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Fluctuations in the characteristics in Irish salmon

by

A. E. J. Went and Eileen Twomey.

Fluctuations in the catches and stocks of fish are exceedingly important and have interested scientific workers for many years. As far as the salmon is concerned it is known that great fluctuations occur not only in the number of fish entering the rivers from year to year but also in their character. This paper is an attempt to put on record certain changes, some of which have already been recorded in papers on Irish salmon published in a very wide range of journals.

Certain long term statistics which are available for Irish salmon will be considered in this paper. They are—

i. Statistics relating to the arrival of Irish salmon on Billingsgate Market, London;

ii. Statistics relating to the sale of salmon on the Dublin Fish Market;

iii. Export statistics given in *Trade Statistics of Ireland,* compiled on a monthly basis by the Central Statistics Office, Dublin (formerly by the Department of Industry and Commerce);

iv. Catch returns compiled annually pursuant to Orders made under the Statistics Acts since 1945 by the Department of Agriculture and Fisheries, Dublin (they were compiled every two years up to 1943) and published in the annual *Sea and Inland Fisheries Reports;* and

v. Information relating to a number of individual fisheries, sometimes supplied on a confidential basis.

Finally a considerable amount of work has been done on the details of the life history of Irish salmon which in relation to the statistics available give an indication of the fluctuations in the runs of fish in sea year groups in the different rivers.

i. BILLINGSGATE MARKET RETURNS.

These returns are produced annually by the Fishmongers' Company, London, and give details of the number of cases or boxes of salmon of different origins sold on Billingsgate Market each year. This information relates to the whole of Ireland, whereas the other returns mentioned above exclude Northern Ireland. The actual returns for the period from 1924 to 1969 are given in Table 1 and they are illustrated graphically in Fig. 1. To some extent before 1968 the Billingsgate Market returns gave an indication of the strength of the runs in Irish rivers and also their fluctuations. In 1968 and 1969, however, the percentage of the Irish catch of salmon sent to Billingsgate Market decreased drastically. Some indication of this can be seen from the information in Table 2 in which the weight of arrivals on Billingsgate Market in each year since 1954 is compared with the weight of fish exported. There have been large fluctuations in the proportion of Irish salmon handled on Billingsgate Market but in 1968 and 1969 the proportions have been well below the average of the total exported.

The Billingsgate Market returns are useful, however, in indicating trends, and especially the change in quantities of "spring" fish when compared with "summer" fish. For this purpose the returns can be divided into two from January to May inclusive and from June onwards for each year. To see the trends the figures are best treated for each decade as has been done in Fig. 2. (the actual figures being given in Table 3), from which it will be seen that there was a steady decrease from 1924/29 to 1940/49 in the January/May arrivals with a slight increase in the period 1950/59 but a further decline in the period 1960/69. In fact in the year 1968 the number of cases arriving at Billingsgate Market from January to May at 965 was 13.5% of the total for that year.

Whilst the actual numbers of cases arriving at Billingsgate Market do not necessarily give an indication of the change in the character of the catches of Irish salmon the percentage figures probably do so. There has been a rather steady decline in "spring fish" (January/May) from 1924/29 with a very marked decline in the last decade (1960/69) as will be seen from Fig. 2.

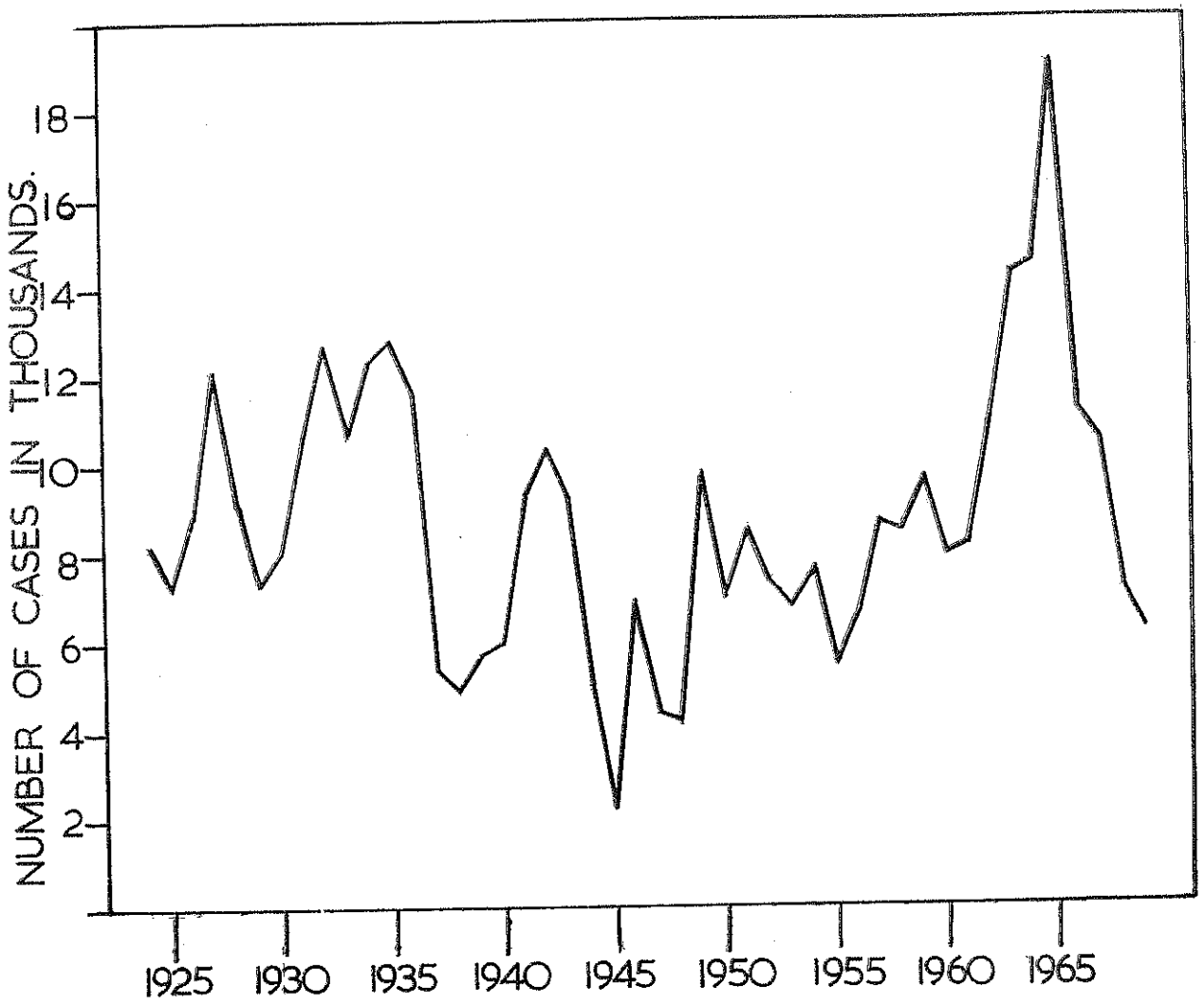

Fig. 1. Number of cases of Irish salmon on Billingsgate Market, London, from 1924 to 1969, inclusive.

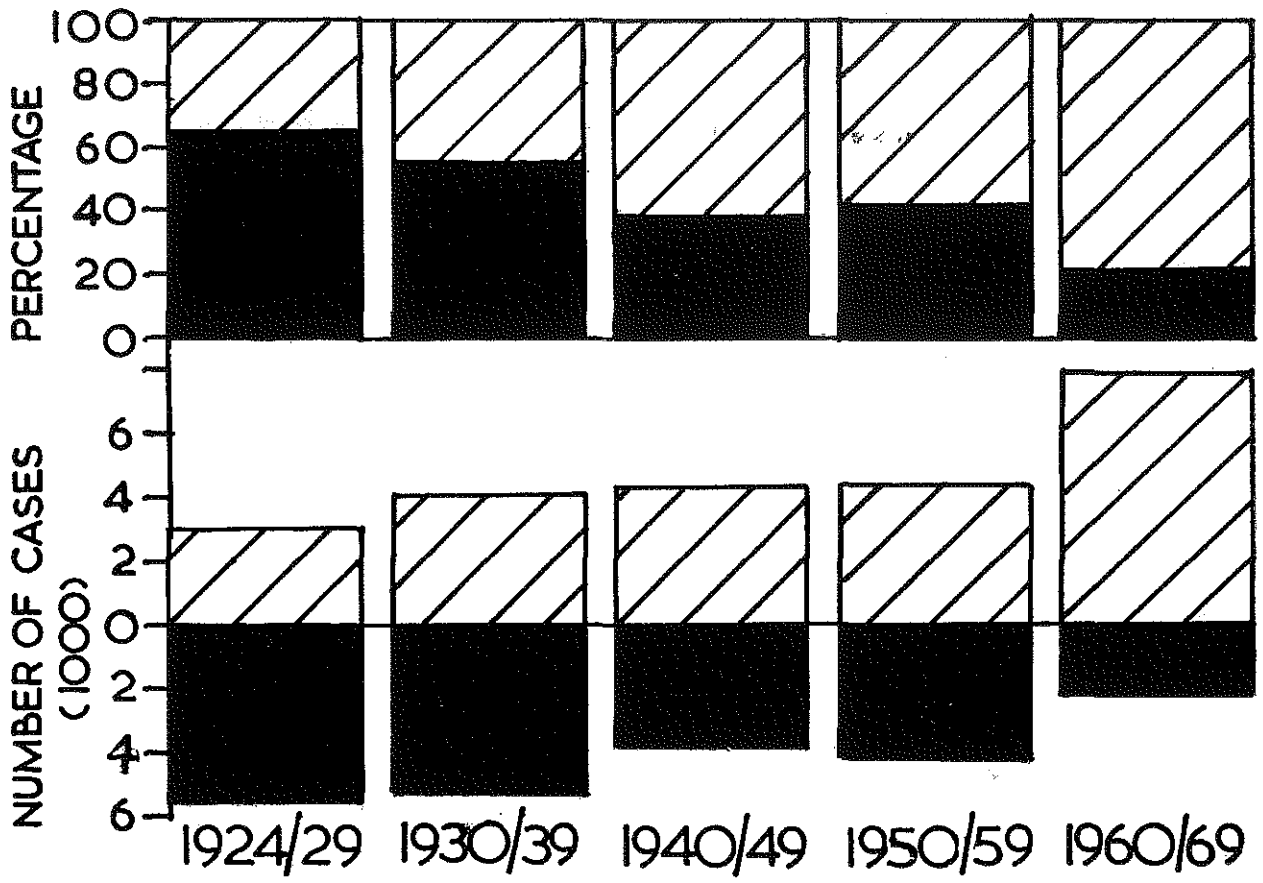

Fig. 2. Average annual number of cases of Irish salmon received on Billingsgate Market, London, in five periods since 1924 (Black areas=January/May and cross hatched areas=June onwards).

ii. DUBLIN WHOLESALE FISH MARKET RETURNS.

