

FEBRUARY
2021

The background of the entire page is a close-up photograph of several Atlantic salmon swimming in clear, light-blue water. In the upper portion of the image, the silhouettes of two people are visible against a bright, overexposed sky.

RSPCA welfare standards for Farmed Atlantic salmon

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Introduction

The RSPCA welfare standards for farmed Atlantic salmon (*Salmo salar*) are used to provide the only RSPCA-approved scheme for the rearing, handling, transport and slaughter/killing of farmed Atlantic salmon. The standards cover the two distinct phases of farming (freshwater and marine farming).

They take account of UK legislation, official codes of practice, scientific research, veterinary advice, recommendations of the Farm Animal Welfare Committee (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.

- **Freedom from hunger and thirst** by ready access to fresh water and a diet to maintain full health and vigour.
- **Freedom from discomfort** by providing an appropriate environment including shelter and a comfortable resting area.
- **Freedom from pain, injury or disease** by prevention or rapid diagnosis and treatment.
- **Freedom to express normal behaviour** by providing sufficient space, proper facilities and company of the animal's own kind.
- **Freedom from fear and distress** by ensuring conditions and care which avoid mental suffering.

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.

The standards are based upon the 'Five Freedoms' as defined by FAWC. Although these 'freedoms' define ideal states, they provide a comprehensive framework for the assessment of animal welfare on-farm, in transit and at the place of slaughter/killing, as well as representing an important element of farm assurance requirements. These 'Five Freedoms' are relevant to fish welfare and should be considered in relation to husbandry practice. These 'Freedoms' are shown in bold below, and the wording has been adapted with supporting text to reflect how they relate to fish welfare.

These freedoms will be better provided for if those who have care of livestock practice/provide:

- **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

- The numbered requirements are the standards, all of which must be complied with.
- Boxed sections (indicated by **(i)**) give additional information, including: providing the reasoning behind a standard, expand on a standard, state how a standard can/will be assessed and/or highlight areas where the standards will be reviewed in the future.
- It is expected that all relevant UK legislation regarding farm animal husbandry and welfare on-farm, during transport, and at the abattoir, will be fully implemented in addition to the RSPCA welfare standards.



RSPCA Farm Animals Department

The RSPCA's Farm Animals Department develops the RSPCA welfare standards for farm animals. These detailed documents are intended to represent 'best practice' in the care and welfare of farm animals.

The RSPCA works to continually develop and improve the welfare standards using a range of information, including the latest scientific research and practical farming experience. We regularly consult with other animal welfare and agricultural scientists, veterinary surgeons, and farming industry representatives. This helps to ensure that the RSPCA welfare standards continue to be at the forefront of farm animal care and welfare, and are also achievable on commercial farms.

The standards also take account of feedback from RSPCA Farm Livestock Officers who carry out monitoring of the RSPCA Assured scheme, RSPCA Assured Assessors who audit scheme members, and the scheme members themselves.

We always value constructive feedback and ideas for improvement from those who are implementing the RSPCA welfare standards. Comments/feedback can be discussed with RSPCA Farm Animals Department scientific staff, by contacting them on the below details:

Address: Farm Animals Department
RSPCA
Wilberforce Way
Southwater
Horsham
West Sussex RH13 9RS

Phone: 0300 123 0183

Email: farm-animals@rspca.org.uk

RSPCA Farm Livestock Officers can discuss any issues during farm visits and offer advice, and can provide feedback to the RSPCA Farm Animals Department scientific staff.

The RSPCA does not approve equipment, but sets standards to ensure any equipment permitted for use is managed appropriately to safeguard the welfare of animals.



RSPCA Assured

RSPCA Assured is the RSPCA's farm assurance and food labelling scheme. RSPCA Assured assesses and approves farms, hauliers and abattoirs that meet all of the applicable RSPCA welfare standards. (Please note that RSPCA Assured does not approve equipment).

Products from animals reared, transported and slaughtered under the RSPCA Assured scheme can be labelled with the scheme's food label: 'RSPCA Assured'. Use of the RSPCA Assured name and mark are strictly subject to RSPCA Assured membership, traceability, licence fee and artwork approval.

Membership of the scheme is subject to an annual fee and successful assessment, as well as risk-based monitoring visits by Farm Livestock Officers from the RSPCA's Farm Animals Department.

RSPCA Assured is a charity in its own right and not for profit. Any surplus income goes back into improving farm animal welfare.

Any queries relating to the operation of the RSPCA Assured scheme (e.g. administration, assessments etc.) should be directed to the RSPCA Assured office:

Phone: 01403 800141

Email: help@rspcaassured.org.uk

Management

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 need to have a good working knowledge of the husbandry system used and the animals under their care. It is important to note that all of the sections of the welfare standards are applicable to all relevant aspects of the farming process.

- 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 RSPCA Assured Assessor and RSPCA Farm Livestock Officer.

Manager and stock-keeper training

- M 2.1** **REVISED** Managers must ensure that all stock-keepers:
- 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) delivered within the first 6 months of their induction period and/or before they are required to perform fish husbandry tasks.

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

REVISED

(i) Examples of recognised courses include, the North Atlantic Fisheries College (NAFC) Fish Welfare Training Course and the Fish Vet Group (FVG) Fish Welfare Training Course, and the Benchmark Health and Welfare of Atlantic Salmon 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:
- develop and implement plans and precautions to cope with emergencies such as fire, leaks, problems with transportation, etc.
 - 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
 - ensure that all relevant staff members are fully conversant with the procedures which have to be implemented if there is a fish escape incident, including the plans for the recapture of escaped fish.

- 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.
- 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.

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 RSPCA Assured 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:
- the time and date of inspection
 - the name(s) and signature(s) of the person(s) conducting the inspection for each group of animals
 - details of any problems identified and any actions taken including those relating to moribund/injured/damaged fish, where the reason for the problem must be recorded.
- 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 Veterinary Health and Welfare Plan (VHWP) (see H 1.1).
- M 3.6** Removal of dead/moribund fish from the surface or the mortality removal system must occur as frequently as is necessary and, in any case:
- at least twice a week, unless adverse weather conditions mean this would involve danger to personnel
 - at least daily for land-based systems.
- M 3.7** The cause of death of all fish must be classified using the categories developed in the VHWP (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 VHWP (see H 1.1).**
- M 3.8** Relevant staff must demonstrate competence in interpretation of mortality records.
- 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 VHWP (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 quality
- b) fish behavioural indicators of poor water quality.

(i) Visual indicators of poor water quality can include water that is heavily soiled. Fish behavioural indicators of poor water quality can include fish gasping and/or increased aggression.

M 3.12 The following accurate and up-to-date records must be maintained:

- a) details of origin of stock, allowing traceability
- b) age of fish
- c) control of other animals
- d) crowding and grading records
- e) calibration records
- f) numbers and weights of fish in each tank/enclosure
- g) estimated current stocking densities in each tank/enclosure
- h) where appropriate, target age and weight at which fish will be transferred to sea or slaughtered (in order to predict final stocking densities)
- i) details of fish and equipment inspects
- j) daily and cumulative mortality expressed as a percentage (reasons stated)
- k) daily and cumulative culling expressed as a percentage (reasons stated)
- l) feed consumption
- m) details of any health problems
- n) details of any medication/vaccinations applied
- o) records of smoltification monitoring
- p) SEPA/other regulatory correspondence
- q) records of water quality tests as appropriate to the system
- r) records of net inspections and maintenance
- s) training records
- t) full details of fish movements.

Health

Fish need to be protected from pain, injury and disease, through good management and husbandry practice, and by rapid detection and treatment of disease. All producers need to 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 site specific Veterinary Health and Welfare Plan (VHWP) must be drawn up, reviewed and updated:

- a) at the start of every production cycle or on an annual basis
- b) by those with responsibility for the health and welfare of the fish, which may include the vet, health manager, stockpersons, nutritionist and other relevant personnel
- c) and details of the review must be made available on request.

H 1.2 The VHWP (see standard H 1.1) must include future husbandry plans, risk assessment, monitoring and control of fish health and diseases.

The RSPCA has developed guidance notes for producers and veterinary surgeons regarding formulation of the VHWP. These guidance notes are available in Appendix 1.



Should you or your veterinary surgeon require further guidance then please contact a member of the RSPCA Farm Animals Department, including 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.



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 The VHWP must be treated as a live document and therefore if a problem is identified, the VHWP (see H 1.1) must be revised without delay to ensure that the welfare of the fish is not compromised.

H 1.7 Any fish suffering from overt physical damage, or disease symptoms, must be:

- a) segregated
- b) treated/humanely euthanised without delay.

Casualty slaughter

- H 2.1** Any seriously sick or injured fish, or fish found not to be recovering, must be humanely killed without delay. Records of this must be made available on request.
- H 2.2** During the seawater stage, in addition to anaesthetic overdose, the following are permitted for the emergency killing of fish:
- a priest of appropriate size for the fish
 - a mechanical percussive device.
- H 2.2.1** Use of the emergency killing methods listed under H 2.2 a) and b) must result in a non-recoverable percussive blow to the head of the fish to render it immediately insensible.
- 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 within 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** **LEGAL** 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 and Welfare 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.

- 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 3.9.2** Any treatments which have clearly not worked, or have produced an adverse reaction in the treated fish or farm staff that have come into contact with the medicine must be:
 - recorded in the medicine record book or the Veterinary Medicines Directorate (VMD) adverse reaction form
 - reported to the farm veterinary surgeon and health manager.
- 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** **LEGAL REVISED** Farms must take all reasonable steps to minimise the gravid lice population, as per the requirements of the Aquaculture and Fisheries (Scotland) Act 2007, as amended 2013 and the Fish Farming Business (Record Keeping) (Scotland) Order 2008.
- H 4.2** Stock-keepers must be able to recognise symptoms of lice infestation.
- H 4.3** **REVISED** Separation of year classes and fallowing of sites must be practised to help control sea lice populations as detailed in the Environmental Impact Plan (see EVI 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 into.
- 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 and Welfare Plan (see H 1.1).
- H 4.6** Sea lice damage to fish must be recorded during lice counts. This must include:
 - condition of fish – good/thin
 - site of lesions

- c) skin condition
- d) fish behaviour – lively/moribund.

H 4.7 Any fish with severe physical damage caused by sea lice grazing must be removed and dispatched humanely without delay.

H 4.8 Non-medicinal sea lice removal technologies must be risk assessed against the impact they may have on the welfare of the fish, prior to each use of the technology.

(i) **The Farmed Fish Welfare Risk Assessment template in Appendix 3 can be used to record the activity outlined in H 4.8.**

H 4.8.1 The requirement to complete the lice removal risk assessment (Standard H4.8) must be included in the VHWP.

H 4.8.2 The lice removal risk assessment (Standard H 4.8) must be made available on request.

H 4.8.2.1 **REVISED** There must be a designated person responsible for the welfare of the fish during the non-medicinal lice removing process.

NEW Mortality Recording and Reporting

H 4.9 Where the level of fish mortality exceeds the threshold figures shown below, this must be recorded and reported to RSPCA Assured within 72 hours:

Freshwater:

- Egg to 1st feed: 6% weekly
- 1st feed to 5g: 3% weekly
- 5g to smolting: 1.5% weekly

Seawater:

Site average weight (g)	Max. Weekly mortality (%)	Max. 5-week rolling mortality (%)
Under 750	1.5	6
750+	1.0	4

H 4.9.1 **NEW** Where the level of mortality exceeds the threshold figures in H 4.9:

- a) an investigation must take place relating to the cause of the mortality
- b) a plan must be put in place to address the issue.

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.

Husbandry practices

High standards of husbandry need to be maintained at all times with the welfare of stock being considered as a priority. Animals need to be handled in a considerate and skilled manner. Caring and responsible planning and management need to 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 or if equipment fails during the process.
- 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, in good repair and disinfected before use with different fish populations/tanks.
- HP 1.6** Fish must not be left to die in air.

Grading/crowding at freshwater lochs and seawater sites

- i** 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.

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.

- i** 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 All personnel involved in the grading operation must:

- a) have access to a paper copy of the current version of the *RSPCA welfare standards for farmed Atlantic salmon*
- b) be familiar with its content
- c) understand and be able to apply its content.

HP 2.2 All personnel working with, or handling the fish must be:

- a) trained and fully competent
- b) aware of the needs of the fish
- c) aware of any risks involved and the procedures to address those risks.

HP 2.3 Grading must only be performed when absolutely necessary.

HP 2.4 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 VHWP (see H 1.1).

