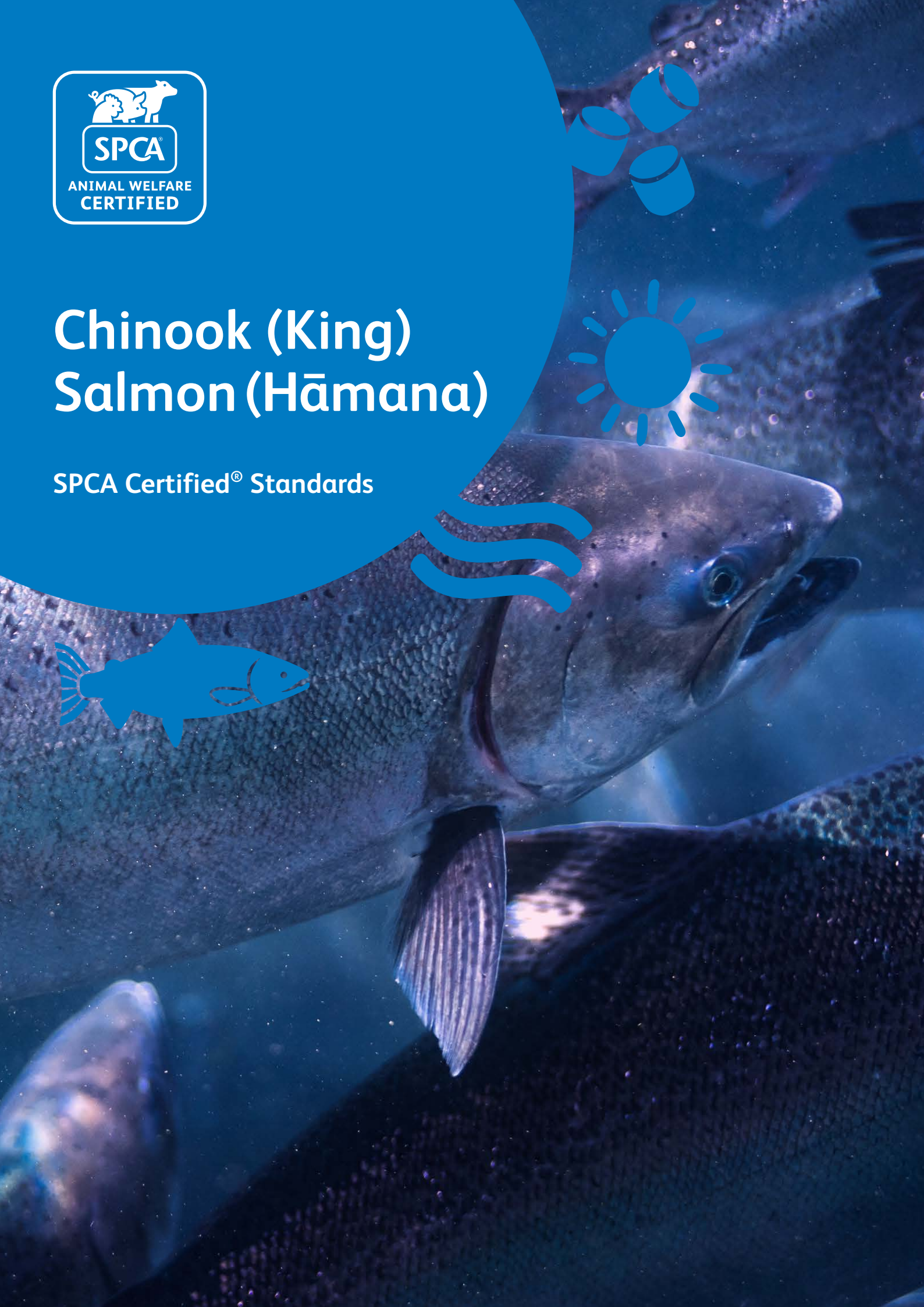
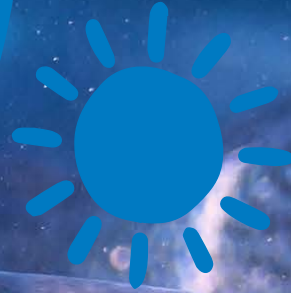




Chinook (King) Salmon (Hāmāna)

SPCA Certified® Standards



SPCA Certified Standards for Chinook (King) Salmon (Hāmana)

VERSION 1 – 2022



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SPCA Certified Standards for Chinook (King) Salmon (Hāmana)

Overview of SPCA Certified

SPCA Certified is a certification system designed to celebrate good farming and raise animal welfare above current legal requirements. Its overarching goal is to improve the lives of as many animals as possible, through a process of increasing uptake and continual improvement over time. As such, SPCA Certified standards for Chinook (King) salmon, *Oncorhynchus tshawytscha*, allow participants to demonstrate that they apply a high level of animal welfare to their farming operations.

Certification is given to participants, which may include farmers, distributors, retailers and companies, through a legal contract, following a successful initial assessment and subsequent welfare audit of compliance with the SPCA Certified standards.

SPCA Certified standards for Chinook (King) salmon apply to all production systems that farm Chinook (King) salmon.

In terms of the welfare outcomes they achieve, SPCA Certified standards are intended to go beyond the Animal Welfare Act 1999 and relevant Codes of Welfare. They are informed by animal behaviour and welfare science, consultation with stakeholders, and the values of SPCA. All farm staff, operators and owners should be aware of, and compliant with the standards, as well as the legal requirements relating to the animals in their care.

SPCA Certified standards are intended to be used alongside existing industry programmes and practices on farm, and should be read in association with the following documents:

- Animal Welfare Act 1999.
- Animal Welfare (Commercial Slaughter) Code of Welfare 2018.
- Animal Welfare (Transport within New Zealand) Code of Welfare 2018.
- Fisheries Act 1996
- Freshwater Fish Farming Regulations 1983
- Marine Mammal Protection Act 1978
- Resource Management Act 1991

Framework of the SPCA Certified Standards

Previous iterations of SPCA Standards (Blue Tick) were based on the 'Five Freedoms' framework, which focuses on freedom from negative states, e.g. hunger, fear and injury, in order to achieve good welfare. However, with the recognition that animals can experience positive, as well as negative emotions and the acknowledgement of sentience¹ in the amended Animal Welfare Act 1999, the time has come for a new approach.

¹Sentience is the ability to feel, perceive or experience things subjectively (i.e. from one's own perspective), rather than objectively (i.e. from an external perspective).

As a result, the framework for the SPCA Certified standards has been derived from the Five Domains model of animal welfare, developed by New Zealand Professor, David Mellor². The Five Domains model is a holistic assessment of animal welfare, which addresses both minimising suffering and promoting positive emotional states.

The Five Domains are:

- nutrition;
- physical environment;
- health;
- behavioural interactions; and
- mental state.

Each of the four physical domains contribute to the provision of opportunities for positive mental experiences, as evaluated in the fifth domain.



Scope

SPCA Certified standards for Chinook (King) salmon apply to all life-stages of the fish, including eggs³, alevin, fry, parr, smolt and adults, until they are humanely slaughtered (harvested) or euthanised on the farm. The standards apply to all production systems that farm Chinook (King) salmon, including hatcheries, land-based, seawater and freshwater systems.

It is the responsibility of the participant (farmer/licensee) to ensure that the supplying hatchery, transport operators, contractors and slaughter facilities comply with the law and follow all best practice recommendations.

²Mellor, D. J., Beausoleil, N. J., Littlewood, K. E., McLean, A. N., McGreevy, P. D., Jones, B., & Wilkins, C. (2020). The 2020 five domains model: Including human–animal interactions in assessments of animal welfare. *Animals: an open access journal from MDPI* 10(10): 24

³Behavioural Interactions and Positive Mental Experience Domains do not apply to the egg life-stage.

Traceability and Integrity

SPCA Certified endeavours to inspire best practice animal welfare within the salmon farming industry and to ensure transparency in animal welfare. To protect the integrity of SPCA Certified and the participating farmers, distributors, retailers and companies who use the brand, it is important that all SPCA Certified members clearly demonstrate product traceability throughout their supply chains.

