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Introduction

The 'RSPCA welfare standards for farmed Atlantic salmon' (*Salmo salar*) cover the two distinct phases of farming (freshwater and marine farming).

They take account of legislation, official codes of practice, scientific research, veterinary advice, recommendations of FAWC and the practical experience of the aquaculture industry. However, difficulties arise in specifying details in relation to several issues (for example, acceptable maximum stocking densities) due to the lack of scientific research examining fish welfare under different commercial systems. It is important to recognise therefore that the following requirements are made pending the relevant scientific research. To this end, the farmer is expected to maintain higher welfare standards at all times and demonstrate commitment to continual improvement as advances in knowledge and technology allow.

Scientific evidence from behavioural, physiological and anatomical studies shows that it is highly likely that fish feel pain. Fish also have a similar stress response system to mammals. It is essential that staff managing farmed fish are aware of the importance of welfare as an integral part of production.

A written Veterinary Health Plan (VHP) must be drawn up, which is regularly updated, in order to ensure higher standards of welfare. Each farm must have a designated fish veterinary surgeon available to advise on fish health matters and able to attend at short notice in case of disease. An Environmental Impact Management Plan must also be drawn up to closely monitor and minimise any effects of the operation on the wider environment.

The 'Five Freedoms' as defined by FAWC are relevant to fish welfare and should be considered in relation to husbandry practice.

- ▶ **Freedom from thirst, hunger and malnutrition**
by access to an appropriate high quality diet and an environment in which fluid and electrolyte balance can be maintained.
- ▶ **Freedom from discomfort**
by maintaining the water at an appropriate temperature and chemical composition and providing well designed enclosures or tanks, with shading if necessary.
- ▶ **Freedom from pain, injury or disease**
by avoiding situations which are likely to cause pain, injury or disease, by rapid diagnosis and treatment of disease and humane killing.
- ▶ **Freedom to express normal behaviour**
by providing the appropriate space and environment for the species.
- ▶ **Freedom from fear and distress**
by minimising stressful situations such as handling or predator attack as far as possible, by making gradual changes to husbandry and water quality, and by humane slaughter.

The Five Freedoms will be better provided for if those who have care of livestock practise:

- **caring and responsible planning and management**
- **skilled, knowledgeable and conscientious stockmanship**
- **appropriate environmental design**
- **considerate handling and transport**
- **humane slaughter.**

Guide to the use of the RSPCA welfare standards

- (i) At the head of each section the broad objectives of the welfare standards are described.
- (ii) The numbered requirements are the standards, all of which must be complied with.
- (iii) Boxed sections (indicated by ⓘ) give additional advice or may highlight areas where the standards will be reviewed in the future.
- (iv) It is assumed that all relevant legislation regarding farm animal husbandry and welfare on-farm, during transport, and at slaughter, will be fully implemented in addition to the RSPCA welfare standards.

Freedom Food Ltd

Freedom Food is a wholly owned subsidiary of the RSPCA, formed to implement these standards. Upon satisfactory inspection farmers, hauliers, slaughterers, processors and retailers may subscribe to the scheme and use the Freedom Food trademark. All participants are regularly assessed by Freedom Food Ltd. A charge is levied to cover inspection, administration and marketing costs. Participants are also randomly monitored by members of the RSPCA Farm Animals Department, free of charge.

It is the intention of Freedom Food Ltd to establish sister, franchise organisations in other countries working to the RSPCA welfare standards and therefore, in time, establish a common and consistent message for consumers around the world.

Freedom Food Ltd is non-profit making. Any surplus income will be used to fund research into farm animal welfare.

Freshwater (pre-smoltification/juvenile fish)

The freshwater phase of the Atlantic Salmon lifecycle involves a number of separate stages. These stages range from the egg through to the fully smolted fish. All of them require detailed standards which ensure the welfare of the fish through the stages of the freshwater phase. These standards also need to ensure that the fish are fully prepared for the seawater phase of their lives. The welfare standards pertaining to the seawater phase are contained elsewhere in this document.

- * **i** For the purposes of these standards the following definitions apply:
- **Green eggs**
Fertilised eggs that are water hardened up to the time that you can see the initial pigment of the fish eye with the naked human eye. This will be at approximately 220 to 250 degree days.
 - **Eyed eggs**
Eggs that have reached the stage of development where the black spot of the eye is clearly visible. Approximately 220 to 250 degree days post spawn.
 - **Alevins**
Hatched eggs not yet ready for first feeding.
 - **Fry**
Starting from first feeding up to 1 gram.
 - **Parr**
Greater than 1 gram and up to the start of smoltification.
 - **Pre-smolt**
The final production period when fish undergo smoltification from parr to smolt.
 - **Smolts**
Fully smolted.

i These standards relate to both re-circulation and flow through systems.

General

i There are areas of ongoing research which are designed to add to our knowledge about the welfare of the eggs and the fish at this stage of their lifecycle. If any new scientific evidence emanating from this research is shown to have a positive effect on the welfare of the eggs and fish involved, the RSPCA will seek to incorporate this information into subsequent versions of their standards. Some of this research may challenge what is at present deemed to be established practice. For example, if it is concluded that the production of a certain type of smolt is detrimental to its welfare, the RSPCA will not permit such fish to be produced as a part of the RSPCA welfare standards.

FW 1.1 Eggs and juvenile fish must be produced either in-house or obtained from another Freedom Food-approved supplier.

FW 1.2 All eggs must be tested for specified fish pathogens as required under the relevant European and national legislation.

Freshwater

FW 1.3 Eggs and juvenile fish supplied by third parties must be accompanied by full health documentation and records of the parent stock as well as the eggs and juvenile fish themselves.

FW 1.4 Supply water must:

- a) be of high quality (see FW 1.6)
- b) if necessary, be filtered or treated with ultra violet radiation.

FW 1.5 * The following maximum stocking densities must not be exceeded:

| | Maximum stocking density |
|----------------------------|---------------------------------|
| Hatchery | 15000/m ² |
| Multi level | 20000 eggs per standard tray |
| First feeding tank | 10000/m ² |
| Freshwater production tank | 30kg/m ³ |

*

i Research shows that stocking density in itself is not necessarily a valid indicator of fish welfare. The RSPCA believes that stocking density should be calculated according to the weight of the fish, rather than simply having one stocking density covering the freshwater stage of the lifecycle, from the time of first feeding. We are therefore proposing to introduce a banded stocking density system based on the weight of the fish.

The RSPCA also believes that the measurement of fish welfare indicators have an increasingly important role to play in helping to determine the welfare of the fish within the context of farm assurance. With this in mind, research has been commissioned by the Institute of Aquaculture at the University of Stirling, to investigate the potential effects that stocking density may have on the welfare of the fish, and also which welfare indicators are the most valid, in terms of enabling us to ascertain the level of welfare of the fish at any one site.

The information that we get from this work will be used to inform the standards. Until we have these results the current standards must apply.

FW 1.6 * The following water quality parameters must be complied with when water quality is managed.

| Parameter | Green Eggs | Eyed Eggs | Alevins/Fry | Parr/Smolt |
|---|-------------------|------------------|--------------------|-------------------|
| Oxygen (O ₂) mg/l | 7.0 | 7.0 | 7.0 | 7.0 |
| Oxygen (O ₂) saturation % in exit water | >90.0 | >90.0 | >70.0 | >70.0 |
| Free ammonia (NH ₃) mg/l | N/A | <0.025 | <0.025 | <0.025 |
| Carbon dioxide (CO ₂) mg/l | <10.0 | <10.0 | <6.0 | <10.0 |
| Max temp °C | 8.0 | 8.0 | 10.0 to 12.0 | 16.0 |
| Min temp °C | 1.0 | 1.0 | 1.0 | 1.0 |
| pH in inlet water | 5.5 to 8.0 | 5.5 to 8.0 | 5.5 to 8.0 | 5.5 to 8.0 |
| Non-spate suspended solids (turbidity) mg/l | <25.0 | <25.0 | <25.0 | <25.0 |
| Nitrite mg/l † | <0.2 | <0.2 | <0.2 | <0.2 |
| Nitrate mg/l | N/A | N/A | <50.0 | <50.0 |

† The RSPCA acknowledges that for fully functioning recirculation systems nitrate levels will be above 50mg/l.

Freshwater

*

i A water quality section on recirculation systems is being developed by the RSPCA and will be included in a future edition of the RSPCA welfare standards.

i Super-saturated water can compromise fish welfare. Levels of oxygen, carbon dioxide and nitrogen should be regularly monitored in order to avoid this. As our knowledge of the water quality needs of the fish improves, it may be necessary to change and/or add to the constituents in the above table. For example the inclusion of parameters associated with the mineral content of the water may be appropriate as we get more information about their effect on the welfare of the fish.

In order to ensure due diligence with regard to the welfare of the fish, it is expected that all water quality parameters with the potential to affect welfare are measured.

FW 1.7 * Flow rates must be such that fish can comfortably maintain their position in the water column.

Green eggs

- FW 2.1** All equipment must be:
- maintained in full working order
 - serviced and repaired as required.
- FW 2.2** Records must be kept of equipment services.
- FW 2.3** The hatching environment must minimise movement of the eggs.
- FW 2.4** Flow and/or oxygen alarms must be fitted to all water intakes to the unit.
- FW 2.5** All alarms must be checked weekly and records kept.
- FW 2.6** There must be a screen to prevent the blocking of inlet valves.
- FW 2.6.1** Inlet valves must be regularly checked (at least daily).
- FW 2.7** All eggs must be disinfected prior to entry to the ongrowing facility.
- FW 2.8** Eggs must be water-hardened before being exposed to disinfectant or transportation.
- FW 2.9** Eggs being transported must be carried with twice the volume of water than eggs.
- FW 2.10** Water flow and tank design must be such that 'dead spots' within the tank/tray do not occur, i.e. it must be sufficient to provide oxygen and remove waste products.
- FW 2.11** Eggs must be placed into the hatching environment to ensure maximum survival rates and be accessible for picking.
- FW 2.12** Conditions in the hatching environment must be hygienic and free from any rough edges that could cause damage to the eggs.
- FW 2.13** Where multi-layer systems such as buckets are used, it must be demonstrated that water hygiene and the integrity of the eggs are maintained.

Freshwater

- FW 2.14** To prevent the spread of disease there must be no cross contamination of water from one container to another.
- FW 2.15** After placement, green eggs must remain undisturbed (other than for picking) for 250 degree days.
- FW 2.16 *** Where picking is practised, dead/unviable eggs must be removed as required with minimum disturbance.
- FW 2.17** Regular inspections must be made to ensure the earliest detection of fungal infections.
- FW 2.18** Eggs must not be shocked before 250 degree days or after 370 degree days.
- FW 2.19** The shocking method must be identified and must not be such that it causes excessive mortalities.
- FW 2.20** Training records must be available which identify those who are competent to perform shocking.
- FW 2.21** Shocking onto a dry surface is prohibited.

Eyed eggs

- FW 3.1** A suitable substrate must be in place before hatching.
- FW 3.2** The transportation of eyed eggs must be done using purpose built boxes.
- FW 3.3** Eggs must not be transported at a depth greater than 4cm.


 Ice can be used above the eggs to allow cooling water to drip through to maintain moisture levels.

Alevins

- FW 4.1** The hatching substrate must provide a secure environment for the alevins without encouraging bunching.
- FW 4.2** All alevins must be inspected daily and any dead ones removed.
- FW 4.3** The siphoning of alevins is allowed, but nets must not be used to transfer them when they weigh under 0.5 grams.
- FW 4.4 *** Abrupt changes in light levels must be avoided.
- FW 4.5** Where water temperature manipulation is practised, fluctuation in temperature and temperature gradient must be kept to a minimum.
- FW 4.6 *** Feeding must start when 90% of the alevins have lost their yolk sac.

Freshwater

* Multi-level hatchery systems

- *  The stocking density calculation for multi-level systems is different from a traditional flowthrough or recirculation system in that, rather than calculating stocking density in square metres, it is calculated per tray. This is because each tray has the ability to maintain its own ecosystem for the eggs.

The following standards must be read in conjunction with the existing hatchery standards.

- FW 5.1 *** Each tray must have its own water intake.
- FW 5.2 *** The flow in each tray must be visible and/or measurable and must be monitored to ensure maximum survival of the eggs.
- FW 5.3 *** Trays must be easily accessible in order to perform tasks such as removing deads without disturbing the other trays.
- FW 5.4 *** The maximum stocking density in each tray must not exceed 20,000 eggs per tray (tray size 55 x 53 cm approx) with eggs no more than 3 deep.
- FW 5.5 *** Producers must be able to demonstrate that mortality was below 5% for the previous year, if intending to stock above 15,000.

Fry

- FW 6.1** Fish must have access to sufficient food to maintain them in full health and vigour.
- FW 6.2** Feed must be:
- available to appetite
 - spread at regular intervals.
- FW 6.3** Light levels must be such that they allow all fish in the water column to see the feed at all times.

 The RSPCA is investigating whether supplying a dark period is of benefit to the welfare of the fish.

- FW 6.4** Water flow rates must be such that the fry can hold and adjust their position in the water easily.
- FW 6.5** All tanks must have individual nets/cleaning equipment.
- FW 6.6** There must not be any grading before the majority of fish weigh a minimum of 1.3 grams.
- FW 6.7** The load of suspended solids must allow visibility to the bottom of the tank.
- FW 6.8** The water depth must be appropriate to the tank being used in order to be able to maintain optimum water quality levels.
- FW 6.9** As the fish leave the bottom of the tank, the water depth must be adjusted to allow natural behaviour.

Freshwater

Parr


- FW 7.1** The water temperature must not be manipulated above 16°C unless required by a veterinary surgeon.
- FW 7.2 *** Feed withdrawal prior to grading must not exceed 48 hours.
- FW 7.3** Parr must only be crowded for a maximum of 2 hours.
- FW 7.4** Grading must only start when the majority of fish weigh in excess of 1.3 grams.
- FW 7.5** The grader must be suitable for the size and type of fish.
- FW 7.6** All staff must be fully trained and competent to use the chosen grading system.
- FW 7.7** Parr must be able to hold and adjust their position in the water easily.
- FW 7.8** When dealing with more than individual fish below 5 grams in weight that require culling, they must be put into an anaesthetic mixture as prescribed by a vet.
- FW 7.9** Individual smolts over 5 grams in weight that require culling must be dispatched using a percussive blow.
- FW 7.10** Measures must be in place to prevent fish escaping.