HP 2.5 The grading plan must include:

- a) the reason for the need to grade
- b) a pre-grade risk assessment
- c) the number of fish to be graded per day
- d) the location of fish populations both pre- and post- grade
- e) the pre-grade fasting period
- f) the health status of the fish
- g) the equipment to be used, including the type of grader
- h) expected timetable for completion of the grade
- i) the required number of staff and duties to be performed
- j) the physical characteristics of the site such as water temperature, tides and weather conditions
- k) the training records of the grading team
- l) the requirement for a post grading health check
- m) post grading mortality records

- n) any relevant contingency plans
- o) the agreement and signatures of the site manager and the person in charge of the grading equipment.

HP 2.6 All grading equipment must be designed and maintained in order to prevent damaging or causing stress to the fish.

HP 2.7 Sweep nets must be of knotless construction and of optimal design for the enclosure, and of an appropriate mesh size for the fish.

HP 2.8 Sweep nets must be used to crowd a portion of the population rather than crowding the whole enclosure.

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.

(i) 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.

(i) 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 Fish must not be crowded for more than two hours.

HP 2.14 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.

(i) A visual guide and indicator to a good crowd can be found in Appendix 2.

HP 2.15 Producers must:

- a) humanely destroy any extraneous/non-target fish that are present
- b) be aware of, and adhere to, any legislation relating to protected species.

HP 2.16 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 2.17 Enclosure nets must be kept clean in order to avoid water quality problems during crowding.

HP 2.18 Oxygen levels must:

- a) be monitored and recorded throughout all crowding operations (e.g. grading, vaccinating and treating)
- b) not fall below 7mg/l, with appropriate action taken should this occur.

HP 2.19 Supplementary oxygen and/or aeration must be available for the duration of the crowding procedure.

HP 2.20 Mortality checks must be recorded as soon as possible after grading.

(i) Pre-grade mortality removal should be undertaken wherever possible.

HP 2.21 All equipment must be thoroughly cleaned and disinfected before use and between sites.

HP 2.22 Grading operations must not take place if adverse weather conditions are likely to compromise fish welfare.

Passive grading

(i) 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.
- HP 5.5** The grader 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.

(i) 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 and Welfare 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.

(i) 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/m³)
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.

Pushing/towing enclosures

HP 6.1 The speed of pushing must be suitable for the size of the fish.

HP 6.2 Nets must be tensioned to avoid the problems associated with the nets bagging, which could compromise fish welfare.

HP 6.3 Nets must be clean before they are considered for pushing.

HP 6.4 **REVISED** There must be a designated person on the enclosure who is responsible for maintaining the welfare of the fish.

HP 6.5 **REVISED** There must be clear communication between the skipper and the designated person on the enclosure.

HP 6.6 The speed of the pushing must not be faster than the speed of the swimming fish.

HP 6.7 **REVISED** Contingency plans must be in place to protect fish from natural hazards, such as algal blooms or jellyfish.

Protection from other animals

NEW

- i** From 1st March 2021, the killing of seals by the salmon industry in Scotland will be prohibited by law.

The Scottish Parliament has also commissioned a review into the use of acoustic deterrent devices (ADD/ASDs) to be concluded by March 1st 2021. This review will inform any decision that the government may make in terms of future plans for legislation regulating the use of these devices. If new legislation comes into force regarding the use of acoustic deterrent devices, the standards may be amended accordingly.

NEW

- i** The shooting of seals is against the principles of the RSPCA welfare standards.

However, at the present time, it is acknowledged that as a last resort only, i.e. when all available non-lethal deterrents have been effectively deployed and the welfare of the fish is being compromised (i.e. they are being attacked), it may be necessary to use a lethal measure to safeguard the welfare of the fish.

The RSPCA continues to examine new non-lethal methods of controlling predators around salmon farms and is aiming to reach a position whereby the shooting of seals is never necessary.

HP 7.0

NEW The shooting of seals is not permitted, other than in exceptional circumstances (see i box below) and when all required non-lethal deterrents have been effectively deployed (see relevant Standards below), i.e. as a last resort.

NEW

- i** An 'exceptional circumstance' is defined as an unexpected/unforeseen event, such as the unavoidable failure of nets, ADDs/ASDs (Acoustic Deterrent Devices/Acoustic Startle Devices), systems or other equipment used to protect the fish from seals due to extreme weather or human error, and where a seal is found to be in the act of attacking the salmon.

HP 7.1

NEW Humane precautions must be taken to protect salmon from other animals that could cause them harm, including bringing in disease

HP 7.2

NEW The producer must fully detail the methods used to protect the fish from other animals in the Predator Control Plan.

HP 7.3

NEW The primary means of protecting the fish must be through physical exclusion, by denying other animals access to tanks and enclosures.

HP 7.4

NEW Enclosure nets must be fully tensioned and weighted to prevent distortion, taking into account local conditions such as currents, tidal flows etc.

HP 7.5

NEW Enclosure nets, including predator top nets, must be checked:

- at least weekly, for holes and fouling, and maintained in good order
- daily, for any trapped wild animals, which must be removed without delay from the time that they are first observed.

- HP 7.5.1** **NEW** The following details of all wild animals removed from nets must be recorded:
- species
 - date removed
 - whether the animal was dead or alive on removal.
- HP 7.6** **NEW** All systems and equipment used to protect the fish from other wild animals must be maintained in good working order, and repaired immediately on detecting any damage/malfunction.
- HP 7.7** **NEW** Removal of dead fish must occur at least twice weekly, except when adverse weather conditions mean that this would be dangerous to personnel
- HP 7.8** **NEW** Enclosures must be:
- protected using visible top nets that are secured to prevent the ingress of predators into the enclosure
 - of a mesh size that does not ensnare birds.
- HP 7.9** **NEW** Predator nets must be considered for deployment at high risk sites during high risk periods, and at other times if there is a risk of attack.
- HP 7.9.1** **NEW** Where predator nets cannot be deployed for animal welfare reasons, the precise nature of the animal welfare reasons must be documented and recorded.
- HP 7.10** **LEGAL NEW** Acoustic Deterrent Devices/Acoustic Startle Devices (ADDs/ASDs) may only be used in accordance with any required licencing requirements, legislation, codes and/or guidelines.
- HP 7.10.1** **NEW** If ADDs/ASDs are used they must be:
- models which operate in a way that do not negatively impact non-target species,
 - effective in deterring seal depredation,
 - regularly serviced and maintained to ensure that they are in full working order
- NEW**
- (i)** The remote monitoring of ADD/ASDs is available. The RSPCA recommends that this is used to ensure that all devices are working properly.
- HP 7.12** **NEW** If ADDs/ASDs are deployed:
- the ongoing operating status of ADD/ASDs must be recorded as part of the daily site checks
 - the date of deployment of the devices must be recorded in the VHWP. (see H1.1).
- HP 7.13** **NEW** If the fish have been attacked, they must be checked for signs of any injury as a result of the attack without delay from the time the attack became apparent.
- HP 7.14** **NEW** The producer must be able to demonstrate that all of the procedures leading up to the point of last resort have been mobilised.
- HP 7.15** **NEW** Prior to being shot, the individual seal responsible for attacking the fish on the site must be positively identified.
- HP 7.16** **NEW** All attempts must be made to recover the body of the animal that has been shot, and it must be recorded whether the body was recovered or not.
- HP 7.17** **NEW** Any dead wildlife carcases must be disposed of in accordance with legal requirements.

- HP 7.18** **NEW** Where it becomes necessary to humanely dispatch a seal as a last resort, the following records must be kept:
- a) Names of all persons with valid firearms certificates who are deemed competent to perform the task
 - b) Details of any bullets used and returned to the ammunition register, if shot by an employee
 - c) Details of any animal that has been shot, including:
 - i) The species
 - ii) The time and date of dispatch
 - iii) The location
 - iv) The reason for the shooting
 - v) The number of fish killed before resorting to the lethal method
 - vi) The number of fish on site
 - d) If an external marksman is used, an employee must be there to record when a shooting takes place.

- HP 7.19** **NEW** For members of a farm assurance scheme, all required details relating to seal shootings must be provided to the scheme in the required format (see Appendix 4) within 72 hours of a shooting having taken place; details must include information relating to HP 7.16.

NEW

- (i)** The assurance scheme should review the information relating to HP 7.19 and visit the site to establish further details and inform decisions around compliance.

- HP 7.20** **NEW** After every shooting incident, a review of all predator exclusion procedures must be undertaken and records kept of such reviews.

- HP 7.21** **NEW** All records and documentation relating to the standards in this section must be made available to farm assurance scheme personnel and their representatives on request.

Genetic selection and modification



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

- HP 8.1** Genetic modification techniques are prohibited.

- HP 8.2** Fish must not have been produced by breeding techniques that result in health or welfare problems for any of the animals involved.

Equipment

The equipment in which fish are kept need to be designed with full consideration of their welfare needs and need to protect them from physical or physiological discomfort, distress and injury, and allow them to perform natural behaviours.

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 effects upon the environment as detailed in the Environmental Impact 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 five 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.

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

(i) 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.

E 3.9 Net cleaning must not unnecessarily compromise the welfare of the fish from either use of the equipment itself, or from the dirt/detritus that is released as a result of the net cleaning process.

(i) Frequency of net cleaning should be increased to reduce the size and quantity of potential detritus.

Feeding

Fish need to 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 needs to 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 2.1** All feed must be manufactured from constituents that are free from active parasites and known fish pathogens and contamination.

- F 2.2** **LEGAL** All feeds must be produced in accordance with all relevant UK and EU legislation.

- F 2.3** **LEGAL** 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:

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

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.

Environmental quality

The stock-keeper is responsible for providing the life support system for farmed fish and needs to maintain the highest environmental quality at all times.

External water quality (seawater/freshwater loch)

- EVQ 1.1** Water quality composition must be monitored sufficiently frequently, if necessary daily, depending on the system, time of year and lifecycle stage of stock (as specified in the VHWP – see H 1.1).
- EVQ 1.2** 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.
- EVQ 1.3** 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.

Lighting

- EVQ 2.1** Lighting must be maintained at a level suitable for each stage of development (as detailed in the VHWP – see H 1.1).
- EVQ 2.2** Fish must be protected from distress caused by high levels of UV light or sudden changes in lighting levels (see EVQ 2.3 and EVQ 2.4).
- EVQ 2.3** Tank covers must be removed or lights provided before transfer to sea in order to habituate fish to brighter light.
- EVQ 2.4** Enclosures must be of adequate depth to prevent damage from ultraviolet radiation.

Climate change and animal welfare

(i) 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.

Environmental impact

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

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

EVI 1.2 **LEGAL** 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 should 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

EVI 2.1 Fish farms must have a site specific containment plan in place with the aim of preventing fish escaping and which includes plans for fish recapture.

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

EVI 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.

Extraneous species

EVI 3.1 Extraneous species must be treated in accordance with the relevant legislation.

- i** There is currently no specific legislation relating to wild fish that have entered farmed fish cages. However, extraneous species are covered under the Aquatic Animal Health (Scotland) Regulations 2009.

Furthermore, if a notifiable disease were found on a farm, extraneous species would be subject to the movement restrictions placed on the farm, i.e. they would have to be disposed of in accordance with the Animal By-Products Regulations and cannot be removed from the cages and re-released into the wild.

Fallowing

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

Aesthetic

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

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:

- **Ova – 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) The RSPCA is seeking to investigate the development of standards for broodstock fish for inclusion in future editions.

(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 RSPCA Assured approved supplier.

- FW 1.2** All eggs must be tested for specified fish pathogens as required under the relevant European and national legislation.
- 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:
- be of high quality (see FW 1.6)
 - if necessary, be filtered or treated with ultra violet radiation.
- FW 1.5** The following maximum stocking densities must not be exceeded:
- | | |
|--------------------|-----------------------------------|
| Hatchery | 15,000 per California basket/tray |
| Multi-level | 20,000 eggs per tray |
| First feeding tank | 10,000/m ² |

Freshwater production tank:

Liveweight (mean)	Stocking density (kg/m³)
Up to 1gm	10
>1-5gm	20
>5-30	30
>30-50	50
>50	Please see information box below

(i) For smolts with an average liveweight above 50g it may be acceptable to stock them to a density of 60Kg/m³. We are interested in examining this in more detail with a view to amending the standard in future publications. If you are an RSPCA Assured member and would like to stock to this level, then please contact RSPCA Farm Animals Department to discuss this further.