SPCA Certified also uses independent audits, to maintain the integrity of the scheme and ensure that participants are meeting its standards. As a result, products carrying the SPCA Certified logo allow consumers to identify Chinook (King) salmon products that have come from Chinook (King) salmon that have been farmed to a higher standard of animal welfare than is currently required by law.

For more information about SPCA Certified, including types of membership, procedures and the third party auditing process, please refer to the SPCA Certified Farmed Animals Operations Manual.

SPCA Certified Standards for Chinook (King) Salmon (Hāmana)


Important notes:

- Section titles and their accompanying descriptions are taken from the Five Domains.
- Information presented in **bold italic** type is either a standard explanation, a recommendation, an area of concern, or an indication of where a standard is likely to be reviewed in the future.
- In order to avoid unnecessary duplication, existing information/records from other sources can be used to demonstrate compliance with the requirements of a standard. Electronic/controller records and logs are acceptable, as long as they can be accessed by SPCA Certified during assessments/audits.

Positive Mental Experience



Provide safe, congenial and species-appropriate opportunities to have positive experiences.

The Chinook (King) salmon icon  indicates those standards and recommendations that provide positive mental experiences for Chinook (King) salmon.

Good Nutrition



Provide regular access to a diet that maintains full health and vigour.

Feed Contents

- N1 Feed must be sourced from independently certified⁴ manufacturers, which can demonstrate:
- a) Ingredients are responsibly and sustainably sourced.
 - b) The percentage of fish meal and fish oil in the feed.

⁴For example, feed suppliers certified by Best Aquaculture Practice (BAP) or Aquaculture Stewardship Council (ASC) Feed Mills Standards.

- N2 Feed pellets must be appropriately sized for the life stage of the salmon based on manufacturer's standards, or as a general rule 20-30% of the size of the fish's mouth gape.
- N3 Feed must not contain growth regulators and added hormones.

Feed Methods

- N4 Feed programmes must be developed for each life stage, detailing their specific requirements. The following aspects of feed management must be documented in the feed programme (Appendix 1):
- a) Feed ration size
 - b) Frequency of feeding
 - c) Temporal and spatial distribution of feed
 - d) Feeding rate
 - e) Feed contents
 - f) Pellet density
 - g) Monitoring of fish behaviour during feeding
 - h) Risk mitigation e.g. equipment failures.
- N5 Feed must be dispensed and distributed in a way that encourages fish to feed, reduces competition for the feed amongst the fish and minimises the risk of over- and under-feeding.
- N6 Monitoring systems, e.g. cameras and/or naked eye by trained staff members, to prevent overfeeding must be used in enclosures to avoid deterioration in water quality.
- N7 Changes in appetite and/or the number and size of the fish present in the population must be managed using responsive ration sizes.

Where appropriate, it is recommended that mechanical feeding systems are used.

It is recommended that fish are fed in a manner, which facilitates the predictability of a feeding event i.e. feeding at the same time(s) each day and accounting for adjustments of timing based on environmental conditions to avoid undue stress on the fish

Efforts must be made to significantly reduce the creation of size hierarchies within populations, including careful consideration of feed distribution and ration sizes, to avoid underfeeding and overfeeding.

Consideration should be made in providing a variety of food sources, which is appropriate for the life-stage and farming system, to enhance positive welfare. SPCA acknowledges that more research is needed in this area. 🐟

It is recommended that a combination of feeding strategies is applied and adjusted in response to fish feeding behaviour.

Feeding Behaviours

- N8 Fish must be observed at least once per day during feeding.
- N9 Feeding behaviour must be documented. Any significant deviation from normal feeding behaviour, such as lack of feeding motivation, abrupt drops in appetite or rejection of feed pellets, must be recorded and actions taken to identify the issue and regain normal feeding behaviour (Appendix 1).

***Fish should be observed for indicators of food anticipatory activity, such as rising to the surface before feeding begins.
Fish should be monitored for signs of competition whilst feeding e.g. chasing and/or fin biting.***

Feed Withdrawal

- N10 Fish must undergo a period of feed withdrawal prior to routine husbandry procedures, such as grading, transport and harvest. Length of withdrawal period must take into consideration environmental conditions, body size, life-stage and the nature and number of procedures.
- N11 Feed withdrawal periods to achieve gut clearance prior to certain procedures must be in accordance with veterinary recommendation and duration kept as minimal as possible. All feed withdrawal decisions must be made with consideration of the welfare risks, benefits and alternative strategies.
- N12 Feed withdrawal lengths must be justified and alternative strategies implemented if the period of feed withdrawal result in negative fish health and welfare outcomes, such as deviations in behaviour (hyper aggression, fin nipping and irregular swimming patterns), reduction in visceral fat and onset of muscle protein catabolization.
- N13 Periods of feed withdrawal in response to adverse environmental conditions, such as storms or algae blooms, that are predicted to compromise welfare, must be advised by a veterinarian and/or a suitably trained member of staff.
- N14 Any period of feed withdrawal must be documented, including details of when fasting began, when feed was reintroduced, the reason for fasting and welfare outcomes (Appendix 1).

SPCA is concerned with the potential welfare risks associated with extended periods of feed withdrawal. We acknowledge the current limited recommendations defining when Chinook salmon welfare is compromised due to food deprivation. Further research in this area will be used to inform future standards.

SPCA recommends that feed withdrawal prior to certain husbandry procedures must not exceed 51 degree days and preferably not exceeding what is necessary to achieve gut clearance.

Feed Equipment and Storage

- N15 Feed must be stored in appropriate areas, e.g. with consideration for temperature and humidity, and protected from pests, using humane pest control methods.
- N16 Feed equipment and storage containers must be well maintained and cleaned between lots of feed.
- N17 Prior to use, feed must be visually inspected and feed batch number and expiry date recorded. If feed is deemed unacceptable, e.g. visual signs of mould, it must be disposed of appropriately and replaced with acceptable feed.
- N18 Feed equipment must be checked daily to ensure it is in good working order. Any faulty equipment must be tended to immediately and corrective actions documented (Appendix 1).

First Feeding

- N19 Alevins must be monitored frequently each day to achieve the correct timing of first feeding.
- N20 Feeding must be initiated when approximately 90 % of alevins have absorbed their yolk sacs (i.e. “buttoned-up”).
- N21 Once feeding is initiated, fry must be monitored frequently to ensure success of first feeding.
- N22 Uneaten feed must be removed promptly to avoid waste build up and maintain good water quality.

Good Physical Environment



Maintain appropriate water quality parameters and provide suitable enclosures, shelter and protection from predators.

Hatcheries/Nurseries General

- E1 Eggs and juvenile fish must be either produced ‘in house’ or supplied by another SPCA Certified farm.
- E2 Maximum stocking densities must be set at a level which allows for maintenance of optimal water quality parameters, reduces the risk of stress and injuries, provides enough space to facilitate normal behaviours and accounts for spatial variations in preferred water quality parameters. 🐟

- E3 Maximum stocking densities must be reviewed at the end of each life stage. Date of review, notes of any problems identified and actions taken must be recorded (Appendix 1).
- E4 Water quality parameters must be monitored and recorded (Appendix 1). Frequency of individual parameters recorded must be site specific and justified in a water quality monitoring plan. Parameters are to be set based on the optimum range for the life-stage and the farming system.

Where appropriate, the following parameters must be monitored and recorded:

- a) Free ammonia (NH₃ mg/l)
- b) Carbon dioxide (CO₂ mg/l)
- c) Nitrite (NO₂ mg/l)
- d) Nitrate (NO₃ mg/l)
- e) Dissolved Oxygen (mg/l)
- f) PH
- g) Minimum and maximum water temperature (°C)
- h) Flow rate
- i) Turnover time of the tank
- j) Any other biophysical measure that could adversely affect fish welfare.

