

Chapter IV: General Husbandry



THE FARMED SALMONID HEALTH HANDBOOK

CHAPTER IV: GENERAL HUSBANDRY

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General Husbandry

4.1 Transfers

Fish health status must be considered when evaluating the risks of moving fish stocks. Fish health regulations require that ALL transporters of aquaculture animals take specific measures to protect the health of fish/shellfish during transportation, thereby preventing the spread of aquatic diseases. Specialist transporters of aquaculture animals must be registered with the Marine Institute. A "specialist transporter" is defined as '*a business or undertaking which wholly or mainly transports live aquaculture animals in a mode of transport specially designed and adapted for that purpose*'. Transporter Registration Forms are available on the Fish Health section of the Marine Institute website (www.fishhealth.ie). Operators must ensure that all equipment used to transport fish safeguards the health of the fish being moved. They must ensure that the process minimizes the risk factors that may predispose the fish to disease, minimizes transfer of disease causing agents and reduces the risk of accidental loss of fish during transport activities.

4.1.1 Pre-Movement

In consultation with a qualified fish health professional, the diagnostic and treatment history of any fish being moved must be reviewed prior to transport. This applies to all fish to be stocked onto aquaculture sites including cleaner fish and where applicable includes mortality, diagnostic and treatment records and examination of a representative sample of fish shortly before transportation.

Fish must be clinically healthy prior to movement and must not come from a farm where there is any unresolved mortality. An exception may be made if a risk assessment demonstrates the animals to be moved originate from a part of the farm epidemiologically separate from the affected area.

Notification of intent to move finfish within the country must be made to the Marine Institute in writing (fax 091-387201 or email notification@marine.ie) at least 72 hours before the movement is due to take place. The written notification must be accompanied by a veterinary report summarising the outcome of a clinical inspection which has taken place within 1 week of the proposed transfer. An exemption of up to 1 month may be feasible for multiple movements from the same site or where transportation/ weather or other unforeseen issues arise. In such instances, if any disease situation is suspected or confirmed in the intervening period, the Marine Institute must be notified.

Juvenile stock must be sourced from farms with no clinical health problems. These farms must be certified as specific disease-free hatcheries in approved health zones.

A risk assessment should be conducted and the transfer of fish (including cleaner fish) onto the site should only take place if the risk is acceptable.

4.1.2 Imports

It is in the farmer's interest to ensure that all imported fin fish have only been treated with medicines that are licensed in accordance with European legislation.

Consignments of live salmonids for import into Ireland from other EU countries must meet current regulatory requirements with regard to fish health. Specifically, fish of susceptible species must be certified in accordance with Commission Decisions 1251/2008/EC, 2009/177/EU & 2010/221/EU.

4.1.3 Movement between sites

In Ireland, it is normal practice for net pen farm operators to transfer stocks during the production cycle within the site (to facilitate operations such as grading) and for some operators to move fish from one site to another to allow for fallowing, single year class maintenance and harvesting. Movements of already introduced stock can be by several methods including; simple hand net (from one tank, pond or pen to another); in transport tanks (within farm movements from one pond/tank to another or farm to farm); by suction or air lift pump (from one pond/tank/pen to another); by passive swimming (pen to pen); via boat towing of pens (site to site over relatively short distances) and by wellboat from one site to another.

1. All stocks must be subject to a health check by the farm biologist on the day of loading.
2. All equipment should be purpose designed, so as to allow, efficient movement of stock with minimal stress, the avoidance of damage and provide optimal conditions to safeguard the welfare of stock at all times.
3. Staff should be competent at carrying out the specific tasks involved in the movement of stocks.

4. All equipment should be maintained in good working order (from hand nets to wellboats) and should have a planned schedule for its hygienic use and disinfection (see Section 5.0).
5. Accurate and auditable records of all stock movements should be maintained to allow the complete tracing of stock from initial introduction to final transfer and to allow managers to request evidence from transport contractors/suppliers that transport equipment has been cleaned and disinfected.
6. Fish movements should be coordinated with other operators so as to maintain, single year class separation, maximum bay following periods and minimize any unnecessary disease risks associated with the movement of one stock in proximity of another.
7. Multi-site deliveries with one transport consignment should be avoided.
8. Fish that are suffering from a viral or bacterial disease should only be moved if advised by a veterinarian in support of the welfare of the stock and following a comprehensive risk assessment.
9. Recovered stocks should not be moved until confirmation of the absence of disease has been advised by a qualified veterinarian and the competent authority in the case of listed diseases.
10. Regular inspections should be carried out during transport to ensure that water quality parameters are maintained within the optimum ranges.
11. Any water exchanges during transport must be carried out at places approved by the Marine Institute and under conditions which do not jeopardise the health status of the aquaculture animals being transported or any aquatic animals at the place of water exchange. Whilst en-route from one site to another, water exchanges from wellboats should only occur when the boat is more than 5kms from an active aquaculture site. Otherwise the boat must travel with closed wells.
12. Helicopter buckets and road transport equipment used for fish transfer should be disinfected as required. Evidence of disinfection should be obtained from the transport company.

13. Wellboats should provide evidence of cleaning, disinfection and route travelled

4.1.4 Wellboats

The Irish aquaculture sector uses wellboats for a variety of purposes. Risk of infectious disease transmission from one site to another is inherent in any movement or handling of fish. In order to minimize the risk of infectious disease transmission, high levels of biosecurity are required by those operating and using wellboats.

All site managers are required to maintain a log sheet recording the following information and perform the following checks of each vessel to visit the site:

1. Name of vessel
2. Name and contact details of the skipper
3. Date of arrival at the site
4. Nature of the task to be completed at the site
5. Check the cleaning and disinfection log sheets presented by the skipper. Sign off if they are satisfactory. Do not allow the boat to commence work at the site if they are not
6. Physically inspect the vessel to ensure it is suitable to start work on the site
7. Details of the bay where the vessel last worked
8. Details of the last task carried out by the vessel
9. Location at which the last cleaning and disinfection events were carried out
10. Details of the cleaning and disinfecting agents used after the last job was completed
11. Details of where cleaning and disinfection will be carried out once the current job has been completed
12. Details of where the vessel will travel to once the current job has been completed
13. Sign off on the log sheet with the skipper

These log sheets should be kept with other site records and made available for inspection on request.

Fish health regulations require wellboat operators to register with the Marine Institute and to observe the following biosecurity standards:

Table V

Wellboat biosecurity stages.