(i) The RSPCA are aware of trials examining the introduction of environmental enrichment to tanks to reduce fin damage. The results from such trials would be greatly appreciated by the RSPCA Farm Animals Department in order to inform future standards.

- FW 1.5.1** The site stocking plan must demonstrate that the facilities can maintain and service the requirements of the stocking densities in FW 1.5.

(i) If this cannot be demonstrated at assessment, then a lower stocking density will have to be adhered to.

FW 1.6 **REVISED** The following water quality parameters must be complied with:

Parameter	Ova	Alevins	Fry	Parr/Smolt
Min Oxygen (O₂) mg/l	7.0	7.0	7.0	7.0
Oxygen (O₂) saturation % in exit water	>90.0	>70.0	>70.0	>70.0
Free Ammonia (NH₃) mg/l	<0.025	<0.025	<0.025	<0.025
Carbon dioxide (CO₂) mg/l	<6	<6	<15	<15
Max temp °C	8.0	10.0	14.0	N/A
pH in the inlet water	5.5 to 8.0	5.5 to 8.0	5.5 to 8.0	5.5 to 8.0
Chloride:Nitrite ratio*	>20:1	>20:1	>20:1	>20:1
Nitrate mg/l †	N/A	<50.0	<150.0	<150.0
Total Suspended Solids (Turbidity)	< 15 mg/l	< 15 mg/l	< 15 mg/l	< 15 mg/l

*Not applicable to flow-through systems

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

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 FW 1.6. 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.

FW 1.7.1 **REVISED** Flow and/or oxygen alarms must be fitted to all water intakes of the rearing units .

FW 1.8 A contingency plan must be in place for recirculation systems to detail the course of action to be undertaken should unexpected issues arise.

Ova

FW 2.1 All equipment must be:

- a) maintained in full working order
- b) 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** All alarms must be checked weekly and records kept.
- FW 2.5** There must be a screen to prevent the blocking of inlet valves.
- FW 2.5.1** Inlet valves must be regularly checked (at least daily).
- FW 2.6** All eggs must be disinfected prior to entry to any new facility.
- FW 2.7** Eggs must be water-hardened before being exposed to disinfectant or transportation.
- FW 2.8** Eggs being transported must be carried with twice the volume of water than eggs.
- FW 2.9** Water flow and incubator design must be such that 'dead spots' within the incubator do not occur, i.e. it must be sufficient to provide oxygen and remove waste products.
- FW 2.10** Eggs must be placed into the hatching environment to ensure maximum survival rates and be accessible for picking.
- FW 2.11** Conditions in the hatching environment must be hygienic and free from any rough edges that could cause damage to the eggs.
- FW 2.12** Where multi-layer systems such as buckets are used, it must be demonstrated that water hygiene and the integrity of the eggs are maintained.
- FW 2.13** To prevent the spread of disease there must be no cross contamination of water from one container to another.
- FW 2.14** After placement, green eggs must remain undisturbed (other than for picking) for 250 degree days.
- FW 2.15** Where picking is practised, dead/unviable eggs must be removed as required with minimum disturbance.
- FW 2.16** Regular inspections must be made to ensure the earliest detection of fungal infections.
- FW 2.17** Eggs must not be shocked before 250 degree days or after 370 degree days.
- FW 2.18** The shocking method must be identified and must not be such that it causes excessive mortalities.
- FW 2.19** Training records must be available which identify those who are competent to perform shocking.
- FW 2.20** Shocking onto a dry surface is prohibited.
- FW 2.21** A suitable substrate must be in place before hatching.
- FW 2.22** The transportation of eyed eggs must be done using purpose built boxes.
- FW 2.23** Eyed 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.

Multi-level hatchery systems

- FW 3.1** Each tray must have its own water intake.
- FW 3.2** The flow in each tray must be visible and/or measurable and must be monitored to ensure maximum survival of the eggs.
- FW 3.3** Trays must be easily accessible in order to perform tasks such as removing deads without disturbing the other trays.
- FW 3.4** The maximum stocking density in each tray must not exceed 20,000 eggs per tray (tray size 55 x 53cm approx.) with eggs no more than three deep.
- FW 3.5** Producers must be able to demonstrate that mortality was below 5% for the previous year, if intending to stock above 15,000.

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.

Fry

- FW 5.1** Fish must have access to sufficient food to maintain them in full health and vigour.
- FW 5.2** Feed must be:
- available to appetite
 - spread at regular intervals.
- FW 5.3** Light levels must be such that they allow all fish in the water column to see the feed at all times.

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

- FW 5.4** Water flow rates must be such that the fry can hold and adjust their position in the water easily.
- FW 5.5** All tanks must have individual nets/cleaning equipment.
- FW 5.6** There must not be any grading before the majority of fish weigh a minimum of 1.3 grams.
- FW 5.7** The load of suspended solids must allow visibility to the bottom of the tank.

- FW 5.8** The water depth must be appropriate to the tank being used in order to be able to maintain optimum water quality levels.
- FW 5.9** As the fish leave the bottom of the tank the water depth must be adjusted to allow natural behaviour.

Parr

- FW 6.1** The water temperature must not be manipulated above 16°C unless required by a veterinary surgeon.
- FW 6.2** Feed withdrawal prior to grading must not exceed 48 hours.
- FW 6.3** Parr must only be crowded for a maximum of two hours.
- FW 6.4** Grading must only start when the majority of fish weigh in excess of 1.3 grams.
- FW 6.5** The grader must be suitable for the size and type of fish.
- FW 6.6** All staff must be fully trained and competent to use the chosen grading system.
- FW 6.7** Parr must be able to hold and adjust their position in the water easily.
- FW 6.8** 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 6.9** Any fish requiring enthanasing must be dispatched humanely.
- FW 6.10** Measures must be in place to prevent fish escaping.
- FW 6.11** All tanks must have individual nets/cleaning equipment.

Freshwater lochs

- FW 7.1** 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:
- kept to a minimum
 - recorded in the VHWP (see H 1.1).
- FW 7.2** Nets used in freshwater lochs must be managed hygienically.
- FW 7.3** Deterioration of water quality due to fouled nets or over feeding must be avoided.
- FW 7.4** The stocking density in freshwater enclosures must not exceed 8 kg/m³.

Pre-smoltification

- FW 8.1** Visual checks and observations must be made for several weeks during the period prior to smolting (silvering, swim pattern, shape).

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

Smolt score

Score Appearance

1	Parr marks clear, light coloured back, flanks green, belly yellow, no silverying.
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, silverying colour dominant.

FW 8.2 The smoltification process must be closely monitored for several weeks as detailed in the Veterinary Health and Welfare Plan (see H 1.1).

FW 8.3 The use of hypertonic water (water above 35 parts/1000) for smolt survival testing is prohibited.

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

FW 8.3.1 Producers must be able to demonstrate that they have done everything possible to ensure maximum survival when smolts are transferred to sea.

FW 8.4 Feed withdrawal prior to transfer to sea must be no greater than 48 hours.

Vaccination

FW 9.1 The VHWP (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.

(i) If effective oral vaccines are developed these should be the preferred method of vaccination.

FW 9.2 All vaccination procedures must be conducted with care and with the minimum possible distress caused to the fish.

FW 9.3 Vaccination at 1 gram liveweight must be by the immersion method only.

FW 9.4 Prior to vaccination, there must be a vaccination plan in place, which must:

- a) be agreed and signed by the vaccination team leader and site appointed supervisor
- b) include the number and weight of the fish to be vaccinated
- c) detail the expected timeframe of the process.

FW 9.5 External and in-house vaccination teams must have a copy of the current version of the *RSPCA welfare standards for farmed Atlantic salmon* and must:

- a) be familiar with and understand its content, and
- b) use it as part of the induction process for team members.

- FW 9.6** Vaccination teams must:
- ensure that all staff working with stock are trained and competent in the aspects of the vaccination process to which they are assigned
 - have a named team leader who has attended a recognised fish welfare course.
- FW 9.7** Vaccination teams must maintain records of all staff training.
- FW 9.8** An adequate number of experienced site staff and vaccinators must be available to deal sufficiently with any problems that arise.
- FW 9.9** Vaccination Team Leaders and Vaccinators must be able to demonstrate their proficiency in procedures that have the potential to cause pain or distress, including the vaccination technique, hand grading of fish to be culled and their humane euthanasia.
- FW 9.10** Vaccination Team Leaders and members must be able to recognise indicators of poor welfare in fish, including abnormal behaviours, physical injury and symptoms of disease.
- FW 9.11** Site staff must ensure that all fish have been pre-graded before they are vaccinated.
- FW 9.12** 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.
- FW 9.13** Anaesthetics and vaccines must be used according to manufacturer's instructions.
- FW 9.14** Vaccines and anaesthetics must:
- be on site before vaccination commences
 - only be administered to fish by suitably trained staff.
- FW 9.15** Veterinary products must be properly labelled and stored appropriately.
- FW 9.16** Water temperature for vaccination must be according to manufacturers' instructions.
- FW 9.17** Any equipment defects must be rectified immediately, or if this is not possible measures must be taken to avoid the welfare of the fish being compromised.
- FW 9.18** All fish must be suitably anaesthetised before being vaccinated.
- FW 9.19** Anaesthetic must only be administered by trained, competent personnel.
- FW 9.20** There must be a team member with responsibility for monitoring oxygen levels in the anaesthetic bath and maintaining them at 7mg/litre.
- FW 9.21** The removal of fish from water or handling of the fish must only be done when necessary.
- FW 9.22** If fish are handled:
- adequate support must be given to the body
 - they must never be held by the tail only or thrown onto solid objects.
- FW 9.23** Time out of water must:
- be kept to an absolute minimum
 - never exceed 15 seconds for a live fish (unless anaesthetised).

- FW 9.24** If hand nets are used, they must be:
- of a suitable size
 - of a design which avoids physically damaging the fish
 - managed hygienically
 - in a good state of repair.
- FW 9.25** Fish must not be left to die in air.
- FW 9.26** Where fish are humanely dispatched at the freshwater stage this must be undertaken through an overdose of a suitable anaesthetic.
- FW 9.27** All vaccination procedures must be conducted with care and with the minimum possible stress to the fish.
- FW 9.28** Fish must be continuously monitored throughout the vaccination process to ensure their welfare is not compromised.
- FW 9.29** Seriously ill, injured or moribund fish must be humanely culled without delay.
- FW 9.30** Vaccinators must regularly inspect their needles and replace them if necessary according to manufacturers' instructions.
- FW 9.31** Audit sampled fish must only be culled by trained/competent personnel.
- FW 9.32** The appointed supervisor/vaccination Team Leader must check at the beginning of the process, and at regular intervals during the day to ensure that the vaccination procedure is being done correctly. Records of these checks must be made.
- FW 9.33** Site staff must ensure that following vaccination, any gradients from the vaccination table to the recovery tank/pen must be such that the fish are not at risk of hitting the bottom of the tank or other fish.
- FW 9.34** Site staff must ensure that the depth and flow of water is 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.
- FW 9.35** Care must be taken when returning the recovering fish to the tank following the anaesthetic/vaccination process.
- FW 9.36** Site staff must ensure that oxygen levels in the recovery tank or pen are:
- monitored regularly, and
 - maintained at a minimum of 7mg/litre.
- FW 9.37** Site staff must:
- check the recovering fish regularly to ensure that they are recovering from the anaesthetic process
 - rectify and record any issues.
- FW 9.38** At the end of the process there must be a reconciliation between the amount of vaccine used and the number of fish which have been vaccinated. This must be recorded.
- FW 9.39** The vaccination procedure must be subject to a third party audit.

Auto-vaccination

i It is the RSPCA's intention to require the use of approved vaccination teams within the next two years.

- FW 10.1** All fish must have been pre-graded before they are vaccinated.
- FW 10.2** 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, where machines simultaneously grade fish at vaccination.
- FW 10.3** The equipment must:
- be thoroughly checked after transportation for any damage/broken parts which may halt the vaccination process
 - be calibrated according to the size of the fish, taking into account the vaccination depth, position, angle and dosage of the vaccine
 - be checked for the correct calibration at least once per hour during the vaccination process.
- FW 10.4** A sample number of fish must be vaccinated to check the calibration before the main process is started.
- FW 10.5** The sample fish must be humanely dispatched before any inspections to check for vaccination accuracy.
- FW 10.6** All fish must be anaesthetised before being vaccinated.
- FW 10.7** 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 10.7.1** There must be continual monitoring to check for any fish which may have become trapped in the pipes of the machine. These checks must be recorded.
- FW 10.8** Needles must be inspected at least every two hours and replaced according to manufacturers guidelines.
- FW 10.9** After transportation, the machine must be thoroughly checked to ensure that any working parts have not been damaged during the transportation process.
- FW 10.10** At the end of the process there must be a reconciliation between the amount of vaccination used and the number of fish which have been vaccinated. This must be recorded.