Freshwater lochs

- FW 8.1** In some adverse environmental conditions it may be necessary to temporarily withdraw feed to avoid compromising the welfare of the fish through the increased risk of de-oxygenated conditions arising, for example, during an algal bloom. This withdrawal period must be:
- a) kept to a minimum
 - * b) recorded in the VHP (see H 1.1).
- FW 8.2** Nets used in freshwater lochs must be managed hygienically.
- FW 8.3** Deterioration of water quality due to fouled nets or over feeding must be avoided.
- FW 8.4** The stocking density in freshwater enclosures must not exceed 8 kg/m³.

Pre-smoltification

- FW 9.1** Visual checks and observations must be made for several weeks during the period prior to smolting (silvering, swim pattern, shape).

 As a guide, the RSPCA recommends the use of the smolt scoring system as amended, of C. Findlay, of the Fish Vet Group Inverness.

Freshwater

Smolt score

| Score | Appearance |
|-------|--|
| 1 | Parr marks clear, light coloured back, flanks green, belly yellow, no silvering. |
| 2 | Parr marks fading, back and fins light, flanks starting to silver, belly yellow. |
| 3 | Parr marks faint, back and fins darkening, flanks silver, belly whitening. |
| 4 | Parr marks very faint, dark back, yellow only around fin bases and operculum, flanks silver. |
| 5 | Parr marks gone, back dark, dark margin to fin edges, flanks silver, belly white, silvering colour dominant. |

FW 9.2 The smoltification process must be closely monitored for several weeks as detailed in the Veterinary Health Plan (see H 1.1).

FW 9.3 The use of hypertonic water (water above 35 parts/1000) for smolt survival testing is prohibited.

*  **The RSPCA's preferred technique for testing that all fish are fully smoltified at the correct time is the ATPase test.**

FW 9.3.1 * Producers must be able to demonstrate that they have done everything possible to ensure maximum survival when smolts are transferred to sea.

FW 9.4 Feed withdrawal prior to transfer to sea must be no greater than 48 hours.

FW 9.5 * After transfer to sea, smolts must not be handled for at least 120 days, for example not crowded.

Vaccination

FW 10.1 The VHP (see H 1.1) must incorporate a vaccination programme to protect fish from diseases for which an effective vaccine is available and which may represent a risk to the fish.

 **If effective oral vaccines are developed these should be the preferred method of vaccination.**

FW 10.2 All vaccination procedures must be conducted with care and with the minimum possible distress caused to the fish.

FW 10.3 Vaccination at 1 gram liveweight must be by the immersion method only.

FW 10.4 * Vaccines and anaesthetics must be used according to manufacturers' instructions.

FW 10.5 * All fish must be anaesthetised before being vaccinated, unless there are good health and welfare reasons not to.

FW 10.6 Following vaccination, any gradients from the vaccination table to the recovery tank must be such that the fish are not at risk of hitting the bottom of the tank or other fish.

FW 10.7 The depth and flow of water must be closely monitored to ensure that returning fish are not returned to water that is either too shallow, or at an incorrect flow rate, depth or quality.

Freshwater

- FW 10.8** Water temperature for vaccination must be according to manufacturers' instructions.
- FW 10.9** Care must be taken when returning to the recovery tank following vaccination.
- FW 10.10** Oxygen levels in the recovery tank must be:
- a) monitored regularly
 - * b) maintained at a minimum of 7 mg/litre.
- FW 10.11** Fish must be checked at regular intervals to ensure that vaccinations are being performed correctly and consistently.
- FW 10.12** The vaccination procedure must be subject to an annual third party audit.
- FW 10.13** All of those involved in vaccinating fish must be trained and competent to do so.

Auto-vaccination

- FW 11.1 *** All fish must have been pre-graded before they are vaccinated.
- FW 11.2 *** An assessment of fish condition must be made before the grading process begins to ensure that they are robust enough to endure the grading procedure.
- FW 11.3 *** The machine must:
- a) be calibrated according to the size of the fish, taking into account the vaccination depth, position, angle and dosage of the vaccine
 - b) be checked for the correct calibration at least once per hour during the vaccination process.
- FW 11.4 *** A sample number of fish must be vaccinated to check the calibration before the main process is started.
- FW 11.5 *** The sample fish must be humanely dispatched before any inspections to check for vaccination accuracy.
- FW 11.6 *** All fish must be anaesthetised before being vaccinated.
- FW 11.7 *** There must be back-up systems and contingency plans in place in order to deal with system malfunctions and breakdowns in order to safeguard the welfare of the fish.
- FW 11.8 *** Needles must be inspected at least every two hours and replaced if necessary.
- FW 11.9 *** After transportation, the machine must be thoroughly checked to ensure that any working parts have not been damaged during the transportation process.

Management and stockmanship

The attitudes and competence of staff are a vital factor determining whether high standards of fish welfare can be achieved. It is the responsibility of management to ensure there is a welfare ethos among staff. It is essential that stock-keepers are suitably trained and experienced, and are able to recognise indicators of poor welfare at an early stage. They must have a good working knowledge of the husbandry system used and the animals under their care.

- M 1.1 *** All records and other documentation that the '*RSPCA welfare standards for farmed Atlantic salmon*' require the producer to keep and maintain, must be made available to the Freedom Food Assessor and RSPCA Farm Livestock Officer.

Managers and stock-keepers

- M 2.1** Managers must ensure that all stock-keepers:
- a) have a copy of the current version of the '*RSPCA welfare standards for farmed Atlantic salmon*' at each site
 - b) are familiar with its content
 - c) understand and apply its content
 - * d) have a), b) and c) as part of their induction program.

- M 2.2** Managers must:
- a) ensure that all staff working with stock are trained and competent in aspects of fish husbandry and welfare, relevant to their duties
 - * b) have attended a recognised fish welfare course.

*  **Examples of recognised courses include the NAFC Marine Centre Fish Welfare Training course and the University of Bristol AWTraining Fish Welfare Officer course.**

- M 2.3** Written records of staff training must be maintained.

- M 2.4** An adequate number of experienced staff must be available to deal sufficiently quickly with any problems that arise.

- M 2.5 *** Managers must:
- a) develop and implement plans and precautions to cope with emergencies such as fire, leaks, problems with transportation, etc.
 - b) provide an emergency action board, sited in a prominent position, which must include:
 - appropriate emergency contact numbers
 - a map grid reference and postcode for the location of the unit.

- M 2.6** Stock-keepers must be able to demonstrate their proficiency in procedures that have the potential to cause pain or distress including netting or other handling, crowding and euthanasia.

Management and stockmanship

- M 2.7** Stock-keepers must be able to recognise indicators of poor welfare in fish including abnormal behaviour, physical injury and symptoms of disease.
- M 2.8** Managers must ensure the Veterinary Health Plan (VHP) is drawn up (see H 1.1), implemented and regularly updated.

Inspection and records

- M 3.1** Any welfare problems seen during an inspection by the producer must be dealt with appropriately and without delay.

i Welfare problems of sufficient severity that they should have been noticed on previous inspections and dealt with, shall be taken by the Freedom Food Assessor or RSPCA Farm Livestock Officer as evidence of negligence of duties by the stock-keeper.

- M 3.2 *** Fish must be inspected at regular intervals, at least twice daily, weather permitting.

i It is the responsibility of the person caring for the fish to ensure that suitably regular and thorough inspections are being made.

- M 3.3** Full records must be maintained of inspections, including:

- a) the time and date of inspection
- b) the name(s) and signature(s) of the person(s) conducting the inspection for each group of animals
- c) details of any problems identified and any action taken.

- M 3.4** If problems are identified during an inspection, the stock-keeper must act promptly to discover the cause and take remedial action, in consultation with a veterinary surgeon when necessary.

- M 3.5 *** High standards of biosecurity must be maintained to avoid the spread of diseases between different populations of fish, as specified in a written policy, contained within the VHP (see H 1.1).

- M 3.6** Removal of dead fish must occur frequently, and at least twice a week, except when adverse weather conditions mean this would involve danger to personnel.

- M 3.7** The cause of death of all fish must be classified using the categories developed in the VHP (see H 1.1).

i Veterinary advice should be sought if the cause of death is not clear according to the criteria identified in the VHP (see H 1.1).

- M 3.8** Relevant staff must demonstrate competence in interpretation of mortality records.

Management and stockmanship

- M 3.9** Any equipment defects must be immediately rectified or, if this is not possible, alternative measures must be taken to safeguard fish welfare.
- M 3.10 *** Alternative measures relating to M 3.9 must be written into the Emergency Action Plan section of the VHP (see H 1.1) and all staff must be made aware of them.
- M 3.11** Stock-keepers must be able to recognise:
- a) visual indicators of poor water
 - b) behavioural indicators of poor water quality.
- M 3.12** The following accurate and up-to-date records must be maintained:
- Details of origin of stock, allowing traceability
 - Age of fish
 - Pest control/predator control
 - Crowding and grading records
 - Calibration records
 - Numbers and weights of fish in each tank/enclosure
 - Estimated current stocking densities in each tank/enclosure
 - Where appropriate, target age and weight at which fish will be transferred to sea or slaughtered (in order to predict final stocking densities)
 - Details of fish and equipment inspections
 - Daily and cumulative mortality (reasons stated)
 - Daily and cumulative culling (reasons stated)
 - Feed consumption
 - Details of any health problems
 - Details of any medication/vaccinations applied
 - Records of smoltification monitoring
 - SEPA correspondence
 - Records of water quality tests as appropriate to the system (see E 4.1)
 - Records of net inspections and maintenance
 - Training records
 - Full details of fish movements


Husbandry practices

High standards of husbandry must be maintained at all times with the welfare of stock being considered as a priority. Animals must be handled in a considerate and skilled manner. Caring and responsible planning and management must be employed to safeguard welfare during essential procedures.

Handling

- HP 1.1** Removal from water and handling must only be carried out when absolutely necessary.
- HP 1.2** If fish must be handled:
- a) adequate support must be given to the body
 - b) live fish must never be held by the tail only or thrown on solid objects.
- HP 1.3** Time out of water must:
- a) be kept to the minimum possible
 - b) never exceed 15 seconds for a live fish (unless anaesthetised).
- HP 1.4** Where pumps and pipes are used these must:
- a) not unnecessarily stress fish
 - * b) be free from sharp protrusions, kinks and bends that are likely to injure fish.
- HP 1.4.1 *** Wherever pipes are used there must be a humane method in place to ensure that all fish have been removed from the pipe at the end of the operation.
- HP 1.5** When hand nets are used they must be:
- a) of a suitable size
 - b) designed to avoid the occurrence of physical damage
 - c) kept clean, disinfected and in good repair.
- HP 1.6** A different net must be used for handling fish from different populations to reduce the risk of disease transmission.
- HP 1.7 *** Fish must not be left to die in air.

Crowding and grading (general)

- *  Consideration should be given to stocking tanks and enclosures to final biomass from their initial stocking, so that fish do not require grading or handling at all throughout that part of the production cycle.

Husbandry practices


- * **i** Optimising husbandry practices and farming environments can significantly reduce the creation of size hierarchies within populations, and therefore also reduce the requirement to grade. For example, evidence shows that feed distribution and ration size are extremely important, as is knowing how many fish and of what size are present in the population. Underfeeding quickly results in the development of a hierarchy which, if allowed to prevail, can be the cause of welfare problems for some fish.

Lighting strategies can also reduce or eliminate the need to grade maturing populations. Size grading S1s early gives the opportunity to select potential grilse in the first harvests prior to maturation.

- HP 2.1 *** Only the following grading methods are permitted:
- manual grading using traditional 'Y' type boards
 - passive grading with 'flexi-panels'
 - automated grading, e.g. using wellboats or grading barges.
- HP 2.2 *** All personnel involved in the grading operation must:
- have access to a copy of the current version of the '*RSPCA standards for farmed salmon*'
 - be familiar with its content
 - understand and be able to apply its content.
- HP 2.3 *** All personnel working with, or handling the fish must be:
- trained and fully competent
 - aware of the needs of the fish
 - aware of any risks involved and the procedures to address those risks.
- HP 2.4 *** Grading must only be performed when absolutely necessary.
- HP 2.5 *** A written grading plan must be agreed between farm management and site staff and /or grading operator prior to operations commencing. This plan must become a part of the VHP (see H 1.1).
- HP 2.6 *** The grading plan must include:
- the reason for the need to grade
 - a pre-grade risk assessment
 - the number of fish to be graded per day
 - the location of fish populations both pre- and post- grade
 - the pre-grade fasting period
 - the health status of the fish
 - the equipment to be used, including the type of grader
 - expected timetable for completion of the grade
 - the required number of staff and duties to be performed
 - the physical characteristics of the site such as water temperature, tides and weather conditions
 - the training records of the grading team
 - the requirement for a post grading health check
 - post grading mortality records
 - any relevant contingency plans
 - the agreement and signatures of the site manager and the person in charge of the grading equipment.

Husbandry practices

- HP 2.7 *** All grading equipment must be designed and maintained in order to prevent damaging or causing stress to the fish.
- HP 2.8 *** Sweep nets must be of knotless construction and of optimal design for the enclosure, and of an appropriate mesh size for the fish.
- HP 2.9 *** Only healthy fish must be subjected to the grading process.
- HP 2.10 *** Prior to grading, fish must be fasted for the minimum period required in order not to compromise their welfare.

*  **A longer fasting period may be required if advised by the veterinary surgeon/animal health manager due to sub-optimal conditions occurring.**

- HP 2.11 *** If fish are being returned to their original enclosure, it must be large enough to ensure the welfare of both the original and returning populations.

*  **It is preferable to grade all populations into new enclosures in order to promote optimal welfare for the duration of the grade**

- HP 2.12 *** The grade must be completed in one continuous operation.
- HP 2.13 *** Sweep nets must be used to crowd a portion of the population rather than crowding the whole enclosure.
- HP 2.14 *** Fish must not be crowded for more than 2 hours.
- HP 2.15 *** No enclosure must be crowded more than twice in any one week or three times in any month, unless this is required by the designated veterinary surgeon for fish welfare reasons.
- HP 2.16 *** Producers must:
- humanely destroy any extraneous/non-target fish that are present
 - be aware of, and adhere to, any legislation relating to protected species.
- HP 2.17 *** Fish must be monitored throughout the operation by a designated person whose responsibility it is to recognise welfare issues and take appropriate action if necessary.
- HP 2.18 *** Enclosure nets must be kept clean in order to avoid water quality problems during crowding.
- HP 2.19 *** Oxygen levels must:
- be monitored throughout crowding
 - not fall below 7 mg/l, with appropriate action taken should this occur.
- HP 2.20 *** Supplementary oxygen and/or aeration must be available for the duration of the crowding procedure.
- HP 2.21 *** Mortality checks must be recorded as soon as possible after grading.