SPCA recommends setting parameters within the preferred range of the species and acknowledges the current knowledge gaps in Chinook (King) salmon's preferred range of parameters. 🐟

- E5 Where possible, a contingency plan must be established to mitigate any unanticipated deviation of water quality parameters from optimal range. All non-urgent procedures that may cause additional stress (i.e. handling) must be postponed during this time, until parameters are back within the optimal range.
- E6 Turbidity and total dissolved solids must be monitored and have mitigation plans in place.
- E7 Where appropriate, automated alarm systems to monitor water quality and enable early identification and correction of uses must be used.
- E8 Water temperature must be maintained within 6-18°C, if temperature goes outside this range a mitigation plan must be employed.
- E9 Oxygen saturation must be monitored and maintained in relation to water temperature. If oxygen saturation drops below 70% immediate remedial action must be taken and recorded.
- E10 In tank, ponds and raceway systems, water flow rates must be managed so that fish can comfortably hold station.
- E11 Efforts must be made to reduce noise pollution and vibrations in the fish enclosures and surrounding environment.

- E12 Where artificial lighting is used, rapid changes in light intensity must be avoided. Gradual light changes from dark to light, and vice versa must be applied.
- E13 Light levels must be set to facilitate the salmon's ability to see feed.
- E14 Where possible, fish must be slowly transitioned to new lighting conditions before being transferred to a new environment.
- E15 Where appropriate, protection from UV light must be provided e.g. shade coverings, tank lids, adequate enclosure depth.

SPCA encourages further research into optimisation of chilling times and early growth rates to reduce spinal abnormalities in smolt and to inform future standards.

Eggs

- E16 Water temperature must be kept within 6- 14°C.
- E17 Eggs must be incubated in consistent darkness or low light intensities.
- E18 Oxygen saturation must be maintained to at least 90 % during incubation.
- E19 Flow and/or oxygen alarms must be fitted to all water intakes to the incubation environment. Records of alarm checks must be kept (Appendix 1).
- E20 During incubation, oxygen saturation at discharge must be controlled, monitored and recorded daily.
- E21 Shocking must only be carried out by trained members of staff who are competent to perform shocking. Training records must be available to identify these staff members.
 - a) The shocking method chosen must minimise mortalities of viable eyed eggs.
 - b) After each shocking event percentage of mortalities of viable eyed eggs must be recorded.
 - c) Eggs must not be shocked until the eye spots are clearly visible.
- E22 Egg trays must be designed to minimise movement of the eggs e.g. implementing hatching mats, hatching substrate and/or hatch trays.
- E23 Green Eggs (i.e. fertilised eggs that have not reached eyed stage) must not be disturbed for at least 24 hours after placement.
- E24 Where picking is practised, dead/unviable eggs must be removed with minimum disturbance to the remaining viable eggs.
- E25 Eggs must be checked daily to ensure early detection of fungal infections. Date and time of checks, observational notes and any remedial action taken i.e. treatment of fungus must be recorded (Appendix 1).

Wherever possible the design of the hatchery environment and husbandry procedures should help minimise the movement of eggs.

Alevin

- E26 Alevins must have access to appropriate hatching substrate that provides a secure environment and facilitates normal burrowing, shelter seeking behaviours, without encouraging bunching. 🐟
- E27 Nets must not be used to transfer alevins weighing less than 0.5 g.
- E28 Alevins must be monitored daily and any mortalities removed.
- E29 All mortalities must be recorded, noting the reason for culling or cause of death (Appendix 1).
- E30 Light levels must be kept at low intensities (preferably dark) and abrupt changes in light levels avoided.

Fry

- E31 The load of suspended solids must allow visibility to the bottom of the tank, pond, raceway system.
- E32 Grading must not occur before the majority of fish weigh a minimum of 1-2 g.

Parr

- E33 Parr must be observed for signs of aggression and action taken to reduce social stress if aggression occurs. Notes of any problems identified and actions taken must be recorded.
- E34 Length of feed withdrawal prior to grading parr must be justified and durations kept as minimal as possible (see section 'feed withdrawal').

Smolts

- E35 Smolts must not be transferred to seawater until all fish have completed smoltification i.e. adapted to saltwater.
- E36 Length of feed withdrawal prior to smolt transfer must be justified and durations kept as minimal as possible (see section 'feed withdrawal').
- E37 If used, sodium potassium ATPase tests must only be conducted on fish once they have been humanely euthanised.
- E38 After seawater transfer, smolts must not be handled (e.g. crowded) for at least 4 months, unless required for fish health and welfare reasons.
- E39 Percentage of growth retardation ('runting') post-transfer must be monitored and recorded weekly for up to 6 weeks post-transfer. Smoltification and seawater transfer procedures must be reviewed and remedial action taken if greater than 10% runting is observed.

SPCA acknowledges the current limitations in available valid and reliable indicators to determine that Chinook (King) Salmon are ready for sea water transfer. Further research into the development of a smolt-scoring system for Chinook (King) salmon will be used to inform future standards.

SPCA recommends that gradual salinity changes are used prior to transfer to seawater pens to help alleviate osmotic disturbances.

Grow-Out Site

General

- E40 Water temperature (°C) and oxygen saturation (%) must be monitored and recorded daily at the appropriate depth. Information gathered must be used to inform stocking densities.
- E41 Maximum stocking density in pens must be within 10- 20 kg/m³ (calculated as the weight of fish/m³ of water volume).
- E42 Stocking densities should be evaluated at the end of each production cycle (Appendix 1).
- E43 If water quality parameters, especially temperature or oxygen levels, are outside the optimal range, non-urgent procedures that may cause additional stress must be postponed until parameters are back within the optimal range, as fish will be more vulnerable and may experience prolonged recovery times.
- E44 Efforts must be made to reduce background noise/ potential acoustic stresses in the surrounding environment e.g. consideration for the placement and use of pumps and motors.
- E45 Fish must be provided with access to the surface, to facilitate behavioural/buoyancy control and rest, unless submerged for health and welfare reasons e.g. to provide relief from suboptimal environmental conditions and/or harmful organisms.
- E46 If submergence is required for health and welfare reasons, it must be implemented for a short term period (e.g. < 21 days) and fish must be submerged at a depth no greater than the maximum depth at which they are neutrally buoyant.

Lighting

- E47 Where continuous lighting is used to control sexual maturation in adults, the following conditions must be followed:
 - a) Manipulation of photoperiods must only be performed during appropriate times of the year.
 - b) Efforts must be made to ensure the minimum duration of photo period manipulation without compromising its efficiency, to mitigate any potential welfare impact.
 - c) Efforts must be made to ensure that only the light intensity required for beneficial outcomes is used (i.e. unnecessary over-powering of lights should be avoided).

- d) Effectiveness of photoperiod manipulation must be assessed after each harvest and corrective action taken if needed.

SPCA supports the use of continuous lighting to mitigate the negative health and welfare impacts associated with pre-harvest sexual maturation. SPCA acknowledges the need for further research into the potential welfare impacts associated with the long-term use of lighting to control sexual maturation.

Equipment

General

- E48 The locations of tanks and enclosures must be carefully considered with regard to fish welfare, personnel safety and minimising adverse effects upon the environment and surrounding wildlife.
- E49 Surfaces, fittings, equipment, tanks, netting and enclosures must be designed, constructed and maintained to:
- a) Minimise the risk of injury or disease in fish.
 - b) Provide protection from predators for susceptible life-stages.
 - c) Prevent fish escaping and wild stock entering.
 - d) Be free from rough edges, sharp protrusions and abrasive surfaces which may cause injuries to the snout, fins and scales of fish.
 - e) Facilitate easy and effective cleaning.
- E50 Where present, facility alarms and controls must be fully operational and maintained as required. Date and times of alarm and control checks must be recorded (Appendix 1).
- E51 Procedures must be in place to manage equipment failures and other breakdowns that may impact on fish welfare.
- E52 Back-up power generators must exist and be tested and maintained as appropriate, to support essential equipment in the event of a power failure (Appendix 1).
- E53 Enclosures must have appropriate coverage, e.g. tank lids, netting of a suitable size and jump fences, to minimise escapes.