Stage	To be completed:	Biosecurity steps:	When/where:
1	After each consignment of fish is unloaded	Brush or clean solids from all surfaces. Pressure clean the deck, wells, equipment, pumps and protective clothing using an appropriate detergent.	As soon as work has been completed on a site
2	When coming to Ireland from abroad AND when moving between bays in Ireland, except when carrying out shuttle runs between agreed management areas	Steam clean and disinfect all surfaces, including the hull down to the waterline	At a location at least 5km from an active fish farm
3	When leaving an area infected or suspected of being infected with a listed disease, either within Ireland or abroad OR If the vessel is entering Irish waters with a fouled hull that has not been de-fouled in the previous six months	Slip the vessel, clean and disinfect the hull below the waterline	A suitable port in the country of origin, or Belfast, Cork or Dublin Ports. Once slipped, the boat should steer a course at least 5km from an active fish farm *

**It may not always be possible to steer a course which is 5km or more from a fish farm. In such cases, wellboats must travel with their wells closed. Ballast water may not be discharged within 5 km of a fish farm.*

Statutory Requirements

It is mandatory for wellboats to:

- Adhere to the levels of cleaning and disinfection outlined above and retain paperwork to support these biosecurity measures (see below and checklist available on www.fishhealth.ie).
- Keep a Transportation Log detailing all sites visited and the route taken between sites (see below).
- Have all equipment which is important for the health and welfare of the fish being transported serviced and calibrated by suitably qualified engineers, at the frequency required by the manufacturer. Records must be retained for inspection.
- Facilitate on the spot inspections by Marine Institute personnel.
- Notify the Marine Institute where the presence of a listed disease is suspected.

Paperwork Required

1. CLEANING & DISINFECTION

Table VI

Wellboat disinfection stages

Stage	Approved by	Notify the Marine Institute
1	Stage one cleaning must be signed off by the skipper and witnessed by another crewmember	
2	Stage two disinfection must be signed off by the skipper and witnessed by another crew member. On arrival at the site of destination, the fish farm's site manager must also sign off stage two disinfection, having satisfied him/herself that the cleaning and disinfection has been carried out thoroughly. He/ she should also inspect the travel plan used by the boat en-route to the site before signing the checklist. Wellboats must travel with a clean (non-fouled) hull when entering Irish waters.	If a wellboat is coming from another country to work on an Irish site, a signed copy of the checklist must be faxed/emailed to the Marine Institute.
3	Stage three disinfection must be signed off by a vet	If a wellboat is coming from an area infected or suspected of being infected with a listed disease, a signed copy of the checklist should be faxed/emailed to the Marine Institute before work commences on a new site

2. TRANSPORTATION LOG

A Transportation Log must be kept by all vessels, containing at least the following information for each consignment:

- Date and time of loading.
- Name and address of the site of origin.
- Species transported.
- Number of fish transported.
- Size of fish transported.
- Date and time of un-loading.
- Name and address of the site of destination.

- Details of observed mortality during the journey (number of animals and general observations).
- Details of the route taken by the vessel when travelling to sites in Irish waters and between sites in Irish waters.

4.2 Single Year Class

Stocking of single year classes and the separation of generations is known to reduce the risk of transferring infectious disease agents between stocks/generations.

Only one generation of fish should be held on any one site (and if possible only one generation of fish should be held in one bay or hydrographically linked water body).

Hatchery operations may have several overlapping year classes on site e.g. early incubation, fry rearing and/or broodstock. Rearing units must be kept separate as much as possible to prevent transmission of disease between classes and appropriate biosecurity measures put in place to protect each cohort.

4.3 Fallowing

It is a condition of all marine licences that each site must be fallowed for a minimum of four weeks between generations¹. Fallowing is a recognised management strategy known to assist in the control of disease and parasite problems.

The goal of fallowing is to break infection cycles by removing susceptible hosts and by decreasing infection pressure at a given location. Fallowing should break the life cycle of sea lice and many other pathogens thus reducing disease pressure for subsequent fish introductions. The process also allows for the complete breakdown of organic waste material associated with the farm on the surrounding sea bed area.

Fallowing is usually carried out prior to the introduction of a new population of aquatic animals into a previously used site. Experience has shown that with certain fish pathogens this approach can be ineffective and total bay or synchronous fallowing may need to be considered.

¹ DMNR, 2000. *Protocol for fallowing at offshore finfish farms.*

Currently in Ireland, the minimum statutory fallowing period for marine sites is one month. Where necessary this time frame should be extended to take account of the infective period of any pathogens of concern. Where this is unknown, the longest fallowing period possible should be used. A mandatory fallowing period of up to six months may be required before re-stocking following an outbreak of a notifiable disease.

The fallowing period begins after all susceptible species have been removed. This is followed by thorough cleaning and disinfection of the pen/tank infrastructure and ancillary equipment, using approved methods.

4.4 Feed & Nutrition

Farmers should ensure that they use feeds that have been formulated specifically for the life-stage of the species being farmed. Farmers should regularly review the fish feed specification with the supplier and ensure that the correct feeding method is being used. Feed should only be sourced from reputable suppliers with nutritional expertise in formulating feed for the species concerned. Feed must comply with EU legislation in relation to animal feed stuffs.

A number of immunostimulant diets or supplements are currently available for salmonids. Given the emphasis on disease prevention rather than cure, these diets may be used as required. This may be prior to stressful events such as movement or in the face of a disease outbreak to boost immunity.

The farmer must adhere to the following standard operating procedures:

1. Each farm must have an up to date feed storage licence issued by DAFM.
2. Feed must be purchased from a licensed and reputable feed manufacturer.
3. Feed should be manufactured to a certified and accredited manufacturing standard.
4. Feed bags should be clearly labelled for example to include details such as feed rate, date of manufacture and if particularly if the feed has been medicated. Feed data sheets should be readily accessible.

5. Feed in storage must be managed to ensure that it does not pass the expiry date and out of date feed must not be used.
6. Feed that has deteriorated in quality must not be used.
7. Clean equipment should be used to handle and transport feed.
8. Hazardous chemicals should not be stored in the feed area.
9. A feeding strategy must be devised in consultation with qualified technical staff to ensure the correct type and quantity of feed is fed to meet the physical and nutritional requirements of stocks at all times.
10. The feeding ration should meet the daily nutritional demands of each batch of fish in terms of energy requirement and nutrients required for healthy growth and vitality.
11. Feeding practices must ensure that feed is delivered in sufficient quantity to minimize fish crowding and damage. The feed should be delivered at a sufficient rate and over a large enough area to satisfy the fish population and prevent scale loss.
12. Regular observation of feeding behaviour should be undertaken to assist the assessment of feeding level. If necessary cameras should be used to observe feeding response and to facilitate optimum feeding and reduce feed waste. Any abnormalities in feeding behaviour should be reported to the site manager and recorded on the feeding sheet.
13. Accurate records of the quantity of food fed must be kept.
14. Feed conversion ratios (FCR) must be assessed on a regular basis and FCR kept to a minimum.
15. Automatic feeders should be maintained in good working order and cleaned regularly.
16. At critical/stressful periods during the cycle, fish may be fed approved diets containing vitamin supplements and/or immuno-stimulants.

