

# Welfare issues in Atlantic salmon



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## Introduction

This summary covers 'ongrowers' (post-smolt salmon between approximately 100g and slaughter weight). For a full overview and detailed information on welfare issues in the commercial production of Atlantic salmon (including full references) please see the document, "Improving the welfare of farmed Atlantic salmon at rearing".

## Physical wellbeing

Welfare Issue	Problem	Solution
Confinement/ overcrowding	Injury (descaling, snout and flank damage, fin erosion, cataracts, eye damage), water quality is often compromised, social stress	Stocking density should be 10 kg/m <sup>3</sup> to allow for sufficient space for salmon to live with one another with minimal injury and stress. Feed distribution methods should allow all fish access to feed to avoid aggression and fish should be fed to satiety.
Inappropriate water temperature	Confined fish are unable to behaviourally thermoregulate when water temperature is too low or too high, causing physiological stress	Atlantic salmon can adapt to temperatures between 6° and 18°C. Optimal, preferred temperature is 17°C.
Poor water quality	Poor water quality leads to acute and chronic stress, reduced ability to osmoregulate, increased susceptibility to disease, poor body condition, fin erosion, gill damage, reduced growth and increased mortality rates	For highest welfare ensure good water exchange within sea-cages (primarily driven by tide, fish movements, weather and fish densities). Dissolved oxygen levels should be above 80%, and other relevant water parameters (e.g. suspended solids, turbidity, water speed, salinity) should be regularly monitored.
Disease	Many diseases are difficult to diagnose and classify at their early stages, which delays treatment/prevention	Fish should be monitored regularly for signs of health problems <sup>1</sup> by a trained member of staff. When identified, diseased fish must be either treated without delay or humanely euthanised.
Exposure to air	Severe physiological stress; fear and discomfort	Removing fish from the water, for example when estimating the level of sea lice infestation, is one of the most severe stress events, and induces a high cortisol response. Live fish should not be taken out of water without it being absolutely necessary. If this is the case, each fish should not be out of water for more than 15 seconds.

## Physical wellbeing

Welfare Issue	Problem	Solution
Fasting	Hunger; physiological stress; fatigue	Fish must not be fasted for more than 72 hours this includes time for transport and holding time for processing.
Fin erosion	Increases risk of secondary bacterial infection; pain and discomfort	Provide sufficient space and appropriate stocking density for fish to escape from one another; this should be between approximately 15 kg/m <sup>3</sup> to 20 kg/m <sup>3</sup> , and no more than 25 kg/m <sup>3</sup> .
Live transport (road)	Overcrowding; handling stress; water movement and changes in temperature; noise and vibrations in water; changes in light; build-up of waste. May all occur simultaneously, causing severe stress.	For best welfare, fish should not be transported whilst alive, and should be humanely slaughtered on-farm. If live transport is absolutely unavoidable, water quality must be high and constantly monitored during the journey. Additional oxygen should be available in case of delays. Numbers of fish in each tank and stocking densities should be calculated in advance. Tanks should be insulated to ensure constant water temperature. A trained person must be present during the journey who is accountable for the welfare of the fish, and has knowledge of fish welfare principles. Handling should be kept to an absolute minimum during loading and unloading (e.g. through pumping), and sick/injured animals should not be transported.
Slaughter without effective stunning	Ineffective or absence of stunning (e.g. use of carbon dioxide systems)	<p>The use of carbon dioxide systems must be phased out. The use of a single method (i.e. percussive blow or electrocution) that both stuns (instantly) and kills is recommended. Percussive or electrical stunning followed by a separate kill method is also acceptable, providing fish do not regain consciousness after stunning. Acceptable post-stun kill methods are: effectively performed percussive, decapitation, spiking/coring or gill cut (following an effective percussive stun only).</p> <p>If any signs of consciousness are observed then stunning is likely to have been ineffective. If in any doubt as to whether a fish is unconscious, do not hesitate to repeat the stun or use an alternative, back-up method.</p>



## Mental wellbeing

Welfare Issue	Problem	Solution
Crowding	Severe and often chronic social stress (e.g. aggression); decreased water quality	Provide sufficient space and appropriate stocking density for fish to escape from one another.
Barren environment	Chronic lack of cognitive, sensory and physical stimulation	Based on their natural migratory behaviour there is some evidence that currents can be used to enrich salmonid environments but further research to confirm positive welfare is required.

## Natural behaviour

Welfare Issue	Problem	Solution
Aggression	Social conflict/competition may intensify when there is a lack of resources and space to escape leading to increased injury and social stress	If distributed across the water surface, sufficient feed must be provided to discourage high levels of competition for access to food. Self-access feeders may lead to more dominant fish preventing others from feeding. Provide sufficient space and stocking density.
Restriction of behavioural expression	Freedom of movement to swim is severely restricted; lack of space to escape from one another	Provide appropriate space and shelter for fish to rest and escape from one another.
Swimming behaviour	Inadequate water parameters (e.g. low water exchange in a recirculating aquaculture system) can lead to abnormal side swimming and surface swimming behaviour	Maintain high water exchange in recirculating systems; monitor water quality parameters.

<sup>1</sup> In salmon farming major concerns are sea lice, infectious salmon anaemia, pancreas disease, heart and skeletal muscle inflammation, cardiomyopathy syndrome, yersiniosis (Norway) and amoebic gill disease. Several countries reported finding Winter Ulcer Disease in salmon caused by *Moritella viscosa* and in addition flavobacteriosis, furunculosis, and saprolegniosis (Baltic salmon). Cardiomyopathy syndrome caused by PMCV is of increasing concern in Norway as is piscine reovirus infection (PRV1) ([http://www.eurl-fish.eu/Activities/survey\\_and\\_diagnosis](http://www.eurl-fish.eu/Activities/survey_and_diagnosis))