These returns are only available from 1953. Attempts were made in 1953 to 1955, inclusive, to ascertain the actual numbers (but not weight) of salmon sold on this market by extracting the figures given daily in the Dublin newspapers and checking these against other information. From 1956 onwards the returns are based on examination of the registers which licensed salmon dealers are obliged to keep by law. The returns are summarised in Table 4. The Dublin Wholesale Fish Market has been increasing in importance since the returns were compiled first in 1953 and it now handles about half of the Irish catch of salmon and grilse. Whilst there have been marked fluctuations in the number of fish arriving in the period January to May each year (see Table 4 and Fig. 3), the actual percentage of fish arriving at this period has declined fairly steadily with a particularly rapid decline in the years 1967 to 1969 inclusive.

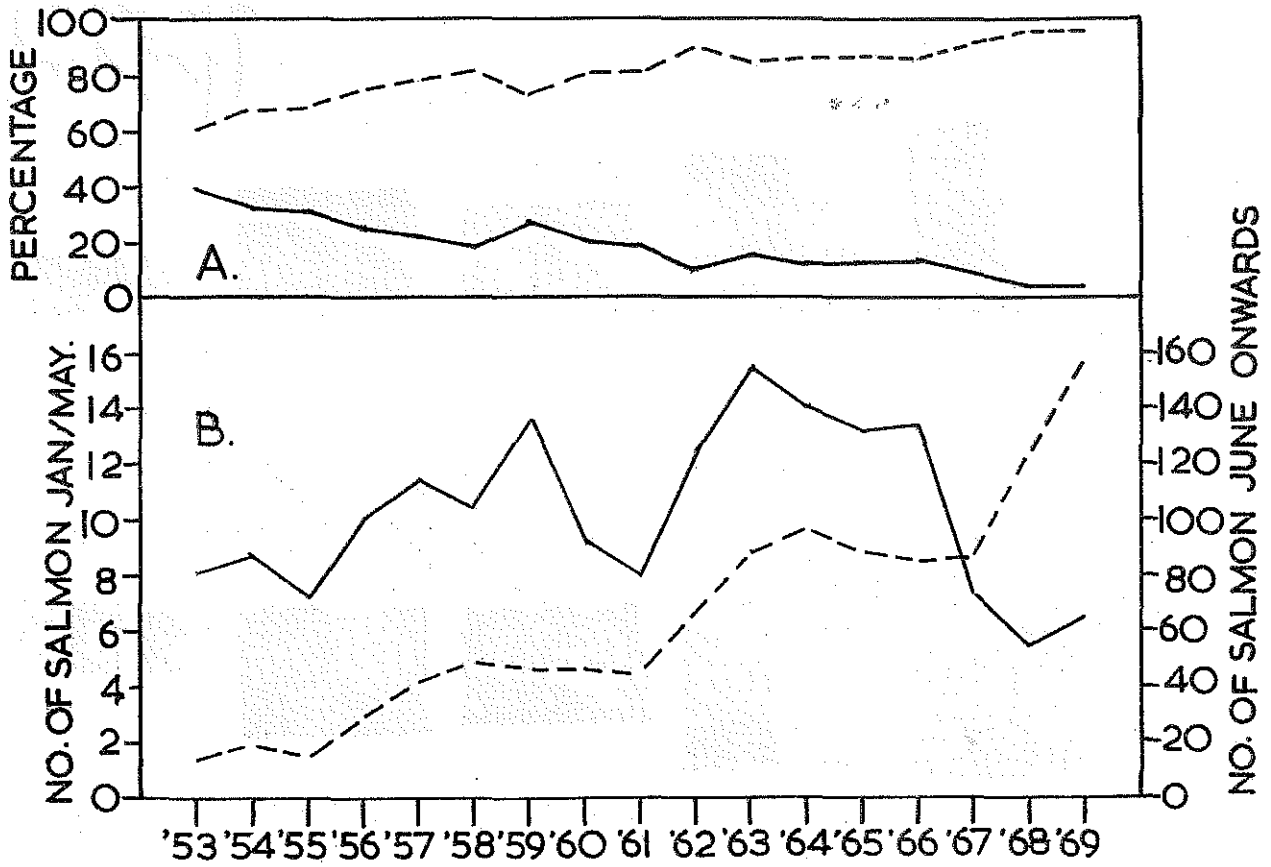

Fig. 3. A. Percentage of salmon sold in Dublin Wholesale Fish Market and

B. Actual numbers of fish sold (in 1000).

(Full line = January/May and Broken line = June onwards).

The rise in the importance of the Dublin Wholesale Fish Market as far as salmon is concerned has paralleled the decline in Billingsgate Market as an outlet for Irish salmon and explains to some extent the drastic reduction in the numbers of cases of salmon handled in Billingsgate Market in the years 1965 to 1968. This change is due to three main causes, namely, the increase in the consumption of salmon on the home market, compared with former years, exports which have been developed to Continental markets in recent years and the diversion of salmon from Billingsgate to other British markets, including chain-store and hotel organisations.

iii. EXPORT STATISTICS GIVEN IN TRADE STATISTICS OF IRELAND.

These statistics are available since 1924 on a monthly basis and they provide indications of the differences in times of export over that period. They suffer, however, from the fact that in recent years more salmon has been consumed at home and, therefore, the exports in recent years tend to form a somewhat lower

proportion of the total catch than in former years. The figures used do not include salmon exported in the form of smoked sides but this makes comparatively little difference as they form a small proportion of the total exports of salmon in all states of preservation, i.e. fresh, chilled, frozen or smoked. In 1969, for example, the total weight of salmon exported in the fresh, chilled or frozen state was 19,351 cwt. whereas only 750 cwt. of salmon were exported in the "dried, salted or smoked but not further prepared". The figures also include trout but the quantities are small and can be ignored in what follows.

The figures for the five periods used previously for January to May, inclusive and June onwards are given in Table 5 (see also Fig. 4). The weight of salmon exported in the decade 1960/69 for the months of January to May inclusive was the lowest in the period under review and well below that for the decade 1940/49. On the other hand the exports from June onwards were the highest in the decade 1960/69. In other words the export returns confirm the conclusions from the Billingsgate and Dublin Wholesale Fish Market returns.

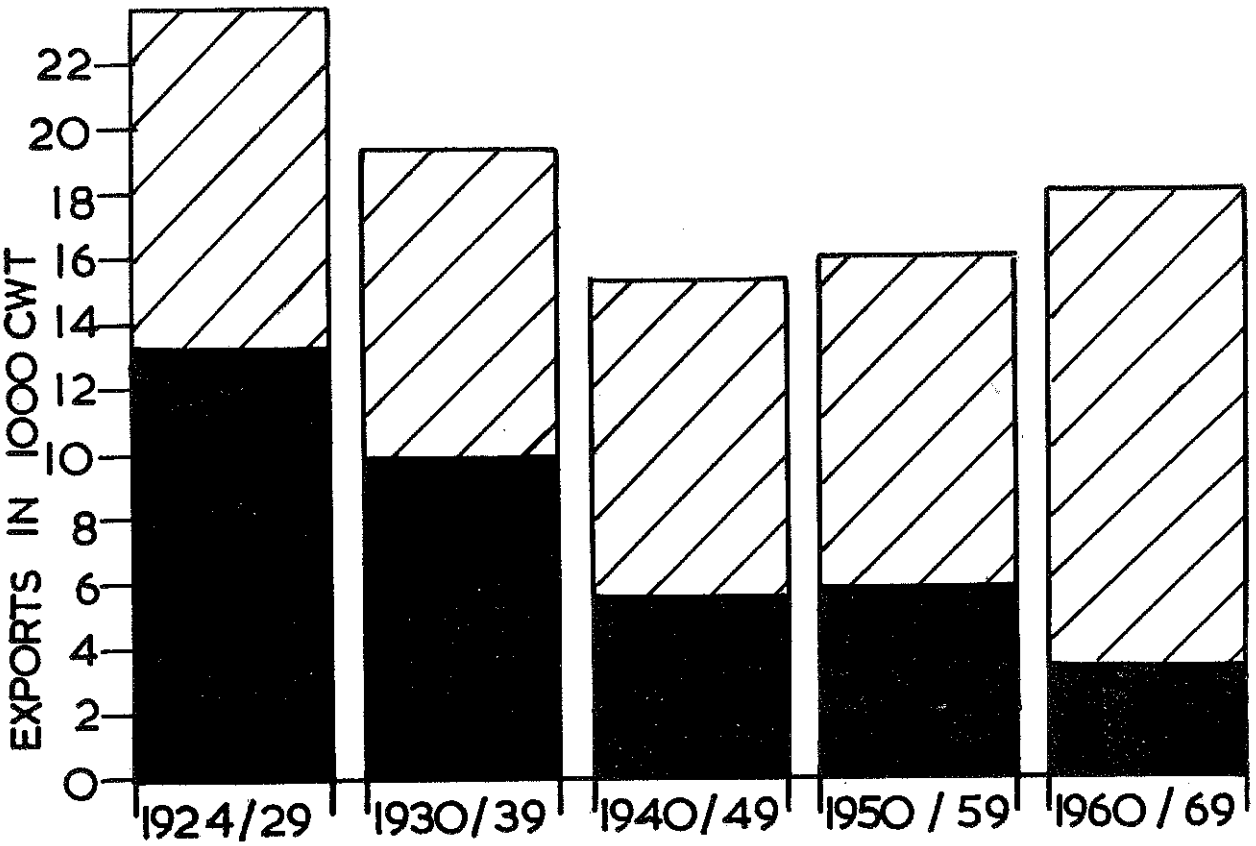

Fig. 4. Exports of salmon and trout (in 1000 cwt.) for January/May (shown black) and June onwards (shown cross hatched).

iv. CATCH RETURNS COMPILED ANNUALLY SINCE 1945.

These returns were compiled prior to 1945 only for every other year. The returns from commercial methods and rods are available separately. The relevant figures for commercial methods are given in Table 6. These figures are not quite comparable for the whole period since from 1952 the catches in the former Moville Fishery District, now part of the Foyle Fisheries Commission area, are not included. The figures are not available on a monthly basis.

Both commercial methods and rod fishing for salmon are affected in different ways as regards weather. When water conditions are favourable for rod fishing there is a tendency for commercial methods not to be so successful. Consequently, with a moderate run of fish, catches by nets and weirs may be high if drought conditions prevail but rod catches will tend to be small. The fluctuations in the actual catches by commercial methods and the catch per licence are shown in diagrammatic form in Fig. 5, the actual figures being given in Table 6. Both Table 6 and Fig. 5 indicate that from 1962 onwards the catch and the catch per licence has been very high compared with the earlier period. This confirms what we know from observations of the stocks of fish in Irish rivers in recent years.