Triploid fish

i At present the RSPCA welfare standards for farmed Atlantic salmon only apply to diploid fish. The RSPCA is monitoring the work being done on the specific needs of triploid salmon, such as diet, management and health care, in order to investigate how and whether their welfare needs can be properly satisfied, which will ultimately determine whether they will be allowed to be used in future under the standards.

The seawater stage of the salmon lifecycle contains a number of critical control points (CCPs), such as wellboat transportation to harvest. The standards are designed to address these CCPs in order to ensure that the welfare of the fish is not compromised during these seawater-based processes.

Seawater stocking density

SW 1.0 In the case of RSPCA Assured members all fish must be sourced from a RSPCA Assured approved population, including any fish that may have spent part of its life on another freshwater site prior to transfer to the present site.

SW 1.1 The following maximum stocking densities must not be exceeded:

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

SW 1.2 The maximum stocking density must be calculated on the weight of fish/m³ of water volume.

SW 1.3 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.

SW 1.4 Whichever net design is being used, the proportion of the cone which is included in stocking density calculations must permit a minimum of a 5m diameter swim circle.

(i) In relation to SW 1.4, this includes all types of coned net: circle with coned base, square with coned base and fully coned nets.

SW 1.5 After transfer to sea, smolts must not be handled for at least 120 days, for example not crowded, except for veterinary treatments.

Transport

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

General transport

- T 1.1** All suppliers of different modes of transport (road/helicopter/wellboat) used for fish from RSPCA Assured approved sites must be RSPCA Assured approved.
- T 1.2** All persons involved in transportation of fish must be familiar with, and transport fish in accordance with, all relevant legislation.
- T 1.3** Transport operators must ensure that all persons involved in the transportation of the fish have a copy of the current version of the '*RSPCA welfare standards for farmed Atlantic salmon*' at each site/on each vehicle and:
 - a) are familiar with its content
 - b) understand and apply its content
 - c) have a) and b) as part of their induction programme.
- T 1.4** There must be good lines of communication between all of those involved in transporting/harvesting/grading fish in order to avoid potential or actual welfare problems occurring with the fish. These communications must include the:
 - a) number of fish to be transported
 - b) size range of the fish
 - c) weight of the fish
 - d) current health status of the fish.
- T 1.5** All staff working with, or handling fish must be:
 - a) trained and competent
 - b) aware of their duties
 - c) aware of any welfare risks involved
 - d) In the case of RSPCA Assured members, records of staff training in relation to T 1.5 must be kept and made available on request.
- T 1.6** In the case of RSPCA Assured members, records of staff training in relation to T 1.5 must be kept and made available for the RSPCA Assured Assessor or RSPCA Farm Livestock Officer.
- T 1.7** Any handling of fish prior to transport must:
 - a) be kept to a minimum
 - b) be conducted in such a way as to prevent any unnecessary distress to the fish
 - c) not result in fish being out of water for more than 15 seconds (unless anaesthetised).
- T 1.8** Changes in water temperature and pH during transportation which could compromise fish welfare must be avoided.

- T 1.9** Water temperature and pH during transportation must be as close as possible to that from which the fish came.
- T 1.10** Water must be free from contaminants which may be detrimental to the welfare of the fish.

Site staff responsible for moving fish

- T 2.1** All journeys must have a transport plan, which:
- a) is up to date
 - b) covers important aspects of the journey, including:
 - i) journey times
 - ii) water qualities
 - iii) contingency plans
 - iv) identity of those responsible for fish welfare.
- T 2.1.1** Managers must ensure that all staff, including transport staff, are aware of this transport plan (see T 2.1).
- T 2.2** Any handling of fish must be:
- a) kept to a minimum
 - b) conducted in such a way as to prevent any unnecessary distress to the fish.
- T 2.3** Only healthy, undamaged fish must be transported.
- T 2.4** Care must be taken to ensure dead fish are not loaded for transport.
- T 2.5** Sick or seriously injured fish must:
- a) not be transported
 - b) be humanely destroyed.
- T 2.6** There must be a named member of staff responsible for monitoring the welfare of the fish during loading and unloading.
- T 2.7** Records of procedures relating to loading and unloading must be maintained and include details of any casualties or compromises to the welfare of the fish.
- T 2.8** The following records must be kept:
- a) time since last handling
 - b) time since vaccination
 - c) time since last treatment (including anaesthetic)
 - d) feed withdrawal time
 - e) date of full smoltification
 - f) any clinical signs of disease
 - g) crowding records
 - h) oxygen levels during crowding
 - i) numbers of fish in each tank to be transported
 - j) stocking densities of tanks being used for transport.
- T 2.9** Pre-transport fasting must:
- a) never exceed 48 hours, unless specified by a veterinary surgeon/senior production manager
 - b) be recorded in the Veterinary Health and Welfare Plan (VHWP) where it exceeds 48 hours.

- T 2.10** Any bath treatment must be:
- completed a minimum of 14 days before transport, unless under veterinary/health adviser advice
 - recorded in the VHWP.
- T 2.11** If fish pumps are to be used, they must be appropriate for the size of the fish being pumped to avoid injury.
- T 2.12** There must be no joints, kinks, bends or rough internal edges on, or in the pipes which may cause physical injury to the fish.
- T 2.13** 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 or where a breakdown occurs.
- T 2.14** The drop from the end of any pipe must be such that it:
- avoids injuring the fish
 - allows fish to disperse without others landing on top of them.
- T 2.15** Hand nets must:
- be of a 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 which prevents fish escaping
 - not be overfilled.
- T 2.16** Fish must not be netted before they are ready to be received at the transport tanks/helicopter buckets.
- T 2.17** 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.

Transport staff

- T 3.1** All equipment that the fish rely on for life support must be inspected at least every 4.5 hours.
- T 3.2** If any faults are found in the equipment:
- any fish in transit must be inspected
 - any problems must be corrected immediately.
- T 3.3** 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 3.4** Oxygen levels must be:
- monitored throughout the journey (including for any internal journeys)
 - maintained at a minimum of 80% saturation and/or a minimum of 7mg/litre.
- T 3.5** Excessive changes in water temperature and pH during transportation must be avoided.
- T 3.6** Any fish which die during transportation must be separated from live fish immediately upon arrival.
- T 3.7** Records must be kept of any deaths or injuries that occur during transportation.
- T 3.8** Transport containers must be cleaned and disinfected after each consignment, to prevent the spread of disease.

Fry transport

- T 4.1** Calculation of stocking densities of the floor area of tanks must take into account the tendency of fry to crowd together on the bottom of the tank.
- T 4.2** The oxygen supply to the bottom of the tank must take into account the nature of fry crowding behaviour.
- T 4.3** 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 or unloading, and also in case of emergency breakdown.
- T 4.4** If a hose is used to flush the tank out at the end of a discharge, it must not be aimed at the fish, but at the side of the tank in order to avoid injuring the fish.
- T 4.5** Oxygen levels must be:
- continuously monitored
 - maintained at a minimum of 7mg/litre.
- T 4.6** Air sausages must be securely attached to avoid damaging the fish.
- T 4.7** Ferries must be pre-booked prior to sailing.

Road transport

- T 5.1** The driver of the vehicle must:
- be fully aware of the transport regulations relating to the fish
 - understand the needs of the fish being transported
 - drive in a manner which will not compromise the welfare of the fish.
- T 5.2** Tank insulation must be such that it allows the water to remain at a constant temperature +/- 1.5 degrees C from the start of the journey.
- T 5.3** 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.
- T 5.4** All transport tanks and life support systems must:
- be fit for purpose
 - be without leaks, chips or cracks.
- T 5.5** After the required stocking density has been reached, tanks must be filled to the top with good quality water (see FW 1.6 as a reference) from a known source.
- T 5.6** The maximum stocking density must be set so that water quality (see FW 1.6 as a reference) can be maintained for the duration of the journey.

(i) The maximum stocking density will depend on the distance travelled, but as a general guide it should be within 60–100kg/m³.

- T 5.7** Diffused oxygen must be spread around the water column by the use of an oil free compressor.
- T 5.8** There must be sufficient aeration to avoid deadspots.
- T 5.9** All lids, outlets and any other openings must be fully secured before departure.

- T 5.10** During the journey, if oxygen levels become unstable, the driver must:
- be able to visually check the fish for signs of stress
 - be able to identify the cause of the oxygen instability
 - take appropriate action to ensure the welfare of the fish.
- T 5.11** If a journey requires the use of a ro-ro ferry, procedures must be in place to ensure the welfare of the fish during the journey.
- T 5.12** Any ferries used must be pre-booked before sailing.
- T 5.13** Drivers must be able to gain access below deck during the journey in order to monitor the welfare of the fish.
- T 5.14** When arriving at the discharge site, the driver must:
- have been aware of the biosecurity/environmental requirements before arrival on site
 - ensure compliance with any biosecurity/environmental requirements.
- T 5.15** After arriving on site, discharge must take place without undue delay.
- T 5.16** The lorry must be sited to ensure that all tanks can be fully emptied, taking into account any cambers which may be apparent in the ground.
- T 5.17** Valves must be suitable for more than one fish to pass through at any one time.
- T 5.18** All pipes must be securely attached to prevent fish from escaping during the unloading process.
- T 5.19** All unloading must be through valves which do not compromise the welfare of the fish, rather than netting fish from the tanks.
- T 5.20** Any pipes used for unloading must be able to be adjusted in order to account for any rise and fall in the tide.
- T 5.21** Water must always be in the tanks during unloading in order to avoid the last fish becoming dry and without oxygen.
- T 5.22** There must be a system for flushing the tanks at the end of unloading to ensure that the last fish is removed without compromising their welfare.
- T 5.23** Tank design must facilitate the discharge of the last fish by having sloping floors which guide the fish to the outlet.

Helicopter transfer

- T 6.1** Pilots and ground crew must be trained and competent in the welfare consequences of how they handle fish.
- T 6.2** There must be staff available at each site receiving fish who are aware of the necessary procedures to safeguard welfare.
- T 6.3** All receiving enclosures must be clearly identified, e.g. with marker buoys.
- T 6.4** Site staff must be able to communicate with the loading site and the helicopter.
- T 6.5** The fish must be transferred from the tanks/rearing enclosures without causing injury to fish.

- T 6.6** Helicopter buckets and other ancillary equipment must be:
- a) fully maintained
 - b) clean
 - c) fit for purpose.
- T 6.7** There must be sufficient buckets to ensure that the time that fish have to wait for transportation does not compromise their welfare.
- T 6.8** The loading of the fish into the buckets must coincide with the arrival of the helicopter.
- T 6.9** The helicopter bucket must contain approximately two thirds water before any fish are loaded into it.
- T 6.10** The life support system of the bucket must be switched on and working before the fish are put in.
- T 6.11** A sample weight of fish must be known before loading commences.
- T 6.12** Helicopter buckets must have their own independent supply of oxygen.
- T 6.13** The oxygen levels in the bucket must be:
- a) the same as that of the tanks from where the fish came,
 - b) maintained at a minimum of 7mg/litre.
- T 6.14** The helicopter bucket must be lowered gently into the water when unloading the fish to avoid injuring them.
- T 6.15** The helicopter bucket must be allowed to empty completely before moving off.
- T 6.16** The planned maximum journey time to the discharge site with fish on board must be no longer than 15 minutes.
- T 6.17** The maximum stocking density in the bucket must be no greater than 400kg/m³.
- T 6.18** There must be a contingency plan in place for:
- a) bad weather
 - b) if a bucket will not open.

Wellboat transport – smolts

- T 7.0** Wellboats arriving into the United Kingdom (UK) to work within UK waters must carry a valid certificate of disinfection from their country of origin.
- T 7.1** Only wellboats with the ability to run on closed valves are permitted.
- T 7.2** 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.
- T 7.3** There must be trained and competent staff available at the site that is to receive fish.
- T 7.4** Vessel crew members and skippers must have completed or be able to demonstrate that plans are in place to complete a recognised fish welfare course.
- T 7.4.1** In relation to T 7.4, there must be plans in place for staff that have been unable to complete a recognised training course to attend the course at the next available opportunity.

