



2010: YEAR ZERO FOR WILD SCOTTISH SALMON?

Major Salmon and Trout Association study of peer-reviewed science condemns current fish-farming practices as totally unsustainable Leading wild fisheries organisations call on Scottish govt. for immediate action

The Salmon & Trout Association (S&TA) today (March 22nd 2010) publishes its ground-breaking summary report on scientific studies into the environmental impact of current salmon farming operations. It reveals a devastating catalogue of malpractice in the way salmon farming is impacting wild salmon, sea trout and the marine environment, and provides incontrovertible proof that it is a sword of Damocles suspended over some of Scotland's most iconic natural resources. It accuses the multi-million pound salmon farming industry of precipitating an environmental disaster, and calls for a nine-point survival plan to be actioned immediately.

The report's main findings provide evidence that:

- **Fish farm parasites can kill young wild salmon and sea trout**
Studies show as many as 80% of juvenile salmon and sea trout are killed by sea lice allowed to breed in massive numbers in open cage system salmon farms. Sea lice are a natural salmonid parasite, but infestations on this scale can kill.
- **Salmon farming could force wild salmon into extinction**
Gene pools could be destroyed in decades by the inter-breeding of farmed fish escapees with natural populations – some Norwegian rivers already have breeding populations of up to 80% fish escaped from farms. It is impossible to prevent escapes from open cages, or for escapees to interbreed with wild fish stocks. Evidence shows that these hybrids do not thrive in the wild, and so could significantly impact native stocks, which within a few generations.
- **Salmon farming sewage can poison the sea bed**
The effluent produced by farmed salmon, together with the chemicals and antibiotics used to treat fish, can become established in estuaries, lochs and inshore zones close to fish farms, smothering natural aquatic life and increasing nutrients to unnatural levels

Paul Knight, S&TA CEO, declares: “Aquaculture (fish farming) practiced sustainably can offer enormous benefits to mankind and significantly reduce the pressure on our precious wild oceanic stocks. But the scientific literature unequivocally demonstrates that fish farms, as presently constructed and operated, are having a disastrous impact on native fisheries, the wider environment and the many public benefits associated with it. Quite apart from the S&TA’s nine point action plan to counter impacts that our report shows are already scientifically proven – especially from sea lice and farm escapees - we urgently need more research into the effects of all the waste material and veterinary chemicals swilling about Scotland’s West Coastal waters and lochs, particularly with so many valuable shell fish stocks in the immediate area.”

The S&TA, together with colleagues from Fish Legal, the Association of Scottish Fishery Boards (ASFB) and the Rivers and Fisheries Trusts of Scotland (RAFTS), is calling on the Scottish government to act before it is too late to save wild Scottish salmon and sea trout.

S&TA believes that a nine-point action plan must be implemented as a matter of urgency:

- **The long term target of the industry and Scottish Government must be for the universal use of enclosed systems for rearing fish, therefore cutting out any interaction between farmed and wild salmon and sea trout. A timescale for this transition should now be agreed between Government, industry and wild fish organisations**
- Meanwhile, the Precautionary Principle (as enshrined in EU legislation protecting species and habitats, and the basis of inter-Government agreements through the North Atlantic Conservation Organisation, signed up to by Scotland as a member of the EU delegation), should be adhered to at all times
- An effective lice dispersal model must be developed in order to assess acceptable maximum farm/area lice levels
- A list of ecologically and economically sensitive sites must be drawn up
- Sea-based salmon farms must be moved away from locations with significant salmon and sea trout migration runs, within estuaries, lochs and offshore. As a practical start, an experiment should be conducted by removing an individual farm from a sensitive site - agreed with wild fish organisations - and the effect on wild salmon and sea trout stocks monitored
- No new sites should be permitted in sensitive areas highlighted by the list above
- All new fish farm applications must be supported by independent Environmental Impact Assessments
- Salmon smolt farms should be banned from operating within any wild salmonid river, unless in enclosed systems
- The impact of escapees should be reduced by the mandatory stocking of sterile fish within an agreed timescale

S&TA’s Head of Science, Janina Gray, adds, “it has been a sobering experience researching the evidence surrounding the interaction between salmon fish farming and wild fish stocks. The evidence is clear that aquaculture can have a significantly negative impact, in some areas, on wild salmon, sea trout and their environment. We must learn from the scientific evidence available, enforce the precautionary principle and take action before it’s too late.

