

RURAL ECONOMY AND CONNECTIVITY COMMITTEE

SALMON FARMING IN SCOTLAND

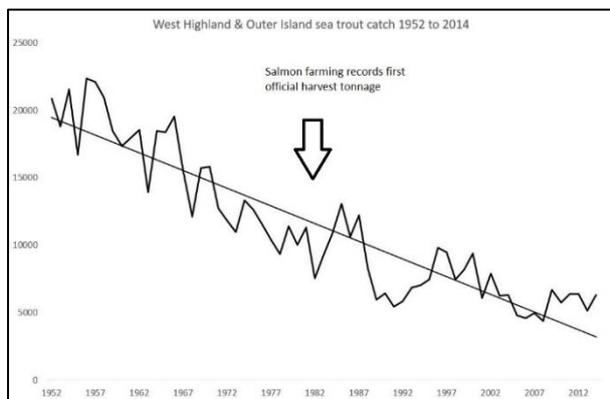
SUBMISSION FROM DR MARTIN JAFFA, CALLANDER MCDOWELL

This committee's enquiry into salmon farming in Scotland was prompted by 'Petition PE1598' submitted by Salmon & Trout Conservation Scotland (S&TCS). The petition is entitled 'Protecting wild salmonids from sea lice from Scottish salmon farms' and begins by stating that *wild salmonids in the 'aquaculture zone' on the west coast are in trouble*. However, S&TCS fail to mention that wild salmonid fish are in trouble across their whole range, not just along the Scottish west coast. This includes huge areas where salmon farming is not present, begging the question that something else must be causing this trouble.

In their Petition, S&TCS fail to provide any incontrovertible proof that salmon farming is responsible for declines in west coast wild salmonid stocks.

By comparison, the following graph, drawn from sea trout catch data collected annually by Marine Scotland, questions S&TCS's claims about role of salmon farming in the decline of wild fish numbers. The graph covers all rivers in the west coast 'aquaculture zone' where salmon farms are active. It is based on a graph

produced by the West Highland Sea Trout Group during the 1990's.



It can be seen, sea trout catches have been in decline for the thirty years since 1952, when the data collection began, until salmon farming really got underway in the early 1980's. If the decline before 1980 was not due to salmon farming, could the decline after 1980 be for the same reason. The decline has tailed off in recent years

despite the presence of salmon farming in the locality. This graph is fundamental to the question as to whether salmon farms have a negative impact on wild fish. S&TCS have so far refused to comment.

Rather than provide any specific evidence to support their petition, S&TCS have focused on the Scottish Government's classification of river systems following the belated introduction of 'Conservation Limits' for the 2016 season. S&TCS say that all rivers in the west Highlands and Inner Hebrides have been placed in the worst performing category as wild salmon stocks have not reached their conservation limits. The implication is this is because of the impact of salmon farming.

However, what S&TCS fail to mention is that the categorisation of the same rivers in 2017 was very different with nearly 23% of rivers in the 'aquaculture zone' being

classified as category 1, 35% of rivers were designated as category 2 whilst category 3 accounted for just 42% of rivers. This means that 58% of rivers in 2017 could be exploited, which translates into anglers being able to catch and kill wild fish for sport in these rivers. This change in fortune of west coast salmon rivers has occurred despite the presence and continued activity of salmon farming. If salmon farming is the cause of problems in the wild fish sector, why were so many of these rivers been categorized as Grade 1 and 2 rivers?

The 2018 classification of Scottish rivers has seen many of these rivers now being downgraded to Grade 3 but this reflects changes across the whole of Scotland including the east coast. This has occurred irrespective of the activity of the salmon farming industry.

S&TCS's petition continues with a broad statement that fishery scientists are increasingly clear that sea lice from salmon farms harms wild fish at both an individual and population level but do not qualify their statement with the identity of these fishery scientists. They also refer to a review paper written by eight Norwegian scientists together with one from Scotland and another from Ireland, simply quoting a section of the paper's abstract. S&TCS focus on the conclusion that 'sea lice have a potential significant and detrimental effect on marine survival of Atlantic salmon with potentially 12-29% fewer salmon spawning in salmon farming areas.'

It is important to understand from where this range of 12-29% is derived. Much originates from mathematical modelling of sea lice dynamics rather than an experimental approach. However, there is experimental evidence, which Dr Alan Wells of Fisheries Management Scotland, detailed to the Committee. This involves the release of two groups of fish into the wild. One group is treated prophylactically with an anti-sea lice product whilst the other is untreated and acts as the control. The fish are recaptured when they return to the river and the two groups compared.

Dr Wells told the Committee that what this experimental approach has shown is that on average about 20% less fish return to rivers in the control group as compared to the group treated for sea lice (The 20% figure is approximately the average of 12-29%).

The 20% figure quoted by Dr Wells is incorrect. The large-scale, long-term study undertaken by Dr Dave Jackson and his colleagues from the Marine Institute in Ireland involved the release of 350,000 salmon smolts and a similar study run in Norway by Dr Ove Skilbrei in Norway, releasing 140,000 smolts both showed that sea lice had a very small impact of about 1% mortality on wild fish. This is very different from the figure of 20% quoted by Dr Wells.

