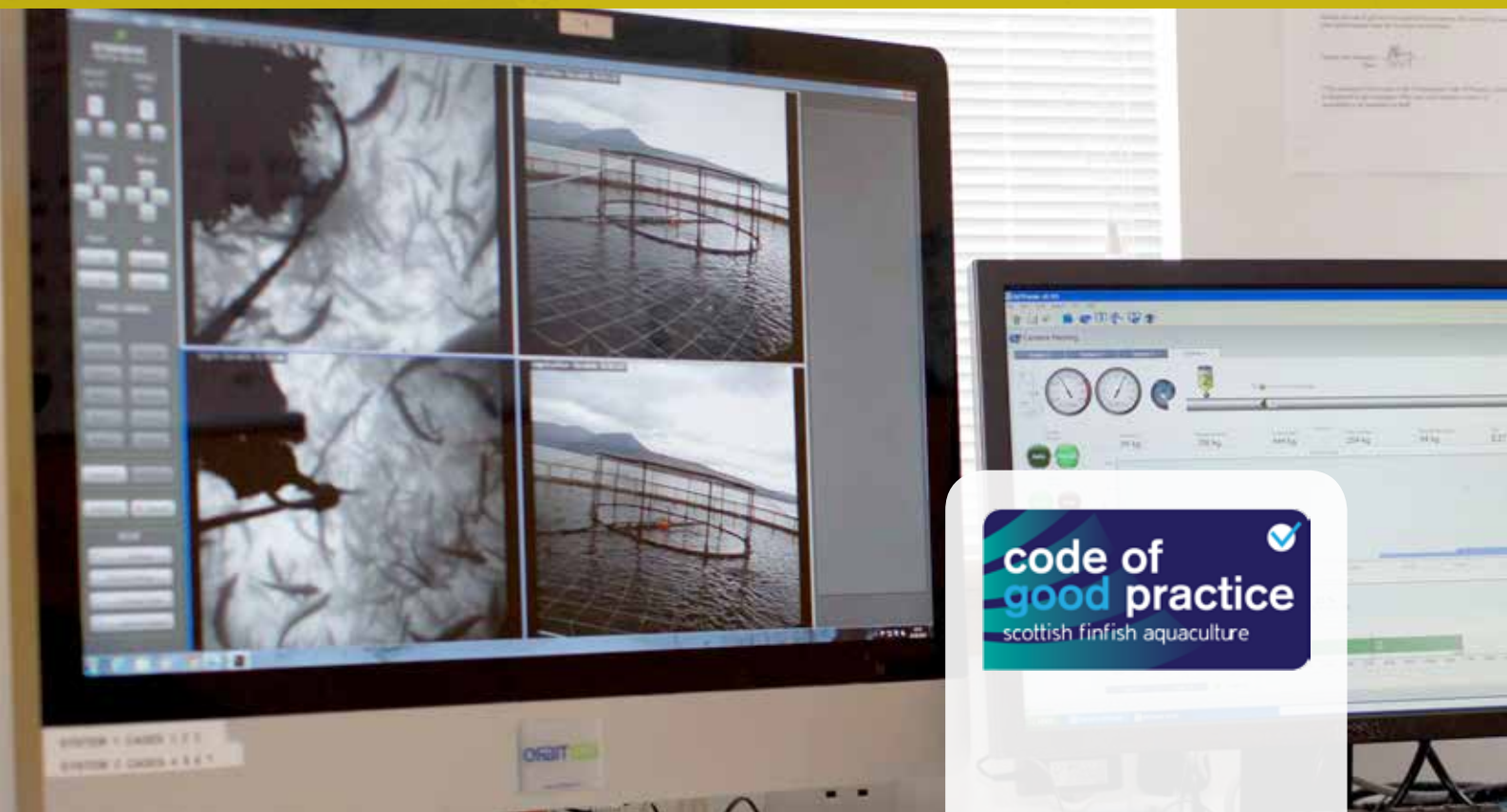
# Code of Good Practice

## Annexes



# ANNEXES

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# ANNEX 1

## HAZARD ANALYSIS CRITICAL CONTROL POINTS

### INTRODUCTION

Hazard Analysis Critical Control Points (HACCP) is a step by step approach to managing food safety risks. It is not currently a legal requirement for primary production operations which are only required to operate management systems based on HACCP principles. However, in practice, many businesses have adopted a HACCP approach and it is a recommended that HACCP is implemented to maintain the industry commitment to food safety.

This Annex provides an overview of HACCP implementation. For further information it should be read in conjunction with The Codex Alimentarius Commission *Recommended Code of Practice,* General Principles of Food Hygiene CAC/RCP 1-1969 Revision 4 (2003), which provides a detailed coverage of HACCP implementation techniques. The application of Codex Principles is a requirement of article 5 of EC Regulation 852/2004 on the hygiene of foodstuffs and a HACCP study must be carried out in accordance with recognised HACCP methodology.

HACCP is a methodological approach which identifies, evaluates, and controls hazards which can have significant implications for food safety. It is science-based and systematic, identifying specific hazards and measures for their control to ensure the safety of food. HACCP is a tool to assess hazards and establish control systems that focus on prevention rather than relying mainly on end-product testing.

HACCP can be applied throughout the food chain from primary production to final consumption and its implementation should be guided by scientific evidence of risks to human health (the underlying methodology has now been adopted more widely in a range of industries and settings). The successful application of HACCP requires the full commitment and involvement of management and the work force. It also requires a multidisciplinary approach; this, depending on the circumstances being evaluated, might include: expertise in agronomy; veterinary health; animal production; microbiology; medicine; public health; food technology; environmental health; chemistry; and engineering.

The application of HACCP is compatible with the implementation of quality management systems, such as the ISO 9000 series, and is the system of choice in the management of food safety within such systems. However, the HACCP concept can also be applied to other aspects of food quality

### PRINCIPLES OF THE HACCP SYSTEM

For those initially adopting the HACCP system, it can first appear rather daunting because of its use of an unfamiliar vocabulary of terms (see Appendix 1). In reality much of the HACCP approach is common sense and simply depends on quantifying where food safety, contamination or quality problems can occur and putting in place measures to avoid them and to detect when those measures are not being effective. The HACCP system consists of the following seven principles.

- **PRINCIPLE 1** - Conduct a hazard analysis.
- **PRINCIPLE 2** - Determine the Critical Control Points (CCPs).

- **PRINCIPLE 3** - Establish critical limit(s).
- **PRINCIPLE 4** - Establish a system to monitor control of the CCP.
- **PRINCIPLE 5** - Establish the corrective action to be taken when monitoring indicates that a particular CCP is not under control.
- **PRINCIPLE 6** - Establish procedures for verification to confirm that the HACCP system is working effectively.
- **PRINCIPLE 7** - Establish documentation concerning all procedures and records appropriate to these principles and their application.

## GUIDELINES FOR THE APPLICATION OF THE HACCP SYSTEM

### Points to Note

- Prior to application of HACCP to any sector of the food chain, that sector should have in place prerequisite programs such as good hygienic practices.
- These prerequisite programs to HACCP, including training, should be well established, fully operational and verified in order to facilitate the successful application and implementation of the HACCP system.
- For all types of food business, management awareness and commitment is necessary for implementation of an effective HACCP system. The effectiveness will also rely upon management and employees having the appropriate HACCP knowledge and skills.

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- The intent of the HACCP system is to focus control at Critical Control Points (CCPs).
- HACCP should be applied to each specific operation separately.
- The HACCP application should be reviewed, and necessary changes made, when any modification is made in the product, process, or in any step thereof.
- Training of personnel in HACCP principles is essential for the effective implementation of the system.

### Application

The full application of HACCP principles consists of the 12 steps shown in Figure 1 and outlined below. **(**Steps 6 to 12 correspond to Codex Alimentarius Principles 1 to 7.)