17. The feed must be stored adequately according to manufacturer's instructions, and not exposed to extreme heat, light or humidity.
18. The feed must be protected from pests.
19. Adequate systems must be in place to prevent feed spillage.
20. Samples of all feed batches should be taken and stored in a freezer for future reference.
21. Clean equipment should be used to handle and transport feed.
22. Medicated and non-medicated feeds should be adequately separated.
23. Care should be taken to ensure the disinfection of feed trucks which may deliver to a number of farms during the same trip.
24. It is recommended that feed storage bins be inspected routinely, for example, twice yearly, and cleaned or repaired if necessary.
25. Transport of medicated feed from storage to automated feeding equipment or in preparation for hand feeding should be done carefully. Any spillage should be immediately cleaned up and disposed of according to manufacturers instructions.
26. Should there be excess medicated feed remaining on a site the manager should be responsible for contacting the manufacturer to determine proper handling and disposal.
27. It is the manager's responsibility to ensure that there is sufficient feed in storage to minimize stress due to hunger and excessive competition for food.
28. Medicated feed should be administered in accordance with veterinary instructions and the manager is responsible for keeping daily inventory records. Details of all prescriptions should be kept for a period of five years.

4.5 Handling & Grading

Certain husbandry operations require that the fish are crowded to facilitate access for handling (weighing, grading, counting, passive grading, bath treatments, pumping/brailing into wellboats, transport tanks for transfer or harvesting).

1. It is important that these operations are well planned, carried out with suitable equipment by competent personnel and during suitable environmental conditions.
2. All staff involved in procedures such as grading, pumping, fish vaccination and transportation should be aware of and have received training in good fish handling techniques.
3. When examining fish out of the water for more than 30 seconds they must be anaesthetised. Netting and holding equipment must be adequately designed to minimize damage to the fish.
4. When out of the water, the fish must be adequately supported by the operator by holding both the tail and supporting an area around the pectoral fins. After handling the fish should be monitored in a recovery bin to ensure full recovery.
5. Crowding is stressful to fish and should be kept to an absolute minimum (not exceeding 2 hours).
6. Operators should monitor environmental conditions (weather, water temperature, current, dissolved oxygen levels, tidal cycle) to ensure optimum conditions.
7. Where appropriate, crowding a small population with a clean seine net is preferable to crowding the entire enclosure.
8. Fish should be starved for 24-48 hours before any operation requiring crowding.
9. The fish should be carefully monitored throughout the entire procedure.
10. At higher water temperatures (>12°C) the level of dissolved oxygen in the water should be monitored.

11. If the fish show signs of excess stress during the crowding process the area available to them should be increased and/or oxygen should be diffused into the water. Oxygen levels should be kept as close 100% saturation as is possible.
12. Enclosure nets should be kept clean in order to prevent problems during crowding.
13. The size of the grader and pumps must be appropriate to the size of the fish.
14. Passive grading systems are encouraged wherever practical.
15. After a handling episode fish must be examined for signs of poor handling such as skin injury and scale loss. If such signs are noted, affected groups should be carefully observed for increased rates of mortality or illness in the subsequent weeks.
16. All handling events must be recorded in a daily log.

4.6 Stocking Density

Stocking density has a huge bearing on the health and wellbeing of the fish. Optimum stocking density varies according to the life stage, species, culture conditions and the environment.

1. The stocking density of any marine pen should not exceed 20kg/m³ at any time of year and ideally should not exceed 15kg/m³ during the summer months.
2. The stocking density of freshwater units should not exceed 50kg/m³ at any time of year and ideally should not exceed 35kg/m³ during the summer months. Higher stocking densities are possible if reliable and well monitored oxygenation systems are in use.
3. Stocking density should be monitored in relation to health, fish behaviour and water quality to ensure that welfare is not compromised.
4. Levels should be reduced if problems arise.

4.7 Holding Units

Siting of holding units must be carefully considered with regard to fish health and welfare, personnel safety and minimizing adverse effects on the environment. An adequate flow of clean water must be ensured at all times.

4.7.1 Pens

1. In marine sites maximum current speeds should not exceed 1.5 knots at peak spring tides. The daily minimum current speed should be greater than 0.5 knots.
2. In marine sites the pen net should not be less than 5 metres in depth and 4 metres in freshwater sites.
3. In marine and lake sites the net material should be smooth, knotless and non-abrasive.
4. The net must be adequately tensioned and weighted so as to maintain shape and volume.
5. The net should be kept free of bio-fouling and marine nets should be changed/cleaned at least once every 3 weeks during the period April – September and as necessary at other times of the year.
6. All nets should be labelled so as to allow traceability to and from contract net cleaning facilities.
7. All nets should be serviced and tested at appropriate intervals to ensure that they are within specified limits for mesh strength and nets that do not meet specifications should be decommissioned.
8. Damage from predators should be minimized through the use of predator nets both above and below water.

4.7.2 Tanks

1. Tanks should be made of smooth non-abrasive material and constantly checked for imperfections which could cause injury to the fish.

2. Holding units for fish in fresh water must be designed so as to promote uniform flow and healthy growing conditions.

4.8 Predator Control

Management methods must be designed to reduce the attraction of predators to culture facilities and prevent predators attacking fish thus avoiding stress that could result in an increased risk of disease. The predator control strategy should consider the following:

1. A named person should be responsible for the predator control strategy on site.
2. Fish food and dead fish must be properly stored.
3. Predator exclusion methods must be used e.g. top-nets, outer predator nets, ultrasonic seal scarers, cone nets, sinker rings, tension nets and bird scarers.
4. Regular facility inspections must include checks for signs of predator attacks.
5. Top nets must be used in freshwater sites.
6. Predator netting or similar devices must be checked for signs of being breached and repaired as soon as possible upon detection.
7. Measures taken to protect fish from predators must consider predator welfare and not endanger the predator population.

4.9 Harvesting

Fish being moved via live haul to a harvesting station must be handled in as stress free a manner as possible. Fish must be seined, brailled, pumped and stunned humanely. The European Food Safety Authority has published reports on the welfare aspects of current stunning and killing methods of farmed Atlantic salmon² and trout³. The following harvesting strategies should be in place:

² EFSA, 2009. Species specific welfare aspects of the main systems of stunning and killing of farmed Atlantic salmon. The EFSA Journal 2012, 1-77.