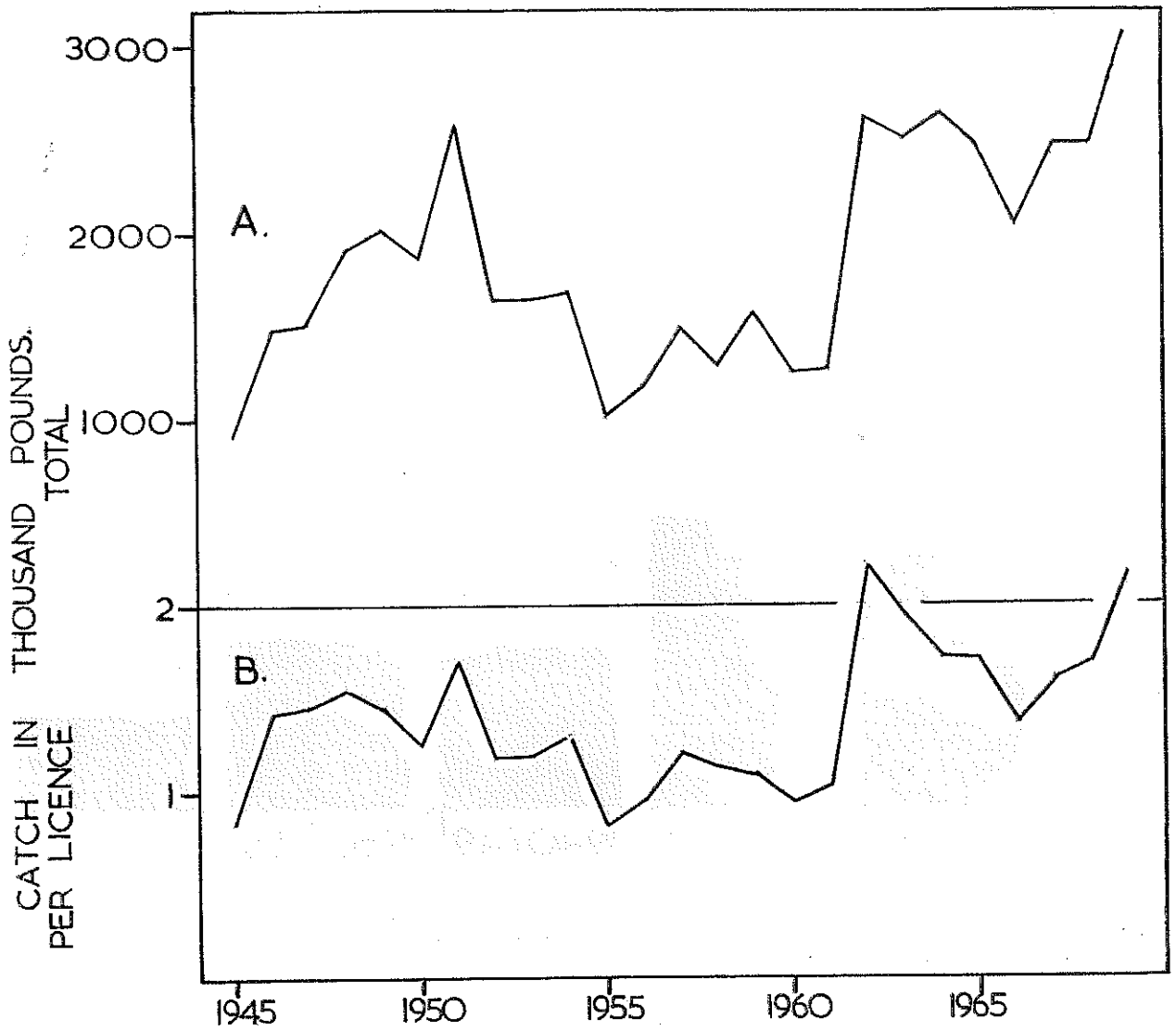

Fig. 5. Catch in 1000 pounds from 1945 to 1969, inclusive.

A.=total catch and B.=catch per licence.

There are marked fluctuations in rod returns, as will be seen from Table 7, but these are of no significance as indicating fluctuations in stocks or runs. In 1969, for example, the weather conditions were completely unsuitable for rod fishing (i.e. extreme drought) for much of the season.

v. STATISTICS RELATING TO A NUMBER OF INDIVIDUAL FISHERIES.

Some of these statistics have been supplied on a confidential basis and, therefore, instead of giving actual figures the statistics have been given in some other suitable form. In other cases, however, the figures are published elsewhere or there is no objection to their production in the original form.

a. **River Foyle.** Since 1952 the Foyle Fisheries Commission has published annually statistics relating to the catch by commercial methods within its area. The catch figures for 1952 to 1963 inclusive have already been published (Went, 1964a) and those for the period 1964 to 1969, inclusive are given in subsequent Annual Reports of the Commission. The details are given in Table 8. The catch since 1952 has fluctuated between 39,538 fish (1952) and 149,633 fish (1964) with a tendency, as will be seen from Fig. 6, for catches from 1962 to be very high. These catch figures are not exactly comparable since there have been differences in fishing seasons and in 1969 the fishing was closed off early to enable fish to escape for spawning, the escapement into fresh water being poor owing to low water conditions for the major part of the main run of fish. Even though conditions were very satisfactory for netting in the year 1969 the catch per unit effort (per licence) was low compared with the average for the period 1962 to 1969 inclusive.

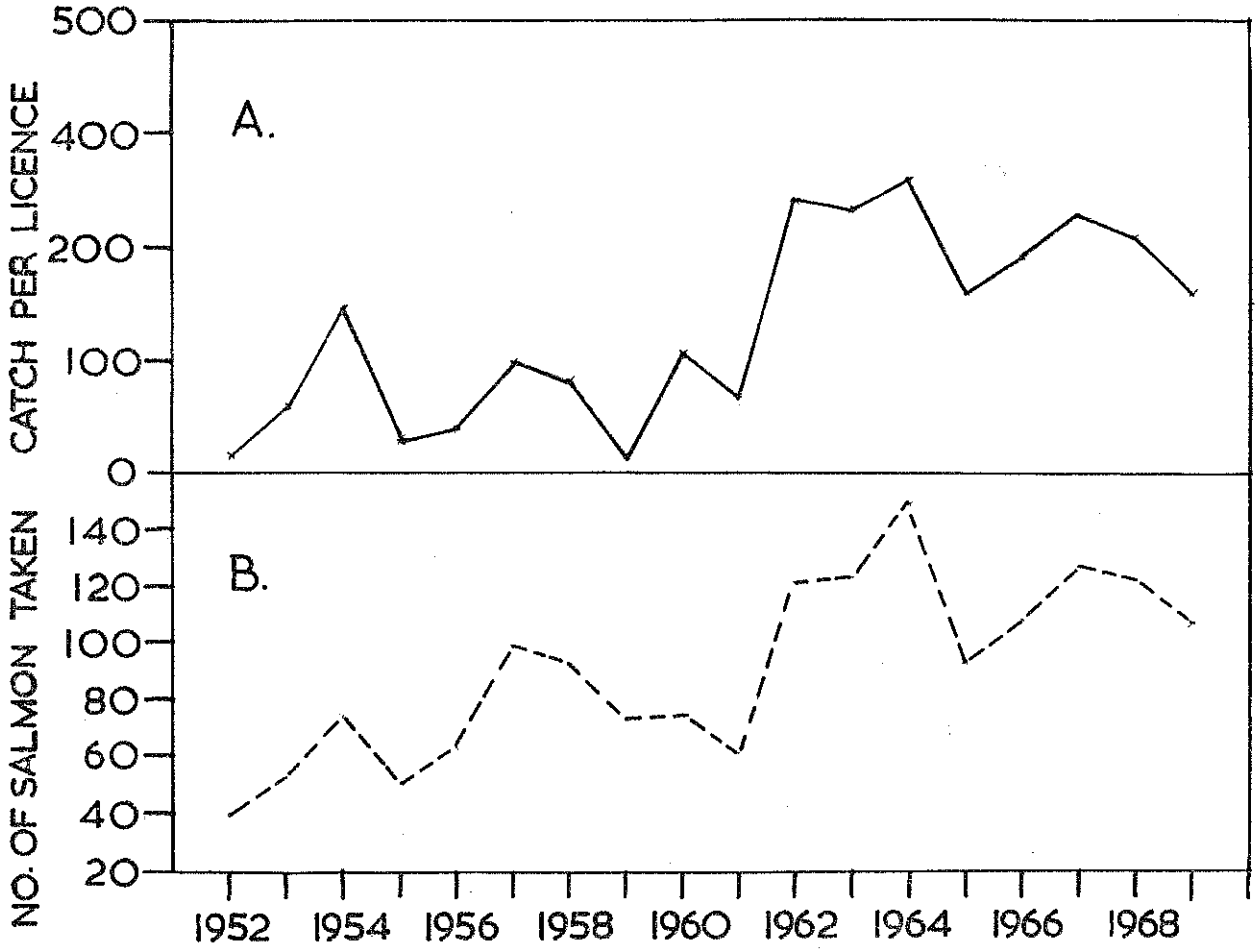

Fig. 6. Statistics relating to catch by commercial methods in the River Foyle.

A.=Mean catch per licence and B.=Total number of salmon taken.

In the years 1954/58, 1962/63 and 1967/69 the actual numbers of the different age groups in the catches have been estimated (Went, 1970) and the results are given in Table 9 and Fig. 7. These data confirm the information obtained in previous sections in that there have been substantial runs of grilse (1+sea winters) since 1962 or thereabouts in most Irish rivers.