We now look forward to Dr Ken Whelan, of the Atlantic Salmon Trust, publishing his paper later in the spring, focussing on the impact of sea lice on wild salmonids.”

Paul Knight concludes: “it **must** be the Government’s statutory responsibility, and the industry’s moral one, to protect two of Scotland’s most valuable and iconic natural resources – **wild salmon and sea trout** – before it is too late. We will do everything possible to ensure their survival, and to this end we call upon the Scottish Government and salmon farming industry to respond to this challenge.”

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Notes to Editors:

1. Executive summary of this report follows this press release.
2. Full text of the report will be available on the Salmon & Trout Associations website from 9am Tuesday, 23rd March: http://www.salmon-trout.org/issues_aquaculture.asp together with the Policy Statement from the Salmon & Trout Association.
3. The Salmon & Trout Association (S&TA) was established in 1903 to address the damage done to our rivers by the polluting effects of the Industrial Revolution. For 107 years, the Association has worked tirelessly to protect fisheries, fish stocks and the wider aquatic environment on behalf of game angling and fisheries. In 2008 we were granted charitable status. S&TA’s charitable objectives empower us to use our highly regarded influencing skills to address all issues affecting fish and the aquatic environment, backed up by strong scientific evidence from our burgeoning scientific network – a vital factor in 21st century policy and decision making processes. Our charitable status enables us to take the widest possible remit in protecting salmonid fish stocks, and the aquatic environment upon which they depend.

Executive Summary

The Impact of Salmon Aquaculture on Our Native Fisheries and the Aquatic Environment.

Aquaculture has the potential to be a sustainable source of seafood, which could help to alleviate some of the pressures on the world’s oceans. However, the current stewardship of fish farms is in question, due to the impact of aquaculture on wild fish and the surrounding environment.

In 1980, commercial wild fisheries harvested 99% of salmon consumed worldwide. By 2003, approximately 60% of marketed salmon was from aquaculture. Salmon is now farmed in 24 countries, with Norway, Chile, Scotland and Canada being responsible for 71% of global production. The Atlantic salmon is the most economically important species, representing 89% of salmon production. The industry has become more technologically advanced, but full-time employment at farms has decreased.

This paper focuses on the scientific evidence of the impact of current stewardship of salmon farms on the surrounding environment and, in particular, wild salmon and sea trout.

Impacts of salmon farming on wild salmon and the surrounding environment

Salmon farms pose a threat to wild salmon and the environment in several ways. These include; spreading of parasites – particularly sea lice - and diseases; interbreeding of wild and farmed salmon; chemical waste; biological waste and eutrophication.

Sea lice

The sea louse is an ocean parasite of Atlantic salmon, which easily transfers from farmed to wild populations as open cage systems allow its planktonic larval stage to disperse into the surrounding water. This can be detrimental to migrating fish populations, especially juvenile salmon and sea trout, which are most vulnerable during and immediately after smoltation. Sea lice may also spread microbial and bacterial diseases.

Laboratory dose-response studies on wild salmon smolts found infection of 0.75 lice per gram of fish weight would cause death, while monitoring in the Norwegian sea found no live post smolts with more than 10 adult lice. Other experiments have found that 30-50 sea lice larvae can cause death in juvenile salmonids. Sea trout have been captured from fish farming areas with between 3-20 times the natural infestation rate of adult female lice per fish. In Norway, specialists recommend less than 10 lice per wild salmonid to ensure no impact on wild salmonid populations.