1. Representative samples of fish should be routinely analysed for residues of all treatments used prior to harvest.
2. The manager must fill out a *Traceability Sheet* for all fish harvested. This must contain details of origin, feed type, treatments given and residue analysis results. A copy of this report must be sent with the consignment of fish to the customer.
3. Equipment should be site specific, if possible, to minimize the risk of contamination between sites.
4. Non-porous equipment should be used on decks.
5. Cleaning and disinfection of all equipment should take place before entry onto the site.
6. When cleaning equipment, all visible organic matter should be removed with detergent. Disinfection of equipment should then be performed using an appropriate broad spectrum compound, diluted to the concentration recommended by the manufacturer. The disinfectant should be in contact with all surfaces and left for the recommended time period. Rinsing with fresh water afterwards may be done if necessary.
7. Fish should not be deprived of food for longer than is necessary prior to slaughter i.e. to clear the gut and to reduce undesirable organoleptic properties. Ideally this pre-slaughter fasting period should not exceed one week but it may be extended for an agreed period of time, if the designated vet has duly considered the animal welfare needs of the population to be slaughtered.
8. Before commencing harvest at sea or transporting fish from a farm to a harvest station, the pen net should be examined for holes. This should be carried out before crowding the fish and at intervals during the operation. Any cleaner fish present in the cage should first be removed.

³ EFSA, 2009. Species specific welfare aspects of the main systems of stunning and killing farmed fish: rainbow trout. The EFSA Journal 1013, 1-55.

9. Handling of fish should be carried out with the least stress possible and the method of slaughter employed should be performed in a humane manner and result in rapid and irreversible loss of consciousness.
10. Fish should be stunned prior to slaughter using either an automated percussive stunning machine or an automated electric stunner. If fish are killed without stunning, the method used must result in a rapid and irreversible loss of consciousness.
11. Bleeding should be carried out by cutting one side or both sides of the gill arches or by puncturing the heart.
12. After bleeding the fish should be transferred immediately into iced water. The iced water/fish ratio should be sufficient to reduce the temperature of the fish to $<5^{\circ}\text{C}$ within 4 hours. The fish should then be immediately transported to the packing station.
13. Blood-water and effluent should be contained, and treated prior to discharge, in accordance with the requirements of the relevant effluent discharge licence. Untreated blood-water should never be released into the environment.
14. Blood-water leakage from the harvest raft should be prevented. Blood-water should be collected in harvest bins with sealed bin liners and secure lids then disinfected and disposed of in accordance with the requirements of the relevant effluent discharge licence.
15. The temperature of the iced water and fish should be continuously monitored.
16. At the end of each day of harvesting, all equipment should be cleaned and disinfected. All organic material should be removed with a detergent. Disinfection of the equipment should then be carried out ensuring that the disinfectant is in contact with all surfaces for the recommended time period.
17. All used disinfectant, organic matter washings and rinse water should be contained properly during harvest and slaughter, and treated prior to discharge, in accordance with the requirements of the relevant effluent discharge licence

18. Cross-infection should be prevented by ensuring harvest bins are thoroughly cleaned and disinfected between operations.
19. On site harvesting equipment should be site specific or if moved between sites should be cleaned with a degreasing agent and disinfected.
20. Protective clothing must be provided for staff and should be retained on the premises.
21. The farmer should ensure that the haulage company is both aware and active in all biosecurity matters relating to transport.
22. Bins and transport tankers should be disinfected prior to and after harvesting.

4.10 Vaccination

Vaccination is a key strategy in disease prevention. A strategic vaccination plan should be established for each specific site, taking the final destination of the fish into consideration. This is especially important if fish can only receive one vaccine. Vaccination is usually carried out at freshwater land based sites or lake sites. It is rarely carried out in marine stage fish.

4.10.1 Vaccination by injection

1. A risk assessment should be carried out in order to assist in deciding the most appropriate vaccination strategy for the site. This strategy should be outlined in the Veterinary Health Plan for the site.
2. Only vaccines with market authorisations or an equivalent approval can be used. The use of vaccines requires a veterinary prescription.
3. Farms should ensure that fish are vaccinated against the diseases that are most commonly associated with the species in the intended area of culture (e.g. vibriosis, furunculosis, Pancreas Disease, IPN), based on efficacy, risk assessment and advice from a fish health professional.

4. Vaccination should only be carried out by staff who have received specific training in the vaccination of fish. Vaccination should be carried out under veterinary supervision. Where vaccination teams are contracted in, sometimes from other countries, the risk posed by these teams should be considered in the Biosecurity Plan for the site.
5. High levels of hygiene must be maintained during the vaccination procedure. All vaccination equipment must be clean and disinfected.
6. Vaccination should form part of the VHP.
7. Vaccines are used to facilitate a protective immune response and are used under the conditions recommended by the manufacturer or under veterinary advice.
8. Prior to vaccination: (1) the health of the fish should be assessed (e.g. behaviour, appetite, mortality levels); (2) fish should be weighed and be an appropriate size for vaccination; (3) the correct type and quantity of vaccine should be refrigerated at the appropriate temperature; (4) the vaccine quality and expiry date should be checked.
9. Fish should be taken off feed (48-72 hours) prior to vaccination.
10. Vaccination equipment, tables and tanks to receive the vaccinated fish should be clean and disinfected. Strict biosecurity for off-site vaccination teams should be enforced.
11. Fish body wall thickness should be assessed and appropriate needle size used to ensure the vaccine is injected into the correct location in the peritoneal cavity (1-2mm penetration). A small number of test fish should be vaccinated, euthanized and examined.
12. Anaesthetic concentration can be adjusted by using a number of test fish. Speed of sedation should match vaccination rate. Monitor time to recovery regularly and adjust concentration of anaesthetic if necessary. Fish should take no longer than two minutes to recover.
13. Fish should be handled gently to minimize scale damage and mucous disruption.

14. Needles should be changed in accordance with manufacturer's instructions (automated) or before they become blunt (manual vaccination).
15. Disinfect and clean surfaces and equipment frequently, especially between batches.
16. Ensure all personal involved in handling the vaccine are wearing suitable protection such as rubber gloves. In case of accidental self-injection the operator and the safety data sheet for the vaccine should be taken immediately to the nearest hospital or medical centre.
17. Discard any vaccine containers according to the manufacturer's instructions.
18. Monitor the fish for 48 hours post vaccination to ensure no adverse reaction to the product has occurred and post-vaccination mortality levels are within the expected range. Any adverse reaction should be reported to the prescribing veterinarian immediately.
19. Records must be kept of all vaccination procedures conducted on site and must include the following: date of vaccination, identification of the groups of fish vaccinated, vaccine used (including batch numbers and method of application), details of dosage and the names of the personnel involved.
20. Vaccines must be used and stored in accordance with the manufacturer's data sheet and/or veterinary advice.
21. Vaccines must be stored in dedicated refrigeration equipment and maintained at the specified temperature (normally between 2 – 8°C). A Refrigeration log book should be maintained. Vaccines must be labelled, stored in an appropriate container and must not be used after the expiry date.
22. Equipment used in vaccination should be maintained in a hygienic manner.
23. Booster vaccinations, if required, should be administered according to veterinary advice.