(i) Examples of recognised courses include the NAFC Marine Centre Fish Welfare Training course and the Meat Training Council/Fish Vet Group course. There is also a fish farm personnel training course run by Vet-Aqua International in Ireland.

- T 7.5** Maximum stocking densities must:
- be within 40–50kg/m³ (depending on water quality and size of smolts)
 - be set so that water quality can be maintained over the length of the journey.
- T 7.6** If fish counting equipment is in place, it must:
- be over a de-warterer
 - be fully maintained
 - be regularly calibrated to maintain accuracy
 - be of a design not likely to cause damage or injury to the fish.
- T 7.7** The number of fish to be loaded must be known in order to be able to verify compliance with the stocking density.
- T 7.8** There must be enough light in the well to enable easy inspection of the fish.
- T 7.9** Pumps and pipes used for unloading must be positioned to minimise the height and distance that the fish have to be pumped.
- T 7.10** Pumps and pipes must be free of any rough edges which might damage the fish.
- T 7.11** There must be a method in place to ensure that no fish are left in the pipes after pumping, or during a breakdown.
- T 7.12** A humane process must be in place to safeguard fish welfare when removing the last fish from the well.
- T 7.13** Adjustments must be made to the trim/balance of the wellboat to ensure fish are aligned with the discharge point.
- T 7.14** 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.

Seawater site staff (receiving)

- T 8.1** A system must be in place to ensure that the numbers of fish to be discharged into each receiving enclosure is pre-planned and reported to well boat staff before discharge begins.
- T 8.2** Any fish which die during transportation must be separated from live fish as soon as possible after arrival.
- T 8.3** Records must be kept of any deaths or injuries that occur during transportation.
- T 8.4** The pipe layout angle and drop must:
- lead to good distribution into the enclosure
 - minimise the risk of collisions between fish.
- T 8.5** The nets at the reception enclosure must:

- a) be set at a sufficient depth to permit inspection
 - b) not be so shallow that fish are stressed by strong sunlight.
- T 8.6** The fish must be given humane protection from birds and marine predators.
- T 8.7** The unloading of fish must not take place if adverse weather conditions are likely to compromise the welfare of the fish.
- T 8.8** Dead and moribund fish must be disposed of humanely and hygienically.
- T 8.9** Records of all dead and moribund fish must:
 - a) be kept
 - b) include the cause of death where possible and any other information relating to the health and welfare of the fish
 - c) be made available for inspection by the RSPCA Assured Assessor or RSPCA Farm Livestock Officer for at least one year.
- T 8.10** Producers must be able to demonstrate that they have done everything possible to ensure maximum survival when smolts are transferred to sea.

Harvest wellboats

- T 9.0** Wellboats arriving into the United Kingdom (UK) to work within UK waters must carry a valid certificate of disinfection from their country of origin.
- T 9.1.1** **REVISED** Wellboat cleaning procedures must comply with the Marine Scotland disinfection guide (current version).'
- T 9.1.2** There must be written contingency plans to accommodate unforeseen circumstances associated with the journey.
- T 9.1.3** Multi-site collections are prohibited (collections of fish from different sites from different disease control areas are prohibited).
- T 9.1.4** Intra-site collections and collections from neighbouring sites of the same year class are allowed, but must be recorded.
- T 9.1.5** The wellboat must be fitted with moveable bulkheads.
- T 9.1.6** The wellboat must be able to monitor and record the numbers of fish loaded in each well.
- T 9.1.7** **REVISED** There must be sufficient natural or artificial lighting to enable continuous inspection/monitoring of the fish throughout the well.
- T 9.1.8** All crowding, loading and unloading of fish must be recorded using CCTV.
- T 9.1.9** Footage relating to T 9.1.8 must be kept for at least 14 days.
- T 9.2** All wellboats registered to operate in Scottish waters must be fitted with auto-logging systems which can:
 - a) record their position
 - b) determine whether all inlet, outlet and bottom valves are either open or closed at any one time
 - c) enable the information to be available in real time and retrospectively.
 - d) kept for a period of at least 14 days.

- T 9.2.1** 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.
- T 9.2.2** Weekly checks must be made and recorded for the calibration accuracy on automatic equipment.
- T 9.2.2.1** ~~REVISED~~ Where calibration is not possible, there must be a demonstrable way of ensuring that the equipment is working properly.
- T 9.3.1** All auto-logging systems must have been certified as being accurate and fit for purpose by a competent independent expert.
- T 9.3.2** ~~REVISED~~
- The maximum stocking density in the well must be based on the liveweight of the fish, as shown below.
- | Liveweight (kg) | Maximum stocking density (kg/m ³) |
|-----------------|---|
| 5.0 | 125 |
| 4.0 | 110 |
| 3.5 | 100 |
- T 9.3.3** There must be no unnecessary delays in unloading the fish once the vessel has docked.
- T 9.3.4** Pumping of the fish from the well to the slaughter plant must be done in a way that:
- a) does not demonstrably compromise fish welfare
 - b) ensures that slaughter personnel can maintain an efficient stunning and bleeding procedure.
- T 9.4** There must be a procedure in place to ensure the last fish is removed humanely from the pipe at the end of unloading, which must not be injurious to the fish.
- T 9.4.1** Extraneous species must be treated in accordance with the relevant legislation (see the information box relating to EVI 3.1 for further information).
- T 9.4.2** The maximum dwell time in the pipe must be no more than 10 minutes.
- T 9.4.3** The following records must be kept for inspection, and be available on request:
- a) wellboat movements
 - b) fish movements
 - c) times of fish movements
 - d) disinfection logs
 - e) number of fish loaded
 - f) fish size distribution
 - g) route covered during transport
 - h) timing of open and closed valve operations.
- T 9.5** Vessel crew members and skippers must have completed, or be able to demonstrate that plans are in place to complete, a recognised fish welfare course.
- T 9.5.1** In relation to T 9.5, there must be plans in place for staff that have been unable to complete a recognised training course to attend the course at the next available opportunity.
- T 9.6** Wellboats must be equipped with water quality monitoring and maintenance equipment, which must be calibrated so it is working and fit for purpose at all times.

- T 9.7** Weekly checks must be made and recorded for the calibration accuracy on automatic equipment.
- T 9.8** Where calibration is not possible, there must be a demonstrable way of ensuring that the equipment is working properly.
- T 9.9** **REVISED** Water must be chilled at a maximum of 1.5°C per hour down to a minimum of 50% of ambient water temperature.
- T 9.10** The pH of the wellwater must always be between 6.8 and 8.
- i** **The aspiration of the RSPCA is to have dedicated onshore facilities strategically located where discharge water can be pumped, filtered and/or treated. When these onshore facilities are available, the discharge of water at sea will be prohibited.**
- T9.11** **NEW** Oxygen levels must be:
- continuously monitored
 - maintained at a minimum of 7mg/litre
- T9.12** **NEW** Carbon dioxide must be kept below a level that is demonstrably not harmful to the welfare of the fish (as a guide, this must be no higher than 20mg/litre)
- T9.13** **NEW** The level of ammonia (NH_3) must be no higher than 0.0125 mg/litre (unionised)
- T 9.14** Only disinfected water can be discharged upstream of another site.
- T 9.15** Any onboard/onshore water treatment/filtration methods must be recorded, and in the case of RSPCA Assured members the records made available to the RSPCA Assured Assessor and the RSPCA Farm Livestock Officer.
- T 9.16** All new harvest vessels operating under the RSPCA Assured Scheme must have an effective lice filtration system in place.
- T 9.17** As part of the Area Management Agreement (AMA), site managers must inform their neighbours when a discharge is going to take place.

Cage side harvest

- T 10.0** All crowding and loading of the fish must be recorded using CCTV.
- T 10.0.1** Footage relating to T10.0 must be kept for at least 14 days.
- T 10.1** Wellboats arriving in the United Kingdom (UK) to work within UK waters must carry a valid certificate of disinfection from their country of origin.
- T 10.2** Inter-site movement of vessels must be kept to a minimum.
- T 10.3** Any visible surface mortalities or obviously moribund fish on the surface must be removed before further operations begin.
- T 10.4** The cleaning and disinfection procedures for wellboats as set out in the current version of *FRS disinfection guide version 4* (<http://www.scotland.gov.uk/Topics/marine/Fish-Shellfish/FHI/healthpractice/DisguideIV>) must be adhered to, and a checklist signed by the skipper upon completion.

- T 10.5** All equipment must be checked regularly and maintained in accordance with manufacturers' or in-house maintenance schedules.
- T 10.6** All equipment must be maintained in clean, hygienic conditions and must be thoroughly disinfected and rinsed after use.
- T 10.7** All storage facilities must:
- a) be bunded
 - b) be wind and water tight
 - c) protect against other animals.
- T 10.8** All solid and liquid waste materials must be stored and disposed of appropriately and in accordance with relevant legislation.
- T 10.9** Cage-side harvest wellboats must not discharge remedial blood water within 5km of any fish farm.
- T 10.10** In the case of any remedial blood water that is discharged at sea:
- a) this must be rendered inert and disinfected
 - b) the treatment methods must be recorded and in the case of RSPCA Assured members the records made available to the RSPCA Assured Assessor or RSPCA Farm Livestock Officer.
- T10.12** The following records must be kept for inspection and be available on request:
- a) wellboat movements
 - b) fish movements
 - c) times of fish movements
 - d) disinfection logs
 - e) numbers of fish loaded/fish size distribution
 - f) route covered during transport
- T 10.13** Vessel crew members and skippers must have completed or be able to demonstrate that plans are in place to complete, a recognised fish welfare course.
- T 10.14** In relation to T 10.13, there must be plans in place for staff that have been unable to complete a recognised training course to attend the course at the next available opportunity.
- T 10.15** Extraneous species must be dealt with according to the legislation (see the information box relating to EVI 3.1 for further information).

Slaughter/killing including cage-side harvest

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

(i) The RSPCA is considering including the requirement for harvest stations to fit sea lice filtration equipment in the near future.

S 1.1 Crowding and handling prior to killing must be kept to an absolute minimum.

S1.1.1 **REVISED** For both percussion and electrical systems, water at the end of the wellboat outflow pipe leading into the slaughter plant must be continuously monitored and recorded for:

- a) oxygen
- b) temperature
- c) pH

S1.1.2 **REVISED** If the water quality in the pipe falls below a 20% threshold of the well water, then immediate remedial action must be taken to make the necessary improvements.

S 1.2 Farmed fish must be humanely killed.

S 1.3 The method of killing used must rapidly, and without pain and distress, render the fish insensible, until death supervenes.

S 1.4 Humane mechanical devices must be used in preference to a manual percussive blow (except for emergency killing).

S 1.4.1 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 or secondary stunner must be available throughout the killing process to allow a percussive blow to be administered immediately in the event of a fish not being effectively stunned.

S 1.5.2 There must be sufficient time after stunning, and safeguards in place, to:

- a) assess the effectiveness of the stun in all fish
- b) ensure all fish that have not been effectively stunned are re-stunned immediately.

S 1.5.3 The number of fish that have not been effectively stunned must be recorded.

S 1.5.4 A Standard Operating Procedure must be in place to detail the procedure for:

- a) dealing with fish that have not been effectively stunned
- b) identifying and humanely capturing and killing cleaner fish.

S 1.5.5 Safeguards must be in place to ensure all cleaner fish are:

- a) identified, and
- b) humanely handled and/or killed without delay.

Slaughter/killing including cage side harvests

- S 1.5.6** CCTV must be installed to provide clear footage of the back-up stun process.
- S 1.5.6.1** Footage relating to S 1.5.6 must be stored for a minimum of 14 days.
- S 1.6** Bleeding must follow within 10 seconds.
- S 1.7** All staff involved with the slaughter/killing process must have received full training and be fully competent in all methods of harvest – dead haul, shore based or cage side.
- S 1.8** There must be a named person responsible for fish welfare throughout the killing process who has attended a recognised training course in humane killing of fish.
- S 1.9** Before the beginning of each harvest:
- a) the stunning system must be tested to ensure it is working properly
 - b) the first 10 fish through each stunner must be assessed and demonstrate the following to ensure the system is functioning correctly:
 - i) the checks must include that fish have no eye movement
 - ii) no rhythmic opercular movement
 - iii) only mild short term involuntary muscular twitches
 - iv) no reaction to tail pinch
 - c) the results of the checks listed in a) and b), above, must be:
 - i) recorded, and
 - ii) made available on request.
- S 1.10** All blood and mucus from killing operations must be contained and disposed of ashore.

