

The Ghillies Seminar
Friday 11th April 2008-04-14

Speakers and their topics

Dr Shona Marshall Introduction and area update
Dr John Armstrong (FRS) Habitat requirements for salmonids.
Mr Jim Raffell (FRS) Observations of sea trout and sea lice in Loch Shildaig, 1999 - 2007
Mr Hugh Richards (WRF) An insight to fish farming
Mr Charles Allen (FRS) *Gyrodactylus salaris* – what it means and how to stop it.

Dr Shona Marshall (WSFT Biologist):

All were welcomed to the seminar and a short report on local issues given.

The potential presence of mink throughout the area was raised. This follows on from a survey of the area on behalf of the EA and SNH. All were asked to report any sightings, or potential sightings, to Shona. These will be forwarded to the relevant group. Duncan Shaw stated that he may have seen one at Carbreck House.

Dr John Armstrong (FRS):

John gave a run down of the work of FRS and the need for science to support the work of fisheries managers. He then detailed the life history of salmon and their habitat requirements in oligotrophic systems.

It was noted that the low nutrient status defines the overall habitat. In these systems it is possible that the lack of returning salmon may also be a cause of low nutrients, with dying salmon returning nutrients from the sea to the freshwaters. This is being examined within the Conon.

Sexually mature parr – precocious parr – are mainly males. They will fight over the redds as soon as the female has laid down her scent, and possibly several days before she lays her eggs. A large proportion of eggs within a redd are fertilised by these parr.

Eggs need well oxygenated, cobble sized gravel, usually found at the ends of pools. It was asked if alevin stay in the gravels – not necessarily, while most will, some move up out of the gravels. Alevin are very vulnerable to predation by, i.e. trout. There are large losses at this point.

Parr need a more bouldery substrate. Salmon are very aggressive and dominant and subordinate fish can be easily recognised by their markings. Dominant fish have ‘tiger’ markings, while subordinates have the ‘minnow’ pattern. However, PITT Tagging has shown that salmon have overlapping home ranges, up to 12 m in size, not as previously thought centred on one small area. There is also a strong effect of ‘kin’ with parr showing more tolerance to siblings feeding within their territory than strangers. Feeding is the most vulnerable time for the fish. Salmon are by preference nocturnal, but a lack of feeding will cause them to be increasingly diurnal and therefore vulnerable to predation. As growth rates decline you get more year classes in the systems and therefore increased competition.

Unlike parr, smolts form shoals. They need pools to allow shoaling and protection from predators as they no longer use the gravels.

Adults feed in the ocean. While normally found near the surface, they can dive to 100 m, possibly to avoid predators. The thin grilse observed recently suggest that changes in the ocean have affected feeding potential.

The limits to population size

The number of spawners is an obvious limit, linked to the spawning escapement, but redd distribution is important. There needs to be a spread of spawning substrate throughout the system.

The main habitat bottleneck is at the alevin stage, where a flow rate of 10 – 15 cms⁻¹ is the maximum for alevin feeding. As they grow, more areas become available, but it is important to ensure that there is sufficient alevin habitat close to the redds. There is a rapid decline in numbers 50 m from the redd for about 1 month alevin to 1st feeding, before survival improves over this distance.

Habitat saturation causes self thinning, with numbers declining as weight increases. In the North Esk smolt production has stayed level, despite a decline in adult numbers. John showed a 'stock – recruitment' curve, showing that the number of smolts increased with the number of returning adults up to a certain point – the spawning escapement – after which the number of smolts levelled out, or even declined slightly.

The discussion followed.

A reduction in feeding was noted, with fewer insects available. Is it possible that this is down to the wetter climate? Possibly.

The addition of nutrients to the system was raised. It was pointed out that this would require a lot of thought, and would probably not be accepted by SEPA.

The benefits of riparian woodland were raised. It was noted that the impacts would depend on the stage and species. Fast growing trees have more nutrient requirements and may remove nutrients rather than add them. However fertilising of trees at the start would add nutrients to the water, while the breakdown of leaves may add nutrients for aquatic insects. John considered that the benefits of aerial insects may be over played, with moorland have a high number of aerial insects itself. The complexity of the system was noted, with important abiotic as well as biotic factors.

The advantages of stocking were questioned. While John doesn't recommend stocking, he felt that putting fish out as early as possible – eggs – was the best method, although keeping some to feed in order to cover the alevin bottleneck may be an advantage where this is possible.

Mr Jim Raffell (FRS):

Jim described the field station at Sheildaig, and some of the work undertaken there. He noted that the Sheildaig River holds different morphs of brown trout and sea trout but no salmon. Sea trout are stocked into the river, broodstock being held at Almondbank and new spawners regularly sent down to maintain the genetic integrity. All stocking is undertaken as eggs.