4.10.2 Vaccination by immersion

1. Prior to vaccination: (1) the health of the fish should be assessed (e.g. behaviour, appetite, mortality levels); (2) fish should be an appropriate size for vaccination; (3) the correct type and quantity of vaccine should be refrigerated at the appropriate temperature; (4) the vaccine quality and expiry date should be checked.
2. Vaccination equipment and tanks to receive the vaccinated fish should be clean and disinfected.
3. Shake the vaccine bottle well before use. Dilute with the appropriate amount of fresh water immediately after opening.
4. Ensure the temperature of the diluted vaccine is not more than 5°C different from holding area.
5. The vaccination units should be oxygenated.
6. Vaccinate the fish in batches according to the size and weight of the fish and the volume of the vaccine. Accurate weighing of the fish is essential to ensure appropriate dosing.
7. Follow the data sheet for timing the immersion of the fish.
8. Ensure all personal involved in handling the vaccine are wearing suitable protection such as rubber gloves.
9. Discard any vaccine containers according to the manufacturer's instructions.
10. Monitor the fish for 48 hours post vaccination to ensure no adverse reaction to the product has occurred and post-vaccination mortality levels are within the expected range. Any adverse reaction should be reported to the prescribing veterinarian immediately.
11. A vaccination log should be maintained with the details of all vaccinations received by each batch of fish. The expiry date, batch number, manufacturer, name of product and supplier should all be recorded. A copy of the data sheet should be

retained also. These records should be maintained until the batch of fish in question has completed its life cycle.

4.11 Treatments

The company veterinarian will determine, where necessary, the appropriate medication to control and/or prevent the outbreak of disease. Delaying treatments causes welfare problems and may ultimately lead to increased medicine use. The veterinarian can prescribe and supply the animal remedy to the manager and/or to the feed mill, where appropriate. Alternatively, the veterinarian can prescribe for the animals under his/ her care and the animal remedy can be sourced through a pharmacy or a licensed veterinary wholesaler. The manager must ensure that all animal remedies are administered according to veterinary advice and/or the manufacturer's instructions. All animal remedies must be administered in accordance with the relevant legislation (Animals Remedies Regulations 2007).

The manager must ensure that the following detailed records are maintained in the *Animal Remedies Record Book* (or computer Log) for three years following treatment:

- a. Aquaculture license number and name of holder.
- b. Location of aquaculture facility.
- c. Species of salmonid.
- d. Name of the prescribing veterinarian.
- e. A log naming the drugs, including:
 - I. Name of the Animal Remedy/Therapeutant.
 - II. Administration method, dosage rate and water temperature.
 - III. Date treatment commenced.
 - IV. Frequency of treatment.
 - V. Date of last treatment.
 - VI. Prescription number, batch number and expiry date of therapeutant.
 - VII. Name and signature of the person responsible for administering each treatment.
 - VIII. Minimum withdrawal period advised by the veterinarian or the manufacturer.

The manager must present the *Animal Remedies Record Book* to an authorised officer upon request.

The following procedures should also be followed:

1. Representative samples of fish should be routinely analysed for residues of all treatments used prior to harvest.
2. There should also be ongoing analysis to assess the efficacy of treatments so that medication regimes can be modified as appropriate.
3. Where treatment is necessary it should be initiated without delay to ensure good welfare and medicine management.
4. Accurate information should be provided to the attending veterinary surgeon so that correct dosages can be calculated for the fish concerned. Ensure that clear instructions for medication, dosage and administration are obtained and are communicated to the staff responsible for treatment.
5. The recommended course of treatment at the correct dosage should always be completed. In the event of the inability to complete the course due to adverse weather conditions or where fish welfare would be compromised, treatment may be terminated. Where treatment is terminated early this should be recorded and advice sought from the veterinary surgeon.
6. All requirements for medicine withdrawal periods prior to the slaughter of fish for human consumption must be complied with.
7. Farmers must keep on file, appropriate data for all medicines used – e.g. product data sheets, package inserts or safety data sheets as available.
8. Farmers must report to the veterinary surgeon any suspected adverse reaction to a medicine in either the treated fish or farm staff that have had contact with the medicine.
9. Temperature may be important for maintaining efficacy of the medicine, and in the case of vaccines, dedicated refrigeration equipment should be available to keep them at the required storage temperature (normally between 2 and 8°C). A refrigeration logbook should be maintained for vaccines.
10. Medicines should be kept in a locked container, out of the reach of animals and children and only accessible to authorised personnel.

11. Unused medicines should be returned to the prescribing veterinarian or supplier and never sold or passed on to anyone else.

4.11.1 Medicated Feed

1. Only authorised in-feed treatments should be used, under veterinary prescription and instruction.
2. In-feed treatments should be mixed at an authorised facility according to manufacturer's instructions and at the precise quantity detailed in the prescription.
3. If the farm has a DAFM Licence to manufacture medicated feedingstuffs, for own use only, in-feed treatments can be mixed on site. Application forms can be completed through www.agriculture.gov.ie . In this case, mixing should be carried out by suitably qualified personnel, wearing suitable protective clothing under management/veterinary instruction.
4. In-feed treatments should be fed according to prescription by suitably qualified personnel with extra vigilance to ensure maximum up-take of the medicated ration.
5. Feeding rate should be in line with the stock feeding rate (% body weight/day) under the consultation of a veterinarian. Where further non medicated feeding is required, medicated feed should be fed as the first meal of the day.
6. A representative sample of medicated feed should be taken by sub-sampling across the total prescribed delivery, accurately labelled, frozen and held for one month after the fish are sold.
7. Accurate records of all in-feed treatments must be maintained in the Animal Remedies Record Book.

4.11.2 Medicine Storage

All animal remedies must be stored in a locked room/container. Access to this store must be restricted to authorised personnel only. It is the responsibility of the site manager to ensure the following:

1. To maintain an inventory in the Chemical Store Log Book of all medicines entering and leaving the store, including details of the type of medication, date received, batch code, expiry date, and date administered.
2. To restrict access to nominated personnel.
3. To keep the room/container tidy, secure, in a good state of repair and vermin-proof.
4. To ensure all chemicals are properly labelled.
5. To ensure medicines are used in strict rotation observing expiry dates.
6. To ensure the proper disposal of empty containers.
7. To ensure that all chemicals that are past their expiry date are disposed of according to the manufacturer's instructions.
8. To ensure that Product datasheets for all chemicals purchased by the company are filed in the 'Datasheets file'.