*  **Pre-grade mortality removal should be undertaken wherever possible.**

Husbandry practices

HP 2.22 * All equipment must be thoroughly cleaned and disinfected before use and between sites.

HP 2.23 * Grading operations must not take place if adverse weather conditions are likely to compromise fish welfare.

Passive grading

*  **Passive grading is recommended where possible and practical to do so.**

HP 3.1 * Where passive grading is used, the size and design of the grading panel must be appropriate for the size of fish that are to be graded, and the enclosure they are contained within.

HP 3.2 * The grading panels must be pre-checked for signs of wear before grading commences.

Hand/manual grading

HP 4.1 * Pumps must be able to pump the required distance and head.

HP 4.2 * The operator must be able to control the speed of the pump.

HP 4.3 * All pipes must be:

- a) smooth with swept bends
- b) of a diameter which is appropriate for the size of the fish, including when they pass through the couplings.

HP 4.4 * Water must always flow through the pipework to minimise the incidence of scaling.

HP 4.5 * The grading table must be smooth, with no sharp edges.

HP 4.6 * Where counters are used, they must be in working order and be fit for purpose.

HP 4.7 * The sweep net/crowding device must:

- a) be of an appropriate size
- b) have sufficient floatation
- c) be constructed of knotless mesh.

HP 4.8 * No fish must be out of the water for more than 15 seconds.

Wellboat grading

HP 5.1 * All wellboat crew involved in the grading process must have received the appropriate welfare training in addition to their maritime responsibilities.

HP 5.2 * There must be a nominated person who is responsible for the care of the fish during the time that they are on board.

HP 5.3 * All equipment must be checked to ensure that it is working and fit for purpose before pumping commences.

HP 5.4 * Extreme care must be taken when pumping the fish.

Husbandry practices


HP 5.5 * The grade must be positioned so that the crew member operating the pumps can clearly see the fish.

HP 5.6 * Graders must have safe personnel access around them to facilitate routine inspection.

HP 5.7 * Returning pipes must:

- a) be fully supported
- b) have minimal joins
- c) be of sufficient length to safely return graded populations away from the edge of the enclosure.


HP 5.8 * Before leaving the site, careful inspection and disinfection of the equipment must be carried out as appropriate.

*  **Vacuum pumping fish twice within 24 hours is not optimal welfare practice. Consideration and preference should be given to the use of wellboats with 'over-pressure' (reverse siphon) discharge capability where possible.**

HP 5.9 * Any fish that are placed in the hold after grading must be subjected to an additional welfare risk assessment. Any additional fasting period must be authorised by the veterinary surgeon or health manager.

HP 5.10 * Any additional fasting period must be recorded in the Veterinary Health Plan (see H 1.1).

HP 5.11 * Discharges which do not entail the use of moving bulkheads must have the ability to trim the wellboat during the final stages of the discharge to prevent compromising the welfare of the last fish.

*  **Ideally, all loading and discharges should be undertaken in the presence of site staff to ensure an effective handover of welfare responsibility.**

HP 5.12 * The maximum stocking density in the well must be based on the liveweight of the fish as follows:

| Liveweight of fish (kg) | Maximum stocking density (kg/m ³) |
|-------------------------|---|
| 5.0 | 125 |
| 4.0 | 110 |
| 3.5 | 100 |
| 3.0 | 90 |
| 2.0 | 75 |
| 1.0 | 60 |
| 0.1 | 45 |

HP 5.13 * The water quality, husbandry, biosecurity and records kept must conform to those as per the wellboat harvesting standards.


HP 5.14 * There must be a site grading plan for inspection.

Pests and predators

HP 6.1 * Humane precautions must be taken to prevent pest infestations on the farm.


Husbandry practices

- HP 6.2 *** The producer must:
- use all reasonable non-lethal methods of control to protect fish from predators
 - detail the methods specified in a) in the Environmental Action Plan.
- HP 6.3 *** The primary means of protecting the fish must be through physical exclusion, by denying potential predators access to tanks and enclosures.
- HP 6.4 *** Enclosure nets must be adequately tensioned and weighted to prevent distortion, taking into account local conditions such as currents, tidal flows etc.
- HP 6.5 *** Enclosure nets must be regularly checked for holes and fouling and maintained accordingly.
- HP 6.6 *** Removal of dead fish must occur at least twice weekly, except when adverse weather conditions mean that this would mean danger to personnel.
- HP 6.7 *** Enclosures must be:
- protected using visible topnets
 - of a mesh size that does not ensnare birds.
- HP 6.8 *** Predator nets must be considered for deployment at high risk sites during high risk periods, and at other times as appropriate if there is a risk of an attack.
- HP 6.9 *** Where predator nets cannot be deployed for animal welfare reasons, the reason why must be documented and recorded.
- HP 6.10 *** Any site that is recognised as having a high risk of attack or has suffered an attack in the past must have a working Acoustic Deterrent Device (ADD) in place.
- HP 6.11 *** If an attack takes place on a site with no history of previous attacks, then an ADD must be deployed without delay.
- HP 6.12 *** All ADDs must be regularly serviced and maintained to ensure that they are in full working order.

*  **ADDs should only be used whilst taking into consideration the potential effects they may have on other wildlife, in particular, cetaceans, which may have a migration route nearby.**

The remote monitoring of ADDs is available. The RSPCA recommends that this is used to ensure that they are working properly.

- HP 6.13 *** If an attack has taken place, the fish must be checked for signs of injury as a result of the attack.


*  **If all non-lethal measures are in place, and seal attacks continue to persist, and where fish welfare is being compromised, then as a last resort, it may be necessary to humanely dispatch the animal.**

For the purposes of these standards, a last resort scenario is defined as:

- Nets are adequately tensioned.**
- Top nets are secured to deny ingress by predators into the enclosure.**
- Dead fish have been regularly removed.**
- ADDs have been utilised and regularly serviced, and are monitored to ensure that they are working.**
- Predator nets/curtains/screens have been deployed.**

Husbandry practices

HP 6.14 * The producer must be able to demonstrate to the Freedom Food Assessor or the RSPCA Farm Livestock Officer that all of the procedures leading up to the point of last resort have been mobilised.

*  **The repeated shooting of seals without having deployed all of the measures leading to a last resort scenario, will result in the site being suspended from the scheme pending further investigation.**

HP 6.15 * There must be positive identification that a seal is causing the problem of fish mortality, or is the cause of compromised fish welfare.

HP 6.16 * Where it becomes necessary to humanely dispatch a predator, the following records must be kept:

- a) names of all persons with valid firearms certificate who are deemed competent to perform the task
- b) detail of any bullets used and returned, in the ammunition register
- c) details of any animal that has been shot, including:
 - the species
 - the time and date of dispatch
 - the location
 - the reason for the shooting.

HP 6.17 * All attempts must be made to recover the body of the animal that has been shot and it must be recorded as to whether or not the body was recovered.

HP 6.18 * Any carcasses must be disposed of in accordance with the law.

HP 6.19 * Seals must not be shot outside the Crown Estate lease area.

HP 6.20 * After every shooting incident, a review of all predator exclusion procedures must be undertaken and records kept of such reviews.

Genetic selection and modification

 **The RSPCA is opposed to any breeding procedures that adversely affect welfare.**

HP 7.1 Genetic modification techniques are prohibited.

HP 7.2 Fish must not have been produced by breeding techniques that result in health or welfare problems for any of the animals involved.

Equipment and environmental quality

The equipment in which fish are kept must be designed with full consideration of their welfare needs, and must protect them from physical or physiological discomfort, distress and injury, and allow them to perform natural behaviours. The stock-keeper is responsible for providing the life support system for farmed fish and must maintain the highest environmental quality at all times.

Enclosure/tank construction, situation and maintenance

- E 1.1** The siting of tanks and enclosures must be carefully considered with regard to fish welfare, personnel safety and minimising adverse affects upon the environment as detailed in the Environmental Impact Management Plan.

Tanks


- E 2.1** Tanks must be designed with fish welfare as a major consideration, with no sharp protrusions which may be injurious to the fish.
- E 2.2** Inlets and outlets must be designed to prevent fish escape, and ingress of wild stock.
- E 2.3 *** Tanks must be provided with lids or covered with appropriate netting to prevent fish escaping.
- E 2.3.1 *** If nets are used, they must be a suitable size for the fish in the tank to prevent escapes and fish becoming entangled.
- E 2.4 *** Flow rate must be suitable for fish to be able to hold their position in the water column.
- E 2.5 *** Tanks over 5 metres in diameter must have oxygen and/or water level alarms fitted.

Enclosures


- E 3.1** The location of enclosures must allow an adequate flux of clean water but must be protected from exposure to extreme conditions that may damage enclosures.
- E 3.2** The current must not be too strong for fish to be able to hold their position in the water column.
- E 3.3** There must be easy access from the shore so that adequate inspections can be made.
- E 3.4** The minimum depth of the enclosure must be 5m (apart from fry in freshwater loch enclosures).
- E 3.5** Netting used in the construction of enclosures must present a smooth, non-abrasive surface to limit injuries to the snout, fins and scales of fish.
- E 3.6** Biofouling must not be allowed to build up on enclosure nets.
- E 3.7** Enclosure nets must be regularly checked for holes and fouling and maintained accordingly.

Equipment and environmental quality

E 3.8 Nets must be adequately tensioned and weighted to prevent distortion.

- *  Having nets that are properly tensioned is important to ensure that the full area of the pen is available to maintain the stocking density, and to act as a deterrent to predators.

External water quality (seawater/freshwater loch)

-  In contrast to most other forms of livestock farming, the life support system for the fish, in the form of a continuous flow of well-oxygenated water, must be provided by the farmer. All staff involved in caring for fish must recognise the importance of this responsibility and the highest water quality must be maintained at all times.

E 4.1 Water quality composition must be monitored sufficiently frequently, if necessary daily, depending on the system, time of year and stage of stock (as specified in the VHP - see H 1.1).

E 4.2 If water quality departs from the acceptable range, steps must be taken immediately to identify the source of the problems and rectify the situation as quickly as possible.

E 4.3 * The Emergency Action Plan must contain provisions to account for potentially catastrophic events that may adversely affect water quality, such as algal or jellyfish blooms.

Seawater stocking density

E 5.1 The following maximum stocking densities must not be exceeded:

| | Maximum stocking density |
|---------------------------------|---------------------------------|
| Seawater enclosure | 17kg/m ³ |
| Seawater enclosure site maximum | 15kg/m ³ |


E 5.2 The maximum stocking density must be calculated on the weight of fish/m³ of water volume.

E 5.3 * The depth of the net must be such that there is a gap of at least 5 metres from the base of the net to the seabed.

E 5.4 * With enclosures of 24 x 24 metres or bigger, or the circular equivalent, the maximum depth to which stocking density can be calculated must not exceed 17 metres.

E 5.5 * If calculating stocking density between 15 and 17 metres depth, the stockperson must be able to demonstrate that monitoring is taking place in order to ensure that all fish are feeding.

E 5.6 * Extra net cleaning must be adopted and recorded if calculating stocking density down to between 15 and 17 metres.


- *  The definition of depth for the purpose of these standards is taken as the actual depth of the vertical net wall from the waterline to the seabed.

Equipment and environmental quality


Lighting

- E 6.1** Lighting must be maintained at a level suitable for each stage of development (as detailed in the VHP - see H 1.1).
- E 6.2** Fish must be protected from distress caused by high levels of UV light or sudden changes in lighting levels (see E 6.3 to E 6.4).
- E 6.3** Tank covers must be removed or lights provided before transfer to sea in order to habituate fish to brighter light.
- E 6.4** Enclosures must be of adequate depth to prevent damage from ultraviolet radiation.

Environmental enrichment

- *  The requirements of salmon for environmental stimulation are not understood. Environmental enrichment is not therefore necessary at present. This policy will be reviewed in 2012.

Climate change and animal welfare

- *  The issues relating to climate change have the potential to significantly affect the welfare of farm animals. The RSPCA believes that it is now appropriate to react to, think ahead, and consider what can reasonably be done to mitigate, any negative effects that adverse weather conditions may have/be having on the welfare of farm animals now, and in the future.

Feeding

Fish must have freedom from hunger and malnutrition by ready access to a high quality diet that is appropriate to their species, and allows full health to be maintained. Food must be distributed in such a way that fish can eat without undue competition.

F 1.1 Feeding must be such that the quality, quantity and frequency are optimal for the fish's stage of development.

Food content

F 2.0 * All producers must be aware of their current supplier's policy on sustainability.

F 2.1 All feed must be manufactured from constituents that are free from active parasites and known fish pathogens and contamination.

F 2.2 All feeds used must be produced strictly to the standards laid down by all the relevant UK and EU legislation.

F 2.3 No feedstuffs containing growth regulators or hormones are permitted.

F 2.4 The use of veterinary medicinal products in food is prohibited except for essential therapeutic use (a disease outbreak or where welfare will otherwise be compromised as advised by a veterinary surgeon).

Feeding methods

F 3.1 Food must be dispensed and distributed in such a way that fish can eat without undue competition.


F 3.2 * Fish must be observed at least once a day during feeding.

F 3.3 The person feeding must check that fish on the periphery of the tank or enclosure receive adequate amounts of food.

F 3.4 Overfeeding must be avoided.

 **Feedback systems to prevent overfeeding are encouraged in seawater enclosures.**

Fasting

 **Although salmon may not feed for long periods in the wild, depriving a farmed fish that has previously been fed regularly will usually have an adverse effect on welfare. It is unacceptable to deprive salmon of food for perceived flesh quality reasons.**

F 4.1 * For harvest fish, fasting time must:

- a) not exceed 72 hours (unless directed by the designated veterinary surgeon for fish welfare reasons)
- b) be recorded in the VHP (see H 1.1).

Feeding

F 4.2 * After any period of fasting, food must be reintroduced in a way that:

- a) encourages the fish to resume feeding
- b) minimises waste
- c) producers can demonstrate does not compromise fish welfare.

F 4.3 * Records must be kept of the period for which the fish were fasted and when feed was reintroduced.

Health

Fish must be protected from pain, injury and disease, through good management and husbandry practice, and by rapid detection and treatment of disease. All producers must develop a health plan in consultation with a designated veterinary surgeon. Disease is a major cause of poor welfare and mortality in farmed salmon. Further, wild fish may be susceptible to disease agents carried by farmed fish. Therefore it is essential to take all reasonable steps to minimise the likelihood of disease outbreaks in the farmed stock.

