IN TOO DEEP

THE WELFARE OF INTENSIVELY FARMED FISH

A Report for

COMPASSION IN WORLD FARMING TRUST

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"Salmon are animals genetically programmed to spend most of their lives swimming freely through the oceans. We now confine them in tanks or cages in close proximity and frequent physical contact with thousands of others. In the open seas they would probably never have come as close to any other fish of their own kind before returning to spawn.

Most of the more dangerous diseases and parasitic infestations are density dependent. Salmon farmers are continually staving-off disaster in the battle against the onset of new diseases or increasing resistance of the old ones. We may have to think again about the environment we provide for the fish. Extra large cages of the 'high-seas' type, where the growing salmon have more space to exercise, may be a step in the right direction, but health and freedom from disease really depends upon a better understanding of the well-being of the fish."

Stephen Drummond Sedgwick, Salmon Farming Handbook, 1988

Toward a better understanding of fish well-being…

EXECUTIVE SUMMARY

Farmed fish now represent the UK's second largest livestock sector after broiler chickens. The vast majority of the 70 million farmed fish produced annually in the UK are reared intensively. Intensive fish farming, whereby large numbers of fish are confined in a small area, causes serious welfare problems that need to be addressed urgently to prevent further widespread suffering.

Caged & Crowded

Up to 50,000 salmon are confined in each sea cage. They are reared at stocking densities equivalent to each three quarters of a metre long (2.5 ft) salmon being allocated a bathtub of water. Packed this tightly, these natural wanderers of the ocean swim as a group, or shoal, in incessant circles around the cage, like the pacing up and down of caged zoo animals. Fins and tails become worn and damaged as the fish rub against the cage sides or each other.

The stress of crowding and confinement can manifest itself in increased susceptibility to disease. In the last few years, high incidences of severe cataracts have been found in intensively farmed salmon and other species. These often cause blindness. The eye of a fish is one of the first organs to be affected by disease or stressful situations. Salmon farming has also been hit by waves of serious disease outbreaks, such as Furunculosis and Infectious Salmon Anaemia, causing the deaths of millions of fish. Salmon continue to suffer high rates of mortality, accounting for 10-20% of fish during the sea-rearing phase alone.

Trout are stocked at even higher densities. Generally reared in freshwater raceways or earth ponds, trout stocking densities of 60 kg of fish per cubic metre of water (60 kg/m^3) have been found. That is equivalent to 27 trout ready for the table being allocated a bathtub of water. More normal rates are 30-40 kg/m^3. This compares with 15-20 kg/m^3 on Scottish sea cage farms for salmon. Tightly stocked trout again leads to them suffer high levels of injuries to fins and tails, indicating poor welfare.

The prevalence of fin and tail injuries, blinding cataracts, abnormal behaviours, disease outbreaks, serious infestation of salmon by sea lice, and high rates of mortality strongly indicate that current commercial stocking densities for farmed fish are too high. Maximum stocking densities of 10 kg/m^3 for juvenile salmon at sea, and 20 kg/m^3 for trout reared in freshwater should be introduced urgently through legislation. Further reductions should be considered in the light of future practical and scientific evidence, taking full account of welfare indicators such as abnormal behaviour, injuries, disease, parasitic attack, and mortality.

Parasite Infestation

Intensive farming has led to sea lice becoming the greatest single problem for farmed salmon in many areas. Sea lice are small parasitic crustaceans that feed on their host causing fish to lose skin and scales. Lice damage around the head can be so severe that the bone of the living fishes' skull can be exposed – a condition sometimes

referred to as the "death crown". Sea lice infestation is a serious welfare problem, which if untreated, can lead to considerable suffering and death in affected fish.

Large numbers of tightly confined fish together with poorly chosen farm sites can exacerbate problems with these parasites. Wherever possible, sea lice should be dealt with by moving away from high stocking densities and intensive management, and through careful site selection. Sites should have clean, fast-flowing water to reduce the likelihood of serious parasitic attack.

However, current treatments centre on the use of strong nerve toxins that have possible environmental effects. Organophospates and synthetic pyrethroids are used to bath fish that are crowded together in a small amount of water. The procedure itself causes the fish a great deal of stress. A new generation of in-feed treatments for sea lice are now becoming available. These avoid the need for subjecting the fish to stressful crowding and bathing in chemicals, as the chemical treatment is incorporated in the feed. However, residues from these oral treatments are feared to pose a potential danger to wildlife on the seabed.

