



Serial No. 2547
(B.g.14)

ICES/ICNAF Salmon Doc. 71/21
(also ICNAF Res.Dcc. 71/77)

ANNUAL MEETING - JUNE 1971

The Length, Weight and Age Composition of the Commercial Catches
from the Rivers Tweed, Tay and Spey in 1969.

by

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In ICES/ICNAF Salmon Doc. 69/2, the results of the analysis of commercial catch samples taken from the net and coble catches on the Rivers Tweed and Tay during 1968, were reported. During 1969 the net and coble catches on these two rivers were again sampled and samples were also taken from the catch made by net and coble near the mouth of the River Spey. This report presents the results of the analysis of these samples.

In 1969, in an attempt to make the sampling more representative, the number of visits was increased. As a general rule visits were paid to each river twice monthly, to obtain scale samples from 100 fish for each half of the month. When the catch was small and this figure was not achieved in one day, the following day's catch was also examined and, when the catch on any day greatly exceeded a hundred fish, care was taken to ensure that a representative sample of the catch was examined.

Because of the distances involved in visiting these fisheries, it was not always possible to justify visits when the catches were very small. No samples were, therefore, taken from the Tweed in February or March (when the catch for these two months accounted for less than 0.5% of the total) or from the Tay or Spey in February (when the catch accounted for just over 1% and less than 0.5% of the total, respectively). With these exceptions, the Tweed and Tay were visited twice monthly throughout the season and similar regular visits were paid to the Spey from mid-June onwards, samples of the Spey catches from March to mid-June being taken daily by the local fishery manager.

A total of 2798 scale samples were collected; details of the numbers of fish examined monthly are given in Table 1. On the Rivers Tweed and Tay the samples represent between 1 and 2% of the total catch but, on the Spey, they represent well over 5% of the catch.

The sample taken during the first half of each month has been assumed to be representative of the composition of the catch during the first fifteen days of the month and the second sample for each month to be representative of the composition during the remainder of the month. The numbers of fish caught during each bi-monthly period have been used to estimate the numbers of each age class caught during each half of the month and these estimates have been combined to provide estimates of the monthly age composition. The percentage age composition for each river for each month, is given in Table 2.

The estimates of the number of each age class present during each half-month have also been used to provide estimates of the age composition of the total catches. For the Tweed, where no samples were taken in February or March, the age composition for these months was assumed to be the same as that for the salmon sampled during the first half of April, except that the fish in February and March were assumed to have made no 'plus' growth. For the Tay and Spey, the age composition of the February catch was assumed to be the same as that for the sample taken in March. On this basis, the estimated age composition of the total catch on each river is given in Table 3.

The average length and average weight of the fish in each age class in the total sample from each river have also been calculated and these are given in Tables 4 and 5, whereas Table 6 gives the average weight for each sea age group in each sample.

Because it has been suggested that the average size of grilse may be increasing, the use of arbitrary weight limits in the commercial fishery to classify catches into salmon and grilse has been investigated, because this practice may have introduced a serious error, in recent years, into the returns submitted by commercial fishermen, on which the Scottish catch statistics are largely based. The catch samples taken during 1969 permit some assessment of the likely extent of such an error on these three rivers in that year.

Each of the commercial fisheries from which samples were taken use different criteria to distinguish between salmon and grilse; these are as follows.

- (a) On the Tweed, the weight division for grilse varies throughout the season. In 1969, all fish of 6 lb. (2.7 kg.) and over were classed as salmon up to 20th June, from then until 7th July this value was increased to 7 lb. (3.2 kg.) and, thereafter, was 8 lb. (3.6 kg.) for the remainder of the season.
- (b) On the Tay, a weight limit of 8 lb. (3.6 kg.) is used throughout the grilse season.
- (c) On the Spey, the weight limit is 9 lb. (4.1 kg.) throughout the grilse season.

The average weights and weight ranges of the grilse in these samples and the percentages of grilse over the appropriate weight limit for each relevant sampling period, are given in Table 7. These data indicate that the average weight and maximum weight of grilse generally increased throughout the season on the Tay and Tweed whereas, on the Spey, although the maximum weight for grilse showed a similar trend, the average weight remained remarkably constant from July onwards. A more detailed examination of grilse weights in the Spey samples reveals that this was due to a tendency for an increase in the numbers of small grilse present (below 6 lb.), to coincide with an increase in the numbers of heavier grilse recorded towards the end of the season.