- H 1.1 *** A Veterinary Health Plan (VHP) must be drawn up and updated regularly, and at least annually (see Appendix 1).
- H 1.2** The VHP (see H 1.1) must include future husbandry plans, risk assessment, monitoring and control of fish health and diseases.

i The Veterinary Health Plan (VHP) forms a vitally important part of the RSPCA welfare standards with regard to maintaining the health and welfare of livestock on farm. The written VHP is agreed between a named veterinary surgeon and the producer and is then frequently updated following regular visits from the veterinary surgeon to the farm.

The RSPCA has developed guidance notes for producers and veterinary surgeons as to how the VHP should be formulated to ensure high standards of health are maintained. These guidance notes are available in Appendix 1.

Should you or your veterinary surgeon require assistance with the formulation of your VHP, please refer to these guidance notes or talk to an RSPCA Farm Livestock Officer.

- H 1.3** All relevant legislation regarding notifiable diseases must be understood and adhered to.
- H 1.4** There must be no recurring physical damage occurring on fish attributable to features of their environment, husbandry procedures or unrecognised disease challenge.

i Recurring physical damage is that seen on a number of fish, with sufficient similarity to suggest a common cause, for example poor tank or enclosure design, methods of handling or a husbandry procedure. Different types of physical damage may also suggest a common cause.

- H 1.5** Fish condition must be continuously monitored for signs of disease or problems with the environment or handling practices.
- H 1.6** If a problem is identified, the VHP (see H 1.1) must be revised to include a programme of remedial action.
- H 1.7 *** Any fish suffering from overt physical damage, or disease symptoms, must be:
- segregated
 - treated/humanely euthanased without delay.
- H 1.8** If the mortality level is above 0.5% a week (excluding pre-swim up fry) the designated vet or trained and competent fish biologist/fish health manager must be notified and an investigation made as appropriate.

Health

Casualty slaughter

- H 2.1** Any seriously sick or injured fish, or fish found not to be recovering, must be humanely killed without delay.
- H 2.2** Overdose of a suitable anaesthetic (as specified in the Veterinary Health Plan) using immersion in a solution of the agent, must be used for culling fish during the freshwater stage, including pre-swim up fry.
- H 2.2.1** For fish during the seawater stage, a non-recoverable percussive blow to the head, using a priest or mechanical percussive device, of sufficient force to render the fish immediately insensible, can be used for emergency killing instead of anaesthetic overdose.
- H 2.3** Under no circumstances must seriously injured or sick fish be left to die in air.
- H 2.4** Culling of sick or injured fish must only be conducted by suitably trained and competent people.

Medicinal products

- H 3.1** High quality management and husbandry standards must be employed in order to minimise the need for therapeutants.
- H 3.2** Treatment must only be given when the welfare of the stock may otherwise be threatened (as advised by a veterinary surgeon).
- H 3.3** Prophylactic use of veterinary medicinal products, where no known disease problems exist, is prohibited (except vaccines as agreed with the veterinary surgeon).
- H 3.4** In cases where medication is required for welfare reasons, treatments must be used in accordance with current legislation and the designated veterinary surgeon's recommendations.

* **i** It is recommended that producers obtain, read and where appropriate, apply the advice contained with the latest versions of the guidelines on '*Responsible use of antimicrobials in fish production*' and the '*Responsible use of vaccines and vaccination in fish*' issued by the Responsible Use of Medicines in Agriculture (RUMA) alliance (www.ruma.org.uk).

- H 3.5** Any veterinary medicines used must be licensed in the UK for use in Atlantic salmon or authorised under an Animal Test Certificate or an Animal Test Exemption Certificate issue.

i The RSPCA recognises that the welfare of farmed fish may be adversely affected by the limited availability of vaccines or therapeutic medicines approved for the treatment of fish. In exceptional circumstances, on the advice of the designated veterinary surgeon, specific products licensed in the UK for use in other food producing species can be administered (following the requirements of the cascade principle) as detailed in the Veterinary Health Plan (see H 1.1), providing that a valid discharge consent is held from the appropriate Government body. All proven medications should be made available to aid disease treatment as advised by the designated veterinary surgeon.

Health

- H 3.6** The medication must only be administered to fish:
- by suitably trained staff
 - strictly in accordance with the instructions prescribed, which must be on site before the treatment commences
- H 3.7** The potential for therapeutic agents to affect the environment, both locally and more widely, must be given full consideration, and all relevant legislation and Codes of Practice must be adhered to.
- H 3.8 *** A valid single point source license must be held, prior to commencement of treatment, for all medicines administered.
- H 3.8.1** Veterinary medicine withdrawal periods must be strictly adhered to.
- H 3.9** Veterinary products must be properly labelled and stored appropriately.
- H 3.9.1 *** Records must be kept of all treatments
- H 3.10** All farms must have a written pharmaceutical waste policy.

Sea lice

i The problems involved with availability of effective treatments for sea lice infestations are recognised. The welfare and environmental impact of treatments must be given full consideration. The RSPCA will monitor the situation, and review new technology and research as it develops.

- H 4.1 *** Farms must take all reasonable steps to minimise the gravid lice population, as per the requirements of the Aquaculture and Fisheries (Scotland) Act 2007.
- H 4.2** Stock-keepers must be able to recognise symptoms of lice infestation.
- H 4.3** Separation of year classes and fallowing of sites must be practised to help control sea lice populations as detailed in the Environmental Impact Management Plan (see ENV 1.1).
- H 4.4** The producer must, through documented evidence, demonstrate that any co-operative management schemes between operations in the same loch/area aimed at reducing sea lice populations have been entered.
- H 4.5** Sea lice prevention and treatment programmes must be drawn-up with the designated veterinary surgeon and fully detailed in the Veterinary Health Plan (see H 1.1).
- H 4.6** Biological control using cleaner fish (wrasse) is prohibited.

i The RSPCA is reviewing current research associated with using wrasse as cleaner fish, in order to establish whether a change to H 4.6 is warranted.

Mutilations

- H 5.1** Mutilations involving the removal of sensitive tissue are prohibited.
- H 5.2** Marking methods that cause distress or injury to fish must not be used.

Transport

Transport systems must be designed and operated to ensure that fish are not caused unnecessary distress or discomfort. The transport and handling of fish must be kept to an absolute minimum. Persons involved in transport must be thoroughly trained and competent to carry out the required tasks.

- T 1.0 *** Managers must ensure that all drivers:
- have a copy of the current version of the '*RSPCA welfare standards for farmed Atlantic salmon*' at each site
 - are familiar with its content
 - understand and apply its content
 - have a), b) and c) as part of their induction program.
- T 1.1** All journeys must have an up to date transport plan, which covers important aspects of the journey, such as journey times, water qualities, contingency plans and those responsible for fish welfare.
- T 1.2 *** Any handling of fish prior to transport must be:
- kept to a minimum
 - conducted in such a way as to prevent any unnecessary distress to the fish.
- T 1.3 *** All equipment that the fish rely on for life support must be inspected at least every 2 hours.
- T 1.4 *** If any faults are found in the equipment (see T 1.3) then:
- fish in transit must be inspected
 - any problems must be corrected immediately.
- T 1.5** Delays in transport must be kept to the absolute minimum possible.
- T 1.6** Supplementary oxygen or aeration must be available during all transportation, which is sufficient to last at least 50% longer than the anticipated journey length.
- T 1.7 *** Oxygen levels must be maintained at a minimum of 7mg/litre.
- T 1.8** Excessive changes in water temperature and pH during transportation must be avoided.
- T 1.9** Care must be taken to ensure dead fish are not loaded for transport.
- T 1.10** Sick or seriously injured fish must:
- not be transported
 - be humanely destroyed.
- T 1.11** Any fish which die during transportation must be separated from live fish as soon as possible after arrival.
- T 1.12** Records must be kept of any deaths or injuries that occur during transportation.
- T 1.13** Transport containers must be cleaned and disinfected after each consignment of fish is transported to prevent spread of disease.
- T 1.14** All persons involved in transportation of fish must be familiar with, and transport fish in accordance with, all relevant legislation.

Smolt transport

These smolt transport standards are to be considered in conjunction with, and as a supplement to, existing transport and wellboat standards.

Smolt transport - general

- ST 1.0 *** Only boats with the ability to run on closed valves are permitted.
- ST 1.1** There must be a named member of staff responsible for monitoring the welfare of the fish during loading and unloading.
- ST 1.2** Records of procedures relating to ST 1.1 must:
- be maintained
 - include details of any casualties or compromises to the welfare of the fish.
- ST 1.3** There must be a pre-transport plan in place that identifies all areas of risk associated with the journey.
- ST 1.4** Should a journey require the use of a ro-ro ferry, procedures must be in place to ensure the welfare of the fish during this stationary time.
- ST 1.5** The ferry must be pre-booked prior to sailing.
- ST 1.6** Drivers must be able to gain access below deck during the journey, to be able to check on the welfare of the fish.
- ST 1.7** Fish must be checked at least every 2 hours.
- ST 1.8** The following records must be kept:
- Time since last handling
 - Time since vaccination
 - Time since last treatment (including anaesthetic)
 - Feed withdrawal time
 - Date of full smoltification
 - Any clinical signs of disease
 - Crowding records (how often/duration etc.)
 - Oxygen levels during crowding
 - Numbers of fish in each tank to be transported
 - Stocking densities of tanks being used for transport
 - Numbers of fish to be put in each receiving enclosure
- ST 1.9 *** Producers must be able to demonstrate that they have done everything possible to ensure maximum survival when smolts are transferred to sea.
- ST 1.10** Only healthy, undamaged smolts must be transported.
- ST 1.11** Pre-transport fasting must never exceed 48 hours, unless specified by a veterinary surgeon/senior production manager.

Smolt transport

ST 1.12 * Any bath treatment must be:

- a) completed a minimum of 14 days before transport, unless under veterinary/ health advisor advice
- b) recorded in the VHP (see H 1.1).

ST 1.13 All staff working with, or handling the fish must be:

- a) trained and competent
- b) aware of their duties
- c) aware of any risks involved.

ST 1.14 Records of training relating to ST 1.13 must be kept.

ST 1.15 All equipment must be:

- a) cleansed and disinfected prior to use
- b) fit and suitable for the purpose that it was intended for.

ST 1.16 To minimise thermal shock and to avoid the inhibition of oxygen release into the water, the water temperature used for transportation must be as close as possible to that from which the fish came.

i As a guide, we would not expect more than 3 or 4°C difference.

ST 1.17 Fish must not be transported above 16°C.

ST 1.18 No fish must be out of water for more than 15 seconds.

ST 1.19 There must be at least 50% more oxygen available than is needed for the journey.

ST 1.20 Water must be free from contaminants which may be detrimental to the welfare of the fish.

ST 1.21 If fish pumps are to be used, they must be suitable for the size of fish being pumped.

ST 1.22 To avoid physical injury to the fish, any bends or joins in the pipes must be kept to a minimum, or ideally avoided altogether.

ST 1.23 There must be no joints, kinks or rough internal edges on, or in the pipes which may cause physical injury to the fish.

ST 1.24 There must be a procedure in place to ensure that all fish are removed from any pipes or other equipment used at the end of loading and unloading.

ST 1.25 The drop from the end of any pipe must be such that it:

- a) avoids injuring the fish
- b) allows them to disperse without others landing on top of them.

i Poor netting technique can compromise the welfare of the fish, and for this reason, the RSPCA would prefer the use pumps to move fish because, in our view, it minimises the risk of compromising fish welfare.

Smolt transport

- ST 1.26 *** Hand nets must:
- be of the correct size so that they can be easily lifted and the fish at the bottom of the net are not injured
 - have a suitable mesh size for the size of the fish that does not allow the fish to escape
 - not be overfilled.
- ST 1.27** Fish must not be netted before they are ready to be received at the transport tanks/helicopter buckets.
- ST 1.28** The netting of the last fish in any tank must be undertaken with a great deal of caution and care so as not to injure any fish.

Pushing enclosures

- ST 2.1** The speed of pushing must be suitable for the size of the fish.
- ST 2.2** Nets must be tensioned to avoid the problems associated with the nets bagging, which could compromise fish welfare.
- ST 2.3** Nets must be clean before they are considered for pushing.
- ST 2.4** There must be a person on the enclosure monitoring the behaviour of the fish to ensure their welfare.
- ST 2.5** There must be clear communication between the skipper and the person on the enclosure.
- ST 2.6** The speed of the pushing must not be faster than the speed of the swimming fish.
- ST 2.7** Extreme care must be taken to avoiding pushing the enclosure through a fluther of jellyfish or algal blooms.

Road transport

- ST 3.1** The driver of the vehicle must:
- be fully aware of the transport regulations relating to fish
 - understand the needs of the fish being transported
 - drive in a manner which will not adversely compromise the welfare of the fish.
- ST 3.2 *** Tank insulation must be such that it allows the water to remain at a constant temperature +/- 1.5°C from the start of the journey.
- ST 3.3** Before leaving the site, the driver must:
- perform a visual check of the oxygen levels and rates of aeration into the tanks
 - record the oxygen levels on the record sheet.
- ST 3.4** All transport tanks and life support systems must:
- be fit for the purpose of transporting fish
 - be without leaks, chips or cracks.
- ST 3.5** Fish must be allowed to settle before departure.

Smolt transport

ST 3.6 After the required stocking density has been reached, all tanks must be filled to the top with good quality water from a known source.

ST 3.7 Maximum stocking densities must be set so that water quality can be maintained over the length of the journey.

i **Maximum stocking density will depend on the distance travelled, but as a general guide it should be within 60 to 100 kg/m³.**

ST 3.8 * Oxygen levels must be:

- a) continuously monitored
- b) maintained at a minimum of 7mg/litre.

ST 3.9 Diffused oxygen must be spread around the water column by the use of an oil free compressor.

ST 3.10 There must be sufficient aeration to avoid deadspots.

ST 3.11 All lids, outlets and any other openings must be fully secured before departure.

ST 3.12 During the journey, if oxygen levels become unstable, the driver must:

- a) be able to visually check the fish for signs of stress
- b) be able to identify the reasons for the oxygen instability
- c) take appropriate action to ensure the welfare of the fish.

ST 3.13 * All equipment that the fish rely on for life support during the journey must be inspected at least every 2 hours.

ST 3.14 * If any faults are found in the equipment (see ST 3.13) then:

- a) fish in transit must be inspected
- b) any problems must be corrected immediately.

