

Review: Tweed Salmon catch trends

This article is based on a more detailed document which can be requested from the Tweed Foundation if desired.

Over the last 200 years or so, the nature of the Tweed's salmon fisheries has changed several times. Sport fishing for salmon can be said to have started in its modern form here with the arrival of the railways in the 1850s and anglers then expected Autumn salmon fishing, mainly after the end of the netting season on the 14th September. It was with some concern therefore that in the early 20th century it was realised that Grilse numbers were falling to levels not seen before: *"In Scotland, certain rivers which used to hold abundance of Grilse do not appear now to do so. In the Tweed quite recently, as I am informed, the absence of Grilse has been evident to all"*¹. This was not just a Tweed phenomenon, J. Arthur Hutton, the pioneer scale-reader, writing of the R. Wye could say *"In 1912, I drew attention to the falling off in the numbers of Grilse and 1913 seems to indicate that this tendency is still going on. Mr. Calderwood informs me of a similar falling off in practically every river in Scotland in 1913. So far no explanation is forthcoming as to the cause"*². The effects of this change and others on angling can be followed in the annual reports on Tweed salmon fishing by the Rev. Dr. William MacCullum in *The Scotsman*:

1921: *BEST SPRING AND WORST AUTUMN FISHING ON RECORD: - One regrets the failure of the Tweed as an Autumn river..... Since 1859 Tweed spring fishing has begun on February 1, but did not become a distinct feature of the river until 1911 who can say why the lively little fish appear in the river so early in the year, and who can tell what they are? Are they delayed grilse? If not, the disappearance of grilse is another of the puzzling problems connected with the salmon. Have we killed out the grilse race or have they changed their habits? Are they remaining longer in the sea and running up the river in the following year as spring salmon?.....*

1922: *UNFAMILIAR GRILSE- The netsmen reported a run of grilse this year. There was a time when these little fish of the same hatch as the small springers of the coming season were more numerous than the salmon in the Tweed, but they had almost disappeared in recent years, and seemed to be staying in the sea until they were of the status of salmon. Why have they been pushing up the river in the grilse stage this year? It has been suggested that the scarcity of herrings and the absence of the normal crustacean fauna may have to do with the re-appearance of grilse in fresh water, but who knows."*

The gloom about Grilse was forgotten, though, in the report for 1935: *A WONDERFUL YEAR – a hundred years hence men may be talking about the Tweed in 1935 as an example of the good old days. It certainly has been a wonderful year Some say there has never been such a spring season on the Tweed, but "vast shoals of salmon" were in the river in the opening months exactly a hundred years ago. But it is almost certain that no living man can look back on bigger bags than those of last spring. Lady Joan Joicey landed 40 fish at one outing, returning a dozen kelts and retaining 28 clean, clear, salmon. On the same day, February 15, the Tweed and Teviot yielded more than 200 springers.*