Salmon farms alter the natural relationship between lice and wild salmonids. For example, wild salmon infested with sea lice would typically suffer from reduced foraging efficiency, thus increasing host mortality, while this is overcome by artificial feeding in aquaculture. Fish farms also expose salmonids to the parasites at an abnormally young period of development, and studies have shown wild salmon and sea trout numbers declining more significantly in areas with fish farms than areas without. Research from two Norwegian fjords found 86% of wild migrating juvenile salmon died as a direct result of sea lice infestations whilst migrating past salmon farms, and Canadian scientists calculated a 99% collapse in one local native pink salmon population within four generations if lice infestation continued.

Disease transfer

The high density of fish at fish farms functions as a reservoir for pathogens and diseases, providing an ideal breeding ground and facilitating movement into nearby wild populations. In addition, escapees may transmit disease to wild stocks which have no natural defences. Wild fish can also transfer disease to fish farm populations, allowing pathogens to multiply rapidly and exacerbate natural levels.

Escapee salmon: Interbreeding of wild and escaped (genetically engineered) salmon

Farmed salmon escape practically everywhere there is aquaculture, often in large numbers compared to wild stocks. In Norway, it is estimated that 1.3 million salmon escape each year and, in 2000, an estimated 500,000 fish escaped in Scotland. There is growing evidence that these escapees are establishing significant populations in the wild. It is estimated that on the west coast of Scotland, 22% of 'wild' caught salmon were farmed escapees and, within Norwegian rivers in close proximity to fish farms, up to 80% of the spawning fish in one season were from fish farms. Experimental ocean fishing off the Faroe Islands during the mid 1990s found 20-40% of salmon caught was from farmed origins.

Farmed salmon typically show lower genetic variability than wild salmon, leading to farmed fish diluting gene pools and local adaptability in wild populations. Farmed salmon differ from wild salmon both morphologically and physically, which can affect behaviour, spawning success and competitive ability. Experiments have shown that farmed fish have survival rates as low as 16% of native fish in the wild.

The use of sterile fish in aquaculture has been found to reduce return rates of escaped farmed salmon to both estuaries and freshwater. This, coupled with their inability to produce viable offspring, could reduce the ecological impact of escapee farm fish.

Chemical wastes

Antibiotic and insecticide medication for diseases and parasites in aquaculture can expose the surrounding environment to chemical wastes, which can be toxic to other aquatic organisms.

Outputs from fish farms are controlled by discharge consents. However, the number of drugs permitted by the Veterinary Medicines Directorate for use in fish farms has grown with the scale of the industry, expanding from three drugs in 1989 to 40 in 2002. Between 1985 and 1987 in Norway, antibiotic use increased from 17 to 48 mt per year, exceeding the combined use by humans and terrestrial animals in the country during the same period. The incautious and profligate use of these antibiotics can lead to the development of drug-resistant strains of diseases in both wild and farmed populations.

Elevated levels of zinc, copper and cadmium have been found in fish farm sediments as a result of feed and faecal outputs, and the anti-foulant products used in aquaculture. A survey of metal concentrations in surface sediments at 70 sites around fish farms in Loch Craignish, on the west coast of Scotland, found maximum concentrations of 921, 805 and 3.5 $\mu\text{g g}^{-1}$ of zinc, copper and cadmium, respectively. Elevated levels of sediment metals can have a wide range of impacts on the benthos, including altering community structure and reproductive success.

Biological Waste and Nutrient Loading

Sediments from faeces and uneaten food beneath fish cages have been found to be enriched in phosphorus, nitrogen, organic carbon and zinc, posing a major threat to water quality and environmental integrity. The wastes can also smother animal and plant communities beneath cages, disrupting benthic communities and impacting sediment nutrient cycling.

Summary

Despite some common perceptions to the contrary, the scientific literature unequivocally demonstrates that, to varying degrees, fish farms are having a detrimental impact on native fisheries, the wider environment and the many public benefits associated with it. In order to make aquaculture a viable and sustainable industry, these threats must be addressed as an urgent priority.