Association of Salmon Fishery Boards

Supplementary Evidence presented to the Rural Affairs, Climate Change and Environment Committee

December 2012

Introduction

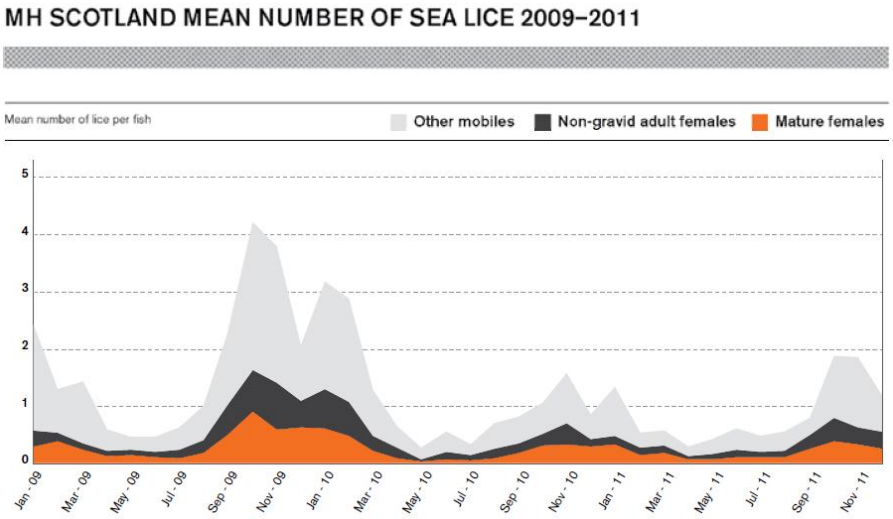
At the meeting of the RACCE Committee on the 5th December, the panel members were invited to submit further supplementary evidence. ASFB would like to pick up on a few issues raised during that meeting and the subsequent meeting on the 12th December.

Sea Lice

- Professor Thomas stated that '*for many fish farmers, the most problematic issue is when a run of mature wild fish come in, as they bring in sea lice—there is a sea lice strike on farms. In that situation, there can be rapid increases in sea lice numbers*'. He then stated that, '*the difficulty is that, when wild runs of salmon come in from the sea with heavy infestations of lice, the transfer of lice from the wild salmon to the farmed salmon tends to be a mixture of lice of different stages, including lice that are quite close to mature as well as lice that are at the free-swimming stage*'. There is no evidence to substantiate this claim, particularly with regard to the most common species of sea louse (*L. salmonis*) – as confirmed by Professor Richards fish are infested by juvenile sea lice, which then grow through several life stages to become adult lice. This prolonged life cycle gives fish farmers the ability to respond and react accordingly. However, even if sea lice could transfer from wild to farmed fish at the adult stages, the inference that sea lice infestations on farmed fish arise only from wild fish is flawed. If, for example, an average fish farm contains 300,000 fish, it would require at least 150,000 adult sea lice to reach the treatment threshold in the spring of 0.5 adult lice per fish (or 300,000 lice for the rest of the year). Even if we assume that all adult fish returning to west coast rivers carried 100 adult lice each, and that all of those lice transferred onto farmed fish in preference to their wild hosts, this would require 1500-3000 returning fish *per farm*. There simply are not the numbers of fish returning to the West Coast to make such a scenario a reality. Despite conceding '*that the predominant route of transfer is through the free-swimming stage*', Professor Thomas continued to make reference to '*a strike of sea lice coming in from the wild*' particularly in justification for why sea lice data should not be published at an individual farm level.
- Professor Thomas also stated that '*the treatment strategy that the industry has adopted since the early 1990s has been geared towards counting sea lice on farmed fish and treating them before that shedding stage—treating adults to prevent the shedding*'. Whilst we accept that this is the basis of the National Treatment Strategy for sea lice, as set out by the industry code of good practice, it is the *outcome* of that treatment strategy that is important in practice. Steve Bracken highlighted that Marine Harvest publish sea lice numbers in Scotland (although this is on a company-wide basis, not a farm by farm basis)[1]. What the Marine Harvest data demonstrates is that, despite the basis of the treatment strategy, there have been mature female sea lice (which release juvenile sea lice into the water column) present on Marine Harvest farms throughout the last two years (see graph below). We do not highlight this in order to criticise Marine Harvest, but rather to highlight that the assertion by Professor Thomas is not borne out in practice. This also highlights the need to