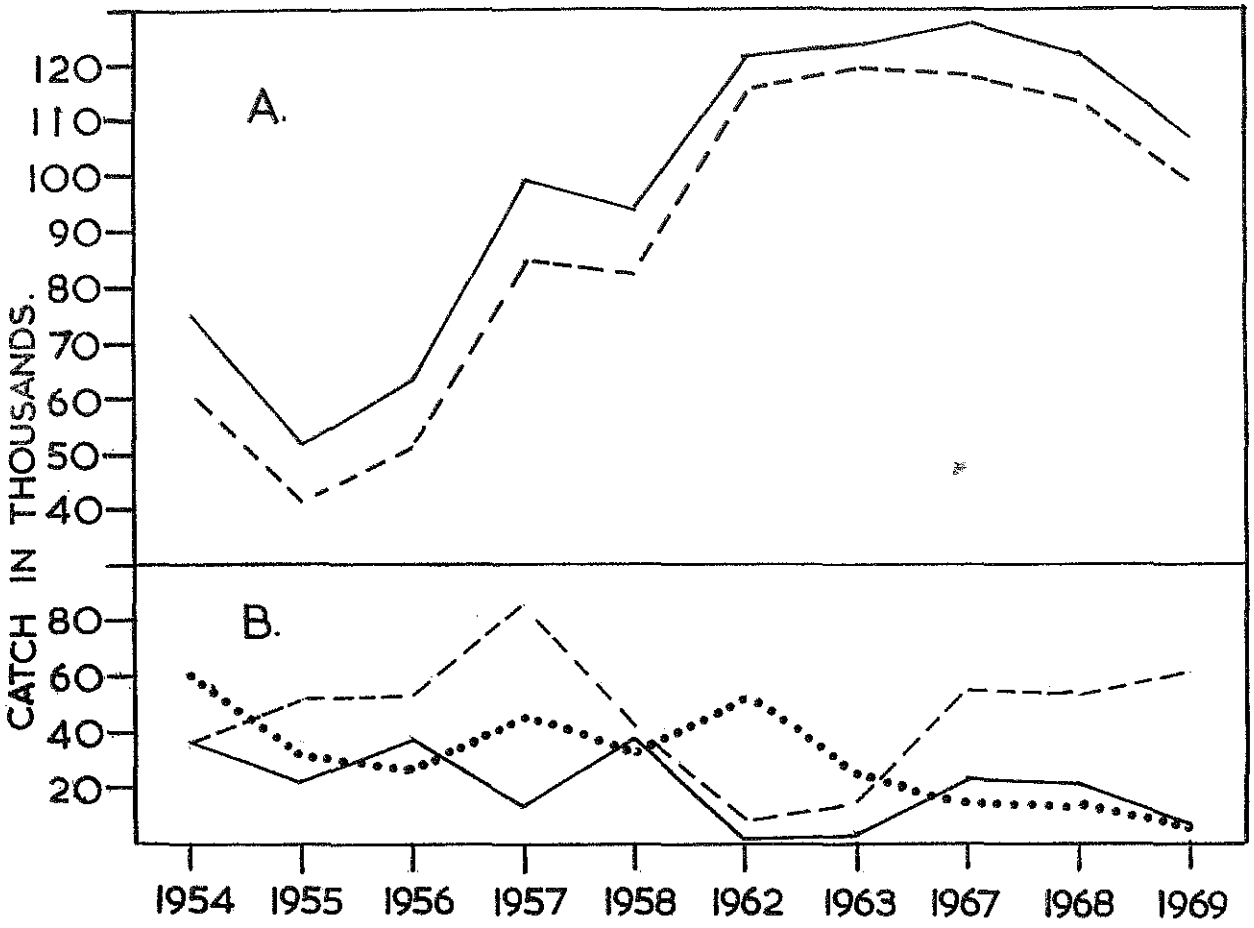

Fig. 7. Changes in the numbers of the different age groups in the River Foyle.

A. Total catch (full line) and grilse (broken line), and

B. Small spring fish (full line), small summer fish (broken line) and previous spawners (dotted line).

The material for the River Foyle also gives some information on the fluctuations in the mean size of the salmon run. The overall fluctuations in the mean weight of salmon and grilse taken in the Derry Fishery owned and operated by the Foyle Fisheries Commission are as follows :—

Year	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*
Mean Weight	7.2	6.8	6.9	6.7	6.7	7.3	6.9	6.7
Year	*1962*	*1963*	*1964*	*1965*	*1966*	*1967*	*1968*	*1969*
Mean Weight	7.3	7.2	7.1	6.8	7.2	7.6	7.1	7.8

This mean weight covers all year classes but in connection with investigations into large grilse in the River Foyle some additional information on the salmon and grilse of the River Foyle can be obtained. This has been given in Table 10. There was a tendency up to 1958 (information was not collected for the years 1959 to 1961) for an increase in the proportions of grilse to be followed by a reduction in the mean weight. From 1962 a marked increase in the population of grilse did not, in fact, produce a reduction in the mean weight and the average weight was higher than in the period 1954/58. Either there must have been an unprecedented increase in the average weight of the non-grilse or a very marked increase in the average weight of the grilse. Clearly in the years 1967 and 1969 the non-grilse would have to more than double their former weight to produce such an increase in average weight. We know this did not happen (i.e. the number of fish around twenty pounds and upwards was very small) and the only alternative, to account for the change in overall average weight, is a marked increase in the average weight of the grilse. The various age groups in the River Foyle obviously show wide ranges in weights and lengths and their means. In the years 1954 to 1958 the the ranges and mean lengths and weights of the grilse (1 + sea winters), small spring (2 sea winters), small summer (2 + sea winters) and previously spawned fish (with Sms.) were estimated and the results are given in Table 11. These data are perhaps best, however, illustrated in the form of a diagram (Fig. 8), from which it will be seen that there is considerable overlap as regards both length and weight as between the three age groups of maiden fish. The maximum weights of grilse as recorded by Went, 1970 were as follows:—

1954	1955	1956	1957	1958	1959
13.0	10.0	11.5	14.3	13.0	13.0

It is obvious that a proportion of the grilse in the River Foyle must reach weights in excess of the mean weight of the small spring and small summer fish. In 1969 this proportion was very high, as indicated by Went, 1970.

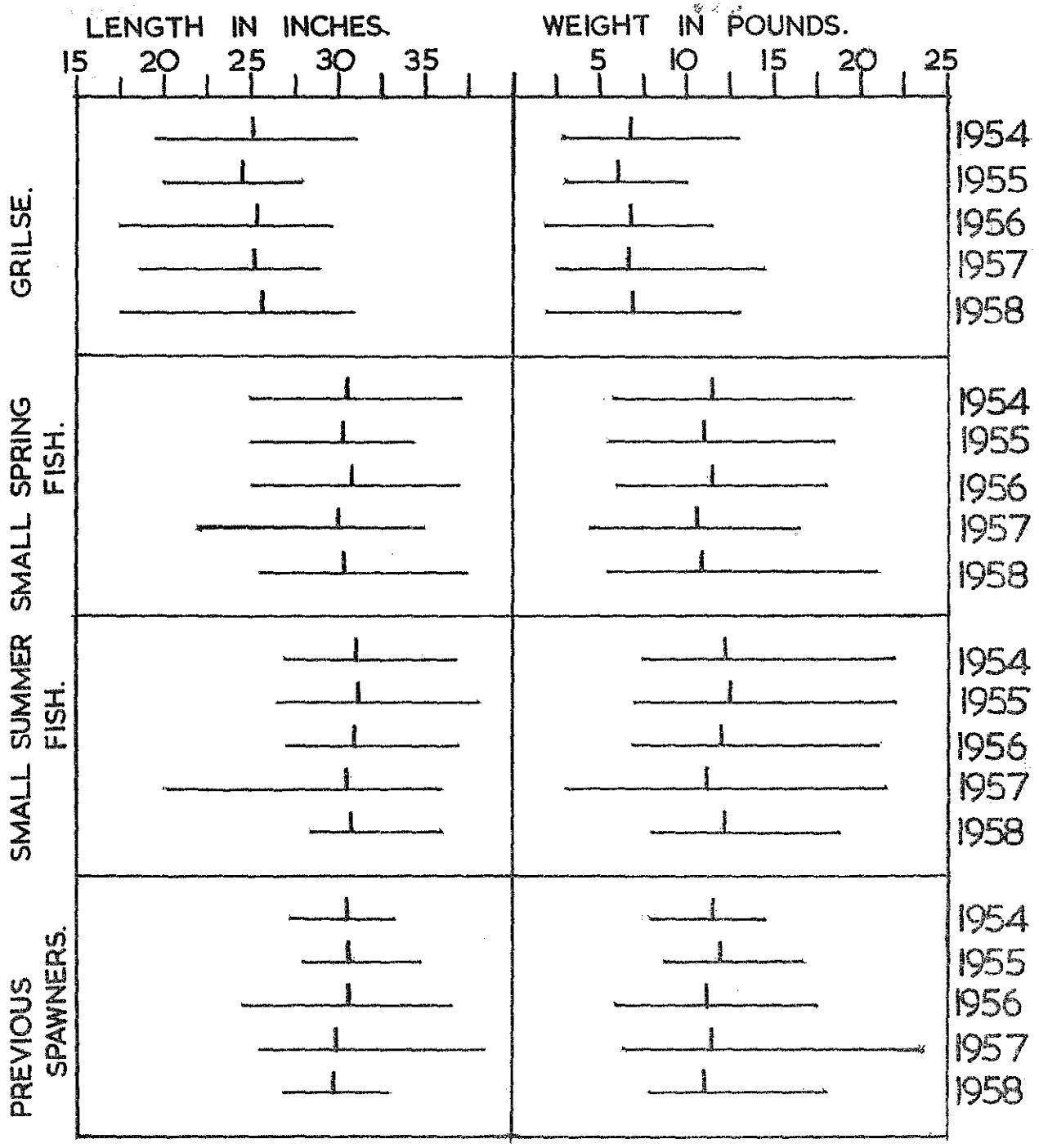

Fig. 8. Minimum, mean and maximum lengths and weights of grilse, small spring fish, small summer fish and previous spawners in the River Foyle in the years 1954 to 1958, inclusive.

(The vertical line indicates the mean).

The proportion of the various smolt classes in the catches have been recorded for a number of years and the relevant figures are given in Table 10. It will be seen that the two-year smolt class constitutes the bulk of the fish and that the one-year smolt class is less important than the three-year smolt class.

b. River Shannon. An important fishery on the River Shannon is that of Thomond Weir at which the daily runs have been recorded since 1941. In addition for most years in this period the Electricity Supply Board for Ireland has collected sets of scales from representative samples of salmon (see Went, 1964b or Twomey 1957 and 1967). One of us (E. T.) has investigated also the material for the period from 1962 to 1969, inclusive and the results are included in this paper.

Details of the runs for the River Shannon at Thomond Weir are available for the period 1941 to 1969, inclusive and the February/May and June/July returns are given in Table 12. (see also Fig. 9.) February to May returns consist mainly of salmon, that is to say small spring (2 sea winters) and small summer (2 + sea winters) fish, a few large spring fish (3 sea winters) with varying proportions of previous spawners, whereas the returns in June and July (until July 19 the end of the season) are mainly of grilse (1 + sea winters) with a few previous spawners and small spring and summer fish. These returns more or less confirm that in most recent years there have been good to excellent runs of grilse with the earlier running salmon well below the pre-1962 average.

