

Investigation into grilse error

The North Atlantic Salmon Conservation Organization (NASCO), following the science advice provided by International Council for the Exploration of the Sea (ICES), defines the Conservation Limit (CL) as “the spawning stock level that produces maximum sustainable yield”.

An applied CL is a pre-defined minimum acceptable number of spawning salmon in a given river. NASCO, which advises the EU and the Scottish Government, has said that managers of salmon stocks in individual rivers should aim for numbers of fish in a river having a high probability of exceeding the CL.

CLs were developed and adopted by the Scottish Government in time for the 2016 fishing season. Rivers in Scotland were given a classification of category 1, 2 or 3: category 1 meaning a river has at least an 80% probability of meeting the CL (having effectively met the CL in four out of five years); category 2 meaning that a river has a 60 to 80% probability of meeting the CL (having effectively met the CL in three out of five years); category 3 meaning a river has a less than 60% probability of meeting the CL (having effectively met the CL in less than two out of five years). In the 2016 fishing season all main rivers in Dumfries and Galloway were classified as category 3 in the application of CLs. The rivers Luce, Bladnoch, Cree, Fleet, Kirkcudbrightshire Dee and Urr were each calculated to have met the CL in fewer than two out of the past five years.

In the official catch statistics published by Marine Scotland (MS), catch data are presented and published as they were reported (supplied by beat owners) on annual catch returns. Prior to publishing, no attempt is made by MS to correct for any mis-classification in the reporting of rod caught fish ('grilse error') between one sea winter grilse, or multi sea winter salmon, which could be an issue, particularly in summer months, and might over-represent the number of spawning females in a river.

As part of the conservation measures and calculation of the 2016 CLs various corrections were applied by MS to the published catch statistics for use in the particular CL model they designed. One of the corrections applied was a 'grilse error' factor which was used to change the reported mix of grilse and salmon. A previous study into 'grilse error' on the Spey had shown that over two beats, 42% of fish identified as summer salmon (multi sea winter) by anglers were actually grilse. Due to the lack of similar data from across Scotland, and little regional data available, the 42% grilse error from the Spey was applied to all data from June onwards across Scotland.

The application of this grilse error to the published catch statistics potentially moved up to 40% of the reported multi sea winter salmon into the one sea winter grilse category. Catches that had not been corrected could potentially over represent multi sea winter fish (salmon) and because a greater proportion of multi sea winter fish than one sea winter fish are female, there was a corresponding over estimate of the number of spawning hen fish, and therefore a corresponding potential over estimate in the annual egg deposition. Ultimately, the application of grilse error removed many salmon eggs from the calculations compared to using just reported rod catches, which, if the grilse error factor was incorrect, could have suggested that some rivers had lower fish stocks than they actually did at that time.

In order to test whether the grilse error correction was accurate for Galloway we, with support from the DSFBs, asked anglers fishing on the Luce, Bladnoch, Cree and Urr in 2016 if they could collect a scale sample from their rod caught salmon/grilse. We asked for an accurate length of the fish and to