Net cleaning and maintenance

- E54 A biofouling management plan for each site location must be developed, which sets clear objectives and strategies adopted for achieving them (Appendix 1).
- E55 Biofouling must not be allowed to build up on enclosure nets and predator nets to a point where water flow and oxygen supply are reduced to an extent that could compromise fish health and welfare.

- E56 Enclosure and predator nets must be cleaned at a high frequency ('groomed') to prevent maturation of biofouling communities and minimise released material. Frequency should take into account seasonal variation and pen location.
- E57 In situ net cleaning must be conducted in a way that minimises the extent that released biofouling particles move through the pen e.g. timing net cleaning procedures with consideration of environmental conditions i.e. currents and tidal flows.
- E58 Timing of net cleaning procedures must take into account proximity to other husbandry procedures that could potentially induce stress.
- E59 The use of copper-based antifoulants are not permitted.
- E60 Enclosure nets must be inspected regularly and maintained accordingly. The date and time of net checks and any maintenance required must be recorded (Appendix 1).
- E61 Nets must be appropriately tensioned and weighted to prevent distortion, which could impact on fish welfare.
- E62 Nets that are used to handle fish must be knot free to prevent mucous removal or tissue damage.

Site Selection

- E63 Site selection considerations must include an assessment of water quality, environmental risks and hydrographic and oceanographic features to identify any potential health and welfare risks to the fish.

SPCA acknowledges the potential for expansion of sea farms offshore. Research defining optimal and preferred biological conditions for farmed chinook in offshore farming systems will inform future standards.

Predator Management

- E64 A site specific predator control plan must be developed, which details all reasonable non-lethal methods of control to protect the fish and a decision tree as to when each method is appropriate to implement (Appendix 1).
- E65 Physical exclusion, e.g. protection nets, must be the primary means of protecting the fish from other animals accessing tanks and enclosures.
- E66 The use of acoustic deterrent devices (ADD's), electronic seal scarers, seal crackers and models of seal 'predators' are not permitted as methods of deterrent.

SPCA acknowledges the current knowledge gaps in the impacts and efficacy of ADD's. Further research and understanding of ADD's and the manner in which marine mammals interact with them will be used to inform future standards.

- E67 Lethal forms of predator management are not permitted.
- E68 Top nets must be of a mesh size that deters but does not ensnare birds.
- E69 Appropriate net tension must be maintained and net maintenance regimes enforced, with consideration of local conditions i.e. current and tidal flows.
- E70 If appropriate, exclusion nets/fences must extend above the water around the farm at a height that effectively deters predators from jumping over (e.g. 1.5–2 m).
- E71 A record must be kept of all significant wildlife interactions, e.g. if a wild animal enters a pen, is entangled in a net, attacks and injures a fish (Appendix 1). Records must include:
 - a) Site, time and date at which the interaction occurred.
 - b) Number of pens affected and total fish count in each pen.
 - c) Reason the control method was required.
 - d) Details of control and/or deterrent method used.
 - e) The estimated number of fish injured and killed.
- E72 If a predator attack has taken place, the fish in the pen must be checked for signs of injury. Where accessible, injured fish that will not recover promptly must be euthanised without delay.
- E73 Regular removal of dead fish must occur as a preventative measure against predator/scavenger incursions.

Emergency Preparedness

- E74 A written emergency response and preparedness plan must be created and all staff must be familiar with it (Appendix 1). The plan must:
 - a) Detail how the health and welfare of the fish will be ensured in emergencies such as fire, leaks, problems with transportation.
 - b) Detail the course of action should unexpected water quality issues and changes in environmental conditions, such as storms, arise.
 - c) Detail the course of action should unexpected equipment failures occur.
 - d) Detail the course of action to be taken in the event of fish escaping.
 - e) Staff roles and responsibilities.
- E75 The emergency preparedness plan must be reviewed annually and updated as appropriate or where major changes in management practices have occurred.
- E76 Mitigation strategies for algal blooms must be developed and incorporated into management practices e.g. undertaking daily plankton sampling for early detection and/or deploying bubble curtains around pens.
- E77 Routine monitoring for jellyfish around marine pens at a site-specific level must be incorporated into management practices, to help identify risk periods for each location.

Transport

General

- E78 All journeys must have a transport plan and records (Appendix 1), which detail:
- Transport method
 - Journey times
 - Water quality parameters monitored
 - Contingency plans
 - Allocated member of staff responsible for fish welfare
 - Number of fish in each tank to be transported
 - Stocking densities of tanks being used for transport
 - Size and weight range of the fish
 - Current health status of the group of fish, including a signed declaration of 'Fitness to Transport'
 - A record of any fish deemed unfit for transport and the reasons why
 - Feed withdrawal time
 - Any transport mortalities, including cause of death.
- E79 Whenever possible fish must not be transported in poor road/sea conditions or following any event that is likely to compromise welfare e.g. heatwaves.
- E80 All staff in charge of loading, unloading and transporting the fish must be specifically trained and competent to carry out the procedure and be aware of any welfare risks involved.
- E81 All equipment used for transport, e.g. pipes, tanks and wells, must be fit for the purpose of transporting fish and checked for rough surfaces, sharp edges, joints, protrusions or anything that may cause physical injury to the fish and corrective actions taken if problems are identified.
- E82 Only healthy fish can be transported. The number of fish found unfit for transport and the reason why must be recorded. Care must be taken to ensure dead fish are not loaded for transport. Sick or injured fish found not to be recovering must be euthanised promptly.
- E83 Fish must not be out of water for more than 15 seconds (unless anaesthetised).
- E84 Fish behaviour and/or water quality parameters must be continuously monitored and recorded during transport. Action must be taken where water quality deteriorates below optimal levels.
- E85 Efforts must be made to ensure there are no abrupt changes in water quality parameters whilst loading, during transportation and unloading.
- E86 The maximum stocking density must be determined prior to loading and be at a level which enables:
- The maintenance of water quality for the duration of the journey.

b) Enough space to minimise fin damage and scale loss, and allow fish to maintain a horizontal position.

E87 Unloading fish must be done at an angle and drop that:

a) Avoids excessive splashing of fish upon entry to the water

b) Avoids injuring the fish

c) Allows them to disperse without colliding with other fish.

E88 Any fish that die during transportation must be removed upon arrival and details of any deaths or injuries that occurred during transportation must be recorded.

Road Transport

E89 Tanks must be insulated to allow the water to remain at a constant temperature throughout the journey.

E90 Transporters must drive in a manner that minimises the risk of sloshing, injury and uncontrolled movement of fish.

E91 Oxygen saturation levels must be continuously monitored and maintained within 90-140 %.

E92 After arrival at the site, there must be no delays in unloading the fish unless justified for fish health and welfare reasons.

E93 All unloading from tanks must be through valves, rather than netting fish from the transport tanks.

E94 Where unloading tanks through valves is not applicable:

a) Methods of netting must receive prior approval from SPCA Certified.

b) All fish must be sedated prior to netting.

E95 Valves must be suitable for more than one fish to pass through at any one time.

Wellboat Transport

E96 Wherever possible, wellboats should be operated on an open-valve system.

E97 Where appropriate, wellboats must be fitted with moveable bulkheads.

E98 Wellboats must be equipped with water quality monitoring and maintenance equipment.

E99 Wellboats must be able to monitor and record the number of fish loaded in each well.

E100 CO₂ and oxygen levels must be continuously monitored.

E101 There must be sufficient light to enable continuous monitoring of fish behaviour throughout the well.

- E102 Wells must contain a sufficient amount of water before loading fish to prevent injuries.
- E103 Fish must be loaded and unloaded from the vessel via pumping (see section on 'pumping').
- E104 All crowding, loading and unloading of fish must be recorded using Closed Circuit Television (CCTV).
- E105 Once the vessel is docked, there must be no unnecessary delays in unloading the fish.

Pushing and towing pens

- E106 Before pushing or towing pens, nets must be sufficiently cleaned to prevent biofouling from compromising fish welfare during transport.
- E107 The speed of pushing/towing must be suitable for the size of the fish and not be faster than the speed of the swimming fish.
- E108 Pen nets must be tensioned to avoid net distortion and associated crowding, entanglement or injury.