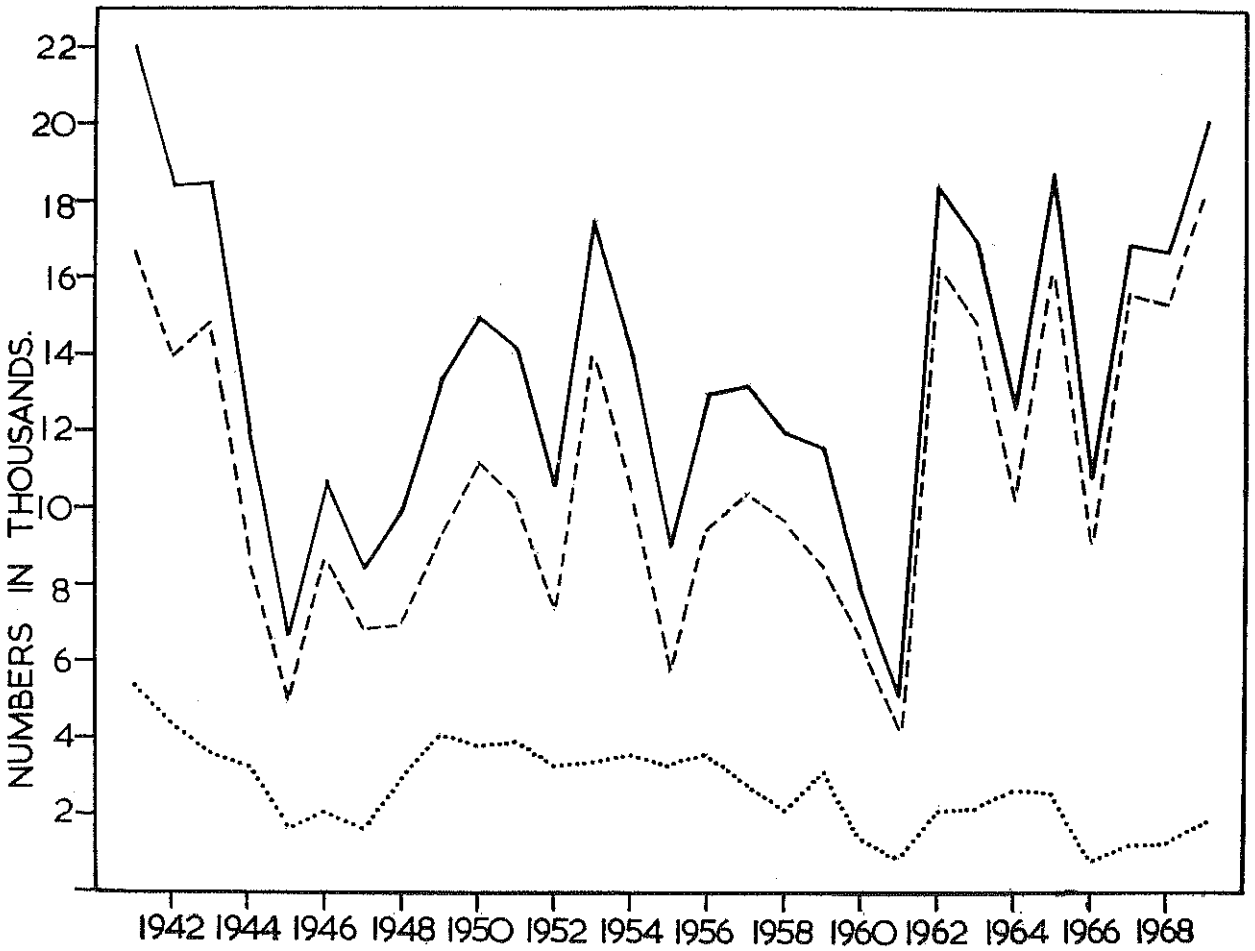

Fig. 9. Number of salmon and grilse entering Thomond Weir in January/May (dotted line); June/July 19 (broken line) and January/July 19 (full line).

The estimated number of fish in each year class are given in Table 13 (see also Fig. 10) for the period from 1944 to 1969 inclusive. Again these estimates confirm the information obtained previously namely that generally from 1962 onwards the grilse runs have been good, whereas there has been a decline in the runs of salmon (fish of 2 or more sea winters).

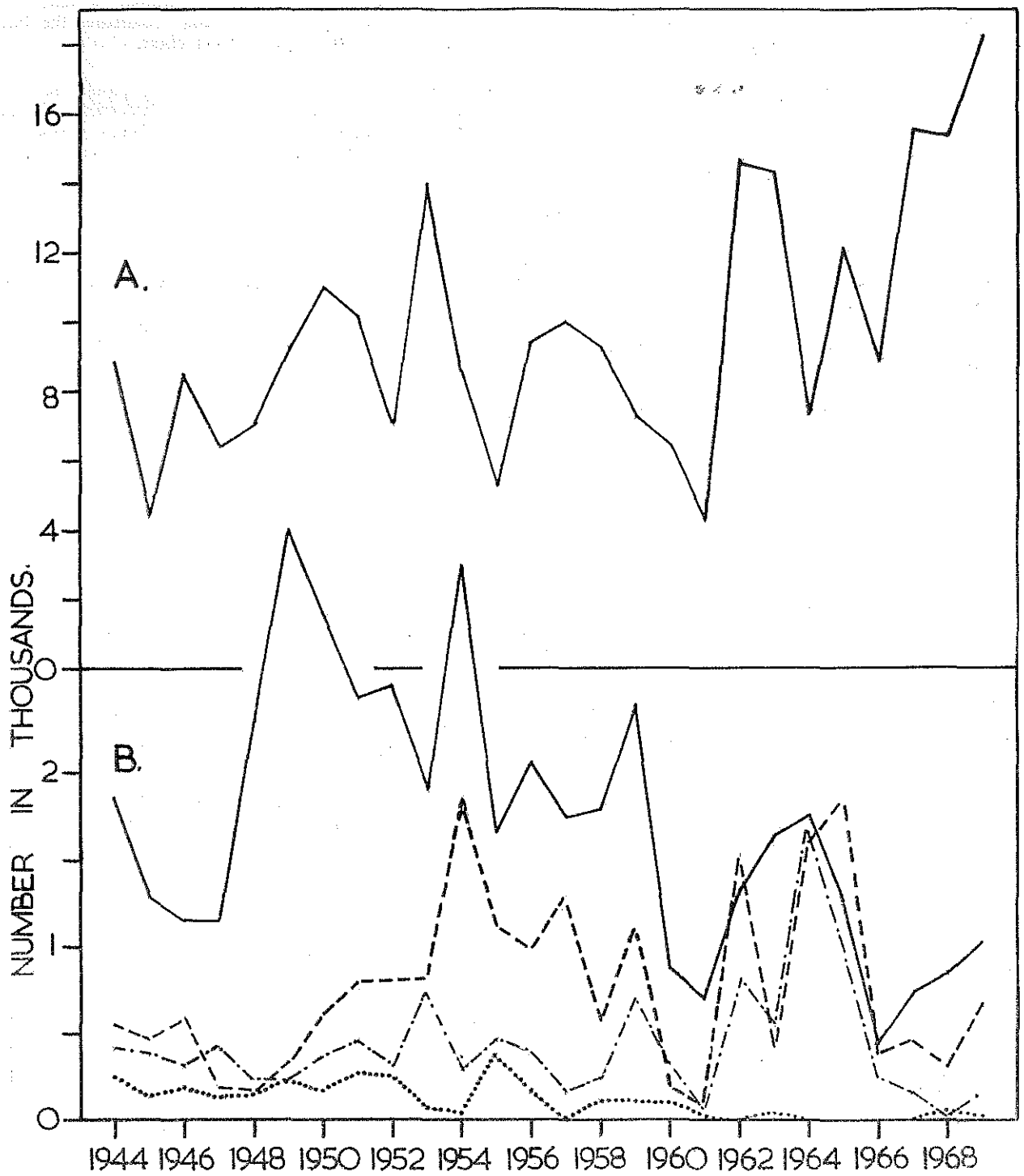

Fig. 10. Numbers in the different year classes of salmon in the River Shannon.

A. Full line=grilse and B. Full line=small spring fish; Broken line=small summer fish; Dotted line=large spring fish and alternate dots and dashes=previous spawners.

The proportion of the different smolt ages in the periods 1924 to 1928 inclusive, and in 1941 and 1944 to 1969 inclusive are given in Table 14. Considerable variations occur in the proportions of the three main smolt classes (one to three) with the one-year old smolts exceeding the three-year smolts in number in most years. Attention should be drawn, however, to the high values obtained in the years 1924 to 1926 inclusive, which were obtained mainly from rod caught fish, mostly large spring fish (3 sea winters) or small spring fish (2 sea winters) in which the proportion of one-year-old smolts is always higher in Irish waters than in the grilse of the same year.

In the case of the River Shannon we have long term information since 1941 and, therefore, we can follow the *brood years*, etc. since that time. The results are given in Table 15.* The numbers in the various brood years have varied from 6,390 (for 1942) to 20,123 (for 1966) which is, however, not yet complete.

The minimum, mean and maximum weights and lengths of the four most important age groups in the salmon of the River Shannon for a number of years were determined (Table 16). These years include two pre-Shannon Scheme years and the rest post-Scheme years. There are considerable variations in the years in question in the minima, mean and maxima as regards both weight and length.

c. River Moy. The catch figures for the River Moy have been given to the authors confidentially and, therefore, they are reproduced in diagrammatic form only in Fig. 11. Catches in the estuarine nets and weir

Fig. 11. Catches in the River Moy (estuarine nets and weirs). No separation on a time basis was possible before 1949. (Full line = total catch; Dotted line = catch February/May and Broken line = catch June onwards).

in the Moy were high in the year 1957 and again in the period 1962 to 1964 but unlike many other rivers in Ireland there is a decline since 1964 as far as total catch is concerned. This may be due, to some extent, to the increased exploitation of the stocks of the River Moy by the drift nets as far as the grilse are concerned because it is known that both the Mayo and Donegal drift nets exploit salmon running to the River Moy (see Went, 1958 and Moriarty, 1968). The earlier running fish, however, are not exploited by the open sea

*See page 29.

drift nets so that the fluctuations of these age groups are dependent on other factors. The February/May catches have varied as follows:—

Year	Percentage 1949/1969 mean	Year	Percentage 1949/1969 mean	Year	Percentage 1949/1969 mean
1949	181	1956	102	1963	100
1950	102	1957	118	1964	113
1951	80	1958	102	1965	105
1952	104	1959	135	1966	132
1953	99	1960	91	1967	59
1954	114	1961	73	1968	52
1955	80	1962	85	1969	74

In other words the February to May catches for the years 1967, 1968 and 1969 have been exceedingly low, similar to the results obtained for other rivers. The actual age composition of the catches are available for some years. Those for the years 1954 to 1956 were given in Twomey (1956) and those for the remaining years have been worked out by the same author. These have been given in Fig. 12 from which it will be seen that in the years 1967, 1968 and 1969 the catches of the small spring fish (2 sea winters) were small compared with most of the earlier years.