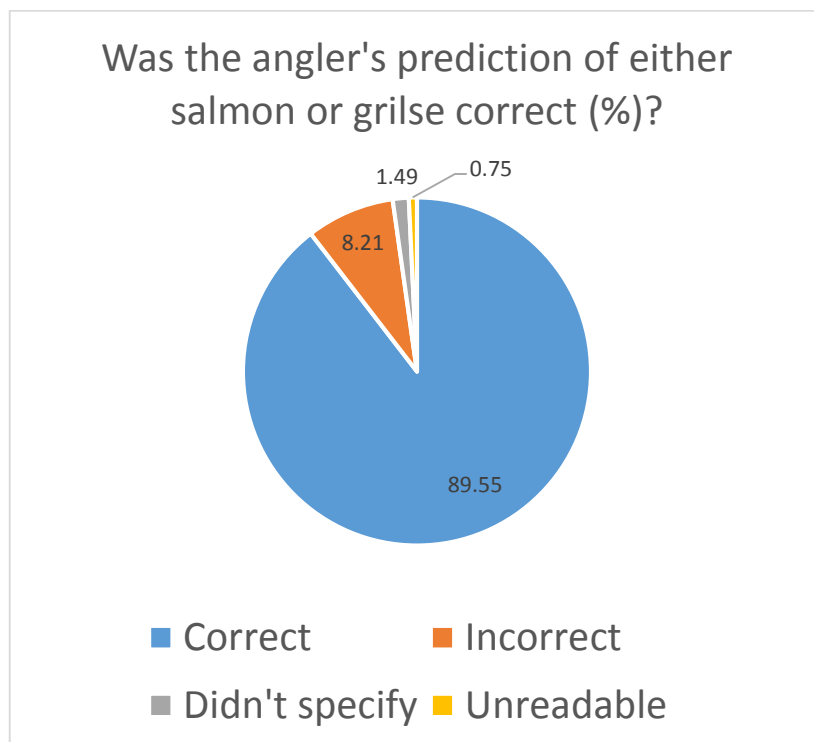
record whether they thought the fish was a grilse or a salmon. We provided anglers with an information sheet, a measuring tape and custom scale packets with a section where they could make a selection between whether they thought their fish was a grilse or a salmon.

In total we received 134 scale samples from across all four rivers and most fish were accurately measured – not an easy thing to do if you’re fishing on your own! Scale samples were sent to us where we compiled the information provided, and sent them onwards to be read by a professional scale reader that GFT, other fisheries trusts and MS have used for many years. After the scales were read we received the following data:

- 52 anglers submitted one or more sets of scales to this project. In total 134 samples were received (19 from the Luce; 44 from the Bladnoch and Tarf; 55 from the Cree and Minnoch; 16 from the Urr)
- All scale samples were read and the results showed that anglers submitted the scales of 88 grilse and 45 salmon. One set of scales was fully unreadable

Angler identification

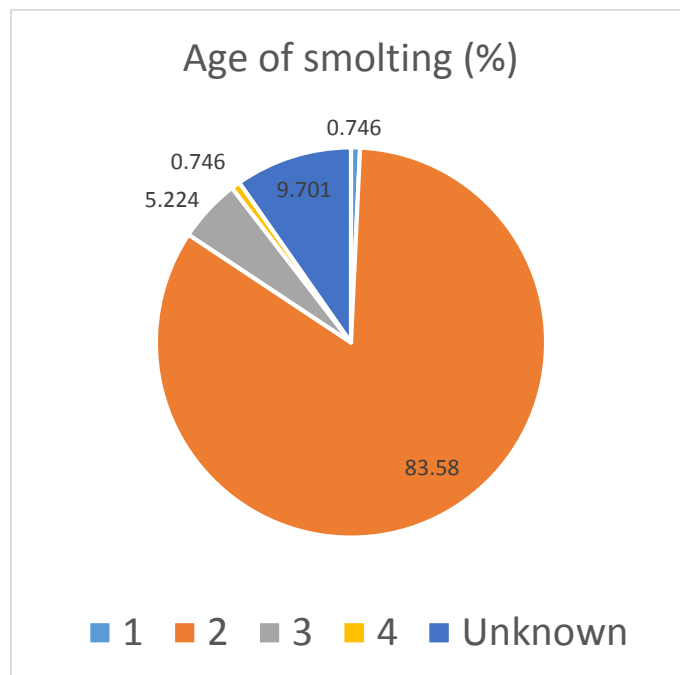
- 86 fish were identified by anglers to be grilse and 46 fish were identified by anglers to be salmon
- 2 fish were not identified by anglers as either being grilse or salmon
- Anglers were correct in their identification of 120 fish, as either grilse (80 correct) or salmon (40 correct). This constitutes anglers being correct in 89.55% of their predictions
- Anglers incorrectly identified 11 fish. This constitutes anglers being incorrect in only 8.21% of their predictions
- One set of scales was unreadable (0.75%) and two sets of scales were not identified as either salmon or grilse (1.49%). The pie chart below shows these identifications