### *1. Assemble a HACCP team*

The food operation should assure that the appropriate specific knowledge and expertise is available for the development of an effective HACCP plan.

### *2. Describe product*

A full description of the product should be drawn up, including relevant safety information such as: composition, physical/chemical structure (including added water, pH, etc.), any microcidal or other treatments, packaging, durability and storage conditions and method of distribution.

### *3. Identify intended use*

The intended use should be based on the expected uses of the product by the end user or consumer. In specific cases, vulnerable groups of the population, e.g. institutional catering, may have to be considered.

### *4. Construct flow diagram*

A flow diagram should be constructed by the HACCP team; it should cover all steps in the operation relating to a specific product and series of processes.

### *5. On-site confirmation of flow diagram*

Steps must be taken to confirm the processing operation against the flow diagram during all stages of the operation and amend the flow diagram, where appropriate. The confirmation of the flow diagram should be performed by a person or persons with good knowledge of the operations.

### *6. List all potential hazards associated with each step of the operation, conduct a hazard analysis, and consider any measures to control identified hazards* **(see PRINCIPLE 1).**

The HACCP team should list all of the hazards that may be reasonably expected to occur at each step according to the scope of the evaluation, from primary production, processing, manufacture, and distribution until the point of consumption, as appropriate. The team should next conduct a hazard analysis to identify, for the HACCP plan, which hazards are of such a nature that their elimination or reduction to acceptable levels is essential to the production of a safe food. In conducting the hazard analysis, the following should be included, wherever possible:

- the likely occurrence of hazards and severity of their adverse health effects;
- the qualitative and/or quantitative evaluation of the presence of hazards;
- survival or multiplication of micro-organisms of concern;
- production or persistence in foods of toxins, chemicals or physical agents;
- conditions leading to any of the above.

Consideration should then be given to what control measures, if any exist, can be applied to each hazard. More than one control measure may be required to control a specific hazard(s) and more than one hazard may be controlled by a specified control measure.

### *7. Determine Critical Control Points* (see PRINCIPLE 2)

There may be more than one CCP at which control is applied to address the same hazard. The determination of a CCP in the HACCP system can be facilitated by the application of a decision tree which adopts a logical approach (as an example, see Figure 2). Application of a decision tree should be flexible, given whether the operation is for production, slaughter, processing, storage, distribution or other. It should be used for guidance when determining CCPs.

### *8. Establish critical limits for each CCP* (see PRINCIPLE 3)

Critical limits must be specified and validated for each CCP. In some cases, more than one critical limit will be elaborated at a particular step. Criteria often used include measurements of temperature, time, moisture level, pH, wetness (added water) and sensory parameters, such as visual appearance and texture. These critical limits should be measurable.

### *9. Establish a monitoring system for each CCP* (see PRINCIPLE 4)

Monitoring is the scheduled measurement or observation of a CCP relative to its critical limits. Monitoring procedures must be able to detect loss of control at the CCP and should ideally provide information in time to make adjustments to ensure control of the process to prevent violating the critical limits. Where possible, process adjustments should be made when monitoring results indicate a trend towards loss of control at a CCP. The adjustments should be taken before a deviation occurs. Data derived from monitoring must be evaluated by a designated person with knowledge and authority to carry out corrective actions when indicated.

### *10. Establish corrective actions* (see PRINCIPLE 5)

Specific corrective actions must be developed for each CCP in the HACCP system in order to deal with deviations when they occur. The actions must ensure that the CCP has been brought under control. Actions taken must also include proper procedures for dealing with the affected product. Deviation and actions taken in dealing with the affected product must be documented in the HACCP record keeping.

### *11. Establish verification procedures* (see PRINCIPLE 6)

Verification and auditing methods, procedures and tests, including random sampling and analysis, can be used to determine if the HACCP system is working correctly. The frequency of verification should be sufficient to confirm that the HACCP system is working effectively.

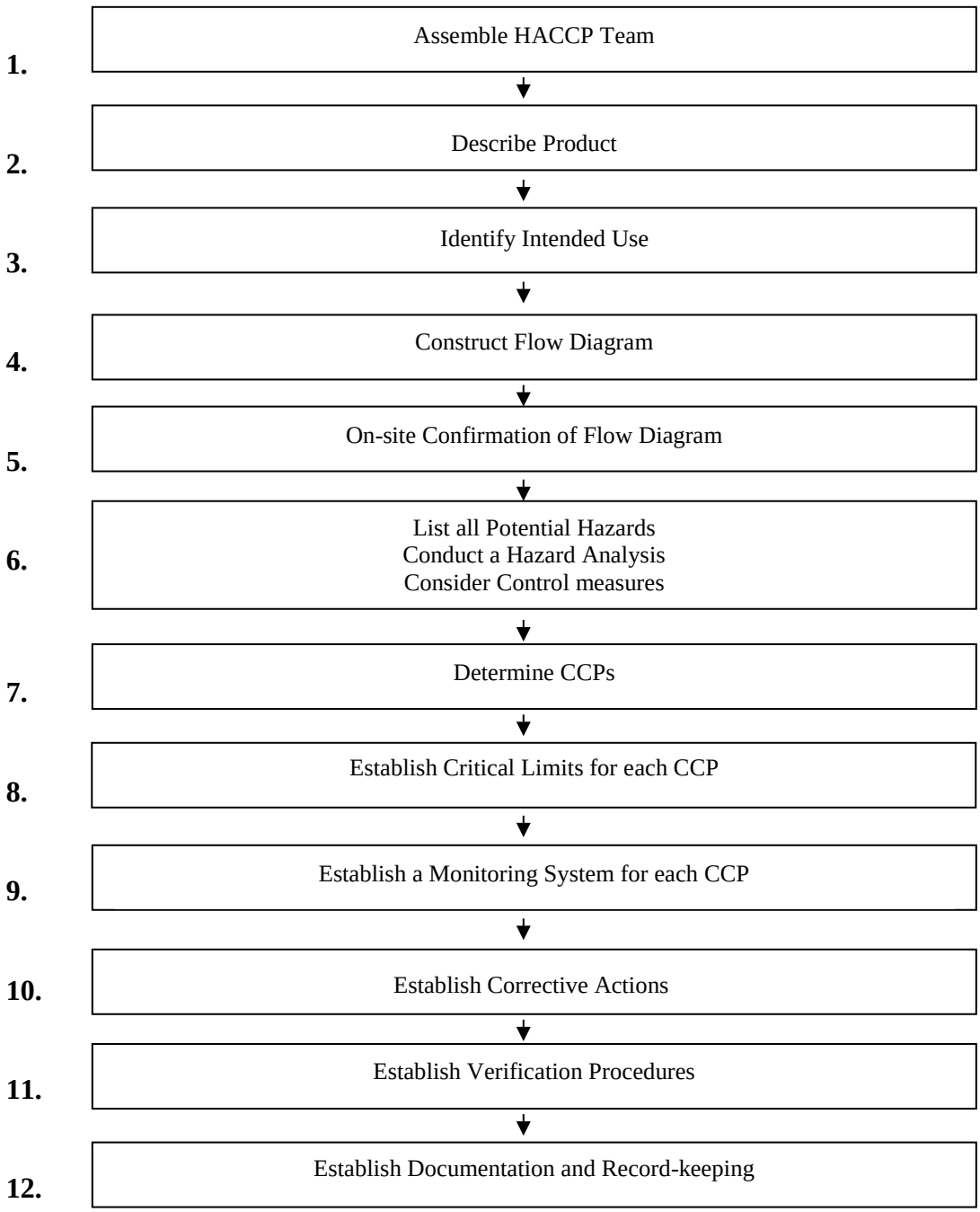
Verification should be carried out by someone other than the person who is responsible for performing the monitoring and corrective actions. Where certain verification activities cannot be performed in house, verification should be performed by qualified third parties. Examples of verification activities include:

- review of the HACCP system and plan and its records;
- review of deviations and product dispositions;
- confirmation that CCPs are kept under control.

