ATLANTIC SALMON TRUST
PATRON: HRH THE PRINCE OF WALES KG, KT, GCB, OM

Suite 3/11
King James VI Business Centre
Friarton Road
Perth
PH2 8DG
Tel: 01738 472032

Policy on the Management of Sea Lice

August 2010

Atlantic Salmon Trust
Policy on the Management of Sea Lice

Context

For the past four decades the Atlantic Salmon Trust has been involved in the funding and sponsorship of practical research programmes tackling the problems facing populations of wild Atlantic salmon (*Salmo salar* L) and sea trout (*Salmo trutta* L). The Trust's work centres on improving our knowledge of these fish, their habitats and their complex and fascinating life histories. To date the Trust's direct support for research has focused on research awards, which mainly took the form of seed funding for a broad range of fisheries related projects. This approach proved very successful and laid the foundation for many key advances in fisheries management over the years. The Trust has recently decided to compile a series of reviews to summarise the current state of scientific knowledge in a number of key areas. The AST will develop a set of policy statements outlining the Trust's views on key management areas. It will also identify where additional work is urgently required and how AST's research goals link with these management objectives.

This is the first such policy statement and is supported by a scientific paper on sea lice impacts: *A Review of the Impacts of the Salmon Louse, Lepeophtheirus salmonis (Krøyer, 1837) on Wild Salmonids*. You can read the Review here.

AST Sea Lice Policy

The Problem

There is compelling scientific evidence that sea lice emanating from salmon farms can pose a very serious and dangerous risk to wild migratory salmonid populations. It is essential that more is done by the salmon farming industry, and by governments, to control levels of sea lice infestation on salmon farms.

Sea lice are the most significant parasitic pathogen in salmon farming in Europe and are estimated to cost the world industry €300m a year. Despite this level of expenditure it is now clear that wild salmonids – particularly sea trout – are still being impacted by excessive infestations of sea lice arising from local salmon farms. Moreover, given evidence of increasing resistance to chemical controls amongst the lice infecting certain farmed stocks and of changing environmental conditions in bays along the western rim of Europe due to climate change, efforts to control lice need to be redoubled if we are to significantly reduce the risks to wild migratory stocks.

The AST's position

AST is committed to the protection of wild salmon and sea trout and the ecosystems that sustain them. We believe that any industry can only claim to be sustainable if it protects and safeguards the surrounding natural habitat. This is particularly true in the case of aquaculture where the welfare of the industry itself is in the longer term totally dependent on the quality and integrity of the surrounding aquatic environment.

AST further recognises the economic and social importance of fish farming in remote rural areas but it is our view that this must not be allowed to override the need to conserve natural ecosystems. Implicit in the adoption by governments of the ecosystem approach to managing our natural aquatic resources is a requirement for the aquaculture industry to be sustainable both economically and environmentally, operating in harmony with its surrounding environment.

The AST also believes that sea lice are the common enemy of both wild and farmed salmon and sea trout, and that the effective control and management of lice is a shared objective between the farming industry and wild fish interests. Mutual concerns relate not only to the direct physical and physiological impacts of the lice themselves but also to their role as disease vectors. The AST will therefore support rational on-going dialogue between the various parties with a clear goal of developing a biologically and economically sustainable aquaculture sector.

The AST recognises that there will be financial costs involved in combating lice infestation, both to governments and industry. However, we believe that these are costs that must be met; if sea lice are not better controlled they will threaten the viability of the salmon farming industry as well as the survival of wild migratory salmonid stocks.

Key principles

AST is convinced that a solution to the problem of sea lice can only be found by taking account of the latest understanding of how sea lice infect farmed and wild salmonids. In our view this requires the introduction of **bay by bay management plans** for lice and the application of new lice dispersion models to assist in the control of lice on farms and a reduction in their potential spread to wild stocks.

Most salmon farms are located in bays and sea lochs. These have a finite limit in their capacity to accommodate fish farming activity. Each bay may well have a different capacity which will vary depending on environmental conditions in any given year. The risk to salmonid year classes is equally variable and therefore the management of the problem requires a rigorous regime of surveillance both in terms of the lice levels on the farms and the health of the neighbouring wild stocks

Recent research has provided innovative sea lice dispersion models which may form the basis for the quantitative assessment of bays and their potential to generate high sea lice levels into neighbouring bays and estuaries. They also provide the possibility of managing lice levels in bays through the strategic locations of cages (including where necessary the relocation of cages to more appropriate farming sites) and managing fish densities in cages.

The following general principles should govern sea lice control within each bay/coastal area:

- Complete separation of generations
- Appropriate fallowing regimes
- Annual synchronous winter lice treatment
- Planned rotation of sea lice treatments over the production cycle
- Adoption of appropriate treatment triggers

Ideally in the longer term, the aim should be to move to **closed containment systems.** Such systems could resolve many of the other problems affecting caged farms (such as disease, escapes and fecal waste).The development of commercially viable closed systems should be a priority for both governments and the industry

Action needed

- Governments should introduce effective **mandatory fallowing and treatment regimes.** These should include single generation management areas; synchronised fallowing of these management areas; minimum fallowing periods, synchronous winter lice treatment; rotation of sea lice treatments and adoption of appropriate treatment triggers.
- Governments and industry should introduce **officially validated lice monitoring regimes, the results of which are publicly available.**

- Governments and the industry should develop, implement and test novel sea lice pest control strategies**, on a pilot basis, in selected bays**. Successful pest control regimes should be progressively extended to all bays in which salmon farming takes place. Initial efforts should focus on bays where wild salmonids appear to be most seriously affected.