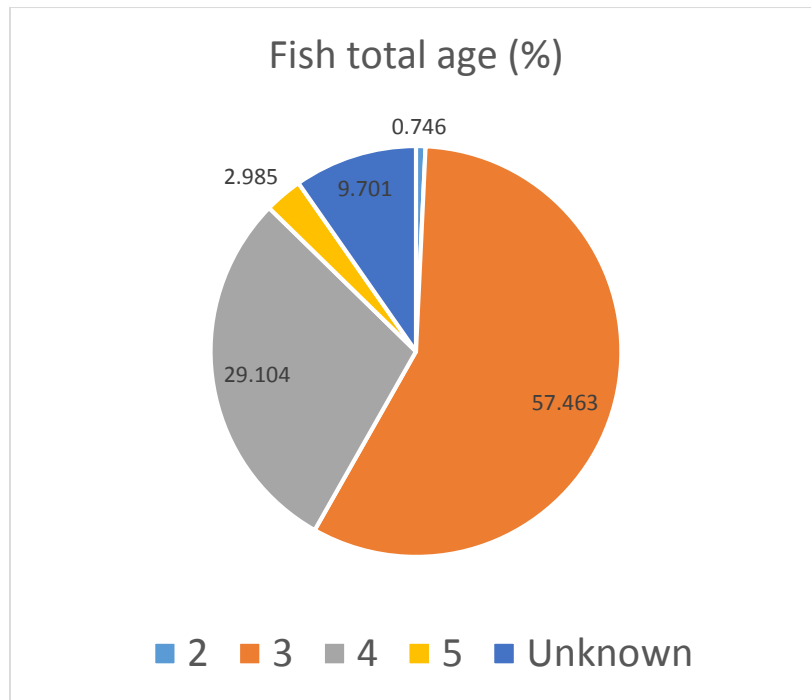
- Anglers were asked to determine the weight of the fish. Angler determined weights ranged from 1 ½ lb (a grilse from the Cree) to 15 ½ lb (a salmon from the Luce)
- From angler collected length information, fish ranged from 32cm to 96cm fork length. Using an Environment Agency compiled calculation of Solway salmon length/weight relationships and the lengths supplied by anglers, weights of the caught fish could potentially have ranged from <3.6lb to 22.2lb.

General information

- No fish caught had spawned in previous years (this is relatively rare in salmon but from scale samples GFT holds it appears to be slightly more common in fish from the Kirkcudbrightshire Dee).
- Fish had spent between 1 and 4 years in freshwater. In this area salmon normally smolt at age 2+ which can be seen from the pie chart below showing the smolt age of the 134 fish sampled



- Eight fish had spent 3 or 4 years in freshwater: two Bladnoch fish were 3+ when they smolted (two grilse); four Cree fish were 3+ when they smolted (three salmon, one grilse); one Cree fish was 4+ when it smolted (grilse); one Urr fish was 3+ when it smolted (grilse)
- The total age of the fish ranged from 2 years old to (one fish, from the Bladnoch) to 5 years old (four fish, all from the Cree) and the percentage of total ages can be seen in the pie chart below. 77 fish were age three and 39 fish were aged four



From the information gained from the scale sample analysis we can see that anglers are correct in their predictions of salmon or grilse in almost 90% of cases, disproving that the Spey grilse error model was relevant to these rivers. If in future a grilse error correction is reapplied to the catch statistics then we have local up to date information with which to assist MS in the calculations (this data has already been submitted to MS).

For the 2017 conservation limits (<http://www.gov.scot/Resource/0051/00510533.pdf>) we are pleased that the model has been changed and grilse error has not been used within the calculations of CLs. In addition the data we provided to MS from scales samples provides a range of information on the local grilse and salmon stocks in the Galloway rivers which is feeding into the ongoing development of conservation limits and the categorisation of rivers, as well as assisting in local fisheries management.

We would like to thank the 52 anglers who participated in this study as well as the DSFBs for contributing funds to purchase the equipment needed. Although we are no longer collecting scales to investigate grilse error we always welcome any salmon or sea trout scales (or any non-salmonid fish species). If you would like information on how to collect a scale sample, or would like some scale packets to collect samples please let us know and we would be happy to provide you with some.