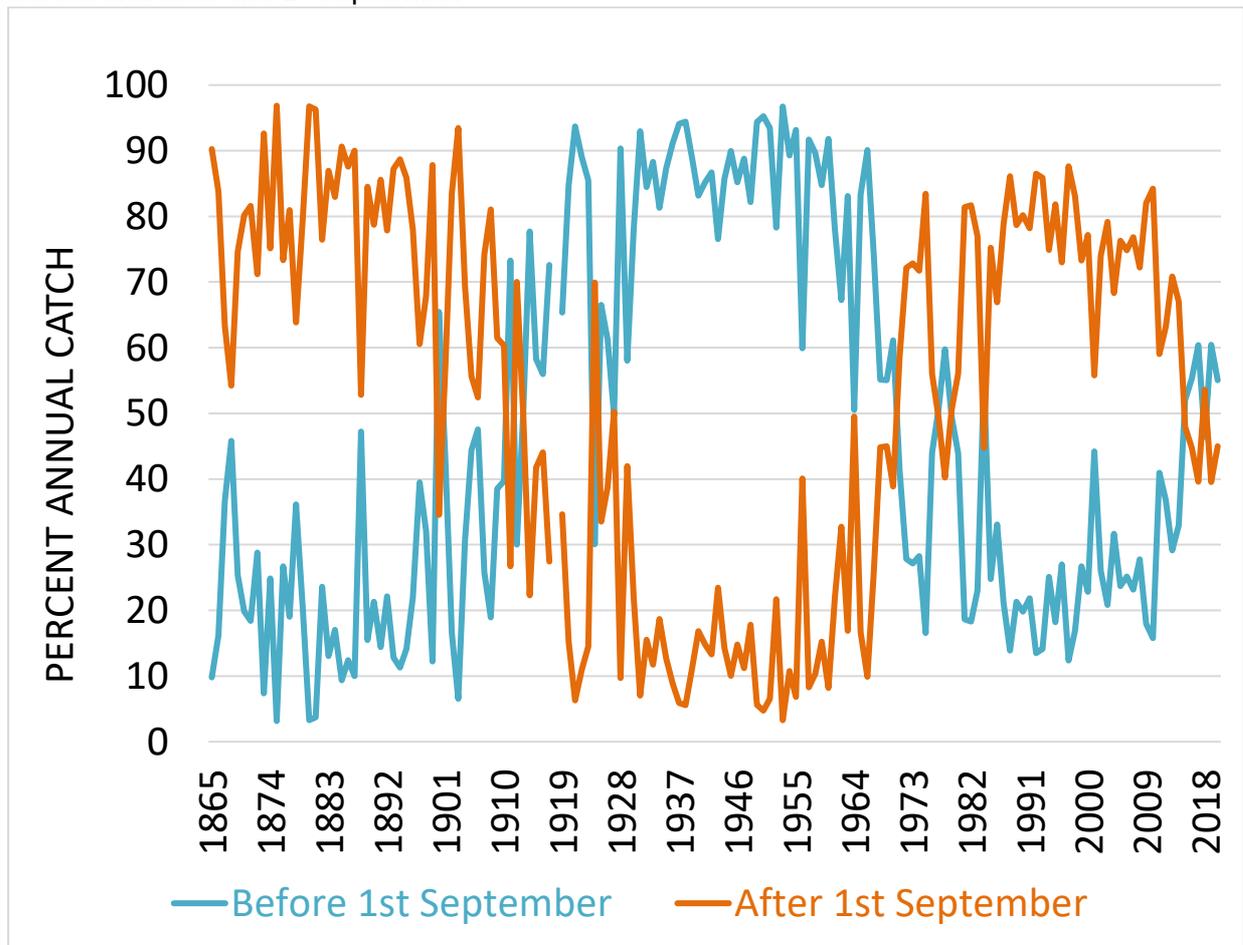
Rod catches continued to be mainly Spring (though with heavy Autumn Salmon also a feature) until 1968 when the proportion of the annual total caught before the 1st September first dropped below 50% as Autumn catches, particularly of Grilse, increased. It then stayed consistently below the 50% level from 1973 onwards, though good catches in February and March continued into the 1980s. Change came again in 2016 when for the first time since the

¹ Calderwood, W.L., 1909: Decline of Grilse, its Significance. *Appendices to the Twenty-seventh Annual Report of the Fishery Board for Scotland* HMSO Edinburgh

² Hutton, J.A., 1914: Results of the Wye scale reading 1909-13. *Salmon & Trout Magazine* No. 7.

1970s the proportion of the annual catch taken on the river before the 1st September went back above 50%. The RTC’s rod catch records for the Tweed only go back to 1947 and are only reasonably complete from the late 1960s, so for a long data series, records from individual beats have to be used. The catches from a number of beats in the Coldstream area can be put together to give a data series from 1865 to 2020. However, as different years have different number of beats contributing data, these results have to be given as percentages rather than numbers.