[1] Available at: http://www.marineharvest.com/Global/MH%20Norway/Image%20bank/Marine%20Harvest%20Bilder%20til%20web/Anlegg/400xx234/MHG_2011_AR_ENG.pdf (Page 26)

understand, at a local level, where there are sea lice issues and to be assured that those issues are being well managed. This cannot be achieved in the absence of sea lice data, published weekly, on a farm by farm basis.



- Alex Adrian raised a scenario in which one farm manages to keep its lice levels just below an agreed threshold whilst another manages to keep its lice levels almost to zero but breaches the threshold on one or two occasions. In his view, no one really knows which scenario is worse and which has a greater effect on the local interests. This is correct. However, in the absence of sea lice data published at an individual farm level, we will be unable to determine which scenario is worse and more importantly we will be unable to tailor the management regime appropriately.
- Alex Adrian made reference to the need for different sea lice thresholds in different areas. We entirely agree and a recent paper from Norway[2] emphasises the importance of such an approach. The paper states, '*With a continued increase in the density of farmed salmon, our analyses suggest that the current management regime will lead to increasing sea lice infection pressure in fish farms, as well as increasing efforts of chemotherapeutic control and hence the risk of development and the spread of treatment resistance. To counter this development, we believe regulations will need to go from a threshold defined for the average infection per fish to a threshold based on a measure of the spatial sea lice density.*'

Escapes

- At the evidence session on 28 November, Willie Cowan stated that '*the impact of escaped farm salmon on wild stocks has recently been the subject of a study, which found no evidence of a substantial impact of one on the other*'. We are not clear which study Mr Cowan was referring to, but a recent study in Norway[3] demonstrated that although generally, escaped farmed salmon have had poor to moderate success in the wild, some highly significant changes were observed in 4 populations due to genetic introgression of farmed fish. A further study in Scotland recently looked at the effects of escapes on catches, but this did not investigate genetic introgression or other ecological effects.
- The Convenor also made reference to anecdotal evidence from a netsman on the north coast who in the past year has caught in the region of 100 salmon that were originally from an aquaculture source. A similar situation has arisen at the Cuil Bay netting station in Loch Linne, which in 2012 caught 96 fish that were originally from an aquaculture source. We don't yet have the total catch figures for that netting station, but this figure could represent as much as one third of the total catch for that netting station in 2012.

[2]Jansen et al. (2012) Sea lice as a density-dependent constraint to salmonid farming. *Proceedings of the Royal Society B*.
[3]Glover et al. (2012) Three decades of farmed escapes in the wild: A spatio-temporal analysis of Atlantic salmon population genetic structure throughout Norway. PLOS one 7(8).

- It is important to emphasise that genetic introgression is only one consequence of escapes. Even in the absence of cross breeding between wild and farmed fish there are a number of wider ecological effects such as the potential for such fish to out-compete wild fish in fresh water, in the short term, through sheer force of numbers and larger body size.
- The Convenor raised concerns about the relative merits of hatcheries raising smolts for fish farming and for wild fisheries, specifically with reference to comments relating to a specific situation on Loch Shin. It is important to emphasise that all hatcheries raising wild fish for stocking do so under closed containment and in most instances the output from such hatcheries are stocked into rivers either as eggs or fry. The majority of smolts for the aquaculture industry are now also raised under closed containment in facilities such as the Lochailort hatchery. However, significant numbers are also transferred to freshwater cages to be raised to the smolt stage. The only situation that we are aware of in Scotland where wild fish are raised in freshwater cages is in Lochaber and in that situation they are raised in partnership with Marine Harvest. No wild smolts are held in cages on Loch Shin.