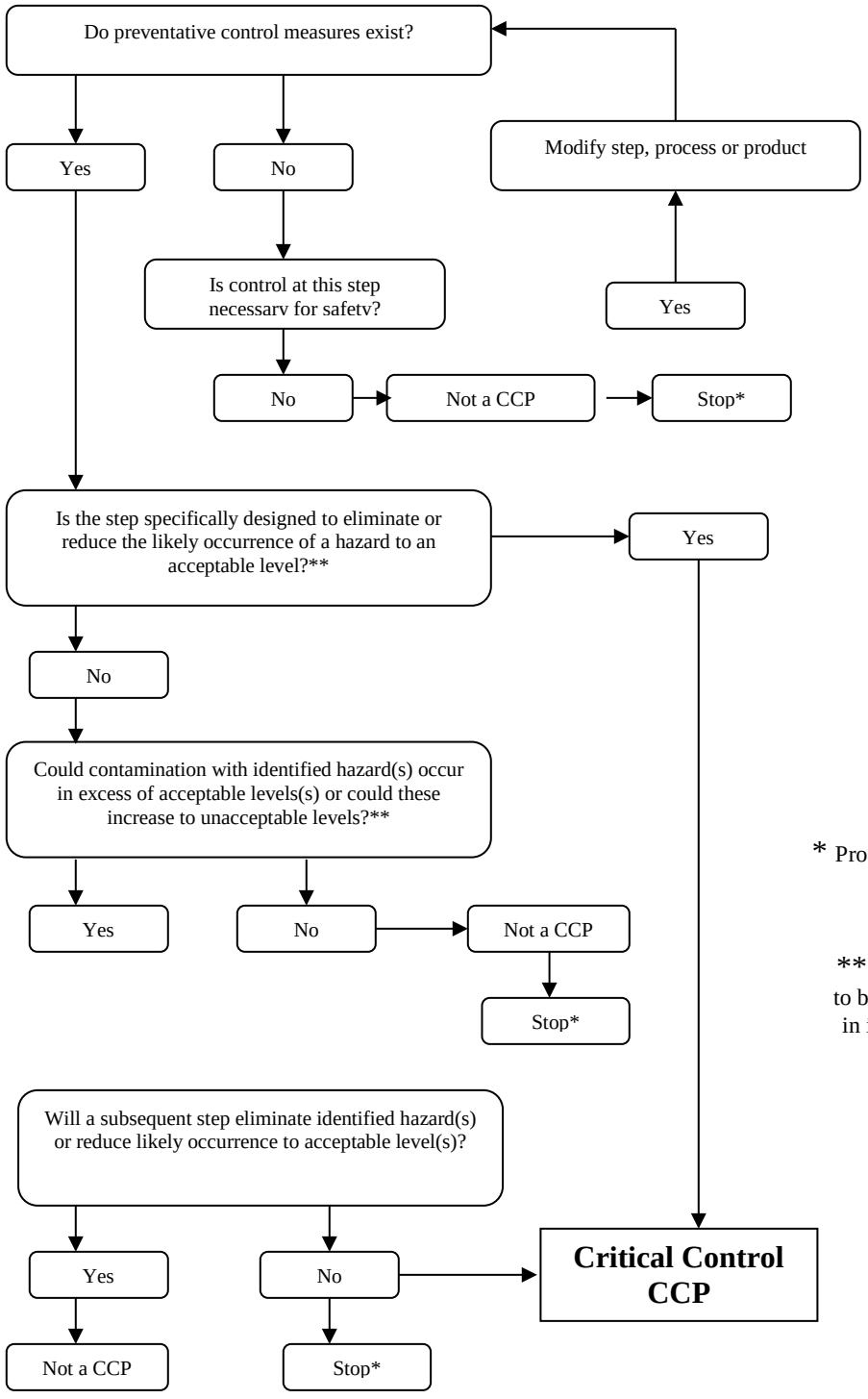
### *12. Establish Documentation and Record Keeping* (SEE PRINCIPLE 7)

Efficient and accurate record keeping is essential to the application of a HACCP system. HACCP procedures should be documented. Documentation and record keeping should be appropriate to the nature and size of the operation and sufficient to assist the business to verify that the HACCP controls are in place and being maintained. In many cases a simple worksheet approach (see Figure 3) will be sufficient, although computer-based records are often adopted.

## DIAGRAM 1 – LOGIC SEQUENCE FOR THE APPLICATION OF HACCP



## DIAGRAM 2 – EXAMPLE OF DECISION TREE TO IDENTIFY CCPs
(answer questions in sequence)




* Proceed to the next identified hazard in the described process

** Acceptable and unacceptable levels need to be determined within the overall objectives in identifying the CCPs of the HACCP plan

## DIAGRAM 3 – EXAMPLE OF A HACCP WORKSHEET

**1.** **DESCRIBE PRODUCT**

**2.** **DIAGRAM PROCESS FLOW**

**3.**

| List | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Step** | **Hazard(s)** | **Control Measure(s)** | **CCPs** | **Critical Limit(s)** | **Monitoring Procedure(s)** | **Corrective Action(s)** | **Record(s)** |
| | | | | | | | |

**4.** **VERIFICATION**

## Appendix 1 Definition of HACCP Terminology

***Control (verb):*** To take all necessary actions to ensure and maintain compliance with criteria established in the HACCP plan.

***Control (noun):*** The state wherein correct procedures are being followed and criteria are being met.

***Control measure:*** Any action and activity that can be used to prevent or eliminate a food safety hazard or reduce it to an acceptable level.

***Corrective action:*** Any action to be taken when the results of monitoring at the CCP indicate a loss of control.

***Critical Control Point (CCP):*** A step at which control can be applied and is essential to prevent or eliminate a food safety hazard or reduce it to an acceptable level.

***Critical limit:*** A criterion which separates acceptability from unacceptability.

***Deviation:*** Failure to meet a critical limit.

***Flow diagram:*** A systematic representation of the sequence of steps or operations used in the production or manufacture of a particular food item.

***HACCP:*** A system which identifies, evaluates, and controls hazards which are significant for food safety

***HACCP plan:*** A document prepared in accordance with the principles of HACCP to ensure control of hazards which are significant for food safety in the segment of the food chain under consideration.

***Hazard:*** A biological, chemical or physical agent in, or condition of, food with the *potential* to cause an adverse health effect.

***Hazard analysis:*** The process of collecting and evaluating information on hazards and conditions leading to their presence to decide which are significant for food safety and therefore should be addressed in the HACCP plan.

***Monitor:*** The act of conducting a planned sequence of observations or measurements of control parameters to assess whether a CCP is under control.

***Step:*** A point, procedure, operation or stage in the food chain including raw materials, from primary production to final consumption.

***Validation:*** Obtaining evidence that the elements of the HACCP plan are effective.

***Verification:*** The application of methods, procedures, tests and other evaluations, in addition to monitoring to determine compliance with the HACCP plan.

# ANNEX 2

## GUIDELINES FOR A VETERINARY HEALTH PLAN (VHP) AND BIOSECURITY PLAN (BP)

### Introduction

A Veterinary Health Plan (VHP) and Biosecurity Plan (BP), which may be combined within a single document, must be prepared by each fish farming company in collaboration with its veterinary surgeon. Each VHP must be developed specifically to cover the health and welfare requirements of individual farms or sites. The VHP and BP are dynamic document(s) which must take account of current scientific and technical knowledge to ensure best practice and must be subject to regular review. The overview of the VHP/BP provided in this Annex is based on the recommendations of the Fish Veterinary Society.