Caution needs to be applied to ensure there is no abrupt temperature change from holding water to transport water, as this could be a potential stressor.

It is recommended that any procedures that may affect fitness for transport are avoided in the week prior to transport.

It is recommended that cameras are installed for continuous monitoring of fish behaviour during transport and sensors installed for continuous monitoring of water quality.

Good Health



Prevent or rapidly diagnose and treat disease and injury, and foster good spine and skin condition and gill health.

Animal health plan

- H1 An animal health plan must be developed in collaboration with a registered veterinarian. It must be life-stage and site specific and include (Appendix 1):
- Procedures for the identification of weak, sick or injured fish, including procedures for separation, treatment and euthanasia.

- b) A vaccination programme (if required) to protect fish from diseases for which an effective vaccine is available and which may represent a risk to the fish.
- c) Grading plan, which is life-stage and site specific and includes a pre-grade risk assessment.
- d) Details of health and welfare issues that have affected previous groups and any preventative actions that were undertaken, as well as details of health and welfare issues that could affect current groups.
- e) A record of all mortalities, including euthanasia and underlying reason(s), where those are known (see section on 'mortality').
- f) Procedures for managing aggression, injury, and fin biting.
- g) Procedures for monitoring and managing disease outbreaks and relevant parasites (e.g. isopods).
- h) Proactive management of common diseases.
- i) Fish health monitoring programme (see section on 'fish health monitoring').

H2 The health plan must be reviewed annually, following a disease outbreak or whenever there is a significant change to the rearing environment or management practices that could impact fish health and welfare.

Fish Health Monitoring

H3 A programme must be developed to monitor and document the health status of the fish at each life stage (Appendix 1). The programme must define the sample number and frequency of sampling of pre-determined health and welfare indicators by trained husbandry staff.

Examples of health and welfare indicators include:

- a) Skin Condition
- b) Fin condition
- c) Emaciation status
- d) Eye status
- e) Opercular status
- f) Gill status
- g) Recording the type and number/percentage of skin lesions on individuals and/or pen/unit (see Appendix 2)
- h) Spinal abnormalities e.g. Lordosis, kyphosis and/or scoliosis (LKS).

H4 High numbers of sudden deaths, major disease outbreaks or other serious welfare issues must be investigated and reported to SPCA Certified.

SPCA acknowledges the knowledge gaps in Operational Welfare Indicators (OWIs) for farmed Chinook (King) salmon and welcomes results produced from studies on this topic to inform future standards.

Medicines

- H5 Prophylactic use of antibiotics and other veterinary medicinal products is not permitted. Antibiotics and other veterinary medicinal products must only be administered for therapeutic purposes under veterinary advice.

Vaccination (immunisation)

- H6 Prior to vaccination, there must be a documented vaccination programme in the Animal Health Plan, detailing the number and weight of fish to be vaccinated and the expected timeframe of the process (Appendix 1).
- H7 All fish must have been pre-graded prior to vaccination.
- H8 Full records must be maintained of all vaccination procedures.
- H9 Vaccination must only be performed by trained members of staff who are competent in vaccinating techniques.
- H10 Appointed supervisor must check at regular intervals throughout the procedure that vaccinations are being done correctly. These checks must be recorded (Appendix 1).
- H11 Vaccination of fish weighing less than 30g must be by immersion method only, unless directed by the designated veterinarian for fish welfare reasons.
- H12 Fish health status must be assessed before grading and vaccination to ensure they are fit for the procedure.
- H13 For vaccination by immersion, oxygen concentration must be continuously monitored and maintained at >80% within the vaccination tank.
- H14 For vaccination by injection, fish must be anaesthetised before being vaccinated.
- H15 Vaccines must be used, stored and disposed of according to the manufacturers' instructions.
- H16 Fish must be monitored for two weeks after vaccination to retrospectively assess problems or welfare threats associated with the procedure. Any mortality during this period must be documented and a necropsy performed to determine cause of death.

Anaesthesia

- H17 Anaesthesia must only be administered by specifically trained personnel.

- H18 Anaesthetics must be used with due regard to water temperature, water chemistry and the accumulation of metabolic waste products.
- H19 The optimal anaesthetic dosage at different water temperatures must be identified to ensure recovery time is as brief as possible.
- H20 Tricaine methanesulfonate (TMS/MS 222) and Benzocaine Hydrochloride must be buffered in water of low alkalinity.
- H21 Fish behaviour, e.g. vestibulo-ocular (eye roll) reflex and opercular movements, must be monitored when the fish are undergoing anaesthesia and during recovery.
- H22 Anaesthetics must be used, stored and disposed of according to the manufacturers' instructions.
- H23 Oxygen levels, within the anaesthetic bath, must be continuously monitored and maintained between 105 and 120% saturation.
- H24 Anaesthetic baths must be periodically refreshed during long procedures to maintain optimum water quality.
- H25 Treatment should cease if there are any signs of reduced welfare. Clear criteria must be available detailing when and how to discontinue treatment, including how quickly to dilute the anaesthetic agent, if needed (Appendix 1). Criteria could include:
- a) Low opercular movement rate
 - b) Extended recovery time
 - c) Damage to the fish
 - d) Abnormal behaviour.

Humane Slaughter (Harvest)

Pre-Slaughter (Pre-Harvest)

- H26 Before each harvest, the slaughter system must be tested to ensure it is working properly.
- H27 The stunning and killing equipment must only be operated, inspected and maintained by competent personnel with adequate training.
- H28 There must be control and backup equipment for stunning and bleeding.
- H29 Pre-slaughter handling must be kept to a minimum.
- H30 Crowding before slaughter must never exceed two hours (see section on 'crowding').
- H31 Feed withdrawal periods to achieve gut clearance prior to slaughter must be in accordance with veterinary recommendation and durations kept as minimal as possible. Alternative strategies must be implemented if the period of feed withdrawal result in negative fish health and welfare outcomes (see section on 'feed withdrawal').

H32 When transporting fish through pipes, lines should be kept as short as possible and with an appropriate pumping speed (see section on 'pumping').

Stunning

H33 Fish must be stunned prior to bleeding.

H34 Electrical or percussive stunning are the only permitted stunning/slaughter methods at present.

H35 Where electrical stunning is used, it must be ensured that:

- a) Insensibility of the fish is achieved immediately.
- b) The correct current, voltage and frequency is being administered throughout the process.
- c) There are no pre-stun shocks.
- d) The stun is maintained until the fish dies or is unconscious.
- e) Dry stunning methods using electricity are prohibited.

SPCA acknowledges the knowledge gaps in stunning parameters for farmed Chinook (King) salmon and welcomes results produced from studies on this topic to inform future standards.

H36 Where percussive stunning is used:

- a) Mechanical stunning devices must be used (except for euthanasia where manual percussive stunning is permitted).
- b) One blow must be delivered to the top of the head just behind the eyes of sufficient force to cause immediate and irreversible loss of consciousness that lasts until death.
- c) Mechanical stunning devices must be monitored to ensure they deliver the stun a the correct location.
- d) The machine delivering the percussive blow must be adjusted according to fish size.
- e) Fish must be checked to ensure that they are entering the stunning machine in the correct orientation.

H37 Duration of crowding, pumping and handling prior to stunning must be kept to an absolute minimum.

H38 The flow of fish to the stunning table/into the stunner must be slow enough to ensure effective position/orientation for stunning.

H39 Fish must be monitored immediately after stunning, to assess the effectiveness of the stun i.e. loss of vestibulo-ocular (eye roll) reflex, rhythmic opercular movements and contracted dorsal fin.

- H40 Staff involved in the stunning/slaughter process must be trained to recognise signs of effective stunning and death in Chinook (king) salmon.
- H41 Any fish that have not been effectively stunned, must be re-stunned immediately e.g. percussive stunning using a priest by trained personnel.
- H42 Use of ice slurries and CO2 are not permitted as a method of stunning and/or slaughter.