Biomass Control

- Councillor Farlow and Douglas Sinclair made reference to the fact that in some cases fish farms hold more fish than they can effectively provide therapeutic treatments for. Douglas Sinclair stated that it was up to the farm in question to ensure that they did not hold more biomass than they could treat. We accept that some sites will be more problematic than others due to prevailing physical conditions at the site and that other management measures such as wrasse may allow such a strategy to be maintained without significant sea lice problems. However, in the light of these comments by SEPA, we would re-emphasise that we do not support a power to allow Scottish Ministers to instruct SEPA to vary (increase) CAR licenses where there is a need to treat fish, above and beyond an existing consent. Such a power would simply allow operators to hold more biomass than is sustainable.
- The paper by Jansen *et al.* (quoted above), makes clear that there is a link between the biomass of farmed fish in an area and the number of sea lice released into the environment. We would therefore emphasise that there is a need for Scottish Minsters to have a power to reduce biomass where necessary to reduce the effects of sea lice on wild fish. We await confirmation from Marine Scotland that this can be achieved under existing powers.

Farm management

- In reference to FMAgs and FMSs being publically available, Professor Thomas stated that *'agreements are live documents. They will change regularly, depending on what the farms do to vary their production cycles and so on'*. However, just as publication of sea lice data at an appropriate resolution will allow the industry to demonstrate their management response to sea lice infestation, publication of such agreements will demonstrate the overall strategy for such management. Publication on a website would not carry any significant cost and would allow such live documents to be regularly updated. If the industry is unwilling to publish such information, it simply enhances the view that there is something to hide and that this issue is not being addressed seriously.

Salmon Fisheries

- Several references were made to the efficacy of catch and release. We include some further information in Annex 1, which we hope demonstrates the extremely high survival of released fish. We have also produced guidance for anglers on catch and release[4] in partnership with other bodies which has been widely disseminated.

[4]Available at: http://www.asfb.org.uk/wp-content/uploads/2011/04/Catch-and-Release-Leaflet.pdf

- According to NASCO, Mixed Stock Fisheries (MSFs) are fisheries that exploit a significant number of salmon from two or more river stocks. Under this definition, and given the high levels of catch and release in Scotland it is unlikely that any rod fishery could be considered to be a mixed stock fishery.
- Margaret McDougal questioned whether catch and release might give inflated perception of abundance. Work on the Rivers Tweed, Dee and Spey has demonstrated that the rate of recapture of released fish is very low, and indeed the longer a fish spends in freshwater the less likely it is to be caught. Between 2000 and 2002 the rate of recapture of released fish on the River Tweed was 2.64%. It is estimated that recaptures on the River Dee were up to 6.1% in 2004. Between 2000 and 2002 the overall recapture rate on the River Spey for spring salmon was 10%. Summer salmon and grilse recapture rates were considerably lower at 0.4%. In addition, there were no recaptures of radio tagged fish on either the River Conon or River Dee (Annex 1).
- There was discussion in both sessions about the management of coastal nets and tensions between netsmen and anglers. We maintain that it does not make sense, and would be counter to sound management, to separate the management of a migratory species between the freshwater and coastal parts of the life cycle. We would point out that the Bill already contains provision to deal with two areas of contention – carcass tagging and genetic sampling to allow the understanding of the mixed stock nature of the catch. The other, more recent, issue of contention is the issue of fishing during the weekly close time and both ASFB and SNFAS have suggested solutions to this problem. Whilst there will be tensions around levels of exploitation (and it is worth noting that these tensions also exist *within* the rod fishery) we do not agree that there is an inherent conflict of interest within Boards. The vast majority of the work that fishery boards and trusts undertake (habitat improvement, removal of barriers, removal of non-natives etc.) is to the benefit of both sectors. None of the current issues will disappear simply by moving the management of the fisheries elsewhere.
- Colin Bean mentioned that some boards do not apply to Marine Scotland for a licence to collect fish out of season. However, in some cases broodstock are collected by rod and line, within the season, and therefore no license is required.
- Simon McKelvey made reference to the fishery management planning process in relation to the Cromarty Board area. We would emphasise that 25 such plans, which are all publically available, have been produced across Scotland, covering a large proportion of the country. This was an outcome of the strategic framework process and we would concur with the view that it is unfortunate that that process, which had buy-in from a wide range of stakeholders, was not utilised to inform the current legislation.
- George Pullar expressed concern about the additional burden of recording tag numbers in a log book. Similar concerns were voiced in England and Wales prior to the introduction of statutory carcass tagging. However, in 2009 36,500 fish were successfully tagged *and recorded* in England and Wales, of which 30,668 were caught in the North East of England. Any scheme which does not use individually numbered, recorded tags will not be consistent with the situation in the rest of the UK and will do nothing to prevent the illegal taking and selling of fish – a wildlife crime. The very fact that Mr Puller distributed tags around the Committee room demonstrates the inherent flaw in a non-numbered tagging system. Following such distribution, Usan Salmon Fisheries has no control over those tags or how they might subsequently be used. The system used in the rest of the UK requires that all tags are accounted for and any unused tags must be returned at the end of the season.
- ASFB have no difficulty with a register of interests – as indicated by Simon McKelvey, this already forms part of our Code of Good Practice. Given that most Board members are fishery proprietors we would not envisage that such proprietorial interests would need to be disclosed – rather it would be interests out with the fishery, which may impact upon the decision making of Board members, which would be registered. We will clarify this issue with the Scottish Government and the Beauly DSFB.

