

# Marine Scotland Science

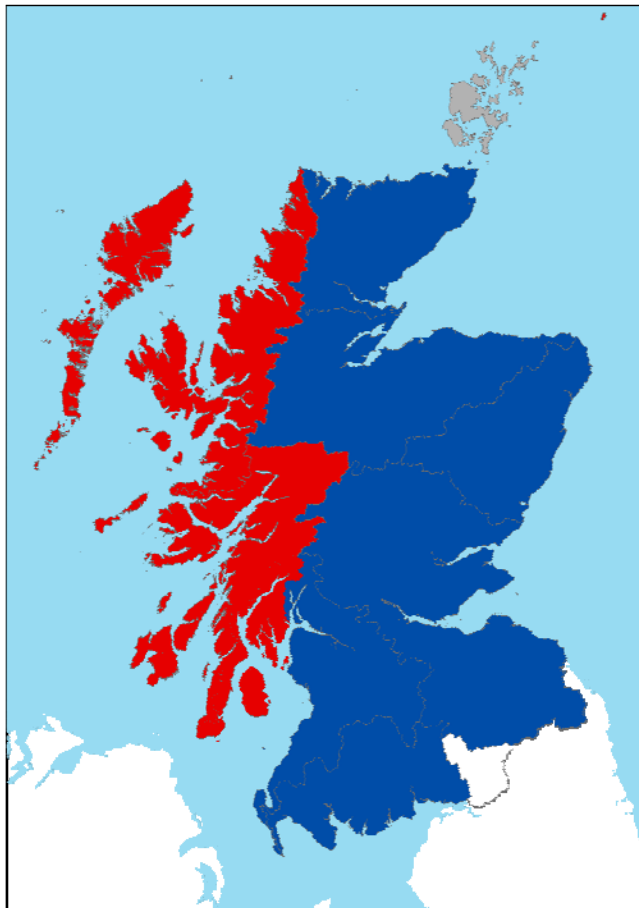
## Using Catch Data to Examine the Potential Impact of Aquaculture on Salmon and Sea Trout

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There is considerable interest in the potential impacts of the aquaculture industry on wild populations of salmon and sea trout. Both wild fisheries and aquaculture interests have used comparisons of catches on the east and west coasts of Scotland to support their contradictory views on this matter. In order to provide a clearer picture on which to base the management of the interactions between the two industries Marine Scotland Science was asked to provide an independent assessment of the catch data to determine what it does show, and what the limitations of the data are.



In general, comparisons designed to examine potential impacts of fish farming have tended to be made between the east and west coasts. However, the aquaculture industry is not spread throughout the west coast of Scotland and more valid comparisons are to be made between areas with salmon farming (red) and those without (blue).