Slaughter (Harvest)

- H43 Bleeding must occur no more than 10 seconds following stunning.
- H44 Fish must be unconscious during bleeding and remain unconscious until death.
- H45 Fish must be bled effectively i.e. by severing the gill arches (preferably all arches) and/or ventral aorta.
- H46 A CCTV system must be installed to provide clear footage of the stunning/slaughter (harvest) process.
- H47 Closed circuit television footage must be regularly reviewed by authorised staff to ensure standards are being maintained. Footage must be saved for a minimum of two-weeks and be made available for audit.

It is recommended that fish are slaughtered (harvested) at the grow out site i.e. enclosure or other.

Euthanasia

- H48 Where accessible, any fish found to be injured, experiencing pain or showing symptoms of disease must be immediately treated or euthanised.
- H49 Culling of sick or injured fish must only be conducted by specifically trained staff.
- H50 Efforts must be made to minimise confinement and handling prior to euthanasia.
- H51 The method of euthanasia must be implemented immediately after capture, by trained personnel.
- H52 Approved euthanasia methods are:
 - a) A non-recoverable percussive blow to the head of sufficient force to render the fish immediately dead.
 - b) An overdose of a suitable anaesthetic using immersion in a solution of the agent e.g. AQUI-S.
- H53 The euthanasia method implemented must be appropriate for the life stage of the fish.
- H54 Fish must never be left to die in air.

- H55 Female broodfish must be euthanised prior to stripping.
- H56 Male broodfish must be anaesthetised or euthanised prior to stripping, if procedure length is > 15 seconds.
- H57 If using anaesthetics, the over dosage levels, holding time, water levels and fish density need to be set correctly to ensure fish are killed effectively and efficiently.
- H58 Fish must be checked to ensure they are dead e.g. loss of vestibulo-ocular (eye roll) reflex.

When performing euthanasia via immersion, SPCA recommends using a lower dose to anaesthetise the fish prior to introducing the euthanasia dose, due to the potential of high concentrations of anaesthesia provoking physiological stress.

Mortality

- H59 Mortality rates for each life-stage must be recorded, including classification of cause (Appendix 1).
- H60 Regular sampling of mortalities for necropsies must be performed by a registered veterinarian and/or a suitably trained member of staff.
- H61 Any fish found dead, must be disposed of immediately upon death/discovery. Disposal must be done:
- In a manner that does not put other animals at risk of disease
 - In a manner that ensures carcasses are protected from pests or being disturbed by other animals.
- A record/statement must be on hand, detailing how and where all dead fish are disposed of (Appendix 1).

Breeding

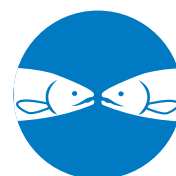
- H62 The farming of triploid salmon is not permitted.
- H63 Breeding procedures must not adversely affect the health and welfare of fish.
- H64 Stripping of male broodfish more than twice over one season is not permitted.

SPCA supports breeding programmes that aim to increase the robustness and resilience of Chinook (King) salmon. 🐟

Biosecurity

- H65 A detailed biosecurity plan⁵ must be developed and implemented (Appendix 1). Staff must be familiar with and follow its instructions, in order to reduce the risk of introducing and/or spreading disease on the farm. For example, the plan must address the following:
- a) A visitor sign-in book
 - b) Personal protective equipment
 - c) Hand washing facilities
 - d) Shoe disinfecting facilities
 - e) Biosecurity signage throughout the hatchery/nursey or farm to ensure personnel and visitors are aware of and follow, biosecurity protocols
 - f) Visitor and vehicle movements
 - g) Staff sanitation
 - h) Movement of equipment and staff between sites
 - i) Movement of eggs/fish between sites/areas
 - j) Routine cleaning and disinfection of buildings, equipment, enclosures and nets
 - k) Site following (if required).

Appropriate Behavioural Interactions



Provide sufficient space, proper facilities, congenial company and appropriately varied conditions. 

Fish Observations

- B1 Fish must be observed at least daily (Appendix 1). Observation records must include:
- a) Date and time of observations.
 - b) Details of any deviations from normal behaviour or sick or injured fish.
 - c) Details of any remedial actions taken.
- B2 If problems are identified, the appropriate members of staff must be informed, remedial actions taken and a registered veterinarian consulted when necessary.

⁵ The biosecurity plan must comply with industry standards, i.e. A+ New Zealand Salmon Biosecurity Standards.

- B3 Descriptions of abnormal behaviours specific to the life-stage and farming system used must be developed and easily identifiable by all members of staff. If abnormal behaviour is observed, details must be recorded and remedial action taken where necessary. Examples of abnormal behaviours may include:
- a) Clumping
 - b) Avoidance behaviours (e.g. hiding, burrowing, shelter seeking)
 - c) Aggressive behaviours (e.g. chases, nips and attacks)
 - d) Unstructured swimming at the bottom of the tank
 - e) Persistent agitation
 - f) Lethargy
 - g) Loss of appetite
 - h) Abnormal shoaling
 - i) Abnormal swimming
 - j) Gasping at surface
 - k) Rapid ventilation.
- B4 Fish distribution within their rearing environment must be monitored. Any changes in normal distribution, e.g. depth, density, speed, swimming and/or shoaling behaviours must be recorded and remedial action taken.
- B5 During periods of adverse environmental conditions behavioural checks must be made more frequently.
- B6 Fish behaviour must be monitored by a designated member of staff during husbandry procedures (see sections on 'crowding' and 'feeding behaviours').

It is recommended that technology is utilised to monitor fish behaviour, such as underwater cameras, remotely operated vehicles (ROV) and echo sounders.

Handling

General

- B7 Wherever possible, the handling of fish must be conducted in water.
- B8 Fish must never be out the water for longer than 15 seconds, unless anaesthetised.
- B9 Fish must never be placed on dry surfaces or handled with dry hands.
- B10 Extra care must be taken when handling smolts as their scales are more loosely embedded than adult fish due to the smoltification process.

- B11 Fish must not be subjected to impact, pressure or strain when handled. When handled out of water, the whole body of the fish must be supported at all times.
- B12 Fish should not come into contact with sharp edges, rough or absorptive surfaces.

Pumping

- B13 Only appropriate equipment fit for the purpose of transporting fish must be used and designed to reduce the occurrence of injuries and minimise stress.
- B14 Where appropriate, transparent pipes must be used when pumping live fish to facilitate behavioural observation.
- B15 Pumping speed must be controlled so that the fish are observed swimming in a smooth and calm motion for the duration of pumping.
- B16 Pumping speed must be set high enough to prevent the majority of the fish swimming against the water until exhausted. Fish must not appear exhausted or damaged once exiting the pipe or other equipment used.
- B17 The upper limit for pumping speed must be based on the equipment used, the sharpness of bends and risks when exiting the pump, to reduce the chance of causing damage to the fish.
- B18 Pumping distances/duration must be kept to an absolute minimum.
- B19 Fish must not be overcrowded in the pump.
- B20 Pipe dimensions must be adjusted in accordance to fish size.
- B21 All pipes must be smooth with swept bends and of a diameter which is appropriate for the size of the fish.
- B22 Pumping must only be done with fish that are healthy, robust and able to withstand the procedure.
- B23 Oxygen saturation levels at input end must be monitored and maintained above 80 %.
- B24 The pump must be checked thoroughly during breaks and at the end of the procedure to ensure that no fish are left in the pump.
- B25 A procedure must be developed and implemented to ensure that all fish are removed from any pipes or other equipment used at the end of the pumping operation or if a breakdown occurs.
- B26 Water in the pipe must be observed for signs of fish damage, such as scales and blood. If signs occur, immediate action must be taken to ensure fish health e.g. adjusting pumping speed and checking for any abrasive surfaces in the pump.