Fig **: Rod catches in the Coldstream area 1865-2020 as percentages of the annual total taken before and after the 1st September

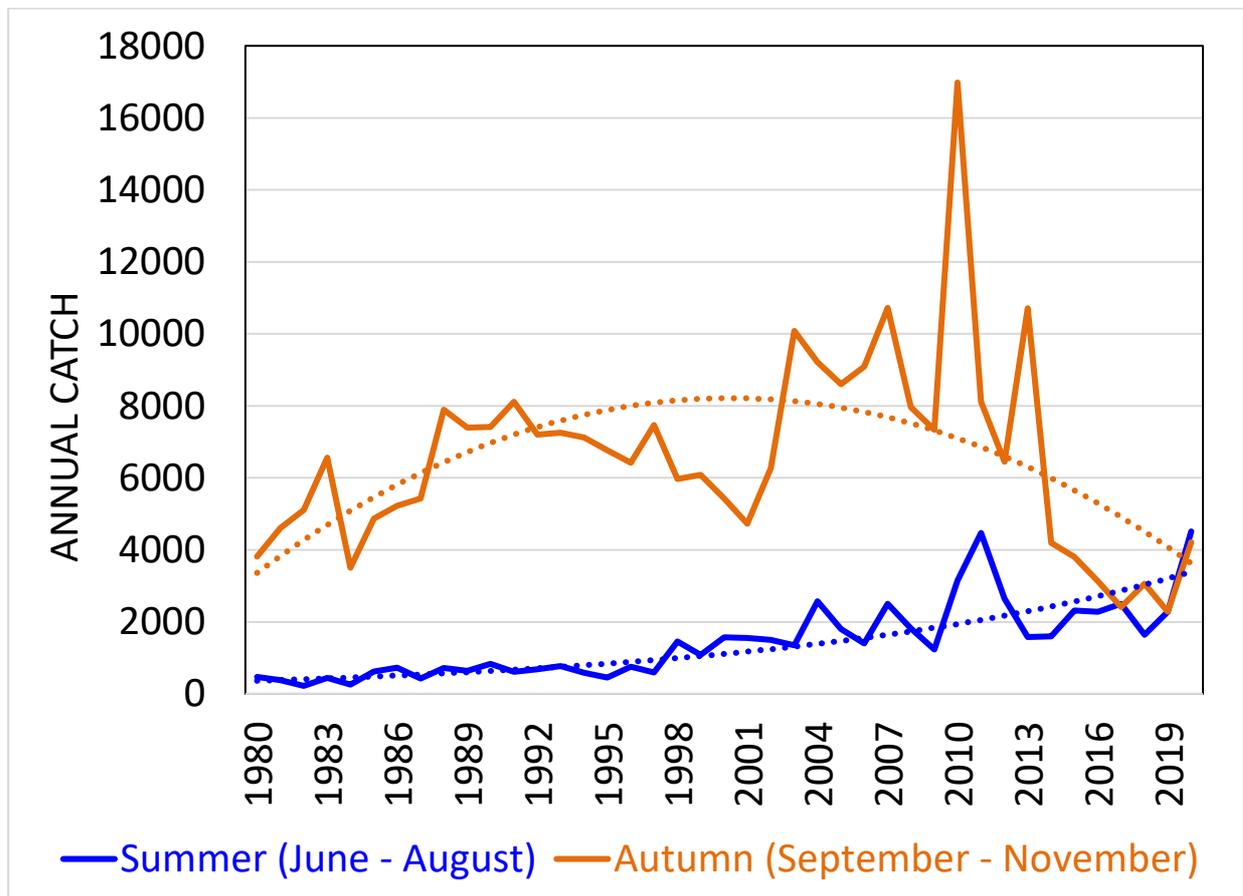


The features noted in *The Scotsman* reports can be seen on this graph, the decline in the Autumn catches around the start of the 20th century; the unexpected Grilse run reported on in 1922 fits with the variability around that time, and then the rise of Spring catches into the 1930s.

