

# Sea Lice Effect on Wild Atlantic Salmon Fecundity

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Parasitic sea lice are ubiquitous ectoparasites infesting Atlantic salmon (*Salmo salar* L.). In Scotland, the species of interest are the salmonid specialist *Lepeophtheirus salmonis* and the generalist *Caligus elongatus*. They have a planktonic nauplii, followed by the infestive copepodid stage. Once settled, sea lice undergo moults and become mobile. These stages move across host surface feeding on its skin and blood.

In recent decades, wild Atlantic salmon populations have declined globally. This has corresponded with climate change influences on the freshwater and marine environments. Increase in salmon cultivation since 1960s has escalated host and parasite densities, leading to the interest in sea lice – wild salmonid interactions in Scottish coastal waters due to their potential impact on salmon returns.

Laboratory experiments demonstrate that sea lice can elicit sub-lethal effects causing physiological stress, a reduction in growth and body condition (a fitness proxy). At high intensities these effects can be lethal. Reports indicate parasitism may influence return rates in diminished river populations.

We evaluated the influence of sea lice parasitism on the body condition of returning salmon using a model accounting for variables year and parasite density (mobile lice/kg). Using salmon data from Strathy Point (N Scotland) collected with bag nets between 1999-2007, we show that sea lice reduce condition by 4 % (0.7-11.3). Applying this condition effect to data for female salmon indicates an ova reduction by 3.1 % (0.5-10.9) in 1SW and 2.2 % (-1.6-13.3) in MSW. However, a concern with sampling returning salmon is that only fish surviving the marine phase can be recorded. Being more likely to die at sea, fish in poor condition (potentially highly infested) are underrepresented. Thus it is crucial to note, that the described effect from sea lice on condition (and thus fecundity) is likely underrated.

This is the first study revealing a non-lethal impact from sea lice in wild Atlantic salmon.

Furthermore, we also derive a useful proxy (i.e. condition) for fecundity incorporating both fish weight and length, which can improve current management practise. We show that a sea lice-mediated condition-effect has the potential to diminish Atlantic salmon stock components and thus can influence population dynamics.