Crowding

- B27 Wherever possible efforts must be made to reduce the occurrence/frequency of crowding events.
- B28 During crowding, the operation must be monitored closely by a designated member of staff and adjusted based on the behaviour of the fish. Corrective action must be made immediately if an increase in dorsal fins breaking the surface water, burst swimming, or a change in skin colour is observed.
- B29 Crowding must not take place if environmental conditions, including strong currents and winds, are likely to compromise fish welfare.
- B30 Oxygen saturation levels must be continuously monitored during crowding and maintained above 80 %.
- B31 Sweep nets/crowding device must be moved at a slow and steady pace. When possible, fish must be able to swim against the current.
- B32 Efforts must be made to avoid “pockets” or shallow areas during crowding where fish can get stuck.
- B33 Nets must be used to crowd a portion of the population rather than crowding the whole enclosure.
- B34 Fish must not be crowded for more than two hours.
- B35 Sweep nets/crowding device must be constructed of knotless mesh and be of an appropriate size for the fish to prevent escapes and fish becoming entangled.
- B36 Brail nets must not be used unless for the purposes of sample weighing.
- B37 Where brail nets are used for sample weighing, they must be ‘wet’ (water filled) brail nets instead of dry.

SPCA recommends the use of the crowd intensity scale (Appendix 3) as a guide to managing acute stress. The aim is to keep the crowd at a level 1, with essentially no fins breaking the surface of the water for the whole procedure.

Grading

- B38 The grading system must be suitable for the size and life-stage of the fish and be situated in such a way that fish can be observed at all times.
- B39 The chosen grading system must only be operated, inspected and maintained by competent personnel with adequate training.
- B40 Where passive grading is used, the size and design of the grading ‘flexi-panels’ must be appropriate for the size of the fish that are to be graded. If fish are observed being trapped

in the panels, being restrained at the opercular for extended periods and/or being forced through the panels corrective action must be taken.

- B41 Fish must only be graded when it is essential. Reasons for grading must be recorded in the grading plan and retrospectively evaluated to identify potential areas for process refinement or improvement, e.g. evaluating initial stocking densities.
- B42 Fish health must be assessed before grading to ensure they are healthy enough to cope with the grading process. Only healthy fish must be subjected to the grading process.
- B43 Whenever possible, fish must not be graded following potential environmental stressors e.g. storms, heatwaves.
- B44 A grading plan must be developed, that is life-stage and site specific and must be a part of the Animal Health Plan (Appendix 1). The grading plan must include:
 - a) Reason for grade
 - b) Equipment to be used, including the type of grader
 - c) Pre-grade risk assessment
 - d) Number of fish to be graded
 - e) Locations of fish pre- and post-grade
 - f) Pre-grade fasting period
 - g) Health status of fish
 - h) Relevant contingency plans.
- B45 Records of grading must be kept and any problems identified must be documented (Appendix 1).
 - a) Date/time grading commenced/finished
 - b) Number of fish graded
 - c) Post-grading mortalities, noting the reasons for culling or cause of death.

SPCA recommends the use of passive grading systems, as this method does not require fish to be fasted, pumped or handled. It therefore supports a “hands off” approach to farming.

Behavioural Enrichment

- B46 Fish must be able to move freely in their enclosure to explore natural or induced environmental gradients to locate their preferred temperature, current velocity, light levels, buoyancy control and for information gathering. 🐟
- B47 If any enrichment is added to the fishes’ environment it must be monitored for its effect on fish behaviour (Appendix 4), to ensure that they positively influence welfare and do not cause health or production issues. A weekly record of fish interactions with enrichment must be kept (Appendix 1). 🐟

Wherever possible and practical, structural, sensory, occupational, dietary and/or social enrichment should be added to the fishes' environment, which facilitate: 🐟

- **Rest: A chance to recover from high levels of activity**
- **Exploration: Opportunities to search for resources and information**
- **Social contact: Access to conspecifics**
- **Behavioural control: Ability to stay balanced, move as they wish and choose where they position themselves in their environment**
- **Safety: The ability to avoid perceived danger**

SPCA acknowledges that further research is needed on the feasibility and practicality of implementing enrichment at an industrial scale. Further studies are also required on environmental preferences of Chinook (King) salmon. Results from such studies will be used to inform future standard requirements for environmental enrichment.

Management

Training

- B48 Managers must ensure that all staff who are directly involved with the fish have access to, are familiar with, and adhere to the most up-to-date version of this document and the relevant Codes of Welfare and regulations/Acts.
- B49 The farm must have a written policy that encourages employees to report any concerns they have in regard to personnel actions or situations that negatively impact fish health and welfare. Where concerns are raised, an immediate investigation into the issue must be conducted.
- B50 All personnel working with/handling fish, at any stage of the life cycle, must be:
- a) Trained and competent
 - b) Aware of their duties
 - c) Aware of the animal welfare risks involved with their duties
 - d) Aware of the needs of fish.
- B51 Specific to their area of work and responsibilities, staff must be able to demonstrate a good working knowledge of the health and behaviour of Chinook (King) salmon. This may include: 🐟
- Understanding normal and abnormal Chinook (King) salmon behaviour, given the specific life-stage, production system and environment.
 - Recognising indicators of physical injury and symptoms of disease
 - Knowing when to seek management and/or veterinary advice
 - Recognising the signs of stress and fear in Chinook (King) salmon
- B52 Staff must be trained in fish handling techniques, including netting and crowding, that minimise stress and pain.

- B53 Staff involved in the slaughter (harvest) process, must be specifically trained in the operation of the stunning and killing equipment.
- B54 Staff involved in administration of vaccinations and anaesthesia must undergo specific training.
- B55 Staff involved with the transportation of the fish must undergo specific training, including assessing fitness for transport and effective monitoring throughout transportation.
- B56 Staff operating in sea pen systems must be trained in handling seal or sea lion incursions and the predator management reporting system.
- B57 Records of staff training, including periodic refresher courses where applicable, must be maintained and be available for inspection (Appendix 1).
- B58 All staff responsible for the fish, including external personnel, must be fully aware of their personal roles and responsibilities with regard to animal welfare.

The initial and continuing training of all those involved with fish husbandry is important in promoting a high standard of animal welfare. 🐟

Wherever available, externally recognised fish welfare training programmes should be utilised, in combination with in house training.

END OF STANDARDS

Appendix 1

Records required

Records	Standard(s)	Description
Daily		
Fish observations	B1	Date and time of observation. Initials of the person doing the observation. Record any signs of injury, distress, abnormal behaviour, changes in fish distribution, swimming, shoaling and/or other concerns identified and any actions taken.
Feeding observations	N8	Record any abnormal observations, problems identified and remedial actions taken.
Feed equipment checks	N18	Must be available for inspection.
Egg checks	E25	Record any abnormal observations, mortalities and remedial actions taken.
Alevin checks	E28	Record any abnormal observations, mortalities, reasons for culling or cause of death and remedial actions taken.
Euthanasia and mortality (of life stages pre-smolts and younger)	E29 & H59	Record mortality rate and reasons for euthanasia.
Weekly		
Rate of runting post-transfer	E39	Record the percentage of growth retardation ('runting') in the pen for up to 6 weeks post-transfer.
Euthanasia and mortality (of life-stages smolts and older)	H59	Records must include: <ul style="list-style-type: none">• The number of fish found dead.• The cause of death (where known)• The number of fish euthanased• The reason for euthanasia
Enrichment interaction	B47	Fish group general summary (See appendix 4)
Annual		

Animal Health Plan	H1	Review and update annually or after a major disease outbreak. Record any corrective actions taken and retain documentation for at least three years.
Feed programme	N4	Review and update as necessary
Stocking densities	E42	Record problems identified and remedial actions taken.
Predator Control Plan	E64	Review and update as necessary
Emergency response and preparedness plan	E74	Must be available for inspection. Review annually and update after any incidents. Record any corrective actions taken
Other		
Alarm and control checks	E19 & E50	Must be available for inspection.
Water quality monitoring plan	E4	Record: <ul style="list-style-type: none"> • Site • Parameters to be monitored and recorded • Frequency of recordings and justification
Feed withdrawal	N14	Details and rationale documented in the veterinary health plan.
Training records	B57	Record: <ul style="list-style-type: none"> • Name of staff member • Date and type of training • Qualifications gained (if appropriate)
Transport plan	E78	Record: <ul style="list-style-type: none"> • Journey times and dates • Water qualities • Contingency plans • Allocated member of staff responsible for fish welfare • Number of fish transported • Stocking densities of each tank • Fitness for transport • Transport mortalities • Feed withdrawal time