Although there are two “Late Phases” apparent on this graph, when most fish were caught after the 1st of September, they were not the same. In the first, in the latter 19th century, the fish were (roughly) half and half Autumn Grilse and Salmon; in the second, at the end of the 20th and the beginning of the 21st century, the fish were mainly Autumn Grilse. During the “Early Phase” of the middle 20th century, when most fish were caught before the 1st of September, they were mainly Spring Salmon. [see Section B of the online document for details of the catches at different times] At present, it looks as if another “Early Phase” is starting, but it does not therefore follow that the fish will be mainly Spring Salmon again: in fact, it looks as if they will

be mainly Summer Salmon. If this is the case, then wet Summers will be needed to give good catches.

Fig **: Summer (June-August) and Autumn (September-November) catches and trends on the River Tweed 1980-2019



This also clearly shows the issue for the fishery: while numbers in the Autumn have decreased by thousands, numbers have (so far) only increased by hundreds in the Summer. The increase for Autumn 2020 comes almost entirely from the September catch, a month of mixed Summer and Autumn fish.

TRENDS IN SIZES AND SEA-AGES OF FISH

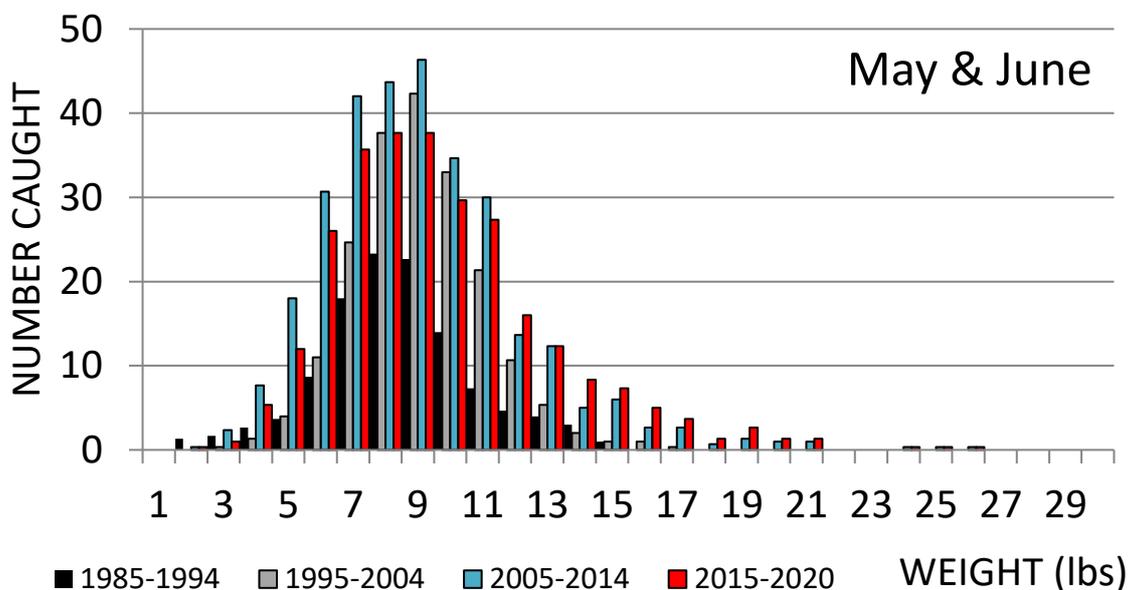
It is not only in numbers and in run-timing that salmon can change, their size (reflecting time spent at sea) also varies and can also explain much of the other changes. The more dramatic changes in sizes in recent years are shown in the following diagrams which have been produced from the catch records of a lower Tweed beat for recent decades and parts of decades, 1985-1994; 1995-2004; 2005-2014 and 2015-2020 (six years only). The diagrams for other periods can be found on the website document.