- George Pullar made reference to the ASFB Constitution[5] preventing SNFAS from attending ASFB meetings. Our constitution makes no such statement - rather it allows members to vote to propose and co-opt other bodies at the AGM. These bodies are proposed and co-opted on an annual basis.

Annex 1: Further information on the success of Catch and Release

River Conon: Cromarty DSFB[6]

In the spring of 2003 a radio-tracking project was carried out on the River Conon to investigate the migration of spring salmon within the system. Twenty salmon were caught on rod and line, held in a keep net, anaesthetised and then fitted with an internal radio tag as well as an external Floy tag. This process is much more invasive and likely to be stressful to the fish than a normal catch and release procedure.

Of the twenty salmon tagged none were recaptured by anglers, two subsequently dropped downstream out of the study area and may have gone to other rivers. One was killed, probably by an otter at Rogie falls, the remaining 17 were tracked upstream and most of them were located at spawning sites in the autumn.

The report stated, 'This study suggests that the majority of salmon released by anglers will survive until the spawning period. It is also apposite to note that salmon utilised in this project were subjected to increased handling due to tagging procedures in addition to levels associated with capture by anglers. The summer of 2003 was also notable for an extended period of drought and high water temperatures. Fish kills as a result of the latter were evident on a number of Scottish river systems. The upstream movement of the majority of fish tracked in this project during the spawning period should thus be seen as a positive for those who consider catch and release of spring salmon as a useful tool in the conservation of this component of the stock.'

River Dee (Aberdeenshire)

The (Aberdeenshire) River Dee has a voluntary total catch and release policy for salmon and sea trout. As part of a three-year study to investigate the released salmon's ability to survive and migrate to spawning grounds as a result of extending the angling season by two weeks into October, 140 salmon were radio tagged by the River Dee Trust between 2008 and 2010. All 140 salmon were caught by paying anglers who were fishing in the autumn period (mid Sep – mid Oct), i.e. they were the regular clientele of the river. This was a necessity of the study as we needed to mimic the 'normal' fishery to assess potential effects of angling on the fish. Once caught, the fish were put into keep nets and held in the river until staff arrived to tag the fish. The fish that were tagged were not selected for and so represented the typical rod catch on the river, with the exceptions that: (1) fish showing signs of significant damage were excluded and (2) fish under 55 cm length were excluded. The latter was to avoid any harm to the fish when inserting the radio tag (the tag length was 5 cm and was pushed into the fish's stomach).