Wildlife interactions (ongoing)	E71	Record: <ul style="list-style-type: none"> • Site, time and date of interaction • Number of pens/fish affected • Names of persons involved • Details of control/deterrent method
Fish health monitoring	H3	Programme defines: <ul style="list-style-type: none"> • Sample number • Frequency of sampling • Health and welfare Indicators • Staff responsible • Note areas of concern and remedial action taken.
Vaccination plan (if required)	H6	Prior to vaccination, record: <ul style="list-style-type: none"> • The number of fish to be vaccinated • Weight of fish • Expected timeframe of procedure
Vaccination checks (if required)	H10	Date and time of vaccination checks must be made available for inspection.
Anaesthesia criteria	H25	Review and update as necessary.
Grading plan	B44	Review and update as necessary.
Grading records	B45	Date and time of grading procedures, number of fish graded and post grading mortalities must be available for inspection.
Biosecurity plan	H65	Review and update as necessary.
Dead fish disposal (every occurrence)	H61	Statement on dead fish disposal available for inspection on request.
Biofouling Management plan	E54	Review and update as necessary.
Enclosure net checks	E60	Date and time of net checks and any maintenance required must be available for inspection.
Back-up generator checks	E52	Records of back-up power generator tests and maintenance must be available for inspection.

Appendix 2

Skin Lesion Classification

Lesion	Size	Colour	Shape
Spots	Variable, mostly small, often <5 mm in diameter	Bright red	Circular individual lesions, may appear in lines or groups
Spreading spots	Becoming larger, up to 20 mm	Bright red	Typically, a large irregular or branching pattern develops
Ulcerated spots	Small	Red	Circular
Ulcerated spreading spots	Variably sized, usually >5 mm in diameter	Lesion may have red or white edge, bright red areas often seen within the lesion	Usually, irregular in outline
MS Ulcers	Large, >20 mm diameter	Dull red, or greyish	Smooth outline

Typical distribution	Number	Depth
Frequently affect ventral flank, belly, fins and around mouth (±linear pattern or grouping)	Multiple spots may be present	Appear superficially located, may appear raised
Mainly affect ventral flank and belly skin	Multiple spreading lesions may be present, may co-exist with smaller spots	May appear slightly sunken into skin, frank ulceration is not grossly obvious
Mostly flank and belly	Can be multiple lesions	Ulceration grossly evident
Mainly affect ventral flank and belly skin	Variable numbers of lesions may be present, may co-exist with smaller lesions	A defect in epithelium is present exposing underlying tissue, in severe cases muscle is exposed
Affect mid-flank or near pectoral fin or caudal peduncle	Single lesion or, more rarely two or three	Loss of superficial epithelium with exposure of underlying tissues, deep and sever



Figure 1: (a) Gross presentation of small spots. (b) Gross presentation of spots on fins. (c). Gross presentation of large spreading spots showing an irregular lesion outline. (d) Gross presentation of ulcerated spots. These lesions can be severe, as above, with significant defects in the skin. Note the irregular outline of the lesion

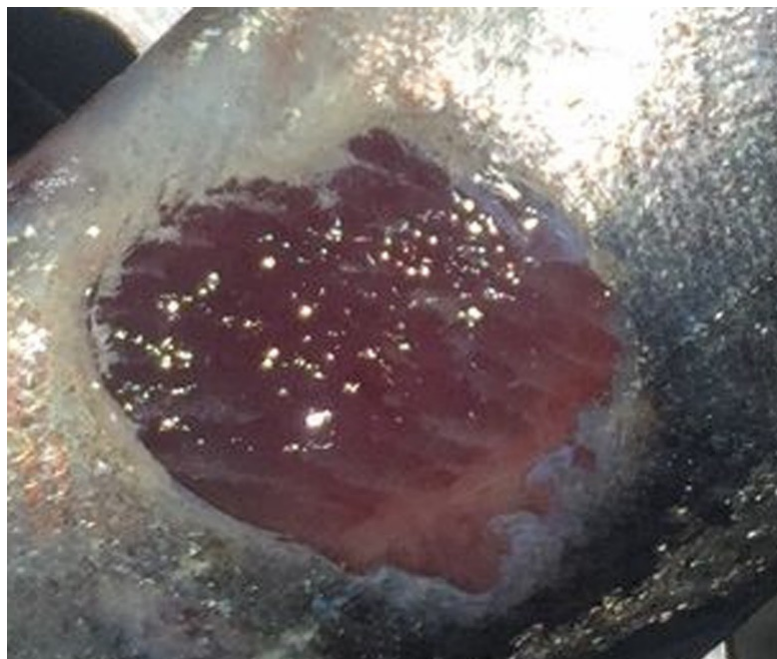


Figure 2: Regular Outline Flank Ulcer (ROFU)—large deep and severe lesions, often oval or round with a smooth outline

Table and Figures by Johnston H, Symonds J, Walker S, Preece M, Lopez C, Nowak B. Case definitions for skin lesion syndromes in chinook (King) salmon farmed in Marlborough Sounds, New Zealand. J Fish Dis. 2021; 44:141–147. <https://doi.org/10.1111/jfd.13317>

Appendix 3

Crowd Intensity Scoring



1. Goal: low stress, no vigorous activity

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



2. Acceptable: some fins on surface

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



3. Undesireable:

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



4. Unacceptable: overcrowding

- 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



5. Unacceptable: extreme overcrowding

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

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Appendix 4

Engagement with enrichment

A record of fish interaction with the behavioural enrichment items provided must be kept. This will give an understanding of the level of engagement with the items, e.g. interaction or no/low interaction. Where possible, comment on any likely reasons for low/no engagement with the enrichment items provided, or where there is high interaction, record those enrichment items being used the most. This will help when planning future enrichment interventions.

Method:

- Visually assess the group for engagement with the enrichment items provided.

Score	Interaction	Description
0	No/Low	<ul style="list-style-type: none">• No or limited interaction with the items.• Likely reasons for no or low engagement with items.
1	Yes/High	<ul style="list-style-type: none">• Fish are observed interacting with the items.

Glossary

Broodfish: sexually mature fish used for the production of eggs and 'milt' (sperm) collected for breeding purposes.

Degree days: a value calculated by multiplying the average water temperature by the number of days e.g. 200 DD is 20 days at 10°C.

Eyed eggs: The stage of development where the black spot of the eye is clearly visible.

Grow-out: The final phase in production where fish are raised until harvest.

Hatchery: The site dedicated to breeding, hatching and rearing through to early salmon life-stages.

Hold station: Maintaining position in a current without actively swimming.

Life-stage: The different developmental phases of life an individual Chinook (King) salmon passes through in their lifetime, including:

Eggs: Fertilised eggs before and after the eyed stage.

Alevins: Recently hatched fish that are still attached to their yolk sac, not yet ready for first feeding.

Fry: fish starting from first feeding up to 1g.

Parr: Juvenile fish greater than 1g and up to the start of smoltification.

Pre-smolt: Fish that are undergoing smoltification from parr to smolt, typically 8 months after hatching.

Smolts: Fish that have completed smoltification and weigh an average of 135g.

Adults: Fish weighing an average of 3.5- 4kg, which have not reached sexual maturity.

Nursery: The site dedicated to raising juvenile fish until transfer to grow out.

Optimum range: The range of conditions, which provides for normal physiological responses and normal behaviour (i.e. without symptoms of thermal, respiratory or psychological stress).

Preferred range: The range of conditions fish will most frequently inhabit when allowed to select freely.

Shocking: The process of physically turning unfertilised eggs (at the eyed stage) white, so they can be more easily identifiable and separated from the fertilised eggs.

Smoltification: The physiological transformation of salmon from parr adapted to freshwater, to smolt adapted to seawater.

Stripping: The physical removal of eggs and 'milt' (sperm) from broodfish.

Tripliod salmon: Sterile salmon produced by applying thermal or pressure shocks to the egg and sperm mix at fertilisation.



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