The proportions of the fish of each sea-age [1 Sea-winter (1SW), 2 Sea-winter (2SW), 3 Sea-winter (3SW)] for each period are given in the tables below each graph. When most fish were

killed in the 1980s and 1990s, many more scale samples were taken and so reflected the population in the river. As fewer fish were killed, the number of scale samples decreased and so they do not now necessarily reflect the population. They can still, however, suggest explanations for changes in the population so, for example, in some months there are larger fish than in the past and at the same time the scale samples for those months have more 3SW fish in them, suggesting that the increase in larger fish is due to more older fish rather than to the fish just getting bigger.

In May & June, Fig ** shows that larger salmon have become more common in these months in recent years: fish over 12lbs were 7.8% for 1985-1994; 3.4% for 1995-2004; 8.9% for 2005-14 and 15.0% for 2015-2020 and they have also become more numerous. The proportion of 3SW fish in the scale samples also increased from 2005 to be almost 30% which matches with the increase in size.

Fig **: Sizes of fish caught in May and June, months with upward catch trends and that are almost all Salmon with only a very few Grilse



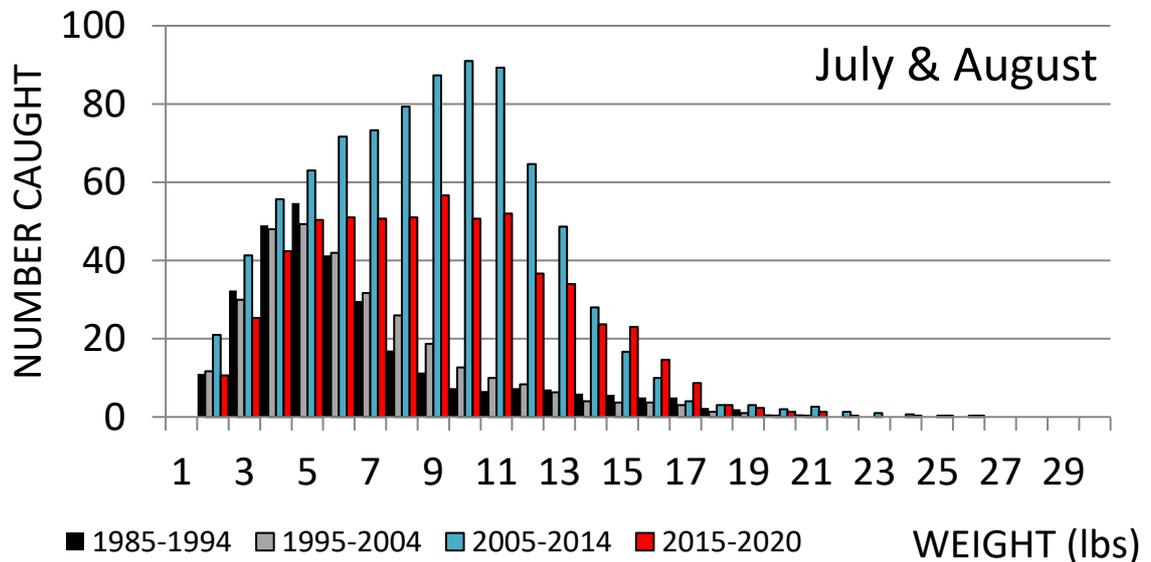
Scale-readings:

May & June	<u>1SW</u>	<u>2SW</u>	<u>3SW</u>	n=
1985-1994	1.41%	98.59%	0	71
1995-2004	1.11%	95.56%	3.33%	90
2005-2014	1.52%	80.30%	18.18%	66
2015-2020	0	70.83%	29.17%	24

For July and August, Fig ** shows that larger salmon have also become more common in these months in recent years: fish over 12lbs were 11.6% for 1985-1994; 7.0% for 1995-2004; 12.3% for 2005-14 and 17.2% for 2015-2020. Numbers have also considerably increased for these months. The commonest sizes have also changed: for 1985-1994 and 1995-2004 these were 4 to 6lbs, after 2005-2014 they were 6 to 12lbs. This happened because the type of fish being caught changed from mainly Grilse in the 1980s and 1990s to mainly Summer Salmon in the

2000s: the scale samples show that while 70-80% of the readings were Grilse before the 2000s, 50-60% are now Salmon.