4.11.3 Egg Disinfection

1. Eggs of salmonids are collected and disinfected to minimize the risk of transfer of pathogens from broodstock to progeny.
2. Methods used for pathogen reduction are based on vertically and horizontally transferred pathogens present or suspected in the broodstock.
3. Culturists are encouraged to consult a qualified fish health professional when designing their broodstock and egg handling protocols.
4. Before eggs are brought in for incubation, equipment must be washed, disinfected and thoroughly rinsed.
5. Operators must use a disinfectant that is recognized for use in aquaculture and follow manufacturer's instructions.
6. Strict hygiene should be observed at all times in the hatchery.

7. Equipment should be specific to the hatchery. In addition, hatchery tools should not be used between different tanks, raceways etc. Colour-coded labelling of tools may be helpful in keeping tools separate. Equipment should be cleaned, disinfected and properly stored after each use.
8. When cleaning equipment all visible organic matter should be removed with detergent. Disinfection of equipment should then be performed using an appropriate broad spectrum compound, diluted to the concentration recommended by the manufacturer. The disinfectant should be in contact with all surfaces and left for the recommended time period. Rinsing with fresh water afterwards may be done if necessary.
9. Observation of new batches of eggs or livestock should be carried out in order to detect any abnormality. This should be done if possible in a quarantine area. It is advisable to have the quarantine area physically separated from other areas on the site.
10. During spawning it is important to avoid contamination of the gametes with organic material such as urine, faeces and blood. Eggs should be rinsed thoroughly with fresh water.
11. As soon as possible after fertilisation, an appropriate disinfectant should be used to disinfect pre-hardened eggs, using the correct concentration and contact time.
12. Careful handling of eggs is advisable to avoid damage and opportunistic infection.
13. Disinfection of eyed eggs (including eggs of cleaner fish) is advisable prior to movement within the hatchery or to another location, using an appropriate disinfectant at the correct concentration and for the recommended contact time.
14. All incoming batches of eggs or livestock should have records filed regarding date and origin of arrival/stripping, time, type and amount of disinfection and clinical observations.

4.12 Mortality Removal & Disposal

Mortality removal must be carried out regularly to prevent re-infection occurring which could potentially compromise the health of the stocks and to prevent a deterioration of water quality. The frequency of mortality removal will be determined by the site manager based on time of year and numbers/type of mortalities. Records of mortalities must be maintained for each unit. Arrangements must be made for high temperature rendering of all fish which die on the farm.

The following procedures should be adhered to:

1. Regular removal of dead fish from holding units is essential to prevent the spread of disease.
2. The cause of mortality should be investigated by suitably qualified personnel in conjunction with a fish veterinarian.
3. A daily log of mortality numbers, categories and trends should be maintained in a specific mortality record log. Details should be entered on specific sheets that allow categorisation of mortalities. These records should be kept for at least three years.
4. In freshwater tanks/pens mortalities should be removed and quantified daily. Every tank/pen should have its own equipment for this task. All such equipment should be maintained in disinfectant solution when not in use and cleaned regularly. In lake pens, nets may need to be raised to ensure all mortalities can be removed using a hand net.
5. In seawater pens mortalities should be removed at least twice weekly, with the frequency of removal increasing in response to any increase in mortality. In the event of increased mortality levels in a specific pen, this should be dived and mortalities removed only subsequent to all the other pens on the site. If possible, divers should not operate on two or more sites. If this is unavoidable, a different set of equipment should be used for each site.
6. Any increase in mortality above normal should be reported to the veterinarian. 'Normal' levels should be recorded for each site under ambient conditions – once these are breached, an investigation will commence.

7. All equipment used for mortality disposal should be disinfected after the operation is completed.
8. Dead fish should be disposed of in a manner that will not facilitate the spread of disease.
9. Disposal of mortalities must adhere to relevant waste management regulations.
10. The containers used to store dead fish must be adequately designed to minimize the risk of leakage.
11. Mortalities must be collected and taken off site on a routine and frequent basis to minimize the potential spread of disease.
12. Only licensed transport companies can be used.
13. Only authorised rendering facilities can be used.
14. The transport truck must carry documentation describing the material being carried, the place of origin, the name and address of the carrier, the name and address of the rendering or processing facility. All documentation must be kept for 2 years.

4.12.1 Large Scale Mortality Event

If a sudden mass mortality is experienced on a farm the following procedure should be implemented:

1. The affected farm/site should be immediately designated as being in isolation. Where mortalities are due to infectious disease a zone of those units/sites deemed most at risk of exposure to infection should be established.
2. Water quality should be analysed and in the case of land-based sites and hatcheries all equipment regulating water supply and quality should be assessed for damage.
3. If a notifiable disease is suspected the farm veterinarian and relevant authorities should be contacted immediately.
4. Other farms within the 'at risk' zone should be notified of the diagnosis or suspected diagnosis.

5. Non-essential deliveries or visits to the farm should be halted. Essential supplies should be delivered to the affected site last.
6. Movement of equipment, vessels, personnel etc between sites should be immediately halted. Movement of staff between the affected farm and other farms should be halted.
7. Thorough disinfection of all equipment, clothing, vessels etc should take place if there is to be movement between affected and non-affected sites. Footbaths and, if practical, hand wash stations should be maintained and used by all personnel before accessing and leaving the site. These footbaths should be located at all access/exit points. They should be clearly visible and marked.
8. Mortality removal frequency should be increased depending on the rate of mortality.
9. Moribund fish should be slaughtered in a humane and rapid manner.
10. Mortalities should be transported in sealed containers to avoid spread via spillage or predators.
11. Fish should be transported to an approved disposal facility and rendered appropriately.
12. Should slaughter of affected fish be necessary then strict disinfection and cleaning regimes should be adhered to. All blood-water should be contained and treated.
13. An intensive sampling routine should be instated by the farm veterinarian and relevant authorities.
14. All surfaces that come in contact with infected material should be thoroughly cleaned and disinfected.
15. Unaffected fish should be placed under quarantine and monitored for a time period after the event, to be decided by the veterinarian, manager and relevant authorities.

16. After the date of removal of the last affected fish from the facility an appropriate time period should elapse while the site remains fallow and before re-stocking takes place. Other sites in the 'at risk' zone should also follow this procedure.
17. When restocked, the site should be monitored for a number of months for signs of disease.
18. Additional measures may also be required in the event of an outbreak of a disease listed in Council Directive 2006/88/EC or for which Ireland has national measures under Article 43 of that Directive.
19. Daily mortality records should be kept in relation to all affected pens/tanks. Records of all visitors to the site as well as details of all biosecurity measures put in place must be maintained and presented for inspection, on request.