More 'environmentally-friendly' methods; hydrogen peroxide and cleaner fish have serious animal welfare drawbacks. Bathing fish that have been crowded together with hydrogen peroxide is highly aversive to them, even causing some to die. In 1996, some 3 million wrasse, a small fish that feeds on parasites, were taken from the wild for use on Norwegian salmon farms. The use of these "cleaner fish" presents a serious animal welfare problem. Wrasse often suffer high mortalities from starvation, bullying, being eaten by larger salmon, or dying from the stress of capture and transport to the farm. Hydrogen peroxide and wrasse for treating sea lice are both unacceptable on welfare grounds.

Grading for Size

Fish grow at varying rates. Under confined conditions, larger fish may bully smaller ones, or even cannibalise them. This is minimised on the farm by periodic 'grading' or sorting into different sizes. Grading is a stressful management procedure for fish and may be carried out 3-5 times during the rearing cycle. It usually entails fish being netted or pumped out of their aquatic environment over a series of bars or slats. They drop through the bars according to size. Comparative work is needed to assess the welfare aspects of different grading methods using non-invasive techniques. This work should compare the levels of stress caused by the different grading systems, looking at how much physical damage they cause to the fish (e.g. scale loss and abrasions), the length of time fish go off their feed, and the post-grading 'growth check' – the drop in growth rate in the days immediately after grading. The stress caused to the fish by grading should be minimised.

Transport

Salmon fry are generally reared in freshwater tanks, cages or ponds. In the spring, they undergo physical changes that allow them to tolerate seawater. These 'smolts', or juvenile salmon, are then transferred to sea farms with the help of lorries, helicopters and well boats. Similarly, trout may be transported from the hatchery to rearing farm or for slaughter. Most trout are transported on flatbed lorries.

Movement and transfer can be a frightening experience for fish, and has been described as causing "considerable" stress (Shepherd & Bromage, 1988). To protect fish welfare, transport times should be reduced to the absolute minimum. Water conditions for the fish in transit, such as oxygen levels, carbon dioxide, and pH, should be monitored at frequent intervals.

Biotechnology, Sex-Reversal & the Genetic Engineer

Biotechnology to produce chromosome-manipulated fish known as "triploid" is widely used in the UK trout industry. Newly fertilised eggs are subjected to heat or pressure shock so that cells carry three sets of chromosomes instead of the normal two. This causes the resulting fish to be sterile for production reasons. It also causes a range of health and welfare problems. Triploid fish have been found with higher levels of spinal deformities, breathing difficulties, low blood haemoglobin levels, a lowered ability to cope with stressful situations, and higher rates of mortality.

The triploidy process is usually used in conjunction with a technique to induce all-female fish through sex reversal. This involves feeding the male sex hormone, testosterone, to young female brood fish, and using their eventual eggs to produce later maturing female only fish, allowing them to be reared for longer without adversely affecting flesh quality. Tens of millions of trout eggs are produced in Britain this way. CIWF Trust believes that biotechnology techniques involving chromosome manipulation (e.g. sex reversal and triploidy) should be prohibited.

Current industrial fish farming is highly intensive. Genetic engineering using transgenic methods threatens to increase the level of intensification still further, potentially causing even more suffering to farmed fish. Genetic engineering can also cause welfare problems in itself, with transgenic salmonids for example, having difficulties breathing, feeding, and developing normally. Fish, in common with other farm animals, are sentient beings that can experience suffering. Genetic engineering should not be used to further relegate them to the status of animal machines. The use of genetic engineered fish for farming should be prohibited.

Starvation & Slaughter

Farmed fish are normally starved for about 7-10 days before slaughter. It is said that this is to empty their gut and minimise the risk of the flesh becoming contaminated when gutted. However, gut clearance only takes 24-72 hours. Farmed fish are conditioned over months and years to expect frequent and plentiful feed. To suddenly cut off that feed is likely to be detrimental to their welfare. CIWF Trust believes that starvation periods of longer than 72 hours should be prohibited.

About 40 million salmon and 30 million trout are slaughtered annually in the UK. That represents more animals than all the pigs, sheep, cattle and turkeys killed altogether. Some widely used slaughter methods for farmed fish cause appalling suffering. So much so that the perpetrators would be prosecuted if they were slaughtering other farm animals in a similar way. Widely used slaughter methods in the trout industry, for example, include the suffocation of fish in air or on ice. In the latter method, the cooling effect of the ice prolongs the time it takes for the fish to become unconscious, with fish being able to feel what is happening to them almost 15

minutes after being taken out of the water. The Government's advisory Farm Animal Welfare Council (1996) condemned this killing method, recommending that it be prohibited. Nearly five years on, it remains widely used.