### Aims

A VHP/BP must cover areas of biosecurity, monitoring procedures, management and husbandry and recording/reporting procedures to accomplish the following aims:

- the prevention of introduction and spread of disease;
- the reduction and elimination of factors which predispose to disease;
- the establishment of disease prevention procedures;
- the reduction of disease incidence;
- the maintenance of an environment and systems of management and husbandry which reflect best practice in terms of maintaining fish health and welfare;
- the establishment of monitoring and reporting structures ensuring adequate fish health surveillance, early warning of any potential health or welfare problem, rapid action and follow-up.

### Methods

These aims will be achieved through implementation of high standards of animal husbandry, regular veterinary visits, daily record keeping and compliance with the Code.

### Responsibilities

There will be a named person in the fish farm/company who will be responsible for the overall implementation of the VHP/BP. There will also be a named veterinary surgeon or named veterinary practice retained by the farm.

### Format of VHP/BP

A typical plan may have the following sectional structure.

### *Biosecurity*

This section should deal with the following:

1. Health checks and certification of all incoming stocks including cleaner fish;
2. Visitor and vehicle control;
3. Sanitation and movements of personnel including third party contractors;
4. Sanitation of equipment – moveable and fixed structures and buildings;
5. Stock separation and fallowing policies;
6. Duties of person responsible for monitoring and recording biosecurity procedures;
7. Biosecurity procedures review protocol.

### *General management procedures*

This should cover the principal management procedures which may have a direct impact on fish health and welfare; it should address the objective of minimising stress, damage and detrimental effects on health and welfare status of the fish:

1. Transport of fish, transfer of smolts and fish handling;
2. Stocking procedures and stocking density;
3. Routine inspection of fish, nets and equipment including recording systems;
4. Monitoring of smoltification in relevant species;
5. Water quality parameters, monitoring systems and recording procedures, emergency back-up arrangements and alarms;
6. Monitoring algae/jellyfish, prevention and contingency planning;
7. Predator control systems, procedures and licensing requirements;
8. Fish grading systems;
9. Fish crowding procedures for management purposes;
10. Slaughter, including emergency slaughter arrangements;
11. Disposal of mortalities.

### *Disease Surveillance*

Procedures must be in place to carry out regular observation of fish by personnel trained in the recognition of fish diseases.

1. On farm monitoring for the presence of disease.
2. Actions on suspicion of disease – in house investigation, chain of responsibility and communication with diagnostic services.
3. Veterinary and laboratory support in disease detection and diagnosis.
4. Sampling procedures for disease detection/monitoring.
5. Actions on suspicion of notifiable disease.

### *Disease Control Measures*

Disease control measures are aimed at prevention of disease outbreaks and minimising fish losses. Appropriate vaccination policies must be in place, based on risk assessment and the available products. Procedures must be in place to minimise the incidence of specific diseases. These procedures must be based on current knowledge of the disease and means of preventing or minimising its incidence.

This section needs to cover the following:

1. Removal and culling of sick fish from pens or tanks;
2. Removal and disposal of dead fish using legally permissible methods; diver biosecurity;
3. Emergency slaughter procedures;
4. Vaccination and prophylaxis policies, including vaccination procedures, documentation and auditing (in-house and third-party); vaccination biosecurity;
5. Use of chemicals and medicines; data sheet and COSSH information; stock control; recording usage; storage and safe handling of products;
6. Anaesthesia procedures.

### *Procedures for the control of specific diseases based on past history and risk assessments*

These procedures must include risk assessment, prevention, identification and diagnosis, control and treatment. Examples are as follows:

1. Freshwater parasites;
2. Bacterial diseases;
3. Saprolegnia;
4. Infectious pancreatic necrosis;
5. Pancreas disease and associated pathologies;
6. Sea lice;
7. Gill disease;
8. Algae/Jellyfish;
9. Deformities.

### *Monitoring, recording and control*

This section needs to cover the following:

1. Record keeping – health monitoring including monitoring of, for example, mortalities (separated into categories), sea lice numbers, gill disease, physical damage to fish, predation, deformities, occurrence of cataracts, vaccine responses, feeding behaviour and diver observations;
2. Occurrence of regular veterinary visits; recording observations and agreed actions;
3. Environmental monitoring (oxygen, temperature, algae/secchi, etc.);
4. Stock performance (sample weights, FCRs, feeding rates, etc.);
5. Veterinary and pathology reports;
6. On farm and company reporting structures and responsibilities relevant to the VHP/BP;
7. Health meetings and mechanisms for VHP/BP review, to include assessment of effectiveness of control measures in place; use of chemicals/medicines, mortality rates, incidence of specific disease;
8. Use of Animal Remedies Record Book, detailing all treatments and vaccinations undertaken;
9. Feed medicines details (brand, type, batch number, dates of use, quantity, etc.);
10. Use of Chemical Store log book.

### *Training*

A documented training programme must be in place to include areas specifically related to the VHP/BP. Examples of what the training programme must include are as follows:

1. Recognition of fish diseases;
2. Investigation of disease including correct sample submission and recording procedures;
3. Sea lice monitoring, recording and control procedures;
4. Safe and effective use of medicines and chemicals;
5. Fish handling;
6. Fish crowding/grading for management purposes;
7. Humane slaughter and culling of fish.

# ANNEX 3

## RISK ASSESSMENT PROTOCOL FOR FISH HEALTH

### INTRODUCTION

In cases relating to fish health, the documented risk assessment should be based on the model shown in this Annex. In other cases, a simplified risk assessment covering relevant aspects of the risks and the decisions taken is sufficient (see also Annex 1).

### RISK ANALYSIS

Risk analysis is a tool to aid decision making. It provides for a documented assessment of the risks associated with an activity, which can be evaluated by others. It can provide justification for proceeding with a course of action. Alternatively, it can provide a robust defence for not conducting a particular activity. Much of the risk analysis required for compliance with the CoGP will be qualitative rather than quantitative. This means the estimated risk will be expressed in words, e.g. high, moderate or very low, as opposed to a numerical estimate of probability. Nevertheless, qualitative risk analysis is accepted as a valid and useful means of assessing risk. The quality of any risk analysis is dependent on the knowledge and expertise of the individual or team conducting the risk analysis and, as with HACCP analysis, some risk assessments will require a multidisciplinary approach. Every risk analysis contains elements that may be regarded to some extent as subjective. Therefore, transparency is essential. The following is a brief guide to risk analysis for fish health.

### STEP 1: HAZARD IDENTIFICATION

In fish health terms, hazard identification normally involves identifying the pathogens that could *potentially* cause disease following the movement or importation of biological material or equipment, such as live fish or their eggs, personnel, vehicles, feed, nets or any other equipment or materials that could be contaminated with pathogens.

### STEP 2: RISK ASSESSMENT

The risk assessment step of risk analysis involves five components:

- release assessment;
- exposure assessment;
- probability of establishment;
- consequence assessment;
- risk estimation.

#### *Release assessment (R)*

Release assessment is the estimation of the probability (i.e. likelihood), that a hazard will be introduced as a result of the movement or importation of a biological material or equipment. In other words, it is an estimate of the probability that biological material or equipment will be infected or contaminated. Terms commonly used to qualitatively describe the probability of an event occurring are shown in Box 1 (adapted from AQIS, 1999). In making an assessment,

biological, source and item risk factors should be considered as outlined in Table 1. Each potential hazard should be dealt with separately. If the release assessment demonstrates no significant risk, the risk assessment can be terminated at that point.