- **Existing regulations and rules must be fully enforced.**

- Where there is a persistent problem with sea lice control in a given location, regulators should be empowered to enforce sanctions and take appropriate action including **such measures as mandatory treatments and harvesting.**

- Governments and industry must continue to i**nvest in research geared towards reducing the impact of sea lice on wild migratory salmonids**.. Particular priorities should include the refinement and application of sea lice dispersion models as practical management tools; a quantitative assessment of the migration patterns and health of sea trout stocks in selected areas of the coastline, including an ongoing assessment of sea lice infestation parameters and in the longer term the development of commercially viable closed containment farming systems.

Glossary

Ecosystem. An ecosystem consists of all the organisms living in a particular area, as well as all the non-living, physical components of the environment with which the organisms interact. In other words, a biological community and its physical environment. Ecosystems can be permanent or temporary, and usually form a number of food webs. **Ecosystem management** is an approach to natural resource management which aims to sustain ecosystems to meet both ecological and human needs in the future. In the case of Atlantic salmon and sea trout, we need to consider both the freshwater (river and loch) and marine (open ocean, inshore water and sea loch) ecosystems.

Salmon farms. At present, all Atlantic salmon raised commercially on marine farms are held in net pens (also known as cages), so that the fish are swimming in natural seawater. A typical salmon farm site in Scotland and Ireland will now hold up to 14 cages. Bigger farms are planned for the future.

Sea lice. Parasites which attach themselves to fish (usually on the fins, and around the head), and graze on their skin. The two types of sea louse which have the biggest impact on Atlantic salmon and sea trout are the salmon louse *Lepeophtheirus salmonis* (known as 'leps') and *Caligus elongatus* (known as 'cals'). By far the most troublesome for farmers within the British Isles is *L. salmonis*. Sea lice are found in the natural marine environment, and their presence is a way for anglers to identify a fish which has come into the river within the last few days. However severe lice infestations can cause stress, and can even cause fish mortalities.

Treatment triggers. Salmon farmers treat their fish with anti-sea-louse medicines at various stages during the marine production cycle, to keep the infestation levels down to an agreed number of adult female lice per fish. This agreed 'trigger level' normally varies according to the time of year; the levels are designed to minimise the number of breeding adult female lice on farmed fish at the time of salmonid smolt migration (normally April to early June).

Single bay management/bay-by-bay management. When first established salmon farm sites operated by different companies were often sited close to one another within sea lochs, fjords and bays. These farm sites often held fish of more than one generation, and were at different stages of the production cycle. Over the last twenty years, experience has shown that sea lice control on farms within mixed-generation bays is extremely difficult. If all fish farms in a single bay or loch contain fish which are the same age, then the production cycle can be synchronised, so that all fish are put into cages at roughly the same time, and harvested at roughly the same time. All the farm sites in that bay can then be left fallow simultaneously. Equally importantly, all farms can be treated for sea lice at the same time, so that a farm which has been treated does not re-infect its untreated neighbour. The farms can also arrange to use anti-lice medicines in rotation, to reduce the build-up of resistant lice. This has been shown to be one of the most effective ways of keeping lice levels on salmon farms under best possible control.

Fallowing. After all the salmon have been harvested from a particular farm site, the cages will be left empty for a time. This helps break the cycle of disease, and also interrupts the breeding cycle of sea lice. The Scottish salmon farmers' Code of Good Practice specifies a minimum fallow period of 4 weeks, although many salmon farming companies choose to allow much longer fallow breaks. One company fallows each bay for a full year after the end of each production cycle, but this is unusual. The process works most effectively if an entire sea loch/bay is fallowed at the same time, so it is an essential part of good single bay management.

Lice dispersion models. During the first stages of its life after hatching from the egg, the larval sea louse can be carried significant distances by wind and tide. Because every bay/sea loch will have different hydrographical and morphological characteristics, tidal currents will also differ from one to another. In the same way, prevailing winds will vary in strength and

direction. Recent scientific studies have shown that, taking these local characteristics and the behaviour of the sea lice larvae into account, it is possible to map, on an experimental basis, the likely dispersion pattern of sea lice larvae emanating from salmon farm cages.

Closed containment systems. Several technology companies in Scandinavia and North America are developing systems for growing Atlantic salmon right through the marine stage of production, to harvest. Such systems would mean that farmed fish would be separated from wild salmonids (and from the environment) by a physical barrier. Both land-based (recirculating) and floating closed containment systems are being trialled. They are likely to offer many benefits to salmon farmers, as they would protect their fish from sea lice, disease, predators and other natural threats such as jellyfish swarms and algal blooms (which cling to the net pens and suffocate the fish). However, no company has yet demonstrated that such a closed system can operate at commercial scale. Modern net pen salmon farms in Scotland are 1000 – 2,500 tonnes, those in Norway even bigger. Production in the closed containment facilities which have been trialled is typically in the range of circa 100 tonnes at most. The capital costs of setting up a closed containment farm would be many times greater than the net pen equivalent, and at present operating costs would also be considerably higher, with a much greater carbon footprint. AST supports urgent investment in R&D to bring closed containment systems to commercial viability,