118 (84%) of the fish were tracked through their spawning period (late Nov – Jan), which contributed to the study's conclusion that catching and releasing salmon in October made no difference to the fish's ability to survive to spawn compared to catching and releasing fish in September (full reports can be viewed at www.riverdee.org.uk). Of the 22 fish that it was not possible to track through their full spawning migrations, 16 of these fish were tracked moving upstream (minimum of 1 km, average 12 km) and were all tracked for a minimum of 22 days (average 46 d). This confirms that these fish survived being caught and released. A further six fish were tracked for a period of 27 – 75 days after they were captured and released but during that time only migrated downstream. This downstream migration behaviour was considered 'normal' because over the three years an additional 15 fish showed only downstream migration but remained in the river throughout the

[5]Available at: http://79.170.44.155/asfb.org.uk/wp-content/uploads/2011/06/ASFB-Constitution-2010.pdf
[6]More information at: http://cromarty.dsfb.org.uk/files/2012/08/conon-spring-salmon-tracking-report.pdf

spawning period, suggesting that some fish originally migrate above their intended spawning grounds. It was concluded that these six fish also survived capture, tagging and release.

All of the remaining 22 (16%) salmon were therefore accounted for after they were released and so it was concluded that survival release post-release was 100%. In addition though, there were a total of eight fish (5.7%) which although they were tracked throughout the study, showed no movement. It is thought that in all of these cases the tag was regurgitated and remained on the river bed through the tracking period. This is surmised because no carcasses were found or reported and if a fish had died then the carcass would eventually be washed downstream and tracking would have detected this movement. In addition, a study by Environment Agency (Gowans 2004[7]) found a regurgitation rate of 9% in 302 salmon that were radio tagged, which is in line with our estimate of 5.7%.

Gowans (2004) estimated that 2.4% of salmon (five out of 208 tagged fish) caught by anglers died immediately from the effect of capture trauma and a further 2.4% died soon after being tagged and released. In the last four years, 98% of salmon caught on the Dee have been released for the whole angling season. The retained 2% is mostly explained by mortality during capture/handling of the fish, which is in line with the estimate of Gowans (2004). For the Dee, a mortality of 2% of the total rod catch in the last four years equates to an average of 160 salmon per year. In 2004 it was estimated that angling tourism brings in £11.5 million each year to the Deeside economy (Radford et al 2004[8]).

The River Dee was one of the first rivers in the UK to introduce catch and release (in 1994) and in 1996 the survival of these released fish was assessed by Webb (1998)[9]. In this study, 25 salmon that were caught by anglers between March and June 1996 were radio tagged. Of these 25 fish, 21 were successfully tracked until spawning at the end of the year. A further two fish were lost from the study, after being tracked for 83 and 90 d and showing upstream migration of 7 – 37 km. One fish was recaptured 69 d later and killed by the angler. The remaining one fish died 31 d after release with evidence of disease. As it cannot be ruled out that angling contributed to this disease, the study shows a maximum mortality relating to angling of 4%.

Norway

Jensen, J.L.A., Halttunen, E., Thorstad, E.B., Naesje, T.F. & Rikardsen, A.H. (2010). Does catch-and-release angling alter the migratory behaviour of Atlantic salmon? *Fisheries Research* **106**: 550-554.

> Electronic tracking studies have recently focused on the potential negative effects of catch-and-release (C&R) angling in Atlantic salmon (*Salmo salar* L) Common for these studies is that the fish were tagged between C&R and the effects of C&R can thus not be separated from the extra handling effects associated with the tagging procedure In addition reference groups and information on the behaviour prior to C&R is not available In this study 95 homing multi-sea-winter Atlantic salmon were tagged with radio transmitters in the fjord before entering the River Alta Northern Norway and thereafter manually tracked until the spawning period **Ten of these salmon were caught and released by anglers in the river All ten fish survived the angling event and nine were observed in known spawning areas during the spawning No difference in migratory behaviour prior to or after C&R was observed between caught and released fish and a reference group Individuals both among the C&R fish** and the reference group showed downstream

[7]Gowans A (2004). Radio-tracking of Atlantic salmon on the River Eden, Cumbria: spawning distribution and survival to spawning. Environment Agency.

[8]Radford A, Riddington G, Anderson J & Gibson H (2004). The Economic Impact of Game and Coarse Angling in Scotland. Report prepared for Scottish Executive Environment and Rural Affairs Department. Scottish Executive, Edinburgh.