(i) The RSPCA is examining all new developments associated with the 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.

- S 1.11** Producers must always:
- a) humanely destroy any extraneous/non-target fish that are present
 - b) be aware of, and adhere to, any legislation relating to protected species.

Electrical stunning followed by bleeding

(i) The system must ensure sufficient current is passed through the body of the fish for a sufficient duration to render the fish immediately insensible until death supervenes.

- ES 1.1** Whatever electrical process is used (batch, continuous flow etc.) it must be ensured that:
- a) insensibility of the fish is achieved immediately
 - b) there are no pre-stun shocks
 - c) the stun is maintained until the fish dies, or is insensible to percussive stunning.
- ES 1.2** Fish must be presented to the stunner in a way that prevents:
- a) mis-stunning
 - b) fish missing the stunner, e.g. falling from the stun table to the floor.
- ES 1.3** Before the beginning of each harvest, the system must be tested to ensure it is working properly with the first 10 fish.
- a) the checks must include the fish have no eye movement
 - b) no rhythmic opercular movement
 - c) only mild short term involuntary muscular twitches
 - d) no reaction to tail pinch
- ES 1.3.1** The results of the checks must:
- a) be recorded, and
 - b) made available on request.
- ES 1.4** All relevant personnel must be trained and competent to:
- a) identify signs of an effective stun
 - b) operate the stunning/killing system safely.
- ES 1.5** All equipment must be operated in accordance with the manufacturer's recommendations or relevant internal protocols
- ES 1.6** Equipment must be fitted with a visible means of checking that the correct current is being administered throughout the process.
- ES 1.7** All equipment must be:
- a) cleaned and maintained regularly and, in any case, at least in accordance with the manufacturer's instructions
 - b) fit for purpose at all times.
- ES 1.8** Contingency plans must be in place to ensure fish welfare is not compromised should there be any equipment or material failure, including an interruption in the electricity supply, loss of water, or breakdown of the water pump.
- ES 1.9** There must be a humane process in place to ensure no fish are left in the system at the end of the procedure.

NEW Welfare Outcome Assessment

(i)

To ensure we are improving farm animal welfare we need to be able to measure it. Measuring welfare enables us to know what level is being achieved and therefore better understand what impact the resources being provided and management practices being implemented are having on the animals. Measuring welfare in this way is known as Welfare Outcomes Assessment (WOA). WOA need not be a difficult process, and will already be familiar to members because much of this sort of information will already be recorded during routine fish sampling, for example, fins, operculae, eye damage and any notable conditions such as abnormal behaviours, deformities and skin condition. This information is only useful if it is used to improve fish welfare via the health and welfare plan or by being aggregated together anonymously in order to identify trends for certain measures over time. To an extent, this model is already being used in relation to sea lice counts being submitted to the SSPO.

The RSPCA intends to formalise WOA for salmon in the next iteration of the RSPCA standards for farmed Atlantic salmon, which is planned for publication in 2022. This should give ample time for us to discuss this further and examine the best way to progress this area of work.

These cleanerfish standards specifically relate to wild caught and hatchery reared Wrasse (*Labridae spp.*), as well as hatchery reared Lumpfish (*Cyclopterus spp.*).



Subsection headings indicate whether the standards are specifically applicable to wild and/or hatchery reared fish and which species.

These standards are to be applied in conjunction with other relevant sections of the standards document, for example, the general transport standards.

- CF 1.0** Only the following cleanerfish are permitted to be used at the present time:
- a) Wrasse (*Labridae spp.*)
 - b) Lumpfish (*Cyclopterus spp.*)
- CF 1.0.1** There must be a designated, named member of the farm staff, who is competent to, and responsible for, carrying out all aspects of cleanerfish husbandry.
- CF 1.1** All records and other documentation referenced throughout these cleanerfish standards, must be made available to farm assurance scheme personnel on request. For example, numbers and species of wild fish caught and transported, as well as transport start and finish times.
- CF 1.2** Exceptional mortality, or compromises to cleanerfish welfare arising from any single event, along with the causes, must be recorded and reported to RSPCA Assured within 72 hours.
- CF 1.2.1** Any fish brought in from another site that are to be kept as broodstock must be kept in quarantine for a minimum of four weeks before being mixed with any of the fish at the new site.
- CF 1.2.2** Before the site to site transfer of fish:
- a) a welfare risk assessment must be carried out (see Appendix 3)
 - b) site neighbours must be notified
- CF 1.2.3** A dedicated cleanerfish section must be included in the Veterinary Health and Welfare Plan (VHWP) (See H 1.1).
- ### **Catching of wild wrasse and transport of wild and hatchery reared wrasse**
-
- CF 1.3** For RSPCA Assured members:
- a) wild caught wrasse must be obtained from a named RSPCA Assured cleanerfish vessel
 - b) all vessel staff must have access to, be familiar with, and adhere to the relevant sections of the current version of the RSPCA welfare standards for farmed Atlantic salmon.
- CF 1.3.1** Hook and line fishing methods must not be used to catch wrasse.
- CF 1.4** All designated vessels/vehicles used to catch/transport wrasse must have suitable:
- a) smooth surfaced storage tanks
 - b) equipment to catch/transport the fish.
- CF 1.5** Creels, traps, pots and nets must be managed and inspected in a way that does not compromise the welfare of the fish.

- CF 1.5.1** Creels, traps, pots and nets must be designed so that they prevent wild animals, such as otters, becoming trapped, whilst at the same time minimising bycatch.
- CF 1.5.2** Raising the creels, traps, pots or nets to the surface must be done in a way that does not compromise the welfare of the fish, for example, by bursting the swimbladder.
- CF 1.5.3** There must be a procedure in place which enables the decompression of fish to take place if required, by the use of aids, such as hospital creels.
- CF 1.6** Wrasse must not be caught when the water temperature is above 17 degrees centigrade.
- CF 1.7** Transport tank stocking density must not exceed 110kg/m³
- CF 1.8** Supplemental oxygen must be available to maintain tank oxygen levels above 7 mg/l.
- CF 1.9** Water temperature fluctuations between the sea and tank must be minimised to avoid thermal shock, and must not exceed a difference of greater than 4 degrees centigrade within a 30 hour period.
- CF 1.10** There must be suitable equipment available and techniques for all handling and transferring processes involving the fish.
- CF 1.11** Where the fish have to be held temporarily in holding tanks before an onward journey, appropriate food of a suitable quantity must be provided.
- CF 1.11.1** Dead and moribund fish must be removed on a daily basis during the time that the fish are housed in the temporary holding tanks.
- CF 1.12** Records must be kept of:
- a) the number of fish caught
 - b) the species of fish caught
 - c) the number of fish received by the boat
 - d) the species of fish received by the boat
 - e) the transport start and finish times
 - f) post capture mortality.
- CF 1.13** Transport tanks must be filled with seawater of good quality (full strength) before the fish are loaded.
- CF 1.13.1** Prior to filling with water, the tanks must have been thoroughly cleaned and disinfected.
- CF 1.14** Transport plans must ensure that the risk of unnecessary standstill periods are minimised, and that water quality can be maintained, should a standstill period become unavoidable.
- CF 1.15** Water temperature and oxygen level must be monitored to ensure that appropriate water quality is maintained at all times whilst the fish are being transported.
- CF 1.16** At the end of the journey, any fish that are unfit/moribund must be either quarantined or humanely killed and must not be deployed into the salmon enclosure.

Deployment of cleanerfish into the pen after transport: wild and hatchery reared wrasse and lumpfish

- CF 2.0** The receiving site must:
- have all of the necessary equipment, such as pumps, aeration systems and hand nets ready to be used as soon as the fish arrive
 - transfer the fish without delay.
- CF 2.1** Before being released into the enclosure the cleanerfish must:
- be visually screened
 - have undergone a welfare risk assessment for disease and injury.
- CF 2.1.1** The welfare risk assessment and any actions taken, must be recorded in the VHWP.
- CF 2.1.2** Following the welfare risk assessment, the cleanerfish must be:
- released gently into the enclosure
 - released into an area where there are hides/kelp rather than open water.
- CF 2.1.3** To reduce unloading time, partial draining of the water in the tanks must start before the unloading procedure starts.
- CF 2.1.4** At the end of unloading, checks must be made to ensure there are no fish left in the tank.
- CF 2.1.5** Salmon must have been fed before the release of the cleanerfish into the enclosure.

(i) The size of the cleanerfish should be appropriate for the size of the salmon they are being housed with.

- CF 2.1.6** The net mesh size must be suitable for the size of the cleanerfish being released.
- CF 2.1.7** The welfare of the cleanerfish must be monitored in the enclosure on a daily basis, paying particular attention to any folds in the net to ensure cleanerfish are not trapped and to check they are feeding.
- CF 2.1.8** Initial stocking density of wrasse in the pen must not be higher than 10% of the salmon biomass (for lumpfish see **CF 12.13** below).
- CF 2.2** Cleanerfish mortality levels must be:
- recorded 48 hours after transfer to sea
 - assessed against expected targets.
- CF 2.3** Hides/refuges must be located in areas of the pen that allows maximum opportunity for the salmon to come into contact with the cleanerfish.
- CF 2.4** Hides/refuges must be hung away from the net wall, to avoid having to move them when the nets are cleaned.
- CF 2.5** Hides/refuges must be kept clean at all times.
- CF 2.6** Where appropriate, refuges must be left in the enclosure during the winter at sufficient depth to allow cleanerfish, and in particular wrasse, to rest during their period of inactivity.
- CF 2.7** Substrate must be provided to allow all lumpfish to rest at the same time.

Handling of cleanerfish in the pen: wild and hatchery reared wrasse and lumpfish

CF 3.0 Hides must be carefully lifted out of the pen in sufficient time before any farming operation which involves handling the salmon begins.

CF 3.0.1 Nets must not be raised in a way that compromises the welfare of the cleanerfish.

i Where possible, cleanerfish should be removed from the crowd or prevented from participating in the crowd prior to any salmon operation, such as thermolicing, hydrolicing, bath treatments or wellboat treatments.

CF 3.1 Before harvest:

- hides must be moved to the opposite side of the enclosure to the crowd in sufficient time to allow the cleanerfish to migrate away from the crowd, or
- baited creels must be used to catch and move the fish 72 hours before the operation begins.

CF 3.2 Sufficient hospital pots must be available to deal with casualty fish suffering from swim bladder problems or other injuries during salmon operations.

CF 3.3 For fish with swim bladder problems, the pots must be lowered to a sufficient depth until the fish are recovered.

CF 3.4 Where any operations include the use of dewaterers, constant monitoring must be employed to ensure that no cleanerfish are caught between the bars of the dewaterer.

i Cleanerfish should only be given freshwater treatments after being: welfare risk assessed against such a treatment, in terms of potential for injury etc.
The welfare outcomes of freshwater treatments should be recorded in the VHWP.

CF 3.5 For on-site vaccination, cleanerfish must be transferred into bins containing both oxygenated seawater and kelp, post vaccination.

CF 3.5.1 Oxygen levels in the bins must be monitored at all times.

CF 3.6 At the end of any wellboat treatments:

- the cameras in the well must be used to ensure that the well is empty
- there must be no fish left in the well.

Supplementary feeding at sea: wild and hatchery reared wrasse

CF 4.0 Wrasse must have the opportunity to satiate their appetite on a daily basis.

CF 4.0.1 Feedstations must be located near to the hides/refuges and must be available all year round.

CF 4.0.2 Feedstations must be positioned so as to avoid dominant fish preventing others from feeding.

CF 4.1 Feedbags and blocks must be checked on a daily basis, and in particular for any signs that territoriality may be occurring.

CF 4.2 A written return to feed strategy must be developed for wrasse following a farming operation.

Slaughter: wild and hatchery reared wrasse and lumpfish

CF 5.0 Producers must be able to demonstrate that the methods used to kill cleanerfish are humane.

i This is usually a percussive blow for bigger wrasse or an overdose of anaesthetic for smaller fish or lumpfish.

Hatchery standards: wrasse

CF 6.0 Egg hatching water temperature must not exceed 14 degrees centigrade.

i Lighting regimes should include a period of dim lighting during the hatching phase.

CF 6.1 Egg mats must be disinfected daily for the first 7 days of incubation to reduce the risk of disease transfer.

CF 6.1.1 Processes involving egg disinfection and degumming must not be harmful to the eggs in terms of larval survival.

CF 6.2 Water turnover in the incubators must be sufficient to ensure that oxygenation of the eggs is optimised.