**Box 1. Terms used to describe the probability of an event occurring**

| | |
|---|---|
| **High:** | Event would be expected to occur |
| **Moderate**: | There is a less than even chance of the event occurring |
| **Low:** | Event would occur occasionally |
| **Very Low:** | Event would occur very rarely |
| **Negligible**: | Chance of event occurring is so small it can be ignored. |

**Table 1. Examples of biological, source and item risk factors**

| Biological risk factors | Source risk factors | Item risk factors |
|---|---|---|
| Susceptibility of the species of fish | Incidence of clinical disease | Ease of contamination |
| Strain of pathogen | Prevalence of infection | Effect of processing, storage or transport |
| Means of transmission and infectivity of the pathogen | Geographical and environmental characteristics | Quantity of the item(s) |
| Impact of vaccination or treatment | Farming or husbandry practices | |
| | Health certification status of the farm or country of origin of the commodity | |

It may be necessary to consider risk factors for pathogens that could potentially be present on a farm, although there may be no signs of clinical disease, e.g. Infectious Salmon Anaemia (ISA) in marine farms stocking salmonid fish. Potential risk factors, including those identified for ISA by Jarp and Karlsen (1997) and Infectious Pancreatic Necrosis (IPN) by Murray *et al* (2004) on salmon farms are shown in Box 2.

**Box 2. Potential risk factors for disease on marine salmon farms**

Salmonid processing plant, with or without approved system for disinfection of waste water, within 5 km (disinfection of waste water reduces but does not eliminate the risk).

Location of infected site within 5 km (ISA) or 10 km (IPN).

More than one freshwater source of smolts.

Failure to remove dead fish daily, particularly during the summer months.

Pens arranged in a concentrated cluster rather than a longitudinal chain.

Multiple generations of fish on site.

Failure to clean, disinfect and fallow pens between production cycles.

## Exposure assessment (E)

Exposure assessment is the estimation of the probability that, if the disease agent is released, susceptible populations of fish would be exposed to a dose sufficient to cause infection. Biological factors, destination factors and item factors should be considered (Table 2). If the exposure assessment demonstrates no significant risk, the risk assessment can be terminated at that point.

**Table 2. Examples of biological, destination and commodity factors**

| Biological factors | Destination factors | Item factors |
|---|---|---|
| Susceptibility of the species of fish likely to be exposed | Presence of susceptible hosts or vectors | Whether the item is alive or dead |
| Strain of pathogen | Location of neighbouring farmed and wild fish populations | Intended use of the item |
| Infectivity and route of infection of the pathogen | Geographical and environmental characteristics | Waste disposal practices |
| Impact of vaccination or treatment | Farming or husbandry practices | Quantity of the item |

## Probability of establishment (R x E)

Estimating the probability of a disease becoming established involves multiplying the results of the release and exposure assessments. Any combination of probabilities involving a Negligible stage is Negligible and any probability multiplied by a High probability is unchanged (*e.g.* Low x High = Low). Adopting a precautionary approach, any probability multiplied by a Moderate probability is also treated as unchanged. However, when two Low probabilities are multiplied, the result is a Very Low probability and when two Very Low probabilities are multiplied the result is Negligible. A Low x Very Low combination should be treated as Negligible. Therefore, apart from the aforementioned three cases, when two probabilities are multiplied together the result is the lower of the two. This convention is illustrated in Table 3.

**Table 3. Two-way table showing the product of multiplying two qualitative probabilities**

| | | Exposure assessment (E) → | | | | |
|---|---|---|---|---|---|---|
| | | **Negligible (N)** | **Very Low (VL)** | **Low (L)** | **Moderate (M)** | **High (H)** |
| **Release assessment (R)** ↑ | **High (H)** | **N** | **VL** | **L** | **M** | **H** |
| | **Moderate (M)** | **N** | **VL** | **L** | **M** | **M** |
| | **Low (L)** | **N** | **N** | **VL** | **L** | **L** |
| | **Very Low (VL)** | **N** | **N** | **N** | **VL** | **VL** |
| ↓ | **Negligible (N)** | **N** | **N** | **N** | **N** | **N** |

## Consequence assessment

Consequence assessment consists of identifying the nature of any adverse effect(s) on human health, animal health or the environment which may result from the movement or importation of biological material or equipment and the likelihood of these effects occurring. The consequences may be biological, environmental and/or economic. Terms used to describe the severity of the impact, or level of significance of the consequences, are given in Box 3 (adapted from AQIS, 1999). If no adverse consequences are identified, or if the likelihood of the potential consequences occurring is negligible, the risk assessment can be terminated at that point.

**Box 3. Terms used to describe the significance of consequences**

**High:** Associated with diseases that would have serious biological effects (e.g. high mortality or morbidity). Such effects would be expected to be felt for a prolonged period and would not be amenable to control measures. Such diseases would be expected to result in significant economic losses at an industry level, or they may cause serious harm to the environment.

**Moderate:** Associated with diseases that have less pronounced biological effects. Such effects may harm economic performance at an enterprise/regional level. These diseases may be amenable to control measures at a significant cost, or their effects may be temporary. They may affect the environment, but such harm would not be irreversible.

**Low:** Associated with diseases that have mild biological effects and would normally be amenable to control measures. Such diseases would be expected to harm economic performance at an enterprise/regional level. Effects on the environment would be minor or temporary.

**Negligible:** Associated with diseases that have no significant or only transient biological effects. Such diseases may be readily amenable to control measures. The economic effects would be low at an enterprise level and insignificant at a regional level. Effects on the environment would be insignificant.

**Table 4. Risk evaluation matrix**

| | | Significance of Consequences → | | | |
|---|---|---|---|---|---|
| | | **Negligible (N)** | **Low (L)** | **Moderate (M)** | **High (H)** |
| **Probability of Establishment** ↑ | **High (H)** | **Yes** | **No** | **No** | **No** |
| | **Moderate (M)** | **Yes** | **No** | **No** | **No** |
| | **Low (L)** | **Yes** | **Yes** | **No** | **No** |
| | **Very Low (VL)** | **Yes** | **Yes** | **Yes/No** | **No** |
| ↓ | **Negligible (N)** | **Yes** | **Yes** | **Yes** | **Yes** |

**Yes = the risk is acceptable.**
**No = the risk is unacceptable and should not be taken without further risk management.**

### Risk estimation

The final component of the risk assessment step is risk estimation. Risk is calculated from the combination of probability and consequence. The matrix shown in Table 4 (AQIS, 1999) may be used to aid risk estimation. The risk determined is the unrestricted estimate of risk, i.e. the risk based on the absence of risk management, associated with the hazards identified. Each hazard should be considered separately in the risk evaluation. Note, when the probability of establishment is high and the significance of the consequences are high or moderate there is a clear presumption against taking the risk, but as the probability of establishment is reduced and the significance of the consequences are lower, the risk becomes acceptable.

## STEP 3 RISK MANAGEMENT

Risk management is the process of deciding upon and implementing sanitary measures to reduce the risks posed by a particular hazard associated with biological material or equipment to an acceptable level. Where there is significant uncertainty, a precautionary approach should be adopted, but there must be a rational relationship between the options chosen and the risk assessment. Sanitary measures should be monitored and reviewed, for example through inspections and random checks, to ensure they are in place and achieving the desired results.

## STEP 4 RISK COMMUNICATION

Risk communication is the process whereby information and opinions are gathered from potentially affected parties during the risk assessment and the results of the risk assessment are communicated to the decision makers, stakeholders and interested parties. The communication of risk should be interactive, iterative and transparent. The assumptions and uncertainty in the risk estimates of the risk assessment should be communicated. Peer review of any risk analysis is an important component of risk communication for obtaining critical evaluation aimed at ensuring the data, information and assumptions are the best and most appropriate available.

The following hypothetical scenarios illustrate the hazard identification and risk assessment steps of risk analysis. They are intended as a guide and should not be regarded as comprehensive or as directions to proceed with movements under similar circumstances.

***SCENARIO 1***

**Proposed activity**

Movement of a wellboat used to harvest fish from one marine salmon farm (Site A) to another marine salmon farm stocking post-smolts (Site B) in a different farm management area for the purpose of grading the fish.

**Hazard identification**

a) What pathogens are known to be present on Site A? e.g. IPN virus.

b) What pathogens could possibly be present on Site A given the location of the farm and the health status of neighbouring farms? e.g. Suspect pancreas disease (PD) on a neighbouring farm. No observations consistent with the presence of ISA at Site A but ISA virus is a potential hazard in the marine environment.