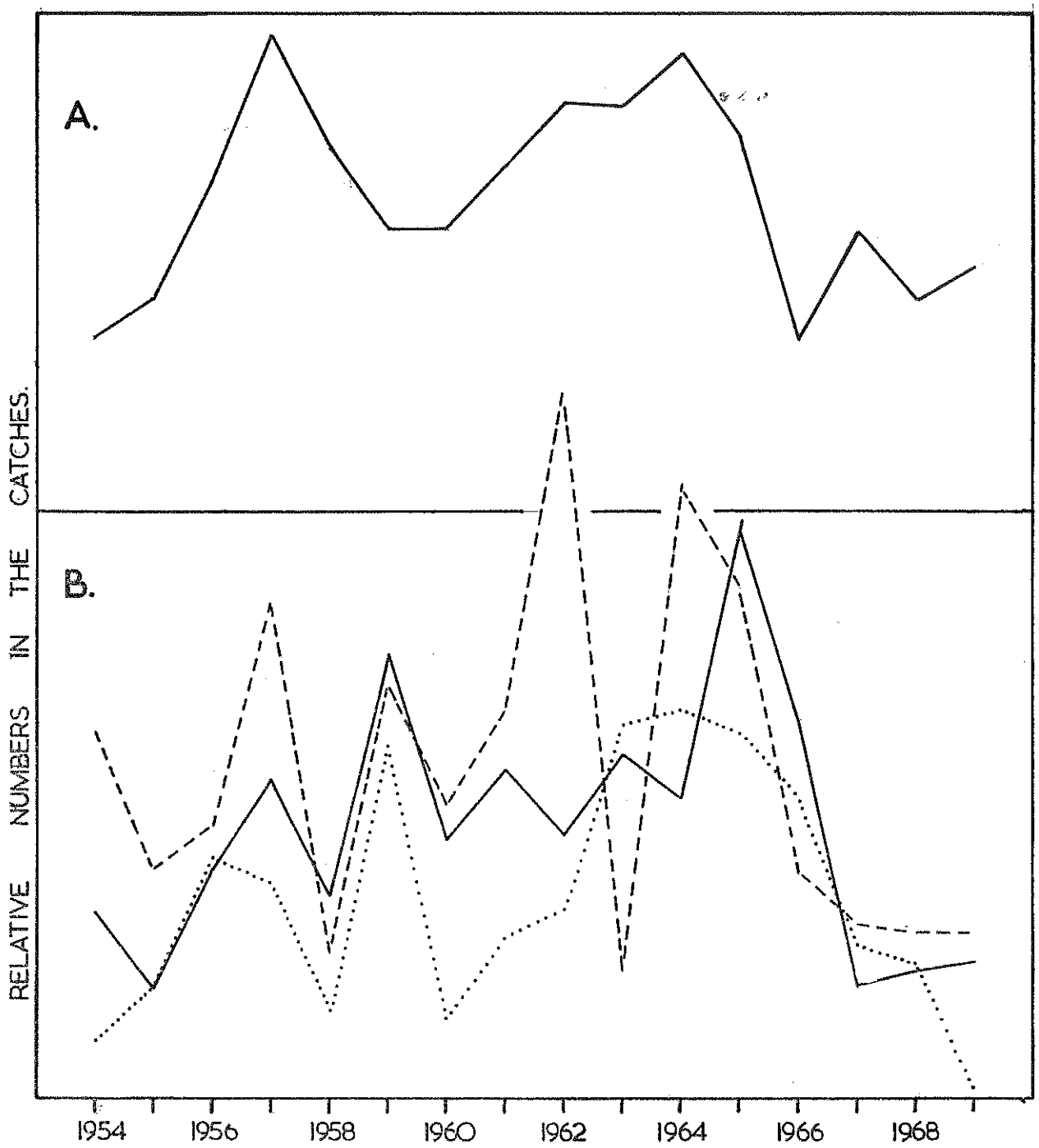

Fig 12. Relative numbers of salmon in the catches of the River Moy. A for grilse and B full line for small spring fish; Broken line for small summer fish and Dotted line for previous spawners.

(Note—Scale for B is 5 times that for A).

The proportions of the different smolt classes in the River Moy have shown considerable variations from year to year (Table 17) but again as in many rivers in Ireland the one-year old smolts comprise a greater proportion of the whole than the three-year olds.

The minimum, mean and maximum weights and lengths of the fish of the different age groups are given in Table 18. It can be seen that there is very little variation in the mean lengths and weights of the different age groups. In the period from 1957 to 1967 there is, however, significant variation in the minimum and maximum weights for the same period.

d. Cork Blackwater. The catches of salmon and grilse from this river (Table 19) have been recorded by the Inspector to the Lismore Board of Conservators since 1953 mainly, but not entirely, on the basis of the registers which licensed salmon dealers are required to keep by law. The returns show that the February/May totals have been well below average in the period 1967 to 1969, the 1968 figure being the lowest in the period under review. In June and July the catches composed almost entirely of grilse have been very high, compared with the average for the period 1953/1961 inclusive. The actual fluctuations in catches are shown diagrammatically in Fig. 13.

Fig. 13. Catches in the River Blackwater for the years 1953 to 1969, inclusive. Full line = total catch; Broken line = catch in February/May and Dotted line = catch from June onwards.

DISCUSSION

Counting devices have been installed on a number of river systems in Ireland but as they have generally been in operation for a comparatively short period it is not proposed to discuss them in this paper. For example a counter has been installed on the River Corrib but the information regarding the commercial catch and the escapement are available only from the year 1965. The series of observations is, therefore, too short to warrant any worthwhile conclusions on the fluctuations in the runs and catch in that river, although the information available will become of increasing importance with the passage of time.

Information from the River Erne has also been omitted because of the changes in regime (i.e. total restrictions on fishing in some years being enforced) over a period of years as part of the programme to rehabilitate the salmon fisheries of the river. Other statistics have defects which render them unsuitable to indicate fluctuations in the salmon stocks of the rivers in question. Accordingly they have been omitted.

Except for the River Shannon the information given in this paper has been obtained from the catches and not from the runs of fish. The information available suffers from this defect but in the absence of other data it must be used to assess the nature of the fluctuations in salmon stocks entering Irish rivers.

The weather, of course, has a very important bearing on the degree of exploitation at any one time. Some forms of gear, such as draft nets, cannot operate effectively in times of heavy floods, partly because the gear itself becomes inefficient and partly because the fish tend to run through the estuaries quickly into the fresh water, whereas in drought conditions fish do not enter fresh water freely and are subject to capture as they move up and down the estuary with the tide. The efficiency of other gears is also very much affected by adverse weather conditions. Indeed the effect of weather conditions on fishing operations may be such as to mask fluctuations in the runs of fish. Whilst, therefore, the catch figures leave much to be desired they can be used to obtain some reliable information on the extent and nature of the fluctuations which are taking place in Irish rivers.

The longer term statistics, i.e. the export and Billingsgate Market returns indicate a steady drop in the number of earlier salmon that is to say the small spring fish (2 sea winters), small summer fish (2 + sea winters), large spring fish (3 sea winters) and early running previous spawners from the "twenties" until the "forties", a slight rise in the "fifties" and a fall in the "sixties". Over the same period there has been a rise in the later running grilse (1 + sea winters) component of the catches, rather gradual at first but since 1962 at a level much above the average for the previous three to four decades.

The other statistics indicate generally the greatly improved catches of grilse from 1962 onwards with poor runs of salmon in the years 1967 to 1969 inclusive.

ACKNOWLEDGMENTS:

We are very grateful to Mr. W. P. Stevens for permission to use the statistics supplied relating to the River Moy and for scale material; to Mr. E. Woulfe of the Lismore Board of Conservators for providing statistics relating to the Cork Blackwater and to the Electricity Supply Board for providing scale material for age determination for the River Shannon.

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Table 1. Number of cases of Irish salmon delivered to Billingsgate Market (based on the returns published by the Fishmongers' Company, London) over the period 1924/1969, inclusive.

				1924	1925	1926	1927	1928	1929
				8164	7256	8802	12127	9178	7298
1930	1931	1932	1933	1934	1935	1936	1937	1938	1939
8068	10590	12705	10602	12281	12786	11550	5320	4876	5744
1940	1941	1942	1943	1944	1945	1946	1947	1948	1949
5930	9221	10314	9162	4959	2192	6960	4320	4130	9730
1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
6942	8522	7308	6775	7676	5392	6600	8678	8493	9627
1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
7851	8116	11933	14277	14519	19038	11212	10422	7155	6171

Table 2. Estimated weight of arrivals of Irish salmon on Billingsgate Market annually compared with exports for the period 1954/69, inclusive.

Year	Weight of arrivals on Billingsgate Market (1000 lb)*	Weight of fish exported (cwt)	Weight of Billingsgate arrivals as percentage of export returns
1954	768	17525	39
1955	539	11135	43
1956	660	13564	43
1957	868	15710	49
1958	849	14047	54
1959	963	13682	63
1960	785	10920	64
1961	812	9059	80
1962	1193	18771	57
1963	1428	23477	54
1964	1452	22642	57
1965	904	19420	42
1966	1121	17159	58
1967	1044	20228	46
1968	716	19847	32
1969	617	19351	28

* On basis of 100 lb to each case.

Table 3. Division of arrivals of Irish salmon at Billingsgate Market January/May (A) and June onwards (B).

Period		Average number of cases	Percentage
1924/29	A	5746	65.3
	B	3057	34.7
1930/39	A	5278	55.9
	B	4138	44.1
1940/49	A	2850	39.5
	B	4372	60.5
1950/59	A	3141	41.3
	B	4460	58.7
1960/69	A	2124	21.2
	B	7947	78.8

Table 4. Sales of Salmon on the Dublin Wholesale Fish Market 1953/69 .

Year	Number of fish		Percentage (to nearest whole number)	
	January/May	June onwards	January/May	June onwards
1953	8,014	12,628	39	61
1954	8,725	18,969	32	68
1955	7,145	16,059	31	69
1956	10,029	29,443	25	75
1957	11,425	41,615	22	78
1958	10,540	48,055	18	82
1959	13,770	37,216	27	73
1960	9,192	36,229	20	80
1961	7,926	34,390	19	81
1962	12,514	118,701	10	90
1963	15,577	88,898	15	85
1964	14,068	97,798	13	87
1965	13,191	88,537	13	87
1966	13,487	85,463	14	86
1967	7,345	87,823	9	92
1968	5,416	125,165	4	96
1969	6,776	149,355	4	96

Table 5. The mean annual exports in cwt of salmon and trout for five periods since 1924.

Period	*January/May*	*June onwards*	*Total*
1924/9	13,249	10,413	23,662
1935/9	9,882	9,496	19,378
1940/9	5,639	9,615	15,254
1950/9	5,823	10,269	16,092
1960/9	3,458	14,635	18,093

Table 6. Catch returns to the nearest 1000 lb for the years 1945 to 1969 inclusive, number of licences issued and mean catch per licence.

Year	Catch in 1000 lb by commercial methods	No. of licences for commercial engines	Mean catch per commercial licence to nearest 10 lb.
1945	905	1070	840
1946	1483	1050	1410
1947	1514	1034	1460
1948	1908	1238	1540
1949	2020	1403	1440
1950	1861	1489	1250
1951	2580	1547	1680
1952	1633	1383	1180
1953	1640	1373	1190
1954	1684	1305	1290
1955	1014	1244	810
1956	1179	1229	960
1957	1491	1246	1200
1958	1279	1146	1120
1959	1364	1230	1110
1960	1134	1195	950
1961	1153	1121	1030
1962	2606	1180	2210
1963	2495	1289	1940
1964	2623	1523	1720
1965	2453	1435	1710
1966	2025	1492	1360
1967	2453	1531	1600
1968	2451	1451	1690
1969	3222	1554	2160

Table 7. Catch in 1000 lb by rods, number of rod lic ences issued and mean catch per licence.