Fig **: Sizes of fish caught in July and August, months with upward catch trends, and that have had significant changes in the sizes of fish caught



Scale-readings:

July & August	<u>1SW</u>	<u>2SW</u>	<u>3SW</u>	n=
1985-1994	70.67%	29.33%		75
1995-2004	77.68%	22.32%		112
2005-2014	43.01%	54.4%	2.59%	193
2015-2020	40.91%	56.82%	2.27%	44

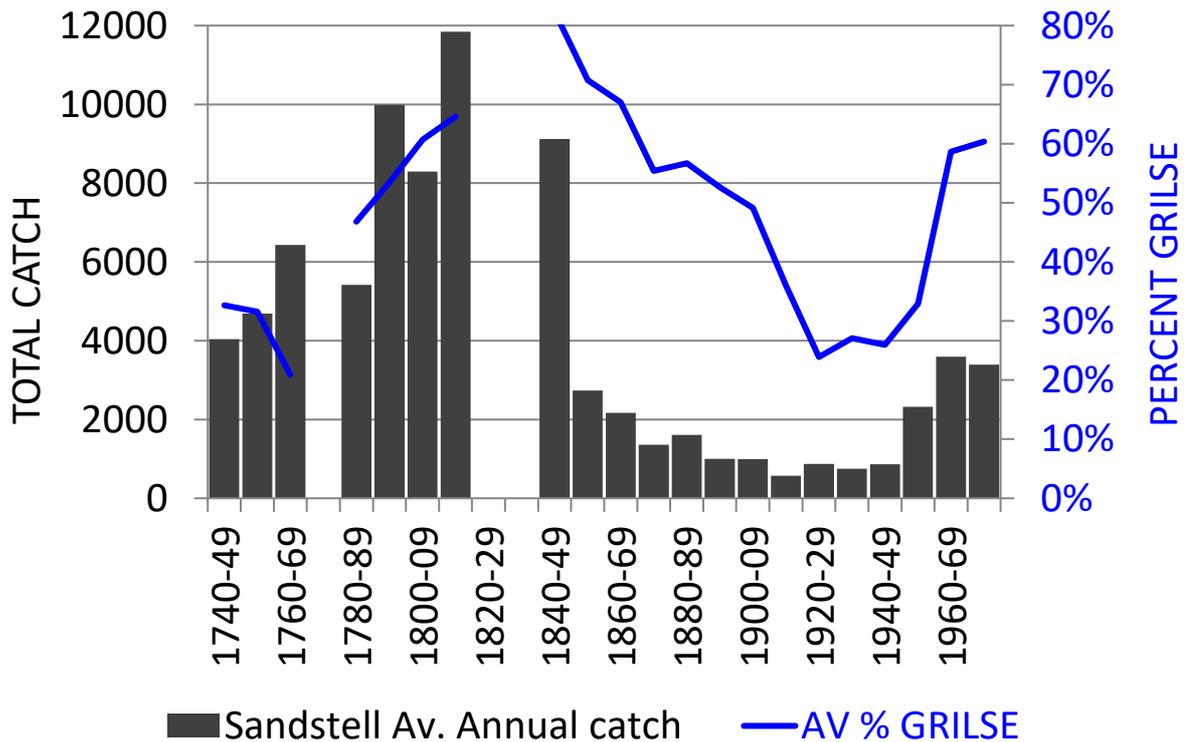
(The graphs for other times of year are given in the online document)