Since stocking started there has been an increase in the juvenile density within the river, but smolt age now swings annually between 2 and 3, possibly as a result of this stocking.

They also monitor predators. Of these, cormorants are mainly at sea except when the smolts are running, and seals also congregate in spring and autumn when the fish are running. Herons tend to appear first, possibly feeding on frogs. There are also a lot of fish seen in the screw trap below Loch Damph with fish bites.

Jim gave a run down of the life cycle of the sea louse and their impacts on the sea trout. It was noted that marine survival was 4%, but that this dropped to 0.5% when the fish farms operating in Loch Torridon lost synchrony of lice treatments. They also found that when the treatment on the farms was synchronised then there were no lice on the shoreline in spring. The numbers of lice at the shore is related to the number of gravid lice on the farms.

It was noted that there were high numbers of lice on the fish in 2006, similar to those seen in West Sutherland, but that as these included adults they must have come from somewhere else and couldn't have developed on the fish.

Sea lice have been recorded on other species, including cod, saithe and sea bass, as well as 3-spined stickleback. However this only occurred where lice numbers were high.

Mr Hugh Richards (WRF):

Hugh split his talk into 2 parts. In the first instance he gave a summary of the results from the planned release from the Ardmair sites. This was an FRS project, which mimicked work being undertaken in Norway.

678 fish were tagged in 2006 at 3.5 – 6 kg in weight, and released on 25.4.06. The first tag was found on 19.7.06, although as it was only a tag the fish was likely to have been taken by a seal.

The 2nd tag was seen in Norway on 31.8.06 in a coastal net, with the 3rd appearing on 13.9.06 quite far inland on a Swedish river. The 4th was then taken in the sea of North Norway on 13.10.06.

A tag was also found on 11.9.07 at Droman Pier, west Sutherland, although again, as this was only a tag it may have been floating on the tide for some time.

A report on the project is expected to be produced shortly.

From the release 24 months ago, 0.4% of the salmon were recovered, with a 0.7% tag recovery. A similar release in Norway produced a 7% recovery. The aim was to determine if escapes from Scottish farms end up in Norwegian rivers. There is no evidence of this from this project.

Hugh then gave a summary of the work of a farm salmon, discussing the primary routines, and associated operations. This included a summary of lice monitoring and treatment regimes.

Charles Allen mentioned the new Act and the legal controls now existing on lice control. It was also noted that escapes are not illegal, although suitable precautions must be taken to reduce their likelihood – i.e. cage maintenance.

Hugh also mentioned the natural factors affecting the farm, for example the dangers of plankton and jellyfish. However, he also mentioned the possibility that the common jellyfish may control plankton numbers and therefore lice numbers.

Charles Allen (FRS):

Charles ran through the lifecycle of *Gyrodactylus salaris*. It has a single stage life cycle and requires sexual reproduction only once every 100 generations. It is species specific, killing Atlantic salmon, although capable of living on others, i.e. trout, rainbow trout and charr. It is freshwater specific, so can't get to Britain naturally.

A new infection has been noted in Italy recently. This was found accidentally as part of another project. Charles then ran a model to show rate of spread within England and Wales, based on known fish movements. An accidental introduction to one place would result in the infection of all catchments within the country within one year.

In Norway over 45 rivers were infected in the 10 years it took to identify Gs as a pathogen, with one, the Vesta, losing 95% of its catches. While the population wasn't wiped out, it was severely damaged. To put this in context, pre infection catches were recorded in tonnes of fish – they are now recorded in the hundreds of individuals.

At a local level it is important to clean and disinfect all equipment – anglers, water sports, scientific equipment. This can be done by any of the following:

heat at 60⁰ C for one hour (this is as hot as a sauna) or 20⁰ C for 24 hours;

Cold – freeze overnight;

Dessication – dry everything out;

Chemical – 1% Virkon, 1% Tegodyne; 3% salt; 0.2% Sodium Hydroxide – immerse in any of the above for 10 minutes.

Charles noted that he uses salt, making sure to rinse everything well in freshwater afterwards, but all are equally effective.

Charles also talked about the Red Vent Syndrome. He noted that 2007 was an unusual year, although this is not a new phenomenon being common in the Tay.

Caused by the Anasakis parasite moving from the body cavity into the flesh, it has almost exclusively affected grilse rather than salmon. It has not affected sea trout or the aquaculture industry, and has also appeared in Norway and Ireland, but not Iceland. This suggests that it is from the feeding grounds.

The advice from the FSA is to cook or freeze all salmon. However, it should be noted that the other name for Anasakis is 'cod worm'.

It was asked if the high mortality seen in the Laxford hatchery this year could be linked to the parasite. This was unknown.