Year	Catch		Number of licences issued*	Mean catch per licence	
	1000 lb	Number		lb.	No.
1945	114	12,179	2,521	45.2	4.8
1946	109	11,990	3,128	34.8	3.8
1947	150	15,157	3,568	42.7	4.3
1948	176	18,226	4,334	40.6	4.2
1949	173	18,587	4,232	40.8	4.4
1950	242	26,450	4,591	52.6	5.7
1951	250	27,055	5,102	49.0	5.3
1952	225	23,838	5,716	39.4	4.2
1953	211	26,931	6,050	34.9	4.5
1954	293	33,225	6,195	47.3	5.4
1955	247	28,561	6,604	37.3	4.3
1956	264	35,757	7,495	35.3	4.8
1957	309	39,647	7,785	39.7	5.0
1958	375	49,696	8,294	44.9	5.9
1959	260	31,338	7,791	35.4	4.0
1960	230	27,199	8,742	26.4	3.1
1961	193	25,349	8,578	22.5	3.0
1962	258	34,271	9,009	28.6	3.8
1963	342	40,394	9,745	35.1	4.1
1964	390	52,510	11,628	33.5	4.5
1965	416	54,865	12,805	32.5	4.3
1966	301	35,732	12,053	25.0	3.0
1967	268	35,341	10,705	25.0	3.3
1968	251	33,749	9,862	25.5	3.4
1969	182	23,815	10,369	17.5	2.3

* The figures for the period 1945 to 1958 inclusive exclude endorsements and thereafter include all licences issued according to the Fisheries (Consolidation) Act, 1959.

Table 8. Catch by commercial methods in the Foyle Fisheries Commission area, the number of licences and catch per licence for the period 1952 to 1969, inclusive.

Year	Fish caught Number	No. of Licences	Catch per Licence
1952	39,538	374	116
1953	52,171	326	163
1954	75,100	305	246
1955	51,848	407	128
1956	63,362	451	141
1957	99,440	501	198
1958	93,622	515	182
1959	72,428	627	116
1960	75,016	364	206
1961	60,703	362	168
1962	121,796	353	344
1963	123,978	367	355
1964	149,633	364	411
1965	93,687	363	259
1966	108,085	371	292
1967	127,643	387	330
1968	122,129	396	309
1969	106,901	408	260

Table 9. Numbers (to nearest 1000) in the different age groups in the commercial catch in the periods 1954/58, 1962/63 and 1967/68 based on Went, 1970.

Year	Age Groups (sea winters)				
	1+	2	2+	With Sms	Total
1954	618	37	36	60	751
1955	413	22	52	31	518
1956	515	37	54	27	633
1957	849	14	86	45	994
1958	824	38	42	32	936
1962†	1,155	1	9	53	1,218
1963*	1,197	3	15	24	1,239
1967	1,186	22	55	14	1,277
1968	1,134	21	53	13	1,221
1969	995	7	61	6	1,069

† Catches only from June to August included, therefore, the 2 and 2+ age groups would be greatly understated compared with conditions in the river.

* The figures given in Went, 1964 have been revised and the final figures for this year have been used instead of the provisional figure as in the previous report.

Table 10. Percentages of the different age groups and smolt classes in the years 1954/8, 1962/3 and 1967/9 in the River Foyle.

Year	Source of information	Age Group (sea winters)				Mean Weight in lb.
		1+	2	2+	With Sms	
1954	Went 1964a	82.3	4.9	4.8	8.0	7.2
1955		79.7	4.3	10.1	5.9	6.8
1956		81.5	5.8	8.5	4.2	6.9
1957		85.4	1.4	8.7	4.5	6.7
1958		88.0	4.1	4.5	3.4	6.7
1962		94.8	0.1	0.7	3.9	7.3
1963		96.7	0.2	1.2	1.9	7.2
1967	Went 1968	92.9	1.7	4.3	1.1	7.6
1968	Went 1969	95.6	1.7	1.5	1.2	7.1
1969	Went 1970	93.0	0.7	5.7*	0.6	7.7

*includes 0.3% of other age groups.

Year	Source of information	Smolt classes		
		1	2	3
1954	Went 1964a	1.3	93.0	5.7
1955		0.3	91.5	8.2
1956		4.0	89.0	7.0
1957		5.5	88.9	5.6
1958		3.0	91.3	5.7
1962		1.2	94.4	4.4
1963		2.5	90.1	7.4
1967	Went 1968	0.7	91.0	8.3
1968	Went 1969	—	90.7	9.3
1969	Went 1970	1.1	92.4	6.5

Table 11. Minimum, mean and maximum weights and lengths for the different age groups in the River Foyle in the years 1954 to 1958 inclusive.

Year	Length (inches)			Weight (lb)		
	Min.	Mean	Max	Min.	Mean	Max
GRILSE (1+sea winters)						
1954	19.5	25.0	31.0	2.8	6.7	13.0
1955	20.0	24.5	28.0	3.0	6.0	10.0
1956	17.5	25.2	30.0	1.8	6.8	11.5
1957	18.5	25.1	29.0	2.5	6.4	14.3
1958	17.5	25.6	31.0	2.0	6.7	13.0
Small Spring Fish (2 sea winters)						
1954	25.0	30.3	37.0	5.8	11.3	19.5
1955	25.0	30.2	34.3	5.5	11.0	18.3
1956	25.0	30.7	37.0	5.8	11.3	18.0
1957	22.0	29.9	35.0	4.5	10.5	16.5
1958	25.5	30.2	37.5	5.5	10.8	21.0
Small Summer Fish (2+sea winters)						
1954	27.0	31.0	37.0	7.5	12.2	22.0
1955	26.5	31.1	38.0	7.0	12.4	22.0
1956	27.0	31.0	37.0	7.0	12.0	21.0
1957	20.0	30.3	36.0	3.0	11.1	21.5
1958	28.5	30.7	36.0	8.0	12.2	18.8
Previously Spawned Fish (With Sms.)						
1954	27.3	30.4	33.3	8.0	11.5	14.5
1955	28.0	30.7	35.0	8.8	11.9	16.8
1956	24.5	30.6	36.5	6.0	11.2	17.5
1957	25.5	29.8	38.5	6.5	11.4	23.5
1958	27.0	29.7	33.0	8.0	11.1	18.0

Table 12. Returns for Jan/May and June/July 19 at Thomond Weir for the years 1941 to 1969 inclusive.

Year	Jan/May	June/July 19	Total	Year	Jan/May	June/July 19	Total
1941	5,327	16,676	22,003	1956	3,571	9,428	12,999
1942	4,354	13,971	18,325	1957	2,753	10,374	13,127
1943	3,596	14,550	18,446	1958	2,351	9,630	11,981
1944	3,216	8,727	11,940	1959	3,073	8,434	11,507
1945	1,654	4,956	6,610	1960	1,373	6,593	7,966
1946	2,021	8,717	10,738	1961	886	4,208	5,094
1947	1,572	6,814	8,386	1962	2,046	16,276	18,322
1948	2,917	6,964	9,881	1963	2,161	14,801	16,962
1949	4,093	9,184	13,282	1964	2,631	10,211	12,842
1950	3,733	11,201	14,934	1965	2,569	16,221	18,790
1951	3,861	10,273	14,134	1966	775	9,119	9,894
1952	3,228	7,314	10,542	1967	1,253	15,601	16,854
1953	3,329	14,102	17,431	1968	1,215	15,396	16,611
1954	3,553	10,440	13,993	1969	1,859	18,282	20,141
1955	3,249	5,731	8,980				

Table 13. Number of fish in the different age groups (to the nearest 10) for each year. (Based on Went, 1964a and Twomey, 1957 and 1967, and later unpublished information).

AGE GROUPS (SEA WINTERS)

Year	1+	2	2+	3	With Sms	Total*
1944	8,860	1,860	550	250	410	11,940
1945	4,350	1,280	460	140	380	6,610
1946	8,500	1,150	590	180	310	10,740
1947	6,470	1,150	180	130	420	8,390
1948	7,060	2,290	160	140	230	9,880
1949	9,260	3,200	330	230	230	13,280
1950	11,020	2,700	610	160	360	14,880
1951	10,190	2,430	790	260	450	14,130
1952	7,030	2,500	460	240	310	10,540
1953	13,910	1,900	820	70	730	17,430
1954	8,600	3,190	1,860	30	300	13,990
1955	5,280	1,670	1,120	360	460	8,980
1956	9,390	2,070	980	160	390	12,990
1957	9,920	1,750	1,300	—	160	13,130
1958	9,260	1,800	570	110	240	11,980
1959	7,230	2,380	1,110	100	700	11,520
1960	6,440	870	190	100	320	7,920
1961	4,230	690	110	10	50	5,090
1962	14,660	1,320	1,530	—	810	18,320
1963	14,320	1,630	410	20	530	16,960
1964	7,830	1,750	1,590	—	1,660	12,830
1965	12,150	1,250	1,850	—	970	16,220
1966	8,850	440	360	—	240	9,890
1967	15,520	710	450	—	170	16,850
1968	15,340	850	350	50	10	16,650
1969	18,180	1,020	660	20	140	20,020

* includes a small number of 3+ and 4 sea winters fish.

Table 14. Percentages of the different smolt classes in the River Shannon in the different years (from Went, 1964a and Twomey, 1957 and 1967, and unpublished data).

	Year	One-year smolts	Two-year smolts	Three-year smolts	Four-year smolts
Pre Hydro-Electric Scheme	1924* ...	42.6	56.8	0.6	—
	1925* ...	41.1	57.8	1.1	—
	1926* ...	38.9	60.0	1.1	—
	1927 ...	23.9	74.6	1.5	—
	1928 ...	13.5	83.9	2.6	—
Post Hydro-Electric Scheme	1941 ...	11.5	83.3	5.0	0.2
	1944 ...	8.2	78.9	12.9	—
	1945 ...	12.8	81.0	6.2	—
	1946 ...	13.5	82.7	3.8	—
	1947 ...	16.5	73.9	9.4	0.2
	1948 ...	20.0	77.1	2.9	—
	1949 ...	20.2	76.8	3.0	—
	1950 ...	18.7	79.8	1.5	—
	1951 ...	20.0	77.5	2.5	—
	1952 ...	15.9	81.8	2.3	—
	1953 ...	16.0	82.1	1.9	—
	1954 ...	16.4	82.4	1.2	—
	1955 ...	24.5	75.0	0.5	—
	1956 ...	21.0	77.8	1.2	—
	1957 ...	19.6	78.8	1.6	—
	1958 ...	18.4	79.2	2.4	—
	1959 ...	17.8	79.8	2.4	—
	1960 ...	19.0	79.1	1.9	—
	1961 ...	25.7	73.5	0.8	—
	1962 ...	18.8	79.2	2.0	—
	1963 ...	18.0	80.1	1.9	—
	1964 ...	16.4	82.9	0.3	—
	1965 ...	18.8	81.2	—	—
	1966 ...	17.4	81.2	1.4	—
	1967 ...	9.5	84.0	7.5	—
	1968 ...	35.6	64.1	0.3	—
	1969 ...	18.4	88.6	3.0	—

* These were highly selected fish, being mainly fish taken on rod and line, belonging to the older age groups in which the proportion of one-year old smolts is known to have been higher than for the remaining age groups. Subsequent years were more representative.