Another inhumane slaughter method often used for salmon and trout is the use of carbon dioxide stunning. The bath of carbon dioxide saturated water causes the fish to thrash around the killing container. They stop moving after 30 seconds, but do not lose consciousness for 4-9 minutes. Salmon usually have their gills cut after stunning and are allowed to bleed to death. The prolonged procedure is inhumane in itself. However, as carbon dioxide causes immobility long before unconsciousness, there is a real danger that fish remain conscious but unable to move as they are bleeding to death.

Inhumane and totally unacceptable slaughter methods, that can take a long time for fish to lose consciousness and die, should be prohibited urgently. These include suffocating fish in air or on ice, bleeding to death without pre-stunning, and the use of carbon dioxide for stunning.

Only slaughter methods that cause an instant death or render the fish instantly insensible to pain until dead should be permitted. These include percussive stunning techniques whereby fish are rendered instantly unconscious when carried out efficiently. Also electrocution methods where properly designed and carried out effectively. In the case of electrocution, the electric current must be sufficient to stun and kill the fish otherwise considerable suffering could result.

Dead Seals & Declining Salmon

Intensive fish farming has resulted in salmon and trout being readily available at affordable prices at the supermarket checkout. However, the true cost not only includes the suffering of the fish themselves, but also the damage inflicted on the environment. Huge numbers of fish in one place form an irresistible attraction to wildlife such as fish eating birds, seals, mink and otters. Some fish farmers have seen the killing of wild animals as a legitimate part of predator control. So much so, that the real price of farmed salmon includes the killing of an estimated 3,500 seals around Scottish fish farms each year. CIWF Trust believes this appalling destruction of wildlife is entirely unacceptable. Wildlife should not be shot, drowned or otherwise harmed as an anti-predator measure.

CIWF Trust believes that every precaution should be taken to avoid predators gaining access to the stock through the use of anti-predator nets and other non-lethal deterrents.

It is often claimed that fish farming may take the pressure off stocks of wild-caught fish by providing an alternative. However, the reverse is true. The farming of carnivorous fish such as salmon, trout, halibut and cod adds to the pressure on wild fish stocks and is therefore environmentally unsustainable. Over 3 tonnes of wild-caught fish are needed to produce 1 tonne of farmed salmon. It also takes nearly 2.5 tonnes of wild fish to produce 1 tonne of trout. For the newly farmed marine species such as halibut and cod, the ratio is over 5 times the weight of wild fish to produce an amount of farmed fish.

Escapes from fish farms have become a fact of life. During 1999, 255,000 salmon and 17,000 trout escaped from Scottish fish farms. Escaped farmed salmon now outnumber catches of wild salmon by more than four to one. 'Genetic pollution' from escapees breeding with wild salmon can have a detrimental effect on the survival of wild populations. This is because wild fish are genetically adapted to life in their local environment. Any genetic mixing can reduce their ability to cope and survive. This problem is compounded by wild fish becoming infested with sea lice from salmon farms, causing them to suffer increased death rates. The link between farmed salmon and declines in wild fish stocks is now recognised as being at near-crisis level. CIWF Trust believes that action must be taken to prevent farmed fish from escaping into the environment.

Alternatives for Consumers

The sheer scale and intensity of fish farming in Europe causes serious welfare problems. In recent years, organic farmers have been developing an alternative. Organic fish farming offers consumers a semi-intensive alternative to industrially reared salmon and trout. Fish are reared at lower stocking densities and with strict slaughter standards, giving UK organic standards strong welfare-friendly credentials. However, the standards currently allow the treatment of salmon sea lice using cleaner fish (wrasse) and bathing in hydrogen peroxide, both methods that are not welfare-friendly. Along with allowing prolonged starvation of fish before slaughter, these are welfare oversights that should be addressed urgently.

An extensive alternative already widely practiced in Japan and Alaska is sea ranching. This involves rearing young fish such as salmon, and releasing them when they would naturally migrate to sea. The fish then grow out at sea where they feed on a natural and totally unrestricted basis. When they mature, the fish return to their release river where they can be captured. Through allowing fish to grow in their natural environment, this method has potential for high levels of welfare. However, increased natural threats such as predation and food shortage should be borne in mind. The potential for sea ranching to damage wild stocks through interbreeding – genetic pollution - should be addressed before going ahead with any venture of this nature.

Previous advice to consumers worried about the welfare, environmental and health aspects of farmed fish was to buy only wild fish. However, wild salmon populations have now declined to the point where wild fish is difficult to come by in the UK, and is much more expensive than farmed fish. Tinned wild Pacific salmon from the Pacific coasts of Canada and the USA is more readily available (BBC, 2001).