**Release assessment (R)**

Biological factors - The fish on Site A are susceptible to all the identified hazards. IPN, PD and ISA can be spread by horizontal transmission via contaminated equipment.

Source factors - The fish on Site A are known to be infected with IPN, although the prevalence of infection is unknown. The fish on Site A may be carrying PD virus. They are not suspected of infection with ISA – there are no known risk factors for ISA other than the fact that the farm is situated in marine waters. There are no clinical signs of disease at Site A.

Item factors - The hull of the wellboat has self-cleaning antifoulant paint and is free of fouling. The pipes, nets and wells of the wellboat come into direct contact with live fish and could be contaminated.

The conclusion is that the probability that IPN, PD and ISA could be released as a result of the movement of the wellboat from Site A to Site B is MODERATE, LOW and VERY LOW, respectively. Continue with the risk assessment.

**Exposure assessment (E)**

Biological factors - Fish at Site B are susceptible to infection with IPN, PD and ISA. IPN, PD and ISA can be spread by horizontal transmission via contaminated equipment.

Destination factors - The fish at Site B recently suffered a clinical outbreak of IPN. They are not suspected of infection with PD or ISA. None of the other farms in the farm management area, including the company's own farms operated by the same staff from the same shore base as Site B, are suspected of infection with PD or ISA.

Item factors - The wellboat will visit Site B to grade the post-smolts. It will operate close to the cages and the post-smolts will come into direct contact with the pipes, nets and wells of the wellboat.

The conclusion is that if IPN, PD or ISA was transferred to Site B via the movement of a wellboat from Site A, the probability that fish could be exposed to a dose sufficient to cause infection with IPN, PD or ISA from Site A to Site B is MODERATE. Continue with the risk assessment.

**Probability of establishment (R x E)**

The probability of IPN, PD or ISA becoming established at Site B as a result of the movement of a wellboat from site A would be MODERATE, LOW and VERY LOW, respectively.

**Consequence assessment**

The consequences of the establishment of IPN at Site B would be NEGLIGIBLE since fish on the farm are already infected. The consequences of the establishment of PD would be MODERATE. The consequences of the establishment of ISA would be HIGH.

**Risk estimation**

For IPN, the probability of establishment = MODERATE and the significance of the consequences = NEGLIGIBLE. Therefore, the risk is acceptable.

For PD, the probability of establishment = LOW and the significance of the consequences = MODERATE. Therefore, the risk is not acceptable and risk management measures are warranted.

For ISA, the probability of establishment = VERY LOW and the significance of the consequences = HIGH. Therefore, the risk is not acceptable and further risk management measures are warranted.

***SCENARIO 2***

**Proposed activity**

Movement of live salmon smolts from a farm in a freshwater loch (Site C) to a fallow marine farm (Site D) by helicopter bucket.

**Hazard identification**

a) What pathogens are known to be present on Site C? e.g. *Saprolegnia* and *Ichthyobodo* (*Costia*).

b) What pathogens could possibly be present on Site C given the location of the farm and the health status of neighbouring farms? e.g. Not applicable as no other farms within the same freshwater loch.

c) What pathogens could be associated with the helicopter buckets? e.g. Not applicable as buckets thoroughly cleaned and disinfected on arrival.

**Release assessment (R)**

Biological factors - The fish at Site C are susceptible to *Saprolegnia* and *Ichthyobodo*. Both *Saprolegnia* and *Ichthyobodo* can be spread by live fish movements and horizontal transmission via equipment.

Source factors - Clinical signs of disease due to *Saprolegnia* have been observed at Site C. The prevalence of infection with both *Saprolegnia* and *Ichthyobodo* is estimated to be high.

Item factors - The pre-smolts, transport water and helicopter buckets could be contaminated with *Saprolegnia* and *Ichthyobodo.*

The conclusion is that the probability that *Saprolegnia* and *Ichthyobodo* could be released as a result of the movement of pre-smolts from Site C to Site D is HIGH. Continue with the risk assessment.

**Exposure assessment (E)**

Biological factors - *Saprolegnia* and *Ichthyobodo* are unlikely to cause clinical disease in the marine environment.

Destination factors - There are no fish on Site D at present.

Item factors – the smolts are likely to recover from *Saprolegnia* and *Ichthyobodo* infection in the marine environment. There is a need to identify any potential hazards in the event that the helicopter buckets become contaminated with sea water from Site D.

*Conclusion* - The probability that fish at Site D will be exposed to a dose of *Saprolegnia* and *Ichthyobodo* sufficient to cause infection is NEGLIGIBLE. The risk assessment can be terminated. However, a potential risk associated with helicopter buckets returning to Site C has been identified.

**Risk estimation**

The risk assessment was terminated because *Saprolegnia* and *Ichthyobodo* posed a negligible threat of disease in the marine environment. However, a separate risk analysis to determine the risk associated with the movement of helicopter buckets from Site D to Site C should be carried out.

***SCENARIO 3***

**Proposed activity**

Movement of live salmon grower fish from a marine farm in one farm management area (Site E) to a marine farm in another farm management area (Site F), which is stocked with the same year class of fish, to facilitate the harvest of fish from Site E. Site E is located in an area that is notoriously difficult to access by wellboat in poor weather conditions.

**Hazard identification**

a) What pathogens are known to be present on Site E? e.g. IPN.

b) What pathogens could be present on Site E given the location of the farm and the health status of neighbouring farms? e.g. No observations consistent with the presence of ISA at Site E but ISA virus is a potential hazard in the marine environment.

c) What pathogens could be associated with the wellboat? e.g. Not applicable as wellboat thoroughly cleaned and disinfected after completion of the harvest at Site E and before arriving on Site F.

**Release assessment (R)**

Biological factors - The fish at Site E are susceptible to IPN and ISA. Both IPN and ISA can be spread by live fish movements.

Source factors - The fish at Site E are confirmed infected with IPN although the prevalence of infection is unknown. The fish are not suspected of infection with ISA. The cages were fallow prior to the current intake of fish, but risk factors for ISA include: the farm is situated in marine waters and other farms in the same farm management area as Site E did not fallow synchronously. There are no clinical signs of disease at Site E.

Item factors - The commodity is live grower salmon.

The conclusion is that the probability that IPN or ISA virus could be released as a result of the movement of live grower salmon from Site E to Site F is HIGH or LOW, respectively. Continue with the risk assessment.

**Exposure assessment (E)**

Biological factors - The fish on Site F are susceptible to IPN and ISA. IPN and ISA can be spread by live fish movements.

Destination factors - The fish on Site F are known to be infected with IPN virus. There is no suspicion of ISA at Site F or at any of the other farms in the same farm management area.

Item factors – The commodity is live grower salmon that will be released into pens at site F.

Conclusion - The probability that fish at Site F will be exposed to a dose of IPN or ISA sufficient to cause infection if the live fish from Site E are infected is HIGH.

**Probability of establishment (R x E)**

The probability that IPN and ISA would become established at Site F as a result of the movement of live fish from Site E is HIGH and LOW, respectively.

**Consequence assessment**

The consequences of the establishment of IPN at Site B would be NEGLIGIBLE since fish on the farm are already infected. The consequences of the establishment of ISA would be HIGH.

**Risk estimation**

For IPN, the probability of establishment = HIGH and the significance of the consequences = NEGLIGIBLE. Therefore, the risk is acceptable.

For ISA, the probability of establishment = LOW and the significance of the consequences = HIGH. Therefore, the risk is not acceptable and further risk management measures are warranted.

It may be that in some cases, particularly where the commodity to be moved or imported is live fish, there are no risk management measures available to reduce the risk to an acceptable level and the movement should not go ahead.