Table 16. The minimum, mean and maximum weights and lengths in the salmon of the River Shannon in the years 1927, 1928, 1941, 1945 and 1952 to 1955 inclusive.

AGE GROUPS (SEA WINTERS)

Year	1+			2			2+			3		
				Weight in lb.								
	Min.	Mean	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.	Mean	Max.
1927	2.5	5.8	14.3	4.5	14.6	25.0	7.3	14.4	27.0	16.5	28.4	49.5
1928	2.0	4.9	7.4	5.1	12.3	23.0	5.9	13.3	25.3	13.6	29.8	48.4
1941	3.5	6.7	12.0	6.0	12.6	25.0	6.0	13.6	28.0	14.5	25.2	40.0
1945	4.0	5.8	9.5	5.0	11.8	22.8	6.0	12.3	22.0	20.0	24.5	31.0
1952	3.0	5.6	11.0	5.0	11.0	28.0	5.0	10.7	20.5	15.0	23.3	36.0
1953	2.5	5.6	12.0	4.0	11.2	30.5	4.5	11.5	26.0	9.5	23.5	35.5
1954	2.0	5.8	14.5	4.0	10.6	19.0	4.5	10.5	23.0	19.0	24.9	30.5
1955	2.5	5.5	12.0	5.5	10.3	15.5	4.5	10.5	22.0	18.0	23.2	34.0
				Length in inches								
1927	18.8	23.7	32.3	23.3	31.8	38.6	26.8	32.4	39.4	34.3	39.7	48.0
1928	17.5	22.6	25.1	23.7	30.8	37.1	25.2	31.5	38.1	32.7	40.0	45.7
1941	20.5	24.6	29.0	25.0	30.6	37.5	25.0	31.4	38.5	33.0	38.2	45.0
1945	21.2	24.0	27.5	23.9	29.8	35.3	24.6	30.6	35.5	35.3	38.2	42.0
1952	20.1	24.3	30.1	20.9	29.7	42.7	23.0	29.8	37.0	33.6	37.3	44.0
1953	20.4	24.2	30.4	21.5	30.2	41.0	22.0	30.2	39.0	29.2	37.8	43.9
1954	17.5	24.4	33.5	20.5	29.3	35.4	23.5	29.8	38.0	35.0	38.4	42.5
1955	19.0	24.0	30.5	22.0	29.7	35.5	22.5	29.8	36.0	32.2	36.9	42.5

Table 17. Percentages of the various smolt classes in the salmon of the River Moy from 1957 to 1969, inclusive.

SMOLT CLASS

Year	1	2	3
1957	17.0	82.3	0.7
1958	11.4	78.6	2.0
1959	17.9	80.6	1.5
1960	16.6	82.6	0.8
1961	26.8	72.1	1.1
1962	28.1	70.5	1.4
1963	16.3	81.7	1.8
1964	30.2	68.6	1.2
1965	24.8	74.5	0.7
1966	12.1	87.7	0.2
1967	13.9	84.9	1.2
1968	25.9	73.2	0.9
1969	8.8	90.0	1.2

Table 18. The minimum, mean and maximum weights and lengths in the salmon of the River Moy from 1957 to 1967 inclusive.

GRILSE (1+sea winter fish)

Year	Length in inches			Weight in lb		
	Min.	Mean	Max.	Min.	Mean	Max.
1957	17.2	23.7	29.2	1.5	5.5	11.5
1958	17.1	23.3	30.0	1.7	5.0	12.0
1959	18.0	24.1	33.4	2.0	5.9	14.0
1960	16.9	23.0	31.5	1.5	5.1	11.1
1961	17.0	23.2	31.0	1.5	5.4	12.0
1962	19.0	24.3	33.0	2.5	5.9	15.0
1963	18.0	23.5	29.2	2.0	5.6	10.1
1964	18.0	23.3	28.8	1.8	5.4	10.1
1965	16.5	23.6	32.1	1.5	5.5	13.5
1966	19.4	24.2	31.2	2.1	6.2	13.3
1967	20.8	23.8	32.6	2.3	5.8	14.8
Small Spring Fish (2 sea winters)						
1957	20.2	28.9	34.0	4.5	9.8	16.5
1958	24.0	29.5	35.0	5.4	10.6	21.5
1959	23.6	29.4	37.0	4.7	10.3	21.5
1960	22.3	29.5	36.7	5.0	10.7	23.5
1961	20.8	28.5	36.0	3.5	9.5	19.5
1962	19.0	28.8	36.0	2.5	9.8	19.8
1963	23.7	27.5	36.9	5.2	10.7	22.5
1964	22.9	28.5	35.0	4.5	9.6	19.0
1965	21.7	28.7	35.5	4.0	10.0	17.5
1966	24.0	28.7	35.9	5.0	9.7	17.5
1967	22.9	28.9	34.5	4.5	10.0	17.0
Small Summer Fish (2+sea winters)						
1957	23.0	29.6	35.1	4.2	10.5	20.5
1958	23.5	30.0	37.2	4.5	11.2	21.5
1959	23.3	29.2	37.0	4.5	11.0	21.3
1960	24.1	30.7	39.0	6.0	12.1	24.0
1961	22.4	29.0	34.5	4.0	10.1	18.0
1962	22.5	29.1	34.3	4.0	10.5	17.2
1963	20.2	29.4	35.0	3.5	11.2	18.0
1964	21.5	28.9	35.1	3.0	9.8	20.0
1965	25.5	29.0	35.1	6.0	10.5	21.5
1966	23.1	29.2	34.5	5.1	10.6	18.5
1967	24.0	29.1	32.5	4.0	10.3	17.5
Previously Spawned Fish (with Sms)						
1957	22.0	30.5	36.4	3.7	11.9	20.2
1958	24.9	30.8	41.8	6.0	12.5	27.0
1959	24.1	29.1	36.5	5.5	10.5	20.0
1960	22.5	31.6	39.7	4.5	13.2	24.8
1961	21.5	31.6	38.3	4.0	13.7	23.0
1962	26.1	29.5	39.0	6.2	13.4	24.0
1963	25.0	30.3	36.1	6.5	12.5	20.0
1964	25.0	31.2	36.5	5.5	13.2	23.0
1965	23.2	31.1	38.0	4.5	12.7	27.0
1966	22.6	28.4	38.5	4.9	10.3	21.0
1967	24.0	30.4	38.0	5.5	12.3	22.0

Table 19. Monthly catches of salmon in the River Blackwater by all methods (rods, nets and weirs).

Year	February	March	April	May	Total Spring Fish	June	July	Total Summer Fish	Combined Total
1953	1,818	1,253	1,841	2,369	7,281	5,265	10,050	15,315	22,596
1954	4,532	6,279	6,253	3,388	20,452	5,004	6,239	11,243	31,695
1955	2,118	2,667	3,534	4,113	12,432	2,993	2,741	5,734	18,166
1956	1,582	1,828	1,874	2,546	7,830	2,955	5,282	8,237	16,067
1957	2,258	1,565	1,826	2,048	7,697	4,242	6,785	11,027	18,724
1958	1,280	1,389	2,168	2,123	6,960	3,812	10,547	14,359	21,319
1959	2,038	3,150	2,672	2,139	9,999	3,339	9,958	13,297	23,296
1960	1,645	1,445	1,779	2,039	6,908	3,403	5,429	8,832	15,740
1961	753	1,261	896	1,191	4,101	3,321	5,764	9,085	13,186
1962	904	1,028	929	1,915	4,776	10,478	21,659	32,137	36,913
1963	1,913	3,512	3,365	4,040	12,830	7,912	20,008	27,920	40,750
1964	2,823	1,835	2,346	4,619	11,623	8,136	20,927	29,063	40,686
1965	1,431	3,248	2,714	3,955	11,348	8,426	15,761	24,187	35,535
1966	1,567	2,808	1,857	3,462	9,694	6,608	13,781	20,389	30,083
1967	631	1,002	1,112	2,685	5,430	8,274	16,796	25,070	30,500
1968	481	357	460	1,417	2,715	6,367	19,351	25,718	28,433
1969	622	749	1,343	2,896	5,610	13,162	20,214	33,376	38,986

Table 15. Estimated numbers of the different brood years in the catches of the different years. (Ba

Brood Year	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956
1939	260	10											
1940	3,500	200	10										
1941	7,220	1,600	180	30									
1942	550	3,980	1,700	160									
1943		440	7,570	1,740	200	10							
1944			970	5,020	1,890	210							
1945				1,020	6,350	2,780	180						
1946					1,210	8,630	2,390	190					
1947						1,420	10,480	2,700	220				
1948							1,520	9,050	2,120	149			
1949								1,740	7,325	2,493	80		
1950									540	12,077	3,850	160	
1951										1,987	8,820	2,480	12
1952											940	4,580	2,36
1953												1,300	8,39
1954													1,73
1955													
1956													
1957													
1958													
1959													
1960													
1961													
1962													
1963													
1964													
1965													
1966													
1967													
Total	11,530	6,230	10,430	7,970	9,650	13,050	14,570	13,680	10,205	16,706	13,690	8,520	12,60

* Nearly complete. † Some additions required.

ars. (Based on Went, 1964a and Twomey, 1957 and 1962 and unpublished data but excluding previous spawners).

1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	Total of brood year
														Incomplete
														Incomplete
														9,030
														6,390
														9,960
														7,290
														10.330
														12,420
														14,820
														12,839
														11,638
														16,141
														13,407
0														7,946
0 120	66													12,099
0 2,360	2,350	59												12,957
0 8,390	8,900	1,867	460											13,065
1,730	1,653	8,458	2,899	55										9,401
		1,365	6,915	1,075	46									6,843
			955	5,262	590	36								6,475
				1,218	3,311	1,911	35							16,163
					1,095	13,231	1,837							17,041
						2,366	12,722	1,953						11,843
							2,275	7,593	1,934	41				11,592
								538	10,498	540	—			12,803
									2,746	8,184	1,857	16		15,085
										780	13,536	16		13,369*
											1,273	709	60	20,123†
												10,147	1,949	Incomplete
												5,511	14,612	
													3,316	
20 12,600	12,969	11,749	11,229	7,610	5,042	17,544	16,869	10,084	15,178	9,545	16,666	16,399	19,937	