—	—	—	4259
1963	22	12794	360	—	—	—	12176	19	4583	360	—	—	—	4962
1964	45	10077	2	—	18	—	10142	45	3425	2	—	18	—	3490
1965	55	7294	1006	—	—	—	8355	35	2998	1006	—	—	—	4039
Totals	322	112349	2285	628	1172	—	116756	299	31972	2285	628	1172	—	36356