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## ANNEX 4

# DISINFECTION PROCEDURES



Fisheries Research Services Internal Report No 13/06

**DISINFECTION GUIDE VERSION IV**
**PRACTICAL STEPS TO PREVENT THE INTRODUCTION AND MINIMISE TRANSMISSION OF DISEASES OF FISH**

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January 2006

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# DISINFECTION GUIDE (VERSION IV)
# PRACTICAL STEPS TO PREVENT THE INTRODUCTION AND MINIMISE TRANSMISSION OF DISEASES OF FISH

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## 1. INTRODUCTION

Emerging diseases have had a significant impact on development of the Scottish aquaculture industry, highlighting the importance of preventing their introduction and minimising their transmission. The risk of disease spread is reduced by the implementation of good sanitary practices by fish farmers, and fisheries and the application of effluent disinfection systems in the processing industry.

To maintain healthy fish stocks and minimise the introduction and spread of disease, the aquaculture industry should ensure best practice on farm sites, during transportation of live or dead fish and equipment, at the processing plant and during subsequent effluent and waste disposal. For an assessment of the risks associated with specific tasks, reference should be made to the *Final Report of the Joint Government/ Industry Working Group on Infectious Salmon Anaemia (ISA)* available from the Fisheries Research Services (FRS) web site, at www.frs-scotland.gov.uk.

The protocols described in this guide are based upon current scientific knowledge and practical experience and will continue to be developed as the needs of industry change. This guide is intended for distribution to relevant industry personnel.

## 2. HEALTH & SAFETY (H&S)

Current health and safety guidelines must be followed at all times. Higher concentrations of disinfectant than necessary can be dangerous to personnel. Label instructions should be followed carefully, referring to the manufacturer's guidelines, including expiry date. Staff must be aware of the appropriate COSHH and risk assessments and must be trained before undertaking any disinfection procedure. Facilities, including operating structures, cages, tanks or vessels must be fit for purpose.

It should be noted that in rare cases some disinfectants may cause a hypersensitive reaction in susceptible individuals.

## 3. DISCHARGE OF DISINFECTANTS

Discharge of disinfectants to the environment is controlled under:

- The Control of Pollution Act 1974 as amended by the Water Act 1989 and the Environment Act 1995 (COPA)

and

- The Food and Environment Protection Act 1985 Part II Deposits in the Sea, as amended by the Environment Protection Act 1990 (FEPA).

COPA discharge consents are issued by the Scottish Environment Protection Agency (SEPA) and must be obtained for discharges made during activities such as net and cage disinfection at both cage sites and shore bases and for effluent disinfection at processing plants. Certain disinfectant agents, such as chlorine and iodine, should be neutralised (see section 5.9.3) before discharge. A list of SEPA addresses is given in Appendix I.

FEPA discharge consents for disposal of waste at sea are issued by Fisheries Research Services (FRS).

## 4. CLEANING AND DISINFECTION

### 4.1 Cleaning

Surfaces and equipment must be thoroughly cleaned, with detergent if necessary to remove any grease or fats, prior to disinfection as the presence of organic material during the disinfection process impairs the effect of the disinfectant. Much infectious material may be removed or inactivated at this important stage.

### 4.2 Disinfection

A disinfectant is an agent that deactivates infection-producing organisms. Disinfectants are usually applied to inanimate objects and are often toxic or harmful to living tissue. To ensure effective treatment, disinfectants should always be applied at the recommended concentration and temperature and for the recommended contact time. The concentration and contact time are dependent on the conditions and procedure undertaken. Organic loading (dirt) has a negative impact on the efficacy of most disinfectants. Any disinfectant which has passed its expiry date should not be used.

It should be noted that good cleaning and disinfection procedures minimise the risk of disease transmission. However, disinfection is not synonymous with sterilisation.

## 4.3 Protocol for General Cleaning and Disinfection of Equipment

- Remove all visible organic material, using detergent if necessary to remove any grease or fats.
- Choose an appropriate disinfectant. In general, use a disinfectant which is effective against a broad spectrum of disease agents.
- Dilute the disinfectant to the recommended concentration, referring to the manufacturer's instructions.
- Apply the disinfectant to all surfaces to be treated and leave for the recommended contact time.
- Rinse with clean water, if necessary.

## 4.4 Choice of Disinfectant

A list of suitable disinfectants and dose rates for various applications is given in Table 1. This list is not exhaustive and will be subject to change as new information becomes available. The effective concentration of disinfectant is dependent on factors such as contact time, temperature and cleanliness of the substrate to be disinfected. It is assumed that all equipment is thoroughly cleaned and that effluent is properly filtered or pre-treated prior to the disinfection process. Certain conditions require special treatments, such as effluent from processing plants or nets, where the organic loading is very high.

## TABLE 1

Disinfectants, doses and applications

| Disinfectant | Example* | Dose | Application | Comments |
|---|---|---|---|---|
| Sodium hypochlorite | Klorsept (Jencons Scientific, UK) | 100 ppm, 10 min<br><br><br>1000 ppm, 10 min<br>1000 ppm, 6 hrs | Boats, cages, tanks, hand nets, harvest equipment<br>Processing plant effluent<br>Cage nets | Reported effective against ISA (Torgersen, 1998 and Smail *et al*., 2004) and IPN (Elliott & Amend, 1978)<br><br><br>Ensure an active free chlorine level of at least 5 ppm after treatment. |
| Chloramine T | Halamid® (Axcentive, France) | 1% (w/v), 5 min | Foot bath, non-porous surfaces | Reported effective against ISA (Smail *et al.,* 2004) (www.halamid.com) |
| Chlorine dioxide | Zydox AD-05 activated by DRA-2 (Zychem Technologies, Norway) | 100 ppm, 5 min | Processing plant effluent | Effective against ISA (Smail *et al*., 2004) |
| Iodophor | Buffodine, FAM30 (Evans Vanodine, UK) or Tegodyne (DiverseyJohnson, UK) | 100 ppm, 10 min | Foot bath, clothing, diving gear, hand nets, salmonid ova, non-porous surfaces | Reported effective against ISA (Smail et al., 2004) and IPN (Elliott & Amend, 1978)<br>Fading colour from brown to yellow indicates inadequate concentration. Not suitable for nets treated with antifoulant. |
| Peroxy compounds | Virkon S (Antec international, UK) | 1% (w/v), 10 min (IPN )<br>0.5% (w/v), 30 min (ISA) | Foot baths, non-porous surfaces | Reported effective against IPN, ERM and BKD.<br>Reported effective against ISA and furunculosis (www.antecint.co.uk). |
| Peracetic acid, hydrogen peroxide and acetic acid mix | Proxitane® 5 (Solvay Interox, UK) | 0.4% (v/v), 5 min | Non-porous surfaces | Reported effective against ISA (Smail *et al.,* 2004). |
| Quarternary ammonium compounds | Cetrimide (FeF Chemicals A/S, Denmark) | 125 ppm, 5 min | Plastic surfaces | Reported effective against VHS & furunculosis (Dorson & Michel, 1987). Not effective against IPN at 12,500 ppm. |
| Formic Acid | | pH < 4, 24 hours | Ensiling fish waste | Reported effective against ISA (Torgersen, 1998). Also, effective against BKD & furunculosis but not against IPN. (Smail *et al.,* 1993) |
| Ozone | | 8 mg/l/min, 3 min (Corresponding to redox potential 600-750 mV) | Water – intake and effluent | Reported effective against IPN, furunculosis, ERM and *Vibrio anguillarum* (Liltved *et al*., 1995).<br>Filtration, pre-treatment is recommended. |
| Heat | | 70°C, 2 hours (IPN)<br>60°C, 2 minutes (ISA)<br>37°C, 4 days (Noda) | Cage nets, diving gear, steam cleaning non-porous surface | Reported effective against IPN (Whipple & Rohovec, 1994).<br>Reported effective against ISA (Torgersen, 1998).<br>Reported effective against nodavirus (Frerichs *et al.,* 2000).<br>Heat treatment above 71°C may reduce nylon net breaking strain. |
| UV | | 122 mJ/cm$^2$/sec (IPN)<br>290 mJ/cm$^2$/sec (Noda) | Freshwater intake supply | Reported effective against IPN (Liltved *et al*.,1995).<br>Reported effective against Nodavirus (Frerichs *et al*., 2000).<br>Efficacy compromised by organic loading. May be combined with ozone for treating effluent from processing plants. |

*Inclusion of brand names is for illustrative purposes only and does not imply endorsement by Fisheries Research Services. Other products may be equally efficacious.