ST 3.15 When arriving at the discharge site, the driver must:

- a) ensure compliance with any biosecurity requirements
- b) have been aware of these before arrival on site.

ST 3.16 After arrival at the site, discharge must take place without undue delay.

ST 3.17 The lorry must be sited to ensure that all tanks can be fully emptied, taking into account any camber which may be in the ground.

ST 3.18 Valves must be suitable for more than one fish to pass through at any one time.

ST 3.19 All pipes must be securely attached to prevent fish from escaping during the unloading process.

ST 3.20 * All unloading must be through mucon-style valves, rather than netting fish from the tanks.

ST 3.21 Any pipes used for unloading must be able to be adjusted to account for any rise and fall in the tide.

ST 3.22 Water must always be in the tanks during unloading in order to avoid the last fish from becoming dry.

Smolt transport

- ST 3.23** There must be a system for flushing the tanks at the end of unloading to ensure that the last fish is removed.
- ST 3.24** Tank design must facilitate the discharge of the last fish by having sloping floors which guide the fish to the outlet.

Wellboat transport

- ST 4.1** The journey must be planned to ensure that arrivals at the loading and unloading sites are such that they avoid delays in moving the fish.
- ST 4.2** There must be staff available at the site that is to receive smolts.
- ST 4.3** The wellboat must have water in the well before loading commences.
- ST 4.4** Maximum stocking densities must:
- be within 40 to 50 kg/m³
 - be set so that water quality can be maintained over the length of the journey.
- ST 4.5 *** Oxygen levels must be:
- continuously monitored
 - maintained at a minimum of 7mg/litre.
- ST 4.6** If fish counting equipment is in place, it must:
- use wet counting
 - be fully maintained
 - be regularly calibrated to maintain accuracy
 - be of a design not likely to cause damage or injury to the fish.
- ST 4.7** The number of fish to be loaded must be known in order to be able to verify compliance with the stocking density.
- ST 4.8** There must be enough light in the well to enable easy inspection of the fish.
- ST 4.9** Pumps and pipes used for unloading must be positioned to minimise the height and distance that the fish have to be pumped.
- ST 4.10** Pumps and pipes must be free of any rough edges which might damage the fish
- ST 4.11 *** There must be a method in place to ensure that no fish are left in the pipes after pumping
- ST 4.12 *** A humane process must be in place to safeguard fish welfare when removing the last fish(es) from the well.
- ST 4.13** Adjustments must be made to the trim/balance of the wellboat to ensure fish are aligned with the discharge point.
- ST 4.14** Water flow through the wells at discharge must:
- be sufficient to facilitate movement of the fish
 - not be so strong as to cause the fish injury.

Smolt transport

- ST 4.15** The pipe layout angle and drop must:
- lead to good distribution into the enclosure
 - minimise the risk of collisions between fish.
- ST 4.16** The nets at the reception enclosure must:
- be set at sufficient depth to permit inspection
 - not be so shallow that fish are stressed by strong sunlight.
- ST 4.17** The fish must be given humane protection from birds and marine predators.
- ST 4.18** The unloading of fish must not take place if adverse weather conditions are likely to compromise the welfare of the fish.
- ST 4.19** Dead and moribund fish must be disposed of humanely and hygienically.
- ST 4.20** Records of all dead and moribund fish must:
- be kept
 - include the cause of death where possible and any other information relating to the health and welfare of the fish
 - be available for inspection by the Freedom Food assessor or RSPCA Farm Livestock Officer for a least 1 year.

Helicopter transfer

- ST 5.1** Pilots and ground crew must be aware of the welfare consequences of how they handle the fish.
- ST 5.2** Pilots and ground crew must:
- have a copy of the current version of the '*RSPCA welfare standards for farmed Atlantic salmon*'
 - be familiar with its content
 - understand and apply its content.
- ST 5.3** There must be staff available at each site receiving smolts.
- ST 5.4** All receiving enclosures must be clearly identified, for example, marked with buoys.
- ST 5.5** Staff must be able to communicate with the loading site and the helicopter.
- ST 5.6** The fish must be netted from the tanks/rearing enclosures to the helicopter bucket with extreme care.

i The RSPCA would prefer that pumps are used to transfer fish for this mode of transport, as it believes that it is better for the welfare of the fish. It will investigate the advantages of such a method, and if appropriate, introduce it as the method to use.

- ST 5.7** Helicopter buckets and other ancillary equipment must be:
- fully maintained
 - clean
 - suitable for the job.

Smolt transport

- ST 5.8** There must be sufficient buckets to ensure that the time that fish have to wait for transportation is minimised.
- ST 5.9** Fish must not be placed into buckets until the imminent arrival of the helicopter.
- ST 5.10** The helicopter bucket must contain approximately two-thirds water before any fish are loaded into it.
- ST 5.11** The life support system of the bucket must be switched on and working before the fish are put in.
- ST 5.12** A sample weight of fish must be known before loading commences.
- ST 5.13** Helicopter buckets must have their own independent supply of oxygen.
- ST 5.14** The oxygen levels in the bucket must be:
- a) the same as that of the tanks from whence the fish came
 - b) maintained at a minimum of 6mg/litre.
- ST 5.15** The helicopter bucket must be lowered gently into the water.
- ST 5.16** The helicopter bucket must be allowed to empty completely before moving off.
- ST 5.17** The planned maximum journey time to the discharge site with fish on board must be no longer than 15 minutes.
- ST 5.18** Maximum stocking density in the bucket must be no greater than 400 kg/m³.
- ST 5.19** There must be contingency plans in place for:
- a) bad weather
 - b) if a bucket will not open.

Wellboats

These wellboat standards are to be considered in conjunction with, and as a supplement to, existing transport standards. At present these standards do not apply to wellboat grading, only for transfer to slaughter.

General

- W 1.1** All vessels must be appropriately certificated and operated by qualified personnel.
- W 1.1.1** All crew members must have attended a recognised fish welfare course within 12 months after joining the scheme.
- W 1.1.2 *** All new skippers must have attended a recognised fish welfare course within 12 months of joining the vessel if already Freedom Food approved.
- W 1.1.3 *** The crew must have attended an approved internal fish welfare training course within 12 months.
- W 1.2** All personnel must:
- a) have access to a copy of the current version of the '*RSPCA welfare standards for farmed Atlantic salmon*'
 - b) be familiar with its content
 - c) understand and apply its content.
- W 1.3** Multi-site collections are prohibited (collections of fish from different sites from different disease control areas are prohibited.)
- W 1.4** Intra-site collections and collections from neighbouring sites of the same year class are allowed, but must be recorded.
- W 1.5** The wellboat must be fitted with moveable bulkheads.
- W 1.6** The wellboat must be fitted with video cameras in each well in order to monitor the fish during transportation, loading and unloading.
- W 1.7** The wellboat must be equipped with water quality monitoring and maintenance equipment such as oxygen and pH probes, carbon dioxide and ammonia strippers.
- W 1.8** The wellboat must be able to monitor and record the numbers of fish loaded in each well.
- W 1.9** There must be sufficient natural or artificial lighting to enable continual inspection/monitoring of the fish throughout the well.
- W 1.10** Where systems are reliant on automatic monitoring equipment, this equipment must be alarmed and underpinned by fully operational manual back-up systems. This includes water quality control methods, such as oxygenators/aerators and carbon dioxide strippers.
- W 1.11** Boats must have the facility to close valves and re-circulate water.
- W 1.12** Journeys must be planned between the producer, the wellboat skipper and the slaughter site.

Wellboats

- W 1.13** There must be written contingency plans to accommodate unforeseen circumstances associated with the journey.
- W 1.14 *** Wellboat cleaning procedures must comply with the '*FRS disinfection guide version 3*' (www.frs.scotland.gov.uk)

Fish pumps

- W 2.1 *** Wellboats must have siphon pumping equipment for loading.
- W 2.2 *** Pumps must be operated and maintained in accordance with manufacturers' instructions.
- W 2.3 *** Pressure relief valves must:
- operate efficiently at all times
 - be tested regularly and these tests recorded.

Water quality

- W 3.1** Water must be chilled at a maximum of 1.5°C per hour.
- W 3.2** The minimum temperature of the water at the end of chilling must be no lower than 4°C.
- W 3.3 *** Oxygen levels must be:
- continuously monitored
 - maintained at a minimum of 7mg/litre.
- W 3.4** The carbon dioxide levels of the water must not be detrimental to fish welfare.

i There are at present recommendations being developed by the Council of Europe for water quality. At present the recommendation is 20 mg/litre for carbon dioxide. This issue will be kept under review by the RSPCA, to ascertain the optimum levels of carbon dioxide from an animal welfare perspective.

- W 3.5** The pH of the water in the well must always be between 7.5 and 8.
- W 3.6** The total suspended solids content of the water must not be detrimental to fish welfare.

i There are few, if any, recommendations concerning suspended solids in the water. This will be kept under review by the RSPCA, to ascertain the optimum levels of suspended solids in the water from an animal welfare perspective.

- W 3.7** The upper limit for ammonia must be 0.0125 mg/litre or less (unionised form).
- W 3.8** The water temperature must remain within the range of 4 to 16°C.
- W 3.9** Salinity levels must be within the range of 28 to 35 parts/1000.

Wellboats

i The RSPCA recognises that many of the issues relating to water quality in the wellboat are inter-linked, and simplistic assumptions relating to them can be unhelpful. The values given above are based on both practical experience and scientific evidence where it is available. It is intended to review the figures regularly in order to ensure that the welfare of the fish is optimised during transportation. Similarly, values will have to be adjusted should any legislation relating to them be introduced.

Loading

- W 4.1** The crowding of the fish in the enclosure must coincide with the arrival of the wellboat.
- W 4.2** The duration of the crowding in the enclosure must not exceed 2 hours.
- W 4.3** At the start of loading, the wells must contain sufficient water to prevent fish suffering injury from hitting each other, the walls or sides of the well.
- W 4.4** The maximum stocking density in the well must be based on the liveweight of the fish:

| Liveweight | Maximum stocking density |
|------------|--------------------------|
| 5kg | 125kg/m ³ |
| 4kg | 110kg/m ³ |
| 3.5kg | 100kg/m ³ |

i These stocking densities will be under constant review. If there are obvious signs of physical injury to the fish, then the stocking density should be lowered accordingly, in increments of 10 kg/m³.

- W 4.5** A counting/weighing device such as a 'Bioscanner' must be fitted on the inlet pipes in order to calculate fish numbers and stocking density.
- W 4.6** Loading speed of the water must be based on the largest fish and must always be in the range of 3 metres/second.
- W 4.7** Pipes must be free from sharp protrusions, kinks and bends which may injure the fish.
- W 4.8** Pipe diameters and flap doors must be appropriate to the size of the fish being moved. In any case the minimum internal diameter of the pipe must be not less than 12 inches/315mm.
- W 4.9** There must be a system in place which ensures that the last fish is removed from the pipe at the end of unloading, or during any pause in unloading.
- W 4.10** Maximum dwell time in the pipe must not exceed 1 minute during loading.

Journey time

- W 5.1** Water quality parameters must be monitored throughout the journey.
- W 5.2** Visual appraisal of the welfare of the fish must be carried out throughout the journey.

Wellboats

- W 5.3** Journey times and holding times under conditions of closed valves must not exceed a planned time of 14 hours with capacity to carry on to a maximum of 21 hours in emergencies only, whilst still retaining water quality specifications.

Unloading

- W 6.1** In order to avoid unnecessary delays, the docking of the wellboat and the end of break time at the slaughter plant, must coincide.
- W 6.2 *** Pumping of the fish out of the wells to the slaughter plant must be done in a way that:
- does not demonstrably compromise fish welfare
 - ensures that slaughter personal can maintain an efficient stunning procedure.
- W 6.3** Water at the outflow pipe must be sampled and tested on a regular basis for oxygen, temperature and pH.
- W 6.3.1** If the water quality falls below a 20% threshold of the well water, then immediate remedial action must be taken to make the necessary improvements.
- W 6.4** There must be a system in place which ensures that the last fish is removed from the pipe at the end of unloading. This system must not be injurious to the fish.
- W 6.5** The maximum dwell time in the pipe must be no more than 10 minutes.

i This can be worked out by the time it takes to empty the well and pipe and the number of fish in the well.

- W 6.6** Unloading speed must not exceed 3 metres per second.

Biosecurity

- W 7.1** Wellboats arriving in the United Kingdom (UK) to work within UK waters must carry a valid veterinary certificate of disinfection from the country of origin.
- W 7.2** Inter-site movement of vessels must be kept to a minimum.
- W 7.3** Any visible surface mortalities or obviously moribund fish on the surface must be removed before unloading.
- W 7.4** Wellboats transporting live fish must travel closed when located within 5 kilometres of any fin fish farm site.
- W 7.5 *** The cleaning and disinfectant procedures for wellboats as set out in the current version of the '*FRS disinfection*' (www.frs.scotland.gov.uk) must be adhered to, and the checklist signed by the skipper upon completion.
- W 7.6** All equipment must be checked regularly and maintained in accordance with manufacturers' or in-house maintenance schedules.
- W 7.7** All equipment must be maintained in clean, hygienic conditions and must be thoroughly disinfected and rinsed after use.
- W 7.8** All storage facilities must be bunded, wind and water tight, and pest proof.

Wellboats

- W 7.9** All solid and liquid waste materials must be stored and disposed of appropriately and in accordance with relevant legislation.

Records

- W 8.1** The following records must be kept for inspection:
- Wellboat movements
 - Fish movements
 - Times of fish movements – loading and unloading
 - Disinfection logs
 - Numbers of fish loaded/stocking density/fish size distribution
 - Mortalities
 - Water quality parameters as set out in the standards
 - Route covered during transport
 - Timing of open and closed valve operation
 - Calibration of equipment used for automatic recording

* **Ambient wellboat transportation (for journeys up to 6 hours)**

- W 9.1 *** All of the standards relating to wellboats/harvesting must be complied with (W 1.1 to W 8.1), with the exception of those listed in the information box below.

- * **i** For short wellboat journeys to harvest of up to six hours:
- a) There is no requirement for moveable bulkheads (W 1.5)
 - b) Fish can be transported in water of ambient temperature (W 3.1 and W 3.2)
 - c) Video cameras in the wells are not compulsory (W 1.6)
 - d) It is not compulsory to monitor CO₂, pH, suspended solids and ammonia (W 3.4 to W 3.9).

Slaughter

Fish must be killed humanely without any unnecessary distress or discomfort. Pre-slaughter crowding and handling must be kept to an absolute minimum. Personnel involved in slaughter must be thoroughly trained and competent to carry out the required tasks.