Alternatively, supermarkets are now stocking organic salmon and trout. These are produced less intensively, free from artificial chemicals and colorants, and higher welfare standards. To make sure that a fish is organic, the labels on the packaging or tags must read "farmed" and "organic", and will carry the symbol of the relevant organic organisation.

SUMMARY OF RECOMMENDATIONS

1. **Maximum stocking densities of 10 kg/m^3 for salmon smolts at sea, and 20 kg/m^3 for trout reared in freshwater should be introduced urgently through legislation. Further reductions should be considered in the light of future practical and scientific evidence, taking full account of welfare indicators such as abnormal behaviour, injuries, disease, parasitic attack, and mortality.**

2. **Salmon sea lice infestation should be controlled by reduced stocking densities and less intensive management. Careful site selection should ensure clean, fast-flowing water to reduce the likelihood of serious parasitic attack.**

3. **The use of hydrogen peroxide and wrasse for treating sea lice are unacceptable on welfare grounds.**

4. **Comparative work is needed to assess the welfare aspects of different grading methods using non-invasive techniques. This work should compare the levels of stress caused by the different grading systems, looking at how much physical damage they cause to the fish (e.g. scale loss and abrasions), the length of time fish go off their feed, and the post-grading 'growth check' – the drop in growth rate in the days immediately after grading. The stress caused to the fish by grading should be minimised.**

5. **To protect fish welfare, transport times should be reduced to the absolute minimum. Water conditions for the fish in transit, such as oxygen levels, carbon dioxide, and pH, should be monitored at frequent intervals.**

6. **Biotechnology techniques involving chromosome manipulation (e.g. sex reversal and triploidy) should be prohibited.**

7. **The use of genetic engineered fish for farming should be prohibited.**

8. **The usual practice of starving farmed fish for several days, even weeks, before slaughter is likely to be detrimental to fish welfare. Starvation periods of longer than 72 hours should be prohibited.**

9. **Widely used slaughter methods for farmed fish such as suffocating fish in air or on ice, bleeding to death without pre-stunning, and the use of carbon dioxide for stunning are inhumane, totally unacceptable, and should be prohibited urgently.**

10. **Only slaughter methods that cause an instant death or render fish instantly insensible to pain until dead should be permitted. These include percussive stunning techniques and electrocution where properly designed and effectively carried out. In the case of electrocution, the**

electric current must be sufficient to stun and kill the fish otherwise considerable suffering could result.

11. **Wildlife should not be shot, drowned or otherwise harmed as an anti-predator measure. Every precaution should be taken to avoid predators gaining access to the stock through the use of anti-predator nets and other non-lethal deterrents.**

12. **In view of the fact that the farming of salmon, trout, halibut and cod adds pressure to wild fish stocks and is therefore environmentally damaging, the sustainability of intensive fish farming should be reviewed.**

13. **Action must be taken to prevent farmed fish escaping into the environment and thereby jeopardising wild fish populations.**

14. **Organic fish farming offers consumers a semi-intensive alternative to industrially reared salmon and trout. However, allowing the treatment of sea lice in salmon using cleaner fish (wrasse) and bathing in hydrogen peroxide, along with prolonged starvation of fish before slaughter, are welfare oversights within organic standards and should be addressed urgently.**

15. **Sea ranching offers an extensive alternative to intensive fish farming. It involves the release of juvenile salmon into their natural environment where they grow and have the potential for high welfare. The potential for sea ranching to damage wild stocks through interbreeding – genetic pollution - should be addressed before going ahead with any such venture.**

APPENDIX

GLOSSARY

Alevin	newly hatched fry of the salmon family that are feeding from the yolk-sac
Brood stock	fish set aside for breeding purposes
Fallowing	a rest period for cages or ponds without fish
Fingerling	fish of about finger length or 10 cm long
Fry	young fish, between alevin and fingerling stages that are external food
Grilse	a salmon that becomes sexually mature after one summer at sea
Milking	the stripping of milt from male fish
Milt	the semen of male fish
Parr	fingerling salmon distinguished by a series of darker patches, or parr marks, on the flanks
Photoperiod	the period of light during 24-hours
Priest	a hand-held club used to stun fish percussively at slaughter
Raceway	a long tank, usually of concrete, through which water flows at a steady rate
Smolt	the juvenile salmon after parr stage, silver in appearance that is able to enter seawater.
Stunning	a process which causes loss of consciousness in an animal
Triploid	an animal with three sets of chromosomes (containing genetic material - DNA) instead of the usual two