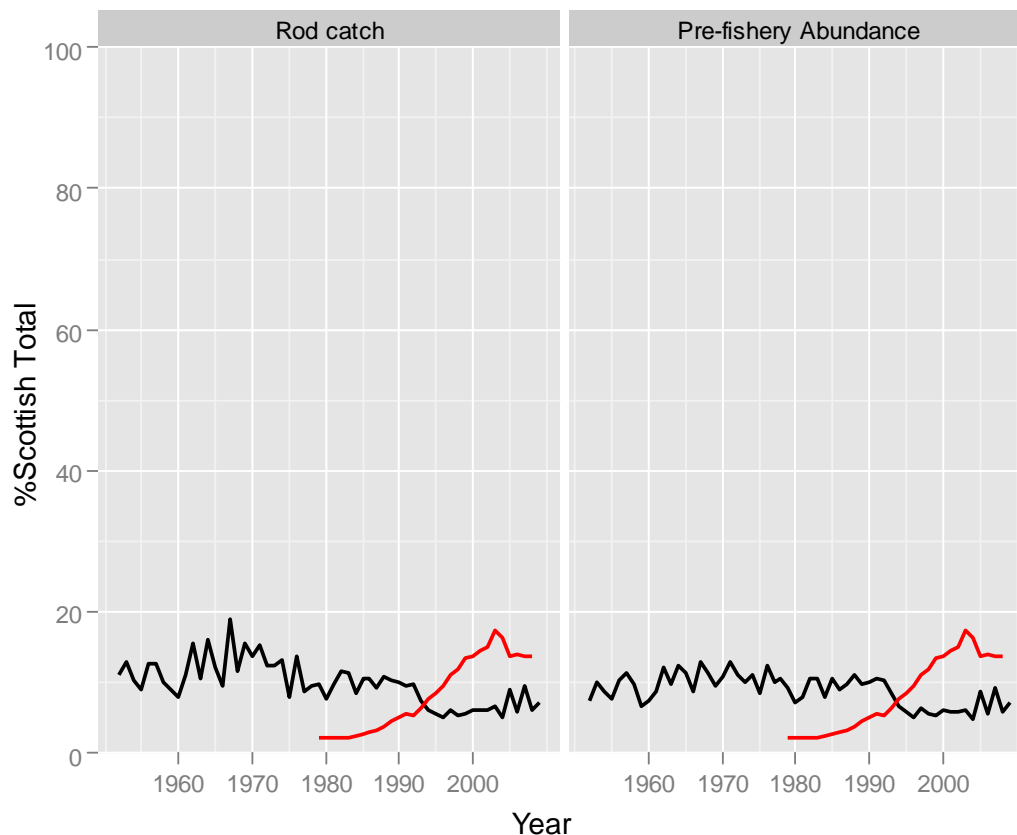
*Map of Scotland with the areas containing the majority of the salmon aquaculture industry shown in red. Note that, while the aquaculture industry is also present in Orkney and Shetland, the extent of salmon and sea trout fisheries in the islands is not well recorded.*

Rod catches give an indication of the number of salmon or sea trout present in the river, and therefore provide a measure of the strength of the populations. They do not, however, give a good measure of changes in factors which are affecting at-sea survival, potentially including the impact of aquaculture. It is well acknowledged that the relationship between rod catches and actual number of fish in the river stock depends on factors that vary from year to year, such as water flow and fishing effort. However, by examining trends over a sequence of years, much of the short-term variation in such factors can be smoothed out. Pre-fishery abundance (pfa) is a distinctly different measure to rod catch and estimates the numbers of salmon, or sea trout, which return to Scotland's coast. Declines in the pre-fishery abundance of salmon and sea trout due to increased mortality at sea over recent decades tend to

be greater than those in rod-catch because of a progressive reduction over time in numbers of fish taken by coastal and estuarial nets.

Examining the proportion of the total Scottish rod catch (or pfa) taken in the farming and non-farming areas highlights the differences in trends between these area.

For salmon there is little difference in the trends shown by rod catches and pre-fishery abundance:

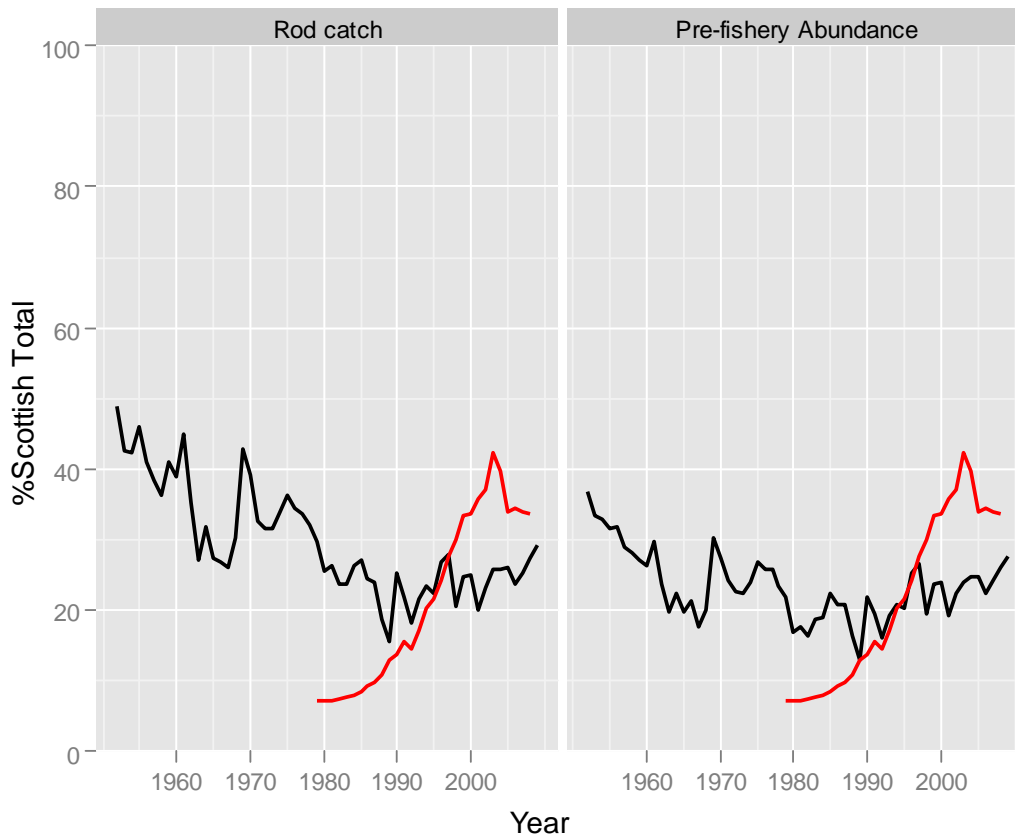


*Trends in the percentage of the all Scotland salmon rod catch (left) and pre-fishery abundance (right) from the farming area during 1952-2009 (black line). The red line gives an indication of the increase in fish farm production over this time period.*

These graphs highlight two main points:

1. From roughly 1990 the farmed areas decline relative to non-farmed areas, which is consistent with there being an impact of salmon farming on wild salmon.
2. The farmed area represents a relatively small (5-19) percentage of the all Scotland rod catch.

As for salmon, there is little difference in the trends shown by rod catches and pre-fishery abundance of sea trout:



*Trends in the percentage of the all Scotland sea trout rod catch (left) and pre-fishery abundance (right) from the farming area during 1952-2009 (black line). The red line gives an indication of the increase in fish farm production over this time period.*

These graphs highlight two main points:

1. Unlike the situation regarding salmon there was no obvious change in the relative contribution of farming and non-farmed areas to the total Scottish catch and pre-fishery abundance of sea trout as salmon aquaculture expanded.
2. The farmed area represents an average of 30 (15-49) percentage of the all Scotland catch.

It is very important to note that analyses of fishery catches such as these cannot be used to prove whether or not fish farming has an impact on wild fish as there are many other factors that may cause changes in fish populations and may differ between the regions of coast that were considered. For example, catches of sea trout have declined over recent decades on both farmed and non-farmed areas in Scotland and it is plausible that different factors are responsible in the two regions.

## Summary

- Salmon farming is one of a range of factors which may affect survival of wild salmon and sea trout. At present it is not possible to determine either the absolute or relative influence of these different factors.
- Analysis of the catch statistics is consistent with an impact of salmon farming on wild salmon, but does not prove a causative link.
- Rod catches of salmon within the fish farming area make up a relatively small percentage (5-19%) of the Scottish total.
- Analysis of the catch statistics is not consistent with there being an impact of salmon farming on wild sea trout, but does not disprove a causative link.
- Other lines of evidence suggest that fish farming may be having an impact on sea trout populations suggesting a potentially complex picture of different mortality factors acting in different areas.
- Broad scale comparisons of catch data (East/West, farming/non-farming) is not ideally suited to providing evidence of any impact of fish farming.
- An experimental approach is being adopted by Scottish Government as part of a programme aimed at quantifying impacts of sea lice on salmon (<http://www.gov.scot/Topics/marine/Salmon-Trout-Coarse/Freshwater/Research/Aqint/sealice> ).



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