- S 1.1** Prior to slaughter, fish must:
- a) only be fasted for the absolute minimum period required to meet food hygiene requirements
 - b) not be fasted for more than 72 hours, unless fasting is beneficial for welfare.
- S 1.2** Crowding and handling prior to slaughter must be kept to an absolute minimum.
- S 1.3** Farmed fish must be humanely slaughtered.
- S 1.4** The method of slaughter used must rapidly, and without pain and distress, render the fish insensible, until death supervenes.
- S 1.4.1** An efficiently applied percussive blow is the only permitted slaughter method at present.
- S 1.4.2** Humane mechanical devices must be used in preference to a manual percussive blow (except for emergency slaughter).
- S 1.4.3** The use of mechanical devices must be monitored to ensure that they are working properly and that they are delivering the stun at the correct location.
- S 1.5** One blow must be delivered to the top of the head just behind the eyes, of sufficient force to cause immediate loss of consciousness that lasts until death.
- S 1.5.1** A priest must be available throughout the slaughter process to allow a manual percussive blow to be administered in an emergency.
- S 1.6** Bleeding must follow within 10 seconds.
- S 1.7** All staff involved with the slaughter process must have received full training to ensure they have the knowledge and skill to perform their task humanely and efficiently.
- S 1.8** There must be a named person responsible for fish welfare throughout the slaughter process who has attended a recognised training course in humane slaughter of fish.
- S 1.9** Slaughter efficiency must be continuously monitored to ensure that every fish is effectively stunned and does not regain consciousness prior to death.



Methods for monitoring fish slaughtering operations are outlined in the Veterinary Health Plan guidelines (see Appendix 1).

Slaughter

S 1.10 All blood and mucus from slaughter operations must be contained and disposed of ashore.

i The RSPCA is examining all new developments associated with the slaughter and killing of farmed fish. If any of these methods are shown not to compromise the welfare of the fish involved, then consideration will be given to incorporating them into the RSPCA welfare standards in the future.

Wider environmental impact

The farm must be operated with respect for the natural environment and employees must recognise their duty to care for the wider environment. All reasonable steps must be taken to minimise the ecological impact of the farming system. Producers must draw up an Environmental Impact Management Plan within two years.

ENV 1.1 An Environmental Impact Plan must be drawn up and complied with.

ENV 1.2 All relevant legislation, official guidelines and Codes of Practice must be strictly adhered to and understood.

i These standards are primarily aimed at the welfare of farmed fish. However, the potential for aquaculture to have wider environmental effects must also be considered. In addition to fully complying with all relevant legislation and recommendations, the farmer must demonstrably and positively review environmental protection policies as developments in research and technology allow. It is the responsibility of the management to ensure that all employees recognise their duty to care for the natural environment and monitor possible impacts on it.

Escapees

ENV 2.1 Every reasonable step must be taken to prevent the escape of farmed fish.

ENV 2.2 Enclosures must be designed and sited in such a way that they are not likely to be damaged by adverse weather conditions.

ENV 2.3 Fish farms must have a containment plan in place with the aim of preventing fish escaping.

i Farmed fish which escape may have an adverse ecological impact and are also likely to experience welfare problems. It is therefore essential that all possible reasonable measures are being taken to prevent farmed fish escaping.

ENV 2.4 The contingency plan, as referred to in M 2.5, must contain a section on actions to be taken in the event of fish escaping.

Extraneous species

ENV 3.1 Extraneous species must be returned to the wild, or humanely culled, as advised by the designated veterinary surgeon.

Fallowing

ENV 4.1 Enclosures must be fallowed as detailed in the Environmental Impact Management Plan to allow recovery of the benthos and help reduce sea lice populations.

Aesthetic

- ENV 5.1** Sites must be kept tidy and all waste must be disposed of by an approved method; burning of plastics is prohibited.

Appendix 1 - RSPCA veterinary health plan guidance notes

This document provides complimentary notes to the RSPCA's welfare standards for farmed Atlantic salmon, and is intended as guidance for producers and their veterinary surgeons during the formulation of their written Veterinary Health Plan (VHP). All farms are different and, therefore, these notes are not intended to be prescriptive but to offer guidance regarding the main areas which should be considered. In places, some of the requirements of RSPCA welfare standards are highlighted. However, these are just relevant examples and the RSPCA welfare standards must be consulted in full for the detailed requirements.

The RSPCA is grateful to those who assisted in formulating these guidance notes – particularly Pete Southgate BvetMed MSc MRCVS of the Fish Vet Group veterinary surgeons, and Steve Kestin BSc PhD of the University of Bristol, for their invaluable contribution. The Society would also like to thank members of the RSPCA/Freedom Food Salmon Working Group for their advice.

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Pete Southgate BvetMed MSc MRCVS, Fish Vet Group

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Steve Kestin BSc PhD, University of Bristol

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The written Veterinary Health Plan (VHP) should be agreed between the vet and the producer and, where appropriate, the stock-keeper. It should involve regular visits on-site by the farm's own vet.

It would be preferable if the visits could be carried out by the same vet to give continuity and consistency of advice. This vet should be named and be responsible for overseeing the drawing up of the health plan on the first visit as well as an annual review.

Part A) VHP guidelines on fish health

Pete Southgate BvetMed MSc MRCVS, Fish Vet Group veterinary surgeons

The VHP is a document which is developed by the farm personnel and their veterinary surgeons to encompass all areas of fish health and welfare. It attempts to identify and define areas of management and husbandry where agreed activities and protocols are aimed at best practice for the maintenance and improvement of the stock health status and welfare. It should set out objectives and aspirations which are regularly reviewed and updated.

See RSPCA welfare standard - H 1.1

The VHP must cover six key areas:

1. Biosecurity.
2. General management.
3. Disease and physical injury – control and monitoring.
4. Training.
5. Major common diseases.
6. Classification of causes of death.

Maximising fish health and welfare is the overall aspiration of the VHP.

1. Biosecurity

See RSPCA welfare standard - M 3.5

Appropriate and effective biosecurity measures must be in place to minimise the introduction of new infectious agents into the farm. These measures should address the following areas:

- . disease examination and certification of ova and fish prior to stocking
- . visitors and vehicle movements
- . staff sanitation
- . movement of equipment and staff between sites
- . stock separation, isolation, sanitary and hygiene procedures between working areas
- . sanitation of fixed and movable equipment
- . day-to-day cleaning/disinfection and terminal disinfection of buildings, equipment, enclosures and nets.

Fish movements

It is recognised that biosecurity may be difficult in some cases e.g. open sea enclosure sites, where isolation of stocks from potential pathogens from the environment is impossible, but these risks must be recognised and minimised as far as possible e.g. by separation of year class stocks, appropriate fallowing and site selection.

2. General management

The farmer is expected to maintain the highest possible welfare standards at all times. It is essential that staff managing farmed fish are aware of the importance of welfare as an integral part of production. Physical health and injury scoring should be used by the farmer as a management tool to improve welfare (see Part C) and this system should be used to provide feedback to the VHP.

The VHP shall establish procedures which identify areas of welfare risk and methods of monitoring and

Appendix 1 - veterinary health plan guidance notes

minimising risk. Monitoring will determine whether the procedures are appropriate and successful. Procedures shall be regularly reviewed and the VHP changed to account for any corrective actions identified.

The VHP will include reference to a 'chain of command' detailing responsibilities for specific procedures, supervisors, reporting responsibilities and the provision of suitably trained deputies.

See RSPCA welfare standards - M 2.1 to M 2.4

Management activities to be addressed:

- . routine inspection of fish and equipment and method of recording
- . methods of handling fish
- . procedures for crowding fish
- . procedures for grading fish
- . procedures for monitoring smoltification by sea water tolerance testing and condition scoring
- . agreed maximum stocking density for each system
- . lighting levels for each stage of development
- . methods for monitoring fish slaughtering operations (see Part B).

Humane culling

The VHP must cover appropriate action when dealing with the humane destruction of seriously sick or injured fish. This should include guidelines on recognising fish that require culling. Fish which are unlikely to recover from a condition or are likely to be experiencing pain or distress must be humanely killed without delay. It is unacceptable to leave such fish to suffer when it is possible to catch and remove them. For example, if a seriously injured fish is noticed during crowding, which can be caught without distressing the remaining fish, it must be removed immediately, rather than subjected to further procedures such as pumping.

Consideration must also be given in the VHP to situations in which mass culling maybe required for emergency reasons such as a major disease outbreak. In such situations prompt identification and action can prevent considerable suffering, and producers must outline measures to ensure this is achieved as part of an Emergency Procedures Action Plan. Due attention must be paid to welfare in such circumstances as advised by the attending veterinary surgeon fish biologist or fish health manger.

See RSPCA welfare standards - H 2.1 to H 2.2.1

3. Disease and physical damage – control and monitoring

Fish must be protected from pain, injury and disease, through good management and husbandry practice, and by rapid detection and treatment of disease.

See RSPCA welfare standards - M 2.7, M 3.2, M 3.6, M 3.7, H 1.4

The VHP shall include future husbandry plans and an assessment of risks to the health and survival of fish stocks. The VHP must be regularly updated following consultation the veterinary surgeon fish biologist or fish health manger.

The VHP must detail methods of removal and disposal of dead fish. The cause of death must be classified (see PART A, 6. Classification of causes of disease). Any culling should be carried out by an agreed procedure. An agreed recording procedure shall be established including cause of death (or reason for culling), dates and times of inspections and signature. Appropriate biosecurity arrangements must be in

Appendix 1 - veterinary health plan guidance notes

place for the disposal of dead fish, including sanitation of equipment used.

The VHP shall detail evidence of physical damage e.g. fin damage, descaling, wounds, lice damage, eye damage etc. Incidence of physical injury and deformity must be regularly monitored (see PART C) and a programme established to identify and rectify the cause of recurring damage on a number of fish. A system of physical health scoring shall be established in conjunction with the VHP.

Farms must benchmark the physical health and damage of their fish at entry to the scheme, using accepted protocols, and monitor fish at regular intervals. As time progresses, it is expected that fish condition will progressively improve. If deterioration in fish condition occurs, this must be investigated with the site veterinary surgeon fish biologist or fish health manger.

and remedial action agreed and updated into the VHP. The log detailing fish physical health and damage must be available for inspection by RSPCA farm livestock officer and Freedom Food Assessor.

Disease surveillance

Early identification of developing health problems is an important component of a VHP, allowing prompt action to be taken. Good stockmanship is therefore crucial for the early recognition of disease symptoms.

See RSPCA welfare standards - H 1.5, H 1.8

It is essential that stock-keepers are suitably trained and experienced and are able to recognise indicators of disease at an early stage.

Every effort should be made to establish procedures to give early warning of disease or health problems by appropriate monitoring techniques, on-site observations, use of cameras and laboratory tests as necessary. The exact nature of these should be determined in discussion with the veterinary surgeon and may include regular on-site monitoring and sampling and laboratory examination such as routine microscopic examination for the presence of parasites and the establishment of lice monitoring as detailed above. The requirements of third party auditing of purchased stocks and the use of tests for detecting covert disease should also be considered.

Procedures must be established for actions taken on suspicion of a disease outbreak or health problem. This must include:

- . personnel responsible for on-farm investigation
- . appropriate on-farm sampling procedures
- . involvement of the veterinary surgeon and diagnostic laboratories
- . submission of appropriate material for investigation
- . notification of disease incidence to appropriate bodies if deemed necessary.

Staff must be aware of the requirements regarding notifiable diseases. All reasonable steps must be taken to facilitate prompt identification, confirmation and response should a notifiable disease be present.

See RSPCA welfare standard - H 1.3

Supply and application of appropriate therapeutic compounds must be included in the VHP including procedures for the proper administration of medicated feeds and bath treatments.

Recording

It is essential that accurate health and production records are kept on the farm. In addition to their use as part of the day to day monitoring of the health and condition of the stocks, they should also be part of the preventative medicine plan and used in conjunction with improving health control and biosecurity measures. Review procedures should be in place to monitor trends and highlight areas of concern which may indicate changes to systems and adjustments to the VHP. The success or failure of any treatment or changes in management/husbandry procedures should also be recorded and reviewed.

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See RSPCA welfare standards - H 1.6, H 1.8

Medicinal products

The use of medicinal products must be detailed in the VHP. Use must be minimised by high standards of management and husbandry and treatments restricted to occasions when the welfare of the stocks is threatened. The VHP shall detail currently available veterinary medicines licensed for fish and their use in accordance with current legislation, including withdrawal periods and discharge consents. Under exceptional circumstances the use of compounds under the prescribing cascade may be advised by the veterinary surgeon; the details of the cascade principle will be set out in the VHP.

See RSPCA welfare standards - H 3.1, H 3.10

The use of all medicinal products will be recorded in full in an appropriate medicines book. All veterinary products must be properly labelled and stored in an appropriate locked cabinet. An up-to-date stock record must be maintained and no out-of-date product retained.

Vaccination

See RSPCA welfare standards – FW 10.1 to FW 11.9

A vaccination policy must be agreed with the farm's veterinary surgeon establishing potential risks and the organisms against which the fish can and will be vaccinated.

Full records must be maintained of all vaccination procedures.

Protocols for effective and hygienic vaccination must be in place, including appropriate fish health assessment prior to vaccination and monitoring during and following the vaccination procedure. Procedures must be conducted with care and with the minimum possible distress to the fish.

All vaccinators must be trained and competent in vaccinating technique, including biosecurity, hygienic practices, health and safety and fish handling procedures.

Appropriate procedures must be in place for third party vaccinators and the vaccination of purchased stock, including monitoring of third party vaccination and supplied vaccinated stocks. These procedures must detail biosecurity precautions in place.

At present vaccines are available for the following bacterial diseases:

- . Furunculosis (*Aeromonas salmonicida*).
- . *Vibrio anguillarum* – usually two serotypes.
- . Winter sore (*Morotella viscosus*).
- . Hitra disease (*Vibrio salmonicida*).
- . Enteric redmouth (*Yersinia ruckeri*).

In the future, effective Infectious Pancreatic Necrosis (IPN), Rickettsial and Pancreas Disease (PD) vaccines may be available.

Choice of vaccine depends on level of threat and assessment of 'side effects' such as post vaccine fungal infection and the level of abdominal adhesions, both of which may have a greater fish welfare implication than the disease against which the fish is being protected.