The present situation is, therefore, that while the total number of fish caught in the Tweed has dropped considerably over the last 7 years, presumably reflecting fewer fish returning from the sea, size and age analyses show that this is not a random “collapse” it is a structured change, a sign that the fish are adapting to changed conditions in their environment. In this case it means more fish are staying longer at sea and so more return as Salmon rather than Grilse and earlier in the season than later. While the drop in Autumn catches has decreased overall totals, catches in Summer are increasing, 2020 showing a remarkable rise in June and July - and not only are there more fish in Summer, they are now mainly larger Summer Salmon instead of being smaller Summer Grilse. This means a great increase in the number of eggs being spawned by this type of salmon just as the number being produced by Autumn fish decreases – what this means for Tweed salmon will become apparent in future seasons.

The shift from Grilse to Salmon has implications for the number of fish returning to the Tweed. Salmon spend longer at sea than Grilse do, and so have more chances of dying there, which means they have a lower return rate. The effect of the proportion of Grilse on fish numbers can be seen in Fig ** which shows the numbers of fish caught at the Sandstell netting station,

which was the best in the Tweed estuary, from the middle of the 18th century up to the end of its individual records in the 1970s. The really large catches were when the Grilse proportion was high and conversely during the Grilse “depression”³(as it has been called) of the 1920s-1930s the annual catches averaged less than a thousand fish a year. As the Grilse proportion started to increase after the “trough” the numbers also increased.

Fig **: The numbers of fish caught at the Sandstell netting station from the 1740s to the 1970s and the proportion of Grilse in the catches.



This illustrates an important point – not all decreases in salmon numbers are due to human impacts on their rivers, there are large-scale natural changes and trends that can have significant effects on their numbers as well. The key point is to be able to distinguish man-made impacts, which can be mitigated or repaired, from natural impacts, which cannot.

Similar trends to those seen on the Tweed have been found to the south and reported on in the Environment Agency’s *Salmon Stocks and Fisheries in England and Wales 2018*⁴. This shows [Fig 17, page 42] how catches on a number of rivers in England have changed from being more Grilse than Salmon to being more Salmon than Grilse, and that this process started in 2012. This trend is general and is being followed in all the regions of England and Wales [Fig 18, page 43] where MSW salmon are increasing both in numbers and in proportions of catches. The graph

³ Menzies, W.J.M & G.G.J. Smart, 1966: Salmon Runs in Scotland. *The Salmon Net II*,