On the Tweed, some grilse were above the appropriate weight limit in each month from June onwards, the proportion of 'overweight' grilse in the catch samples increasing rapidly towards the end of the season and to such an extent that, for the last fortnight of the season, the average weight of grilse in the sample was almost a pound heavier than the weight limit in use. On the Tay and Spey, there was a similar tendency for an increasing proportion of the grilse in the samples to be 'over-weight' from July onwards, the proportion being higher on the Tay, where the grilse were heavier on average and where the weight limit was 8 lb., than on the Spey, where it was 9 lb.

From these data it is clear that, in 1969, a proportion of the grilse caught in these three fisheries will have been reported in the official returns as salmon. An indication of the extent to which this has occurred is provided in Table 8, where the percentages of grilse recorded in the monthly catch returns are compared with the percentage of grilse estimated to be present in these catches, on the basis of the catch samples.

For the whole season, the numbers of grilse estimated to be included in the salmon return i.e. the difference between the estimated number of grilse caught and the number of grilse reported, amounted to 21%, 33% and 8% of the numbers of grilse estimated to be present in the Tweed, Tay and Spey catches respectively; or 57%, 53% and 35% of the salmon catches reported for these three fisheries in 1969.

These results suggest that a substantial error existed in the commercial returns for these three fisheries in 1969, but it should be emphasised that the accuracy of the estimates of its magnitude, depends directly on the extent to which relatively small samples of the catch, taken on only one or two days twice monthly, truly represent the age composition of the catch for a complete month. Any departure from such accuracy, particularly during the peak of the grilse run (over 80% of the total catch on the Tweed and over 60% of that on the Tay was taken during July and August), would have a profound effect on the reliability of these estimates.

Although there is thus evidence that salmon catches may have been seriously over-estimated in 1969, it is also clear that exceptionally heavy runs of unusually large grilse occurred in that year and it should not, therefore, be assumed that an error of like magnitude has occurred in other recent years. The results of the analysis of proportionately larger catch samples on the North Esk in each year since 1962 (Shearer and Munro 1970), indicate that there has been no consistent trend in the weight of grilse taken in that river over the period 1962-1970 and shows that an 8 lb. weight limit would have given an adequately accurate breakdown of the catch into salmon and grilse in each year except 1969, when the error may have been of the order of 20%.

Reference

Shearer, W.M. and Munro, W.R. 'Observations on Scottish grilse and salmon catches.' ICES/CM 1970/M.10.

Table 1 Sampling Details

<u>Month</u>	<u>Number in Sample</u>		
	<u>R. Tweed^a</u>	<u>R. Tay^b</u>	<u>R. Spey^c</u>
February	0	0	0
March	0	47	30
April	106	124	178
May	118	147	166
June	184	197	183
July	213	232	223
August	216	231	98
September	105	-	-
Totals	942	978	878

- a Commercial netting season - 15th February to 14th September
- b Commercial netting season - 5th February to 20th August
- c Commercial netting season - 11th February to 26th August

Table 2 Estimated Monthly Percentage Sea Age Composition

<u>Sea Age</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>September</u>
			<u>R. Tweed^a</u>				
1+	-	5.7	14.4	67.1	96.1	87.2	72.4
2	-	60.6	18.6	1.4	0.2	-	-
2+	-	18.2	65.3	31.1	3.7	12.6	27.6
3	-	11.8	0.8	0.2	-	-	-
3+	-	1.4	0.8	-	-	0.3	-
4	-	0.8	-	0.4	-	-	-
Previous spawners	-	1.6	-	-	0.2	-	-
			<u>R. Tay^b</u>				
1+	-	0.9	1.6	40.6	87.6	81.5	-
2	46.7	57.4	7.0	2.0	-	-	-
2+	-	18.9	87.4	52.0	12.4	18.4	-
3	46.8	16.3	0.8	0.7	-	-	-
3+	-	2.7	2.4	2.3	-	0.1	-
4	2.1	-	-	-	-	-	-
Previous spawners	4.3	3.9	0.8	2.4	-	-	-
			<u>R. Spey^b</u>				
1+	-	-	7.9	73.3	94.1	95.0	-
2	53.3	41.2	20.1	0.9	-	-	-
2+	3.3	8.4	44.4	21.9	4.9	5.0	-
3	43.3	44.3	23.9	1.0	-	-	-
3+	-	2.2	3.8	2.1	-	-	-
4	-	0.5	-	-	-	-	-
Previous spawners	-	3.4	-	0.8	0.9	-	-