There are a small number of researchers in Norway dedicated to investigation of sea lice and in receipt of significant funding to do so. Together with sections of the angling community, they were horrified by findings that showed sea lice have a very small impact on wild fish, that they have invested much effort into using different

statistical methods to show that the impact is much greater than the experimental approach has demonstrated.

However, there is also another factor to consider. In the 1980's 20-25% of wild smolts that migrated to sea, returned to the rivers to breed. Today, this figure is just 5% and is likely to be getting even less. This reduced mortality is believed to be due to changes at sea, especially to the feeding grounds. It affects all wild salmon, not just those returning to rivers in salmon farming areas.

Dr Jackson's research shows that the impact on wild fish by sea lice changes the overall mortality by 1% from 95% to 96% or 94% to 95%. The actual figures are fluid. This means that instead of 5 of 6 fish, just 4 or 5 fish will return.

The 20% figure that Dr Wells quoted come from the idea that if there is a standard mortality of 95% for all salmon, then the 1% must apply to the 5% of fish that do return. Thus, the difference between 5 and 4 fish is 20%.

The problem with this approach is that if there is 95% mortality at sea and 20% mortality due to sea lice, then total mortality equates to 115%.

The Irish state agency, the Marine Institute have been heavily criticised for their findings because they do not support the view that sea lice are responsible for significant wild fish mortality. In response, they published a short video to help clarify their findings. This can be viewed at <https://vimeo.com/83845976> or search for Vimeo sea lice and salmon farming.

During the meeting of the REC committee on March 14th, Dr Alan Wells said that *'it is important to know what happens at a very local level, because we do not manage sea lice on a Scotland-wide level or a Norway wide level; we manage them at local level. Also, we do not manage salmon stocks at Scotland wide level; we manage them on an individual river level. What is actually important is what happens at the very local level as the fish pass out of the rivers and pass the farms'*. Yet, it would appear that Fisheries Management Scotland or Salmon & Trout Conservation Scotland or even Marine Scotland Science have not measured that impact of salmon farming on wild fish stocks at any level. Their evidence is largely circumstantial.

Whilst catch data recorded from individual rivers may not be totally accurate from year to year, over a run of sixty years, any accuracies are likely to be evened out. I have taken the data collected by Marine Scotland Science and plotted catch trends over all 109 fishery districts in Scotland for four separate constituent stocks - Salmon, Grilse, Salmon & Grilse and Sea trout. That equates to 436 sets of data and graphs.

Sixty-one of these districts are in the west coast 'Aquaculture Zone'. Of these, 59% of the fishery districts show an increase for at least one of the constituent stocks, despite the presence of salmon farming. By comparison, 62% of the east coast fishery districts show a decline for at least one constituent stocks.

Within the 'Aquaculture Zone', 48 of the 61 fishery districts (78%) show a decline in sea trout stocks between 1952 and 2014, but critically, 42 of these 48 (87%) were in decline between 1952 and 1982 prior to the arrival of salmon farming on the west coast (Before 1982, production was so small it wasn't even recorded). Therefore, **68% of sea trout stocks within the 'Aquaculture Zone' fishery districts were in decline prior to the arrival of salmon farming.**

For salmon & grilse, 37 of the 61 fishery districts were in decline between 1952 and 2014, whilst 25 of the 37 (67%) were in decline between 1952 and 1982. Therefore **41% of salmon & grilse stocks within the 'Aquaculture Zone' fishery districts were in decline prior to the arrival of salmon farming.**

It is also worth noting that 47% of fishery districts within the 'Aquaculture Zone' show opposing trends for salmon and grilse and sea trout. This is when one of the stocks is in decline whilst the other has increased. Speaking to the Committee, Richard Luxmoore highlighted that the lifecycles of salmon and sea trout are different, and this might explain the occurrence of opposing trends if exposure to sea lice were to blame. Yet, such opposing trends are also found outside the 'Aquaculture Zone' where no salmon farming exists.

This work was first presented at the international conference Sea Lice 2016 and has been submitted to a scientific journal for publication.

By comparison, Salmon & Trout Conservation Scotland have failed to provide any evidence that sea lice from salmon farming has an impact on wild fish populations.

Whilst Salmon & Trout Conservation have expressed their concerns about salmon farming through their petition, they have so far refused to discuss this research. Instead, they prefer to focus on the lice levels found on farmed salmon, yet they have not provided any evidence that increasing numbers of lice on farms leads to any, let alone higher, mortality of wild salmon.

An additional point relates to the note from Salmon & Trout Conservation regarding the likelihood of rivers within the Aquaculture Zone achieving their conservation limit compared to other rivers. What S&TCS fail to acknowledge is the huge difference in the type of river between east and west coast. The River Tay is 180km long whilst the River Morar is less than 1km in length.

There is much more to discuss but this is the end of the allocated 4 pages. It is my opinion that S&TCS have simply failed to prove their claims against salmon farming. Salmon farming is just a convenient scapegoat to deflect attention away from other, more critical issues affecting wild salmon and sea trout.

Dr Martin Jaffa
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