[9]Webb JH (1998). Catch and release: the survival and behaviour of Atlantic salmon angled and returned to the Aberdeenshire Dee, in spring and early summer. Scottish Fisheries Research Report **62**. 16 pp

movements and migratory stops associated with C&R in previous studies In spite of making studies logistically more challenging and expensive the use of reference groups is important when assessing natural versus non-natural behaviour and to separate C&R effects from tagging effects.

Thorstad, E.B., Naesje, T.F.& Leinan, I. (2007). Long-term effects of catch-and-release angling on ascending Atlantic salmon during different stages of spawning migration. *Fisheries Research* **85**: 316-320.

Eighteen Atlantic salmon (*Salmo salar*) (total body length 58-110 cm) were radio tagged following angling and then released in the lower reaches of the River Alta, Northern Norway. The aim was to compare the long-term effects of catch-and-release angling on newly ascended salmon (assumed < 1 week in freshwater) with salmon from a previous study that were released in the upper reaches of the river at the end of their upstream migration (assumed > 1 month in freshwater, n = 44, total body length 53-122 cm). **All 18 salmon survived the catch-and-release angling event and were recorded in known spawning areas during the spawning period, except one individual not found in the river after 15 August (42 days after tagging). There was no difference in survival rate between salmon caught-and-released in lower (17 of 18, 94%) and upper reaches (43 of 44, 98%), nor in the proportion recorded in known spawning areas (17 of 18, 94%, from lower reaches and 42 of 44, 95% from upper reaches).** During the spawning period, four salmon (24%) were recorded downstream of the catch-and-release site (mean 2.3 km, range 0.3-5.7), whereas 13 (76%) salmon were upstream of the catch-and-release site (mean 10.1 km, range 1.9-24.0). Catch-and-release angling may result in a delay in the upstream migration, as the 13 fish recorded upstream of the catch-and-release site during spawning, spent on average 34 days (range 0-94) before they were recorded more than 1 km upstream from the catch-and-release site. This is a longer delay than expected for natural resting periods during upstream migration. In addition, at least 3 1 % (n = 4) of the 13 fish recorded upstream of the catch-and-release site during spawning showed an unusual downstream movement immediately after catch-and-release angling.

Thorstad, E.B., Naesje, T.F., Fiske, P. & Finstad, B. (2003). Effects of hook and release on Atlantic salmon in the River Alta, northern Norway. *Fisheries Research* **60**: 293-307.

The purpose of the study was to collect information on angling procedures and the effects of hook and release on Atlantic salmon in the River Alta, northern Norway, covering both grilse and multi-sea-winter salmon in a non-artificial setting with real anglers. Information on the angling procedure, handling of the fish and the condition of the fish at release was collected for individual salmon in catch logs (n = 543, mean body length 82 cm), whereas physiological stress was studied in a sub-sample (n = 15, mean body length 77 cm). To study post-release behaviour, survival and recapture rates, salmon were tagged with radio transmitters (n = 30, mean body length 83 cm) and anchor T-tags (n = 353, mean body length 79 cm). To evaluate the effects of the hook and release programme on the salmon population, number of spawning redds were recorded from a helicopter in 6 years during 1989-2000. The results showed that at water temperatures 10.0-14.5 degrees C, a high proportion of the radio tagged salmon (97%) survived hook and release and stayed in known spawning areas during the spawning period. However, the behaviour after release seemed to be affected by hook and release. Only a small proportion (4%) of the anchor T-tagged salmon was caught more than once within the same season. Increased playing time, increased number of runs during the angling event, hooking in the throat, bleeding at the hook wound, increased handling time, air exposure and water temperature were factors that affected hooked and released Atlantic salmon negatively, either indicated by a poor condition at release, increased stress levels or unnatural behaviour after release. **Number of spawning redds were more than doubled after the introduction of compulsory release of all angled salmon in Sautso (the upper 16% of the watershed inhabited by salmon) in 1998, which indicates that hook and release can be an effective management tool to enhance declining Atlantic salmon populations**.