a No sample in February or March

b No sample in February, season ends in August

Table 3 Estimated Percentage Age Composition of Total Catch

<u>Smolt Age</u>	<u>Sea Age</u>						<u>Prev. Spawners</u>	<u>Overall</u>
	<u>1+</u>	<u>2</u>	<u>2+</u>	<u>3</u>	<u>3+</u>	<u>4</u>		
								<u>R. Tweed</u>
1	2.7	0.1	1.1	-	-	-	-	3.9
2	81.1	1.2	9.3	0.2	0.1	-	0.1	92.0
3	2.2	0.3	1.2	0.1	-	<0.1	<0.1	3.8
4	-	-	-	-	-	-	-	-
Overall	86.0	1.6	11.6	0.3	0.1	<0.1	0.1	
								<u>R. Tay</u>
1	1.3	<0.1	0.6	<0.1	-	-	-	1.9
2	57.9	1.3	14.2	0.8	0.2	-	0.3	74.7
3	17.4	0.8	3.7	0.4	<0.1	<0.1	<0.1	22.3
4	0.5	0.1	0.1	<0.1	-	-	-	0.7
Overall	77.1	2.2	18.6	1.2	0.2	<0.1	0.3	
								<u>R. Spey</u>
1	1.6	-	<0.1	-	-	-	-	1.6
2	69.9	0.7	4.5	1.7	0.4	-	0.7	77.8
3	14.2	1.1	3.4	0.4	<0.1	<0.1	<0.1	19.0
4	1.2	0.2	<0.1	-	-	-	-	1.4
Overall	86.9	2.0	8.0	2.1	0.4	<0.1	0.7	

Table 4 Average Fork Length (cm) for each Age Class in Sample

<u>Smolt Age</u>	<u>Sea Age</u>						<u>Previous Spawners</u>
	<u>1+</u>	<u>2</u>	<u>2+</u>	<u>3</u>	<u>3+</u>	<u>4</u>	
<u>R. Tweed</u>							
1	64.6 (16) ^a	73.0 (5)	77.0 (9)	-	-	-	-
2	63.8 (547)	71.1 (70)	77.5 (185)	87.4 (11)	92.7 (3)	-	74.2 (4)
3	63.3 (22)	70.3 (21)	75.0 (42)	85.9 (5)	-	83.0 (1)	81.0 (1)
4	-	-	-	-	-	-	-
Overall	63.8 (585)	71.0 (96)	77.0 (236)	86.9 (16)	92.7 (3)	83.0 (1)	75.6 (5)
<u>R. Tay</u>							
1	65.3 (6)	67.5 (1)	77.3 (5)	82.0 (1)	-	-	-
2	66.0 (334)	72.4 (63)	79.7 (207)	90.0 (30)	95.1 (10)	-	89.3 (11)
3	64.6 (111)	72.0 (43)	77.1 (119)	90.2 (16)	110.0 (1)	97.5 (1)	86.5 (1)
4	59.2 (8)	73.4 (4)	77.4 (4)	96.5 (2)	-	-	-
Overall	65.5 (459)	72.2 (111)	78.7 (335)	90.2 (49)	96.4 (11)	97.5 (1)	89.0 (12)
<u>R. Spey</u>							
1	65.8 (6)	-	78.0 (1)	-	-	-	-
2	63.7 (302)	72.4 (52)	77.4 (85)	90.2 (119)	91.7 (16)	-	73.6 (6)
3	62.8 (76)	72.9 (71)	75.9 (93)	90.0 (25)	100.0 (1)	110.0 (1)	79.7 (3)
4	63.3 (6)	69.5 (13)	71.7 (3)	-	-	-	-
Overall	63.5 (390)	72.4 (136)	76.6 (182)	90.2 (144)	92.2 (17)	110.0 (1)	75.6 (9)