4. Training

A programme of training relevant to the requirements of the VHP should be detailed. This should include procedures for identifying and monitoring training needs and progress by means of regular reviews and management observations. The establishment of induction training for new personnel and a system of recording training requirements, provision and performance.

Although the majority of management and husbandry procedures have some impact on the health and welfare of the fish, some specific areas of training requirements are relevant to the demands of the VHP:

- . recognition of signs of poor welfare or disease symptoms
- . investigation of health and welfare problems
- . administration and recording use of medicinal products
- . vaccination
- . sea lice monitoring
- . monitoring fish health
- . handling, crowding, grading fish
- . culling
- . humane slaughter.

See RSPCA welfare standard - M 2.2 to 2.8

Written records of staff training must be maintained and be available to the Freedom Food assessor and RSPCA farm livestock officer.

5. Major common parasites and diseases

Sea lice

See RSPCA welfare standards - H 4.1 to H 4.6

Due to severe welfare problems caused by sea lice infestation, and the possible risk to wild salmonids, farms must take all reasonable steps to maintain a minimal ovigerous lice population. Farms must develop an integrated pest management policy based on stocking/fallowing times, strategic treatment regimen and area management agreements. A sea lice prevention and treatment programme shall be drawn up in conjunction with the veterinary surgeon; this shall include frequency of monitoring, sampling and monitoring protocols and threshold lice levels triggering treatments. The programme shall include agreed treatment regimes, treatment monitoring to ensure fish welfare, critical control and post-treatment monitoring.

Sea lice infestation must be monitored on a weekly basis by sampling a minimum of five fish from a representative number of pens (depending on the size of the farm). To enable appropriate choice and timing of treatments, *Lepeoptheirus* species must be classified into mobile, attached and gravid female stages; *Caligus* species are counted but not grouped. A strategic treatment regime must be implemented to avoid the 'spring settlement' of high numbers of copepodid stages. Treatment regimes and choice of treatment must at all times consider the welfare of the fish and preference must be given to more 'welfare friendly' treatments whenever possible, e.g. in-feed treatments are preferred to bath treatments; some bath treatments may be considered by the veterinary surgeon to be less damaging to fish than other bath treatments. Consideration must be given to treatment strategies to avoid the potential development of resistant lice.

Infectious Pancreatic Necrosis (IPN) virus

IPN can cause serious losses of fish in freshwater and following sea transfer of smolts. Losses can be as high as 50% with affected fish often showing few presenting symptoms. This is a notifiable disease and any suspected outbreak should be reported to the appropriate authority. Outbreaks of clinical IPN are frequently related to levels of stress to which fish are subjected, particularly at seawater transfer. Every effort must be made to ensure that stress is minimised and particular attention should be paid to the following:

- . adequate and continuing biosecurity and hygiene
- . avoiding putting infected fish to sea
- . consideration of stock selection and possible susceptibility to IPN
- . correct timing of vaccination
- . size, health, condition and nutritional status of presmolts
- . use of nutraceuticals, particularly around sea transfer
- . timing of sea water transfer, judgement of smoltification and the utilisation of sea water tolerance tests
- . minimising stress during transport and keeping transport times to a minimum
- . frequent removal of dead and dying fish
- . fallowing and area management agreements
- . controlling other disease conditions such as lice (which can carry IPN virus).

There is no treatment for IPN and control is based upon avoidance and paying attention to the above factors. The practice of starving the fish at the first sign of the disease is not thought to be an effective control measure.

Fungal infection

Infection with *Saprolegnia* fungus can result in serious disease conditions in fresh water stages of salmon production, including the egg. Infection can be particularly severe at times when the fish's resistance to the infection is low e.g. following vaccination, at low temperatures, and when maturing. Damaged fish are particularly vulnerable when even very minor damage – removal of areas of mucus, scale loss, minor fin erosion – allows the germination of fungal spores (which are ubiquitous in the fresh water environment), which can lead to the development of serious skin, fin and tail lesions. The risk of fungal infection varies between water sources, depending on the nature of the water body, water chemistry etc. and it is essential that farmers are aware of the extent of the risk posed. There are no very effective treatments for established fungal infection, and control must rest with minimising the risk of infection. Strict attention must be paid to hygienic practices and the cleanliness and sanitation of equipment; accumulations of dirt, build up of biofilms, waste feed, faeces, and dead fish all act as reservoirs for fungus. Dead, damaged and grossly infected fish and eggs must be removed from the water. All equipment and management procedures, such as crowding and grading, must aim to minimise any damage. Priority should be given to farming practices which are aimed at minimising handling the fish, including stocking policies, grading, moving and transportation. Vaccination protocols must include methods of minimising subsequent fungal infection including hygiene, vaccination technique, consideration of choice of vaccine, netting and handling, and the use of 'wet' vaccination technique. Consideration should also be given to the use of nutraceuticals prior to vaccination, and the prophylactic use of available anti-fungal agents post-vaccination.

Algae/Jellyfish blooms

Blooms of marine (and occasionally freshwater) phytoplankton (algae) and jellyfish (e.g. *Solmaris corona*) have the potential for causing severe damage and heavy losses of farmed salmon. Algae may affect the fish by producing toxins, by reducing oxygen levels at night and when they die off, and by being directly irritant to the gills and skin. Similarly, jellyfish can be directly damaging by stinging, irritating and accumulating within the gills, and by reducing water flows and oxygen levels. Indirect damage to fish can occur as a result of stress and escape responses. Affected fish appear irritated, may 'porpoise' in the

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water, go off their feed and show lethargy, skin damage and pale/damaged gills. Acute losses can occur due to the toxic and/or oxygen depleting properties of the algae. Monitoring for these blooms must be carried out, particularly during the period April-October, when blooms commonly occur. Monitoring should be carried out using secci discs, dissolved oxygen logging, and by taking and preserving water samples for examination. Appropriate procedures must be established to deal with a suspect algal/jellyfish bloom, including stopping feeding, avoiding any stress to the fish, and the use of aeration systems/skirts. Monitoring, area management agreements, early warning, and response must be integral to the long-term management of blooms.

Deformity

Various deformities can occur in stocks of farmed salmon, many of these may not show grossly until the fish are on-growing in the sea, although the problem may have been initiated at a much earlier stage. A number of deformities have been identified including spinal, jaw, operculum and heart, often in combination. The cause is often uncertain although genetic, hatchery, handling and nutritional factors have been suggested. The deformed fish may be more vulnerable to handling, stress, and be particularly susceptible to loss during bath treatments. The presence and extent of any deformities should be monitored from as early stage as possible and any possible causes investigated. Factors in the hatchery which have been implicated, such as high and fluctuating temperatures, high carbon dioxide levels etc., must be avoided and due consideration must be given to the management and handling of affected fish, including possible grading out and culling.

6. Classification of causes of death

Often it is difficult to assign a specific cause of death. It is usually only possible in relatively recently dead fish and frequent removal of dead fish from pens helps this. If there is any doubt as to cause, it is better initially to classify as 'unspecified', to carry out some diagnostic investigation and to reclassify subsequently if a cause has been more clearly ascertained.

See RSPCA welfare standards - M 3.6 to M 3.8

Classifications:

- . unspecified
- . runt
- . predator damage
- . other damage (handling, grading, net)
- . bacterial disease (furunculosis, Vibrio, winter lesion, Rickettsia
- . may wish to categorise separately)
- . lice
- . parasites (freshwater)
- . fungus
- . IPN
- . PD
- . the presence of feed in the gut (express faeces from gut for testing).

Part B) VHP guidelines on ensuring fish welfare at slaughter

Steve Kestin BSc PhD, University of Bristol

1. Introduction

It is now widely accepted that fish experience suffering if they are stressed or injured. During slaughter, stress and pain can all too easily be caused to fish unless the process is carried out carefully. This is because stress can occur during the pre-slaughter crowd, when fish can panic and injure themselves, and when oxygen levels can become depleted. During the slaughter process injury and pain can be caused if the process is not correctly carried out.

The purpose of this section is to provide guidelines on how to prevent fish becoming stressed and to identify whether the fish are being stunned effectively. This allows people involved in fish slaughtering operations to check that the process is being carried out humanely. Improving fish welfare at slaughter is not the only reason to carry out the process carefully. There are also commercial benefits to reducing stress and injury at slaughter. These will also be briefly covered.

2. What is humane slaughter?

The same requirements for humane slaughter must apply to farmed fish as to other farmed animals. Methods used should either cause death instantly or render fish insensible to pain and distress until dead. In order to ensure that fish are being humanely killed, we need to be able to check that they are not experiencing distress or pain.

3. What parts of the operation do we need to examine?

There are two basic operations in slaughtering fish that need to be considered:

- . crowding the fish and delivering them to the slaughter table
- . killing them.

We need different techniques to assess each part but it is important to view the operation as a whole. The welfare and commercial benefits of a humane killing operation will only occur if both parts are carefully handled.

4. Assessing the pre-slaughter crowd

During the pre-slaughter crowding we need to make sure the fish are not stressed or injured.

Typically, during the crowd, the density of fish will be increased near the intake of a fish pump or so that they can be netted out. This crowding may be done using a sweep net or by reducing the depth of the enclosure net, or by a combination of both.

Crowding a small population with a seine net is generally preferable to crowding a whole enclosure.

See RSPCA welfare standard – HP 2.1 to 4.8

Increasing the density of fish is necessary for the operation to be efficient, but it is important that the fish are not frightened into vigorous activity like fast swimming, escape attempts, or 'burrowing' into the net. Fast swimming, escape attempts and burrowing are clear signs that fish are stressed.

5. The 'feed-back loop'

In a pre-slaughter crowd, if fish are frightened or panicked into swimming fast, several things happen:

- . they use up oxygen in the water faster. This in turn will cause further panic as the fish try to find better quality water
- . the fish injure themselves on the enclosure net and on each other, leading to further panic (and increased downgrading from scale loss, injury and bruising)
- . the more the fish swim fast, the more muscle glycogen they use up. This will mean that the carcasses will be prone to gaping and could have paler flesh.

In a pre-slaughter crowd, once fish start to panic and swim vigorously the situation can easily get out of hand and result in mortality and downgrading. Crowding must be done gently and carefully so that fish do not panic, or years of care rearing top quality fish can be undone in a few minutes.

6. Signs to watch out for

In a carefully crowded enclosure, the fish will look calm. Fish will be swimming leisurely. Obviously they will be encountering other fish frequently but they will avoid them with a flick of the tail. Fish will slide along the net and turn casually when they reach an obstruction. No fish will be burrowing into the enclosure net trying to escape. Only the odd dorsal fin of fish will be breaking the surface.

See RSPCA welfare standard - HP 2.17

When fish are stressed in a preslaughter crowd, fish will be swimming fast and could be trying to burrow into the bottom, sides or corners of the net trying to escape. If parts of the back of any fish, in addition to the dorsal fin, are exposed when they swim close to the surface or over each other, then they are almost certainly crowded too much. Fish scales seen suspended in the water column down stream from crowded fish are a clear sign that the crowd is too dense and fish are damaging themselves. Snout damage in the form of sore or bleeding snouts seen on fish after slaughter is also a clear sign that fish have been burrowing into the net. If any of the signs of stressed fish are seen, the fish need to be given more room quickly. Dissolved oxygen in the water must be monitored during the crowd but monitoring oxygen is not a substitute for observing the fish for signs of stress.

See RSPCA welfare standard - HP 2.19

7. Maintaining a good crowd

It is important to realise that fish will be stressed even in a well-crowded enclosure. Therefore, it is important that the maximum crowd duration is not too long. Generally, two hours should be regarded as a maximum crowd duration.

See RSPCA welfare standards - HP 2.4, HP 2.14, HP 2.15

There is a fine line between a crowd that is too dense, causing excessive activity in the fish, and a crowd that is not dense enough to maintain an adequate flow of fish to the killing table. The best way to achieve an adequate but not excessive density of fish is to reduce the volume available gradually as fish are removed. As a guide, in a good crowd the net will be reduced at approximately 15-minute intervals, and at more frequent intervals when there are few fish remaining.

When pulling the enclosure nets or sweep net to crowd the fish, try to avoid areas where the net is shallow just below the surface, or folds causing pockets in the net. These will cause fish to panic if they become trapped.

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To manage the crowd carefully, it should be the responsibility of one person to ensure the fish are carefully crowded and this person should have no other responsibilities or tasks to perform to distract him.

8. Methods for conveying fish to the slaughter table

The transfer operation should not injure or stress fish. It should be carried out quickly using equipment specifically designed for the job. Pipe lines should be kept short (no more than 10 meters), so that fish are not being stressed in the pipe for too long. Obviously, there must be a method for quickly getting fish out of the pipe in the event of equipment breakdown as fish can die in a pipe from lack of oxygen in only a few minutes. Fish should exit the pipe onto the slaughtering table in a way that does not lead to injury, meaning that they must not have to drop down onto a de-waterer or the table.

Air-lift pumps, venturi pumps, vacuum pumps and crane operated brailles are all used to transfer fish to killing operations. Generally, air-lift and venturi pumps are preferred as they damage and stress fish less.

Examine a sample of about 50 fish immediately after slaughter for evidence of scale or skin loss or injury caused by handling equipment like pipes and pumps. As a guide, if any of the fish have areas of recent scale loss etc. larger than a two pence coin, the equipment needs to be examined and improved.

See RSPCA welfare standard - HP 1.4

The whole crowding and pumping operation should deliver fish to the killing table in a steady stream and at a pace that the slaughter team can cope with. The killing team should be able to adjust the flow of fish from the table easily.

Stunners should be positioned on the table in such a way that handling of fish prior to stunning is reduced to an absolute minimum. On a well-designed killing table, fish can be gently guided into the stunner without struggling.

When fish arrive on the table, to minimise stress and injury, they must be stunned immediately. As a guide, operators should aim to stun fish within five seconds of arrival on the table.

9. Managing a good stunning operation

First, the stunning machines should be set up and maintained regularly according to the manufacturer manuals. The pressure of the air delivered to the machines should be clearly visible and checked against the machine manufacturer recommendations, and logged at least twice per shift. A record of checks and maintenance should be kept.

Second, operators should be familiar with the operation of the machine. During training they should practice with a dead fish to perfect their technique of capture and presentation for stunning before killing any live fish.

It is critically important for fish welfare that the machine hits the fish accurately and hard.

If stunning is correctly carried out, the fish will not recover from the blow, even if it is not bled. If fish are not hit hard or accurately, they will be injured or could recover consciousness and will suffer.

Because poor stunning could cause so much suffering, we need to ensure that all fish are being stunned effectively.