CF 6.3 There must be a method of ensuring that larvae can easily transfer into a collection tank when hatching begins.

Tank Husbandry: wrasse

CF 7.0 Tank/incubator water quality parameters must be as follows:

	Eggs	Larvae	Ongrowers
Temperature (°C)	<14	<17	7-17
Oxygen (%)	95-100%	95-100%	95-100%
pH	7.3-8.0	7.3-8.0	7.3-8.0
CO ₂ (mg/l)	<15	<15	<15
TAN (mg/l)	<0.5	<0.5	<0.5
Nitrate NO ₃ (mg/l)	<50	<50	<50

i Tank colour which is optimal for the welfare of the fish is yet to be determined.

CF 7.0.1 The flow of water must be sufficient to allow normal swimming behaviour to be performed at all times

CF 7.0.2 To avoid post hatch clumping, larvae must not be subjected to disturbances associated with noise, sudden bright light or overt water flow.

CF 7.1 For wrasse over 10 grams, suitable environmental enrichment, such as artificial kelp and hides, must be provided.

CF 7.1.2 Stocking densities for wrasse over 10 grams must not exceed 40kg/m³.

CF 7.2 The surface water of the tank must be kept clean to enable the larvae to successfully fill their swim bladders.

Tank feeding: wrasse

- CF 8.0** High quality live feed, such as copepods, rotifers or artemia, must be used for ballan wrasse larvae from 4 - 5 days post hatch, prior to weaning onto dry food.
- CF 8.1** To optimise larval feeding, methods must be used that ensure equal distribution of larvae throughout the tank.
- CF 8.2** Waste feed must be removed from the floor of the tank on a daily basis.
- CF 8.3** During the first feeding phase, tank walls must be cleaned to avoid bacterial build-up.

Hatchery standards: lumpfish

- CF 9.0** Fertilised eggs must be prepared for hatching in a way that maximises the hatching potential of the eggs, for example, by being degummed and disinfected before being placed in the incubator.
- CF 9.1** Water salinity must be maintained between 20-34 parts per thousand to allow the eggs to harden off.
- CF 9.2** Before hatching begins, any dead eggs and dead egg debris from non-viable eggs must be removed regularly to prevent disease.
- CF 9.3** Egg mortality levels must be recorded.

(i) Lighting regimes should include a period of dim lighting during the hatching phase.

- CF 9.4** Hatchery trays must be arranged to allow the easy transfer of larvae to the first feeding tanks.
- CF 9.5** There must be sufficient flat surface area in the hatching tray for all larvae to adhere to after hatching.
- CF 9.6** There must be a system in place to ensure that there are no larval escapes:
 - a) after hatching
 - b) when they are being transferred to the first feeding tanks.
- CF 9.7** Any transfer utensils must be designed so that the larvae do not attach themselves to the walls or base of them.
- CF 9.7.1** Checks must be made to ensure that no larvae are attached to these utensils after they have been transferred.

Larvae/first feeder management: lumpfish

- CF 10.0** Feed must be introduced when at least 90% of the lumpfish in the tank have absorbed their yolk sacs post hatch.
- CF 10.1** First feeder stocking density must not exceed 25kg/m³

(i) Ensuring there is enough surface area for all of the fish to adhere to is an important priority.

- CF 10.2** Whether feeding live or inert feed, it must be distributed across the tank to ensure it reaches the tank perimeter.

- CF 10.3** Feed must be distributed in a way that avoids encouraging aggression between fish.
- CF 10.4** Feed pellet size must be adjusted after metamorphosis from larvae to first feeder, to ensure it is appropriate for the feeding habits of the fish.
- CF 10.5** During the first feeding phase, tank walls must be cleaned to avoid bacterial build-up.
- CF 10.6** A dim light period must:
- be provided for each 24-hour period
 - be recorded in the VHWP.
- CF 10.7** Any fish with deformed sucker plates that are not thriving must be removed and be humanely destroyed.
- CF 10.8** Dead fish must be removed at least once per day.
- CF 10.9** Grading must start when the fish weigh between 0.5 and 2.0 grams.

Ongrower tanks: lumpfish

- CF 11.0** Tank furniture, including oxygen probes, must be protected to prevent the lumpfish sticking to them.
- CF 11.1** Tank/incubator water quality parameters must be as follows:

	Eggs	Larvae	Ongrowers
Temperature (°C)	<10	<14	7-12
Oxygen (%)	95-100%	95-100%	95-100%
pH	7.3-8.3	7.3-8.3	7.3-8.3
CO ₂ (mg/l)	<15	<15	<15
TAN (mg/l)	<0.5	<0.5	<0.5
Nitrate NO ₂ (mg/l)	<50	<50	<50

- CF 11.2** Grading must start when the fish weigh 2g and be maintained at intervals of two weeks to avoid hierarchies forming.
- CF 11.3** There must be sufficient flat surface area in the tanks for all fish to adhere to.
- CF 11.4** If mortality levels rise above 2% in the first six weeks,
- an investigation must be conducted to identify the cause of the mortality
 - remedial action must be taken to address the problem, and
 - this must be recorded in the VHWP.
- CF 11.5** The stocking density in the outgrowing tank must not exceed 60kg/m3.

Juvenile lumpfish: from 10 grams to deployment at sea

- CF 12.0** The use of prophylactic antibiotic treatments preceding their deployment to sea is prohibited.
- CF 12.1** Only healthy fish must be deployed to sea.
- CF 12.1.1** Lumpfish with deformed suckers must not be deployed.
- CF 12.2** Any nets used to move the fish must:
- be clean,
 - be constructed from fine meshed (smolt linen),
 - not contain knots.

- CF 12.3** Transport tank stocking density must not exceed 60kg/m³
- CF 12.4** Before lumpfish are unloaded into the pen, the salmon must have been fed to avoid them eating the lumpfish.
- CF 12.5** The size of the lumpfish must be suitable for the size of salmon to enable the effective removal of sealice.
- CF 12.6** Enclosure nets must be clean before lumpfish are released.
- CF 12.7** The fish must be inspected for any health and welfare issues before they are transferred to sea.
- CF 12.7.1** Any fish that are unwell, damaged, injured or swimming erratically must:
- a) not be discharged into the sea
 - b) be treated or humanely killed without delay.
- CF 12.7.2** Any fish which are unfit for the marine environment must be humanely killed without delay.
- CF 12.8** When transferring fish to sea, high drops, sharp corners or removing the fish from the water for more than 10 seconds must be avoided.
- CF 12.9** At the end of unloading there must be:
- a) procedures in place to ensure there are no lumpfish left in the tanks
 - b) no lumpfish left in the tanks.
- CF 12.10** The lumpfish must be acclimatised to the ambient temperature of the sea before they are transferred.



Lumpfish should be acclimatised to salmon before they are transferred to sea. This may be a requirement in future publications of these standards.

- CF 12.11** There must be sufficient substrate/refuges/hides for all the lumpfish to adhere to in the sea pen.
- CF 12.12** The lumpfish must be released into an area of the pen where they have easy access to the refuges substrates.
- CF 12.13** At sea, lumpfish must be stocked at no more than 20% of the salmon biomass.
- CF 12.14** Hides/refuges must be:
- a) free of algal growth and stinging marine life
 - b) easy to clean.
- CF 12.15** The lumpfish must have access to supplementary feed after they have been released.
- CF 12.16** Post mortality transfer must be:
- a) recorded in the VHWP
 - b) subjected to a full review to identify the cause of such mortalities
- CF 12.17** Sea enclosure nets must be kept clean.
- CF 12.18** Dead lumpfish must be removed from the dead basket on a daily basis.
- CF 12.19** The lumpfish must be prevented from attaching to the dead basket.

Supplementary feeding at sea: lumpfish

- CF 13.0** Lumpfish must have the opportunity to satiate their appetite on a daily basis.
- CF 13.1** The timing of lumpfish feeds must coincide with the end of salmon feeding.
- CF 13.2** Lumpfish feedstations must be positioned to avoid dominant fish preventing others from feeding.
- CF 13.3** Feedbags and blocks must be checked on a daily basis.
- CF 13.4** A written return to feed strategy must be developed for lumpfish following a farming operation.

Sea pen environment/enrichment: lumpfish

- CF 14.0** Pens must have suitable structures and substrates to provide the lumpfish with adequate refuges and places to rest.
- CF 14.1** The refuges and substrates must be easy to clean and managed hygienically when in place.
- CF 14.2** Refuges must be placed where they encourage lumpfish to graze on the sealice (rather than the nets).

Transport of lumpfish

- CF 16.0** All fish must be fit to travel.
- CF 16.0.1** Fish with deformed sucker plates must not be allowed to travel.
- CF 16.1** Fish must have been graded before travel.
- CF 16.2** Fish must have been fasted before travel.
- CF 16.3** Transport stocking density must not exceed a maximum of 80kg/m³
- CF 16.4** There must be a journey plan in place to ensure that the welfare of the fish is not adversely affected by the transfer to sea.
- CF 16.5** All tank surfaces and equipment used for transporting fish must:
 - a) be smooth
 - b) have been disinfected in between loads.
- CF 16.6** There must be enough surface area in the tanks for all of the fish to adhere to during the journey.
- CF 16.7** Fish must not be injured or damaged if removed from the tank surface.
Fish which are strongly adhered to the tank surface must not be injured or damaged when they are being removed.
- CF 16.8** Tanks must be fitted with oxygenation and aeration apparatus.
- CF 16.8.1** Oxygenation and aeration apparatus must be:
 - a) fit for purpose
 - b) in good working order.

CF 16.9 There must be good communication between the transporter and the recipient in relation to:

- a) transport hoses and couplings,
- b) dewaterers,
- c) fish pumps (if needed),
- d) weather conditions, and
- e) ensuring that net mesh size is suitable for the size of the fish

CF 16.10 Where pumps are used to unload lumpfish, a humane method must be used at the end of unloading to:

- a) check there are no fish remaining in the pipe
- b) remove any fish from the pipe

CF 16.11 Any nets used to move the fish must be:

- a) clean,
- b) fine meshed (smolt linen),
- c) not have any knots.

CF 16.12 Fish must be observed at the time of release and any escapes recorded.

CF 16.13 After release:

- a) daily checks must be made for moribund and dead fish
- b) these fish must be removed from the pen and disposed of humanely

Appendix 1

RSPCA Veterinary Health and Welfare Plan guidance notes

This document provides complementary notes to the *RSPCA 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 and Welfare Plan (VHWP). 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 Salmon Standards Technical Advisory Group for their advice.

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The written Veterinary Health and Welfare Plan (VHWP) should be agreed between those with responsibility for the health and welfare of the fish, which may include the vet, health manager, stockpersons, nutritionist and other relevant personnel. It should involve regular visits on-site by the farm's own vet.

Part A: VHWP guidelines on fish health

Pete Southgate BvetMed MSc MRCVS, Fish Vet Group veterinary surgeons

The VHWP 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 VHWP 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 VHWP.

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 VHWP.

The VHWP shall establish procedures which identify areas of welfare risk and methods of monitoring and minimising risk. Monitoring will determine whether the procedures are appropriate and successful. Procedures shall be regularly reviewed and the VHWP changed to account for any corrective actions identified.

The VHWP 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 VHWP 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 VHWP 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 manager.

See RSPCA welfare standards – H 2.1 to H 2.4

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

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

The VHWP shall detail evidence of physical damage e.g. fin damage, de-scaling, 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 VHWP.

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 manager and remedial action agreed and updated into the VHWP. The log detailing fish physical health and damage must be available for inspection by the RSPCA Farm Livestock Officer and RSPCA Assured Assessor.

Disease surveillance

Early identification of developing health problems is an important component of a VHWP, 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 VHWP 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 VHWP. The success or failure of any treatment or changes in management/husbandry procedures should also be recorded and reviewed.

See RSPCA welfare standards – H 1.6 & H 1.8

Medicinal products

The use of medicinal products must be detailed in the VHWP. 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 VHWP 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 VHWP.

See RSPCA welfare standards – H 3.1 to 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 9.1 to FW 10.10

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 (*Moratella 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 VHWP 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 VHWP:

- 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 standards – M 2.2 to M 2.7

Written records of staff training must be maintained and be available to the RSPCA Assured Assessor and RSPCA Farm Livestock Officer.

5. Information on major common parasites and diseases

Sea lice

See RSPCA welfare standards – H 4.1 to H 4.8

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, *Lepeophtheirus* 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. 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 presmols
- use of nutriceuticals, 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 nutriceuticals 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 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.