a Figures in brackets denote the numbers of fish involved

Table 5 Average Weight (kg.) for each Age Class in Sample

<u>Smolt Age</u>	<u>Sea Age</u>						<u>Previous Spawners</u>
	<u>1+</u>	<u>2</u>	<u>2+</u>	<u>3</u>	<u>3+</u>	<u>4</u>	
<u>R. Tweed</u>							
1	3.2 (16) ^a	4.0 (5)	5.0 (9)	-	-	-	-
2	3.1 (547)	3.7 (70)	5.1 (185)	6.6 (11)	8.4 (3)	-	4.1 (4)
3	2.9 (22)	3.5 (21)	4.6 (42)	6.3 (5)	-	6.0 (1)	5.9 (1)
4	-	-	-	-	-	-	-
Overall	3.1 (585)	3.7 (96)	5.0 (236)	6.5 (16)	8.4 (3)	6.0 (1)	4.5 (5)
<u>R. Tay</u>							
1	3.2 (6)	2.8 (1)	3.8 (5)	5.4 (1)	-	-	-
2	3.4 (334)	3.7 (63)	5.6 (207)	7.8 (30)	9.2 (10)	-	7.3 (11)
3	3.1 (111)	3.7 (43)	4.9 (119)	7.6 (16)	16.7 (1)	10.9 (1)	6.6 (1)
4	2.4 (8)	3.8 (4)	4.8 (4)	9.2 (2)	-	-	-
Overall	3.3 (459)	3.7 (111)	5.4 (335)	7.8 (49)	9.9 (11)	10.9 (1)	7.2 (12)
<u>R. Spey</u>							
1	3.1 (6)	-	5.3 (1)	-	-	-	-
2	3.0 (302)	3.9 (52)	5.1 (85)	7.9 (119)	8.3 (16)	-	4.7 (6)
3	2.8 (76)	4.1 (71)	4.8 (93)	7.5 (25)	9.5 (1)	13.6 (1)	5.3 (3)
4	3.0 (6)	3.5 (13)	3.8 (3)	-	-	-	-
Overall	2.9 (390)	4.0 (136)	4.9 (182)	7.9 (144)	8.3 (17)	13.6 (1)	4.9 (9)

a Figures in brackets denote the numbers of fish involved.

Table 6 Average Weight (kg.) for each Sea Age Group in Sample

<u>River</u>	<u>1 Sea Winter</u>	<u>2 Sea Winters</u>	<u>3 Sea Winters</u>	<u>4 Sea Winters</u>	<u>Previous Spawners</u>
Tweed	3.1 (585)	4.6 (332)	6.8 (19)	6.0 (1)	4.5 (5)
Tay	3.3 (459)	4.9 (446)	8.2 (60)	10.9 (1)	7.2 (12)
Spey	2.9 (390)	4.5 (318)	7.9 (161)	-	4.9 (9)

Figures in brackets denote the numbers of fish involved.

Table 7

Characteristics of Grilse in Catch Samples

Period	R. Tweed		R. Tay		R. Spey	
	Average Weight (lb)	Weight Range (lb)	Average Weight (lb)	Weight Range (lb)	Average Weight (lb)	Weight Range (lb)
May 1-15	4.1	3.8 - 4.4	-	-	-	-
	3.9	3.5 - 4.8	3.9 - 5.2	-	-	-
June 1-15	5.0	3.1 - 6.2	5.1 - 7.8	0.0	-	-
	5.8	3.9 - 8.9	3.8 - 9.4	2.1	5.8	3.7 - 8.5
July 1-15	6.2	2.5 - 9.6	4.3 - 10.3	10.2	6.6	3.7 - 9.7
	7.2	4.3 - 12.4	4.0 - 12.9	38.6	6.6	3.5 - 10.5
August 1-15	7.0	3.3 - 11.9	3.8 - 12.3	36.1	6.9	2.3 - 10.5
	7.4	4.2 - 13.0	5.1 - 12.5	29.5	6.6	3.7 - 12.0
September 1-14	8.9	6.1 - 13.4	-	-	-	-
Overall	7.1 ^a		7.4 ^a		6.7 ^a	

^a Weighted average based on numbers of grilse estimated caught during each bi-monthly period.

Table 8

Percentage of Grilse in Catch

Month	R. Tweed		R. Tay		R. Spey	
	Commercial Returns	Catch Samples	Based on: Commercial Returns	Catch Samples	Commercial Returns	Catch Samples
May	12.9	14.4	1.2	1.6	7.8	7.8
June	55.6	67.1	36.6	40.6	66.8	73.3
July	86.1	96.1	65.4	87.6	88.6	94.1
August	62.0	87.2	38.8	81.5	82.7	95.1
September	30.3	72.4	-	-	-	-
Overall	68.2	86.3	51.4	77.2	80.0	86.9