# 5. DISINFECTION PROCEDURES

## 5.1 Fish Farm Vessels and Ancillary Equipment

The following procedure is recommended for cleaning and disinfection of fish farm vessels, helicopter buckets, killing tables and most other fish farm equipment:

**Step 1** Remove all gross fouling and organic matter by scraping and brushing.

**Step 2** Clean using a detergent solution to remove particulate matter, fats and oils. Hot water may give optimum performance but check detergent manufacturer's instructions.

**Step 3** Apply disinfectant at recommended concentration for appropriate contact time.

**Step 4** Rinse with clean water if required.

Steps 2 and 3 may be combined as one step if a foaming detergent solution containing an appropriate disinfectant is used.

## 5.2 Well-boats and Feed Delivery Boats

The number of live fish transfers and feed deliveries made by boat is increasing and may involve serial deliveries to a number of sites. The risk of disease transmission by well-boats and feed delivery boats is highest where contact is made with fish or contaminated seawater. Well-boats and feed delivery boats may transmit disease via:

- Fish
- Transport water
- Bus stop deliveries
- Feed
- Personnel
- Ship structure
- Scavengers.

To minimise the risk of horizontal transmission of disease:

- Restrict access by farm staff to the vessel and from the vessel to the farm cages and other farm equipment.
- Avoid simultaneous carriage of waste and fresh feed.
- Ensure feed is processed to ensure a microbiologically safe product.
- Feed should be contained in clean containers, sealed to prevent scavenging by birds or rodents.
- Deliveries should be made to a single farm management area, to sites of the same health status or to those of highest health status first.

- The order of delivery should normally be to the youngest year class of fish first.
- Ensure appropriate vessel cleaning and disinfection procedures are followed.

Appropriate protocols for disinfection of well-boats and feed delivery vessels under different operational circumstances are given in Table 2. A risk assessment should be conducted before any operation involving the movement of vessels between sites or from a site to another location, such as a processing plant. In certain circumstances it may be necessary to employ a more rigorous stage than described in Table 2.

## TABLE 2

Disinfection stages required by well-boats and feed delivery boats under different operating circumstances

| Operation | Stage 1 | Stage 2 | Stage 3 |
|---|---|---|---|
| Arriving from out with UK waters | X | X | X |
| Leaving a site suspected or confirmed infected with a notifiable disease | X | X | X |
| Leaving a Control[1] or Surveillance Zone[2] for a new operating location of greater health status | X | X | X |
| Leaving a Surveillance Zone on shuttle runs, to destinations of greater health status | X | | |
| Operating between sites of equal health status within a single management area | X | | |
| Operating on shuttle runs between sites of equal health status | X | | |
| Leaving operations in one management area to start in a different management area | X | X | |
| Before and after operating on a broodstock site | X | X | |
| Routine anti-fouling (following company inspection) | X | X | X |

[1]In coastal areas - a control zone is defined as a circle of radius equal to one tidal excursion centred on the infected farm. In inland areas - a control zone may comprise all or part of a water catchment area.

[2]In coastal areas - a surveillance zone is defined as an area surrounding the control zone of overlapping tidal excursion zones. In inland areas - a surveillance zone comprises an extended area outside the established control zone.

**Stage 1** Brush/clean solids from surfaces. All pipe work, including vacuum pumps, must be cleared of fish. Pressure clean (with detergent) the following areas as appropriate:

- Deck
- Wells
- Equipment
- Protective clothing
- Pumps.

Hot water may give optimum performance but check manufacturer's instructions.

**Stage 2** Complete Stage 1 then steam clean and disinfect all surfaces, including the hull down to the waterline.

**Stage 3** Complete Stages 1 and 2 plus slip the vessel and clean and disinfect the hull below the waterline. While travelling to the slip, the vessel must be routed to minimise contact with any fish farm site.

**Note:** Stage 3 may not be necessary when leaving a Surveillance Zone if a self-polishing type of antifouling paint is used on the hull and the hull is free of fouling.

On well-boats, a disinfection checklist (Appendix III) should be kept with the ship's log. The Skipper is responsible for overseeing all procedures and must sign the checklist on completion. Copies should be retained for inspection and audit purposes.

Approval must be obtained from FRS for the movement of all items of equipment liable to transmit infection to or from sites suspected or confirmed infected with a List I or List II notifiable disease of fish. The form given in Appendix IV may be used for applications seeking approval to move equipment.

## 5.3 Delicate Ancillary Equipment

Electronic equipment (eg scales and thermometers) may be sprayed with alcohol and allowed to air dry, paying particular attention to manufacturer's instructions particularly in the initial removal of organic fouling.

## 5.4 Pallets

Plastic pallets should be disinfected according to the procedure described in Section 4.3. Wooden pallets must not be circulated between sites as the absorbent nature of wood means it is difficult to ensure successful disinfection. Pallets returned to the distribution or holding yard, together with those which may have been contaminated in transit, must be kept in a designated dirty area for disinfection or disposal.

## 5.5 Nets

Used nets should be transported in sealed containers. They should be tagged and logged on arrival at the designated dirty area of a net washing station to ensure they are kept separate from clean nets.

Nets should be immersed in sodium hypochlorite solution at a concentration of 1,000 mg/l for six hours (or an alternative equally effective disinfectant at the appropriate concentration) then rinsed with fresh water. The sodium hypochlorite solution must be agitated to ensure an even concentration of hypochlorite. If nets are very heavily fouled the sodium hypochlorite concentration should be increased to ensure the presence of at least 5 mg/l active free chlorine after six hours. Commercially available kits are available for measuring free chlorine concentration.

Alternatively, clean nets can be heat treated by immersion in hot water so that the entire net is subjected to a temperature of more than 65 °C for at least ten minutes.

Nets may be destroyed by incineration, disposed of in an approved landfill site or buried.

**Note**: Iodine based disinfectants are not suitable for use on nets treated with copper based compounds. Iodine will render the antifouling process ineffective. Heat treatment of nylon nets above 71°C can significantly affect their breaking strain.

## 5.6 Cages and Moorings

All removable items, including cage nets, should be cleaned and disinfected according to the appropriate procedures. As a minimum, cages, barges etc. should be scraped clean, using divers if necessary, and disinfected down to and including the waterline. The rest of the structure should be left fallow for at least four weeks.

In the event that a farm is infected with a List I or List II notifiable disease, the entire cage structure may be required to be cleaned and disinfected. Cages can be moved onshore for disinfection or wrapped in a tarpaulin at sea (SEPA authorisation for discharge may be required). If the cages are to be reused on the same farm it may be permissible for the cages to be left in situ for the required fallow period following the cleaning and disinfection of the cages down to and including the waterline. The minimum fallow period in such cases is normally 3-6 months.

Sub-surface moorings can be considered as part of the seabed and, as such, they can be left to fallow *in situ*. If moorings from a site infected with a List I or List II notifiable disease are required for use on another site, and the appropriate fallowing period has not been observed, they must be cleaned and disinfected prior to transfer.

## 5.7 Fish Farm Staff, Divers, Diving Gear and Site Visitors

Fish diseases can be transmitted *via* equipment or personnel who come into contact with infected fish during working practices. It is important that strict hygiene procedures are followed on a daily basis. Staff and visitors, including divers, should use the protective clothing