4.13 Stock Records

Maintaining good records is essential to maintaining consistently healthy fish. Facilities must have an information management system that provides timely information to identify and assess changes in fish health to allow for sound fish health management decisions. For individual groups of fish in the facility, operators must keep up-to-date fish health records including disease history and patterns of mortality, and records of movements of fish within the facility.

Accurate record of feeding rates (% body weight fed per day) and feed conversion rates (FCR = feed consumed divided by biomass increase) for each unit are particularly useful in tracking the health and performance of the stocks. Comparisons of feed rates and FCR between different batches of fish give vital clues as to the health of the population and the adequacy of the diet.

Regular recording of growth performance and mortalities for each unit is essential for tracking trends over time and between sites.

A weekly summary stock sheet should be produced for each site. The stock sheet provides essential information for those who feed the fish but also for the site manager. This information is also required by the fish health professionals, regulators, insurers and for quality and customer audits.

Table VII

Sample weekly stock sheet.

Farm A 07G Stock Sheet

Week No. 9

W/E: 02/03/2008

Cage	Batch	Closing Number	Closing Bio. (kg)	Av. Wt. (g)	Feed (kg) To Date	% Morts To Date	Morts For Wk	% Morts For Wk	Feed (kg) For Wk	% Daily Feed Rate	ECR	Density (kg/m ³)
A1	StrainA/HatcheryA	33,194	11,403	344	8,372	2.7	12	0.0	1,115	1.5	1.0	1
A2	StrainA/HatcheryA	30,487	8,711	286	5,030	4.7	15	0.0	1,030	1.8	1.1	1
A3	StrainA/HatcheryA	33,721	10,406	309	6,490	5.6	18	0.1	690	1.0	0.9	1
A4	StrainA/HatcheryA	32,506	9,513	293	7,025	4.4	10	0.0	1,025	1.6	1.2	1
A5	StrainA/HatcheryA	31,014	8,886	287	5,905	6.0	6	0.0	905	1.5	1.0	1
A6	StrainA/HatcheryA	34,911	8,305	238	5,125	3.0	25	0.1	725	1.3	1.1	1
A7	StrainA/HatcheryA	38,120	9,728	255	7,288	3.5	61	0.2	805	1.2	1.1	1
A8	StrainA/HatcheryA	35,196	8,206	233	5,780	4.9	19	0.1	780	1.4	1.1	1
		269,149	75,159	279	51,015	4.3	166	0.1	7,075	1.4	1.1	

4.14 Hatcheries

Hatchery operations may have several overlapping year classes on site e.g. early incubation, fry rearing and possibly broodstock.

1. Rearing units must be kept separate as much as possible to prevent transmission of disease between classes. Different biosecure areas should be created, possibly with colour coded equipment, with separate clothing and boots for each area.
2. Water quality monitoring is especially important for hatchery fish. Monitoring equipment must be maintained in good functional condition.
3. Failure of oxygen delivery and/or pumps is a major emergency for a hatchery site. The site must have a backup oxygen system for keeping dissolved oxygen levels at an adequate level until the system failure is addressed.
4. Egg disinfection must be carried out according to the manufacturers instructions following fertilization and prior to movement to other sites.
5. Eggs must be checked daily for mortalities, presence of abnormalities or fungus and treated as necessary.
6. Mortality collection must be carried out daily and mortalities stored an appropriate distance from the hatchery to minimize inadvertent spread of disease. They must be subsequently disposed of by rendering.

7. Ice boxes and containers that are used for transporting eggs must be disinfected and disposed of hygienically by the receiver.

4.15 Broodstock

Broodstock may be held at marine, brackish and freshwater sites. All fish health considerations previously listed will apply though they differ slightly between saltwater and freshwater sites and also between salmonid and cleanerfish broodstock

4.15.1 Diet

Broodstock require specially formulated diets to meet their nutritional needs prior to maturation. Feeding strategies must be applied that ensure optimum nutrition especially when fish start to mature. Proper storage of these diets, to ensure their nutritional content is maintained, is essential. Feed should be protected from light, humidity and extremes of temperature.

4.15.2 Biosecurity

Broodstock are held for longer periods than production fish. As a result, they may have been exposed to more pathogens and may be sub clinical carriers of disease. Also, on maturation they become more susceptible due to their compromised immunity, as a consequence of physiological changes. For these reasons staff and equipment should be designated for the broodstock facility and not used in the hatchery or other units. There is a high risk of transferring pathogens from mature fish to susceptible younger fish.

4.15.3 Stripping

Broodstock handling should be kept to a minimum. Adequate anaesthesia must be used when stripping ripe broodstock for gametes. This will help to protect both the broodfish and the gametes. If fish are to be euthanized post stripping it should be carried out in as humane a way as possible.

The milt and eggs must be traceable to individual parents. Screening of broodstock for diseases should be carried out on each batch of eggs and milt, if possible. Where individual parent testing is carried out, biosecurity measures in the incubation centre are of the utmost importance.

Eggs and milt must be mixed and transported to the hatchery in clean, labelled containers. Strict biosecurity and disinfection procedures must be adhered to in order to prevent transmission of infectious agents to the hatchery.

4.16 Minimizing Risk of Escape

Operators must minimize the risk of escape from fish culture facilities. Procedures such as fish input, grading, transfer of fish between sites and harvesting, which could increase the risk of fish escaping, should be carefully planned and supervised to minimize any risk.

All details of introductions, grading, transfers, treatments, handling or any other incident or occurrence that might have led to an escape must be recorded and reported to DAFM in accordance with current legislation.

Where fish are being transferred by helicopter, the receiving pen should be marked with buoys clearly visible from the air.

Netting and holding equipment must be adequately designed to minimize the risk of collapse and escape. All nets should be serviced and tested at appropriate intervals to ensure that they are within specified limits for mesh strength and nets that do not meet specifications should be decommissioned.

All marine pens should be clearly marked with navigational lights and/or radar reflectors to prevent the collision of any approaching vessels.

4.17 Diving

It is imperative that divers adhere to biosecurity and disinfection procedures at each facility. Equipment should be site specific if possible. Divers moving between sites must disinfect their equipment in transit using appropriate disinfectant at adequate concentration and for an appropriate contact period.