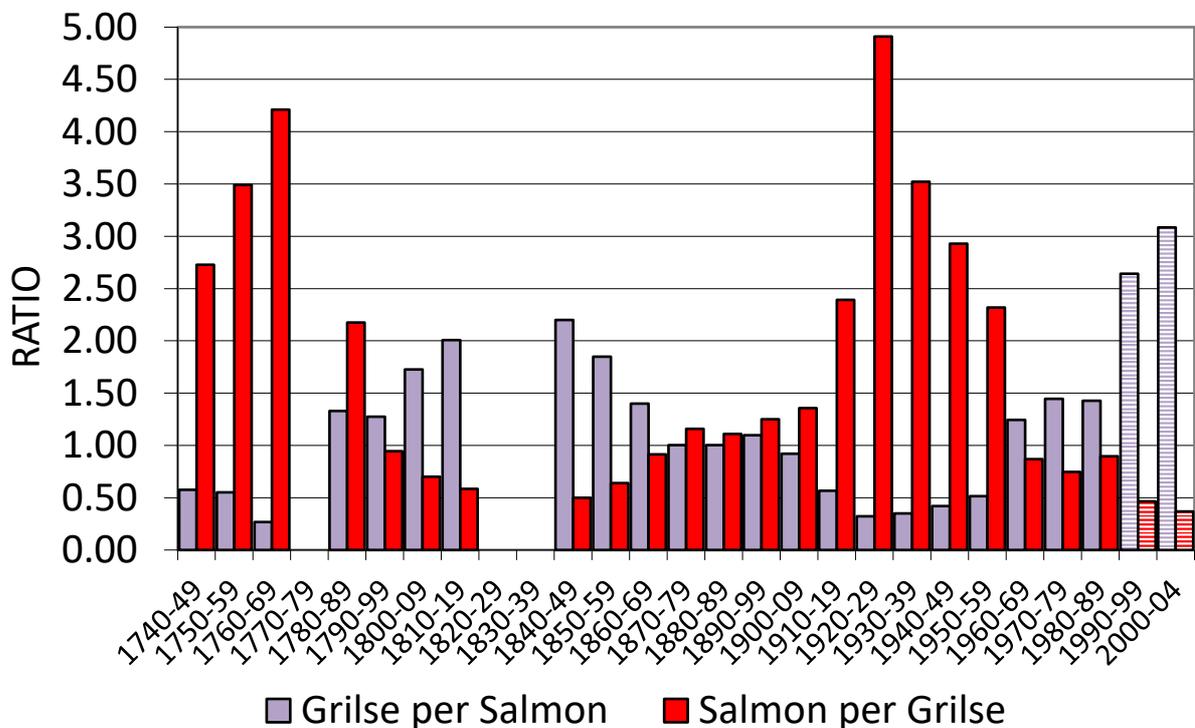
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https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/919734/SalmonReport-2018-assessment_final.pdf

of total catches [Fig 19, page 44] shows how the majority of fish caught in England and Wales are now MSW Salmon after the recent steep decline in Grilse. This is a key graph as it confirms that the current fall in fish numbers is not a random collapse, it is structured: it is Grilse that are declining, while salmon numbers are stable, or increasing. All these trends are similar to what is being seen in the Tweed analyses. Unfortunately, no similar data is available for anywhere in Scotland for comparisons to be made with the north. (*The EA diagrams can also be seen in the website document*)

The obvious question, of course, is what drives such large-scale changes? The answer seems to be Sea-surface temperatures (SSTs). When these are colder than average in the north Atlantic, Grilse predominate and when they are warmer, Salmon do. A long data series of Grilse to Salmon proportions can be worked out for the Sandstell netting station as shown in Fig **

Fig **: The average Grilse to Salmon ratios per decade for Tweed estuary nets 1740-2004



The different phases apparent on this graph are:

- c1740 – c1800: more Salmon than Grilse
- c1800 – c1870: more Grilse than Salmon
- c1870 – c 1910; about equal proportions
- c1910– c 1970: more Salmon than Grilse
- c1970 – to end of series, more Grilse than Salmon

and these can be linked with warmer and colder periods in sea-surface temperatures. The 1860-1900 period of “equal” Salmon and Grilse interestingly links with a period when sea-surface temperatures were very variable, warmer and cooler for a few years at a time. It looks as if this “confused” the fish, the environment not giving a strong lead as to whether the Grilse or the Salmon route led to better breeding (*see the website document for more details*). However, other rivers in Scotland seem to have had more Grilse at this time.

The conclusion of this review, inevitably, has to be that there are no fixed baselines for Tweed salmon, not in their numbers, nor sizes, run-timing, sea-age or any other characteristic, only change is constant. This is nicely illustrated by another *Scotsman* report, of the 1st of February, 1922:

“Times change and the habits of the fish with them. In 1784, thirteen years after the Tweed was subject to special legislation, those engaged in the administration of the Acts of Parliament passed a resolution that “the salmon taken in the Tweed since the year 1776 are greatly short of the usual number” but in the end of the century the Earl of Home wrote:- “The greatest number of salmon ever caught by a rod in one day was on April 9, 1795 by Lord Home....the number caught thirty-six, the weight of the fish ran from 6lb to 36lb”.

And just as the fish must adapt to changing conditions, so anglers must adapt to changing fish.