See RSPCA welfare standard - S 1.1 to S 1.10

10. Assessing the effectiveness of stunning

First, watch fish arriving at the stunning table from the fish pump. Time how long it is between a particular fish arriving and it being stunned. Note down the time and then repeat for about ten fish. Work out the average. As a guide, if the average 'arrival to stunning time' is more than five seconds then the operation needs to be improved.

Reduce the flow of fish to the table by slowing the fish pump and/or reducing the crowd density. Then look at the ergonomics of the killing table. Could fish delivery, presentation or handling be improved by modifying the table with dividers or higher/lower edges or rubber mats, placing the stunners in a different position or are more stunning machines needed? It is surprising how many killing tables are ergonomically not well laid out. Try modifications to the table with temporary wood partitions etc and evaluate the effectiveness of these modifications before having the table modified by professionals.

Second, observe the stunning operation. Count how many stunning blows are needed to stun a particular fish. Note down the number and then repeat for about ten fish. If fish require more than one stunning blow, then the operation and/or set up of the stunner needs to be improved. Check that the operator is presenting fish correctly, that sufficient air pressure is available and that the machines have been maintained and are not obstructed in any way. Re-evaluate the stunning process. If fish require more than one stunning blow, then the operation must be stopped and the manufacturers of the machine need to be contacted.

Note that the unconsciousness induced by percussive stunning should be immediate and permanent i.e. the fish should not recover from the blow, even if it is not bled. Bleeding is not part of the killing operation but is done for flesh quality reasons.

11. Determining whether fish are adequately stunned

Observe fish immediately after stunning. In a properly stunned fish a reflex shudder or tail flap will usually occur for a few seconds after stunning. Do not be worried about this reflex movement if it lasts for up to four seconds. But if movement lasts for much more than four seconds, it is not a reflex and stunning is not being done effectively.

If there is no overt movement in fish after four seconds, pick the fish up and examine it. Look for signs of rhythmic breathing and eye roll. These are the best signs to look for to determine if the fish is properly stunned. This is because rhythmic breathing and eye roll are both signs of brain stem activity – if they are absent it is safe to conclude that the fish is deeply unconscious.

- . Rhythmic breathing appears as rhythmic movements of the operculum (gill cover) (and sometimes the mouth). Note that occasionally fish that have been properly stunned will flare their gills a few minutes after stunning. This is a reflex action and, provided it is not repeated more than a couple of times, can be ignored.
- . To observe eye roll, with the fish lying on its side, look at the movement of the eye when the fish is rolled upright and then back again. In a stunned or dead fish the eye will remain flat and fixed in the skull. In a conscious fish or one that has not been properly stunned (i.e. with brain function), the eye will appear to move in the eye socket, trying to remain upright when the fish is rolled onto its side.

If there is no sign of rhythmic breathing or eye roll then the fish is properly stunned. If rhythmic breathing or eye roll can be observed, then the fish is not adequately stunned. Practice observing rhythmic breathing and eye roll on a few fish before they are stunned so that you know what to look for.

Make sure that all people involved in stunning and bleeding fish know that if a fish is fighting or responding to handling in any way it is not unconscious and must be stunned before anything else is done to it. If a fish responds to handling or the cut of the knife when exsanguinated then it is definitely not stunned.

12. Assessing the stunning operation

See RSPCA welfare standard - S 1.9

Use the simple indicators of brain function to estimate the efficacy of the stunning operation at least once each day fish are killed and particularly when new equipment or operators are used. Examine at least 50 fish picked at random and stunned by all operators and machines. As a guide, if any of these fish respond to handling or show any signs of rhythmic breathing or eye roll they are inadequately stunned and the causes need to be identified and rectified. Make a note of the results of each assessment and any action taken in the killing log.

13. Exsanguination (bleeding)

Remember that properly carried out, percussive stunning is permanent. Bleeding is carried out to improve the flesh quality of fish. In most cases, bleeding is done by cutting all the gills arches on one side of the fish. This should be done reasonably soon after stunning. But, contrary to popular belief, a beating heart is not necessary for effective bleed out.

See RSPCA welfare standard - S 1.9

14. Finally

See RSPCA welfare standard - S 1.7

Each person involved in killing should be aware of the importance of good killing practice. This means minimised stress or injury before slaughter, and rapid and effectively applied stunning. The signs to look for are leisurely swimming fish in the crowd pen, and still carcasses after stunning. In particular, there should be no movement in the bleeding/icing tub.

The overall stress of a slaughter operation can easily be assessed if the pattern of rigor onset and resolution is measured. Salmon killed without stress enter rigor after approximately 40 hours. When salmon are stressed before they are killed, they can enter rigor very rapidly, typically in less than 15 hours.

15. Summary of observations and measurements to make during fish slaughter

Observe the behaviour of fish in the pre-slaughter crowd pen

Look for the following signs of low stress:

- . fish swimming leisurely
- . fish sliding along net, turning casually when obstructed
- . only the odd dorsal fin of fish breaks the surface.

Look for the following signs of high stress:

- . fish trying to burrow into the bottom, sides or corners of the net
- . fish trying to escape from folds in the net or shallow areas
- . parts of the back of fish exposed when fish swim close to the surface or over each other
- . fish scales suspended in the water column down stream from enclosure
- . oxygen levels below 5.5 mg/l.

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Check the killing equipment and staff

Check:

- . pressure of the air delivered to the stunning machines
- . maintenance log of stunning machines
- . operators are familiar with the operation of the machine
- . operators, technique of capture and presentation for stunning is good.

Watch the stunning operation

- . work out the average 'arrival on table to stun' interval. If more than five seconds the operation needs to be improved
- . observe the number of blows needed to stun fish. If more than one blow is needed the operation needs to be improved.

Examine a sample of 50 fish immediately after slaughter

Look for:

- . carcass movement lasting more than four seconds in any fish, stunning is not being done effectively
- . signs of rhythmic breathing and eye roll – if either present, stunning is not being done effectively
- . snout damage in the form of sore or bleeding snouts – sign of poor preslaughter crowd
- . scale or skin loss or injury – signs of poor handling equipment (pumps and pipes etc).

Part C) Development of a programme for monitoring physical injury and deformity

Introduction

Regular monitoring of fish for signs of physical damage or deformity is an important part of management so that welfare problems do not go undetected. However, it can be difficult to observe individual fish clearly due to the large number of animals and the size of enclosures. Whenever husbandry procedures allow closer proximity to fish, the opportunity should be taken for more detailed observation. In addition there should be detailed monitoring of fish health at slaughter where careful examinations of individuals for disease, injury and deformity can be made.

The RSPCA welfare standards require that there is no recurring physical damage occurring on fish attributable to features of their environment, husbandry procedures or unrecognised disease challenge. Incidence of physical damage must be regularly monitored at slaughter according to a programme specified in the VHP (see Part A for more details). This programme must include keeping records to show that physical health scoring has been regularly conducted on a sample of fish at slaughter. The records must also give details of the levels of physical damage observed during monitoring, for example, the percentage of fish with fin damage, descaling, wounds etc. Records should be discussed with the veterinary surgeon, and the VHP must be regularly updated to identify and rectify the causes of any physical health problems that become evident during monitoring.

There follows a guide for a possible monitoring programme which could be used at slaughter. Examples are given of the types of condition which should be monitored. The proportion of fish affected should be recorded. Some photographic scales (see pages 62 to 63) are also presented to demonstrate how the severity of some types of damage could be assessed.

Possible monitoring programme

The conditions which are to be monitored must be specified in the VHP. It is suggested these include:

- . eye damage/loss
- . snout injuries
- . fin damage (dorsal, pectoral, pelvic, tail)
- . deformities (jaw, operculum, spine)
- . scale/skin damage (due to abrasion, sea lice etc).

Examples are given below of scales that could be used to record the severity of the condition for each fish assessed. Each fish is given a score of 0,1 or 2 for each condition. Score 0 indicates the fish is completely normal, Score 1 is used for fish that are mildly affected, Score 2 is used for severely affected fish.

Photographic scales are also given to suggest examples of different scores. These photographs illustrate the type of damage which may be seen, but are not intended to be exhaustive. For some conditions, the severity, age, and extent of damage can vary considerably. Scoring will be somewhat subjective. The important factor is for the person assessing fish to be consistent when scoring in order to be able to monitor any changes in damage levels.

When drawing up a monitoring programme there should be an initial trial of the scoring system, with a sample of fish being removed from the slaughter line after killing and transferred to an examination bench. The process is easier if two people are involved. Each of the conditions should be carefully examined on each fish, by one observer, and a score assigned.

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Once a method of using the scales has been established and scoring can be conducted consistently, assessments can be started on a random sample of fish. A recorder should stand behind the assessor and write down the scores as they were called out. A random sample of 150 fish on the slaughter line should be assessed (trials have shown approximately 150 fish can be assessed in one hour by an experienced team).

Use of the scales in the Freedom Food scheme

The results from this assessment should be used to identify areas where welfare can be improved on the farm, by identifying causes of physical damage and taking action to rectify the situation. Records of physical damage scale assessment must be kept and made available to the Freedom Food Assessor and RSPCA farm livestock officer, along with details of any action taken as a result of the assessment. It is expected that the VHP will be regularly updated, in consultation with the veterinary surgeon, to reflect the results of the physical damage scoring assessment.

Suggested scoring system

The table below shows the score given to a fish for each condition depending on the severity of damage.

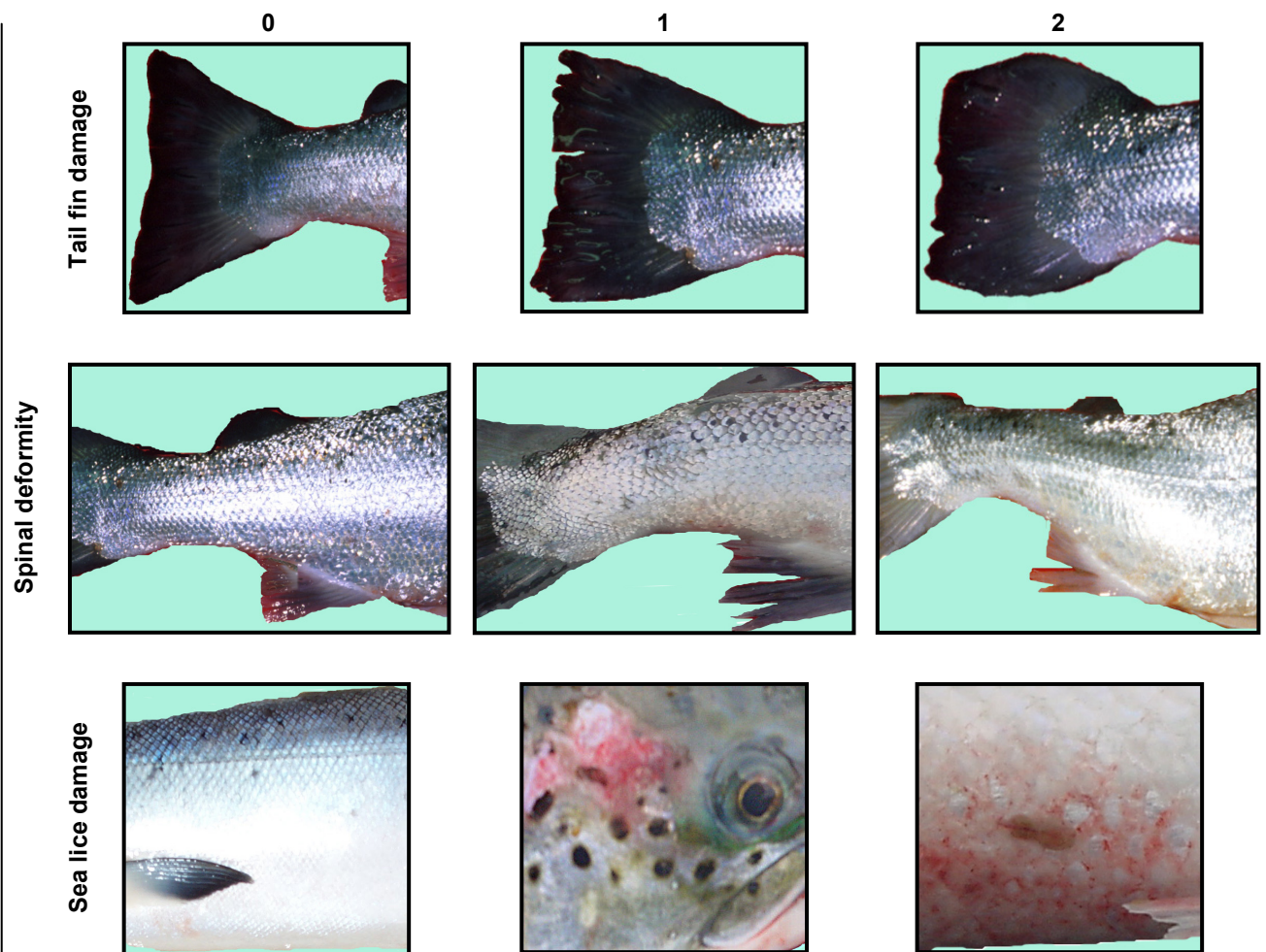
| | | Score given to fish | | | Also note: |
|--------------------------|--|---------------------|---------------------------------|---|----------------|
| | | 0 | 1 | 2 | |
| type and level of damage | Eye loss/damage | None | One eye | Both eyes | Type of damage |
| | Snout injury | None | Mild | Severe | |
| | Jaw deformity | None | Mild | Severe | |
| | Operculum deformity | None | Mild | Severe and/or both sides | |
| | Dorsal fin damage Type and level of damage | None | Mild | Severe | |
| | Pectoral fin damage | None | Mild | Severe and/or both sides | |
| | Tail fin damage | None | Mild | Severe | |
| | Spine deformity | None | Mild | Severe | |
| | Scale loss/skin damage | None | < 10% each side and superficial | > 10% each side and/or deep skin damage | |
| | Sea lice damage | None | Mild | Severe | |

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Suggested examples of normal, mild and severe for conditions classified in this way (note: eye loss/damage and scale loss have a different classification and no examples are given).

| | 0 | 1 | 2 |
|---------------------|---|--|---|
| Snout injury |  |  |  |
| Jaw deformity |  |  |  |
| Operculum deformity |  |  |  |
| Dorsal fin damage |  |  |  |
| Pectoral fin damage |  |  |  |

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These photographs are part of a larger set of photographic scales which have been developed by the University of Bristol for use during on-farm assessment of farmed fish welfare. The copyright for these images belongs to the University of Bristol.

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