1. Divers must adhere to strict biosecurity protocols and should be trained in all aspects of biosecurity.

2. Equipment should be site specific if possible to minimize the risk of contamination between sites.
3. Disinfection routines for divers should be implemented before and after operations on different sites and should be checked and recorded by a named member of site staff on each occasion.
4. All organic material should be removed from all suits and equipment.
5. Suits and equipment should be immersed in water containing a suitable disinfectant.
6. Divers must be fully trained and adhere to strict Health & Safety Regulations.
7. The healthiest or youngest fish at a site should be dived first.
8. Any abnormal behaviour in the fish should be reported to Management who will be responsible for reporting to the veterinarian if deemed necessary.
9. During a disease outbreak divers should be designated to dive the affected site.
10. Diver observations of fish behaviour, mortality levels, reaction to feed etc, should be recorded daily.

4.18 Culling

Fish killed as part of disease surveillance or other management plans or due to illness must be euthanized in a humane manner. A sharp blow to the head or an overdose of anaesthetic are considered humane. Stunning of fish must result in immediate loss of consciousness that lasts until death. Fish are not to be stunned unless they can be killed without delay. If fish are killed without stunning, the method used must result in a rapid and irreversible loss of consciousness.

4.19 Cleaner Fish

Cleaner fish are used as a supplementary biological control for sea lice levels on marine Atlantic salmon farms. In Ireland this includes the wrasse species, ballan wrasse (*Labrus bergylta*), goldsinny wrasse (*Ctenolabrus rupestris*), corkwing wrasse (*Symphodus melops*), rock cook (*Centrolabrus exoletus*), cuckoo wrasse (*Labrus mixtus*) and the lumpsucker (*Cyclopterus lumpus*).

4.19.1 Sourcing & Moving Cleaner Fish

1. Ideally, health screened hatchery reared cleaner fish should be used for the purpose of sea lice control in marine pens. When they are not available, the use of wild-caught cleaner fish may be permitted.
2. Disease risk should be minimised by sourcing wild cleaner fish from the same bay in which the farm is located. Only in exceptional circumstances and following the completion of a risk assessment, should fish be moved in from other bays, or indeed, from outside the country⁴ (see annex).
3. Each year, the first 60 fish (at a minimum) caught in any one bay will undergo veterinary examination and disease testing for pathogens of relevance both to the cleaner fish themselves and to the farmed fish.
4. All movements of wild cleaner fish for aquaculture purposes must be pre-notified to the Marine Institute. Once approved, the movement application will cover all movements from a named bay onto named sites for a 30 day period. As with other movements, if signs of disease or increased mortality occur in the stock within that 30 day period, the Marine Institute must be notified immediately.
5. Ideally, the wild caught cleaner fish will be kept separate from the farmed stock until the disease testing has been completed. In the exceptional cases where wild cleaner fish are moved in from outside the bay (see point 2 above), fish should not be moved until all laboratory testing has been completed.
6. Once the annual disease testing referred to above has been carried out to establish the status of the wild population; subsequent movements that year, will be carried out on foot of a clinical inspection by the retained veterinarian.

⁴ Risk analysis for the movement of wild caught wrasse in Ireland. Fish Vet Group Ireland.

7. Cleaner fish sourced from hatcheries will be subject to the same testing and clinical inspection as aquaculture animals i.e. they will be included in the national risk based surveillance programme and require prior movement approval from the Marine Institute.
8. Where wild broodstock are to be stripped and fertilised eggs are to be placed in a hatchery, testing of the individual broodstock for relevant pathogens should be carried out when the final spawning has occurred. Until the results of this testing are available, the fertilised eggs should remain under biosecure conditions, at a remove from other aquatic species. All such eggs should be disinfected using a product of suitable efficacy, before leaving the biosecure facility.
9. All imported eggs should be disinfected at source and again upon arrival, and kept separate from existing stocks for as long as possible. Importers should comply with the risk analysis for the importation of lumpfish eggs⁵ (see annex).

4.19.2 Fishing for wrasse

1. Anyone involved in the commercial fishing for wrasse within Ireland must hold a suitable licence from DAFM.
2. Nets and pots used to capture wild wrasse should be suitable for use. Fyke nets should have otter exclusion devices fitted. Specifically designed pots are now on the market for capturing wrasse.
3. Nets and pots should not be baited with aquaculture by-products such as frames and carcasses.
4. Fishermen should record details of all fishing activity e.g. fishing location, season, numbers and species caught, size (fish < 11 cm in length should not be caught).
5. When fishing for wrasse, fishermen should be careful when bringing pots to the surface. This should be done slowly, to avoid the over-expansion of the swim bladder.

⁵ Risk analysis for import of lumpsucker eggs into Ireland from Norway, UK or Iceland. Fish Vet Group Ireland.

6. Wrasse should be handled with extreme care, with minimal out of water periods. All fish should be examined for any external signs of damage before being placed into holding tanks. Any damaged or diseased fish should be disposed of humanely.
7. All holding tanks should be well aerated with a good flow of water. The amount of time cleaner fish are held in holding tanks should be kept to a minimum, where practical.
8. Suspicion of disease or occurrence of unexplained mortality in the holding tanks must be reported to the Marine Institute.

4.19.3 Stocking

1. Stocking information records should be kept by the farms for each cage stocked with cleaner fish. At a minimum, the numbers of fish stocked, species and size should be recorded. Where a risk assessment is required, it should also be kept on file.
2. Dead cleaner fish should be removed regularly and the information recorded. Veterinary input should be sought as necessary.
3. Each pen to contain cleaner fish should have an adequate provision of hides for the number of cleaner fish stocked (a minimum of two hides per cage is recommended or one hide per 2,000 fish stocked)
4. The number of cleaner fish to be stocked per cage will depend on the lice levels and the species of cleaner fish. A general indication is one cleaner fish per 20 salmon.
5. The size of the fish stocked should be dictated by the corresponding mesh size of the nets in the cages. A guide is provided in the table below (courtesy of Marine Harvest Ireland).

Mesh Size	Goldsinny	Corkwing	Ballan
58 mm		18 cm +	20 cm +
50 mm		17 cm +	19 cm +
48 mm		15 cm +	17 cm +
45 mm		14 cm +	16 cm +
40 mm	13.5cm +	13 cm +	15 cm +
36 mm	13 cm +	12 cm +	14 cm +
33 mm	12cm +	11.5 cm +	13 cm +
27.5 mm	11 cm +	11 cm +	12 cm +

6. Supplementary feed should be made available when sea lice levels are low (< 0.2 gravid female per fish) and during winter. Commercial feeds for cleaner fish are available.
7. Extra care should be taken to keep handling of cleaner fish to a minimum during overwintering in sea cages.
8. Cleaner fish should not be released into the wild at the end of a production cycle, but should be humanely destroyed and disposed of in compliance with the Animal By-Products Regulations.