Gill Disease

Gill Disease in Atlantic salmon during the marine phase of their lifecycle is caused by a range of pathogens and includes conditions such as Amoebic Gill Disease (AGD) and Proliferative Gill Disease (PGD). Recently, AGD has become more prevalent, and whilst the reasons for the proliferation of the organisms causing the condition are not fully understood, certain factors such as water temperature, salinity, smolt size and quality are key determinants contributing to the prevalence of the disease. Treatments include bathing in hydrogen peroxide or freshwater. The timing and administration of these treatments are key factors in terms of influencing the success of these procedures, as is the requirement to make them as stress free as possible for the fish involved.

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: VHWP 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 standards – HP 2.13 to HP 2.14

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.

When fish are stressed in a pre-slaughter 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 downstream 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 standards – HP 2.18 and 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 2.13 and HP 2.14

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.

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/her.

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 standards – HP 1.1 to HP 1.6

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 practise 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 standards – S 1.1 to S 1.11

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.

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 downstream from enclosure
- oxygen levels below 5.5 mg/l.

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 pre-slaughter 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 VHWP (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, de-scaling, wounds etc. Records should be discussed with the veterinary surgeon, and the VHWP 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 77 to 78) 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 VHWP. 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.

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 RSPCA Assured 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 RSPCA Assured 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.

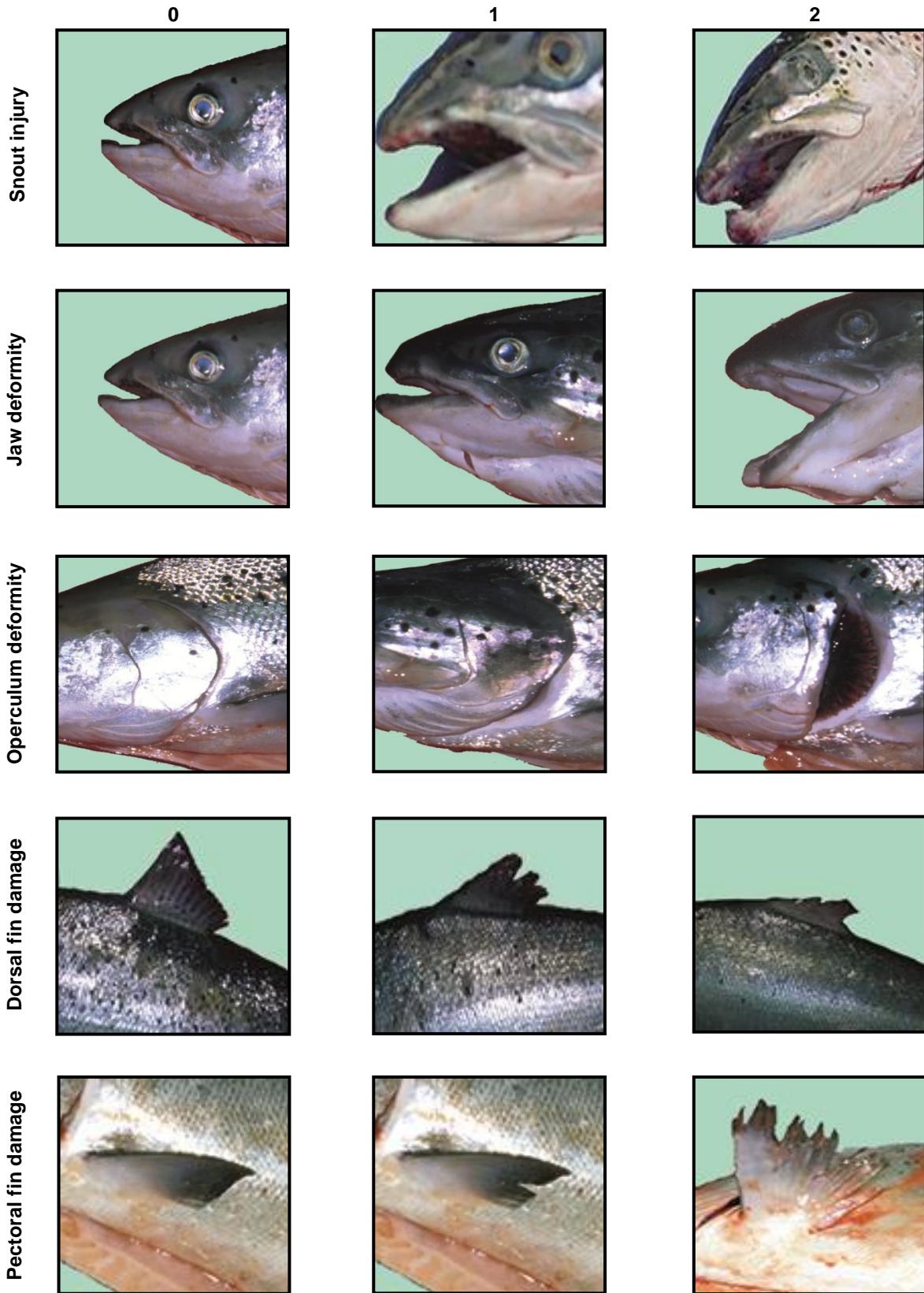
Suggested scoring system

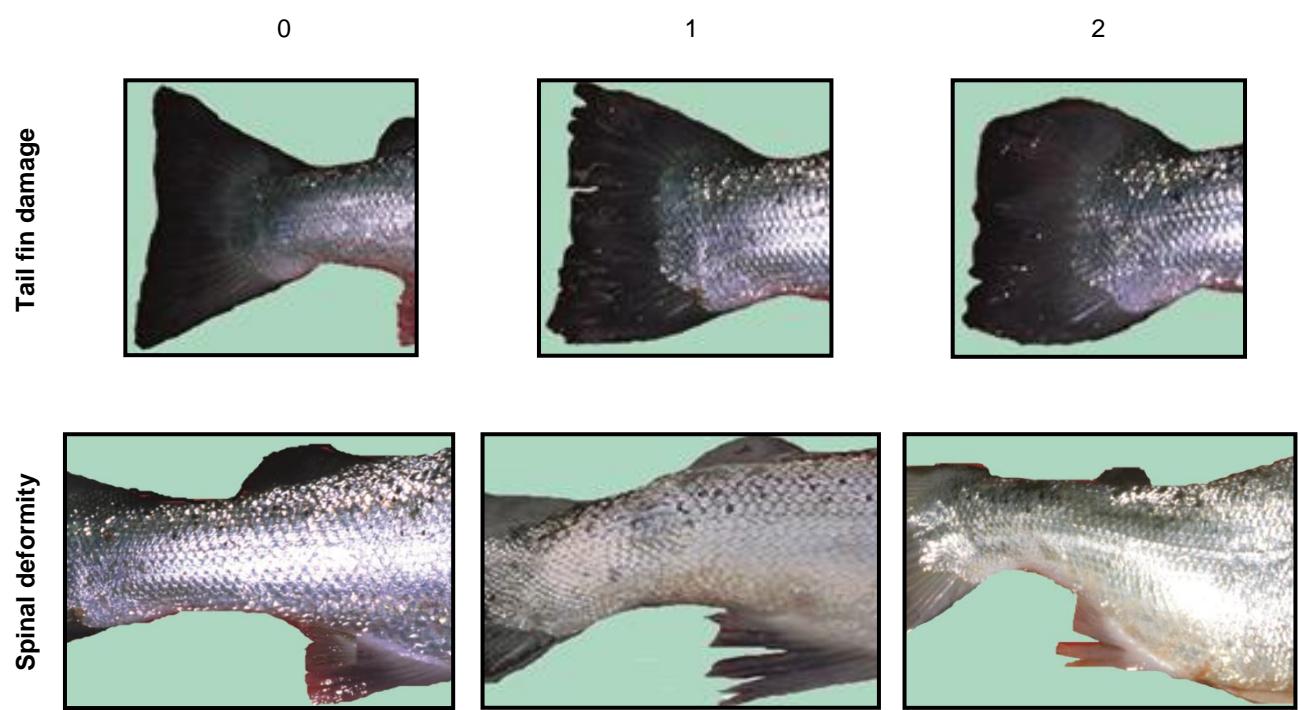
The table below shows the score given to a fish for each condition depending on the severity of damage.

Type and level of damage	Score given to fish			Also note:
	0	1	2	
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	

Photographic examples for scoring

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).





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.

Appendix 2

Crowd intensity scale

A simple fish behaviour scale from 1–5 may be used as a guide to managing acute stress, i.e.:

Goal

1. Essentially no fins breaking the surface of the water.

Acceptable

2. Fins above the water over a small part of the surface of the crowd.

Undesirable

3. Fins and part of the fish above the water over the whole surface of the crowd. Some burrowing, gasping and vigorous activity in parts of the crowd.

Unacceptable

4. The whole surface of the crowd vigorously burrowing, gasping and splashing.
5. Whole surface of the pen boiling with violent splashing.

Level 1: Goal – low stress, no vigorous activity

Observations:

- Fish in the sides of the crowd swimming slowly.
- Normal swimming behaviour, but not all in the same direction.
- No dorsal fins on surface.
- No white sides on surface.



Level 2: Acceptable – some fins on surface

Observations:

- Normal swimming behaviour at suction point, low stress.
- Few dorsal fins on surface.
- No white sides on surface.



Level 3: Undesirable

Observations:

- Over-excited swimming behaviour (different directions).
- More than 20 dorsal fins on surface.
- Some white sides constantly on surface.

**Level 4: Unacceptable – overcrowding**

Observations:

- Over-excited swimming behaviour (different directions). Some fish decreasing activity.
- Pumping rate: Not possible to keep a constant rate.
- Many fish stuck up against the crowd net.
- Many dorsal fins on surface and numerous white sides on surface.
- A few very lethargic fish.

**Level 5: Unacceptable – extreme overcrowding**

Observations:

- Whole crowd boiling.
- Potential for large fish kill without rapid release.



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Please note that the photographs for levels 3 and 4 as received have been reordered in consultation with the RSPCA Salmon Standards Working Group.

Appendix 3



Farmed Fish Welfare Risk Assessment

SECTION 1

Company _____ Designated fish welfare officer _____

Type of fish

VET AVAILABLE IF REQUIRED

General description of event, including location and activity

General Description of event:

Company _____ Designated fish welfare officer _____

Welfare at risk	Severity	Description
1 Freedom from thirst, hunger and malnutrition	1 NEGLIGIBLE	All welfare needs met at all times
2 Freedom from discomfort	2 MINOR	Welfare needs not met for a reasonable duration
3 Freedom from pain, injury and disease	3 SERIOUS	Welfare needs not met for an unreasonable duration
4 Freedom to express normal behaviour	4 MAJOR	Animal suffering unnecessarily
5 Freedom from fear and distress	5 FATALITIES	Animal dies unnecessarily of unnatural causes

PERSON(S) RESPONSIBLE

	Job title	Name	Signed
A			
B			
C			
D			
E			
F			

By signing the above, I understand my responsibilities as set out in section 2 (overleaf).



Farmed Fish Welfare Risk Assessment

SECTION 2

Company _____

Designated fish welfare officer _____

Fish _____

Activity	Duration of activity	Welfare at risk	Severity of risk	Probability/likelihood of negative welfare impact	Control measure(s)	Person(s) responsible for control

This Farmed Fish Welfare Risk Assessment (WRA) contains summary advice for the purpose of ensuring the welfare of fish. It is not intended to be a comprehensive statement of all the needs of the fish or how to meet them.

Appendix 4

RSPCA Assured Salmon Farms – 72 Hour Reporting Form – Seal Cull

Please fill out this form in full and email to asales@rspcaassured.co.uk and malcolm.johnstone@rspcaassured.co.uk within 72 hours of the incident.

Membership number	
Site name	
Date & time of shooting	
Farm SG licence number	
Number of seals shot and species (e.g. grey or common seal)	
Number and locations of pens affected	
Total number of pens and fish on site at time of predation	
Number of fish killed before last resort shooting took place, and over what time period?	
Location of shooting	
Reasons for shooting (explain why this was considered a last resort)	
How was it ascertained that the damage to the fish was seal-related?	
How did the site manager decide that a seal damage threshold had been reached?	
Details regarding nets (incl. Predator nets)	
Details regarding ADDs (model, transducer positioning on site etc.)	
Any other relevant comments	
Remedial action to prevent further seal attacks	

Signed for by:..... Date: dd/mm/yy

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Royal Society for the Prevention of Cruelty to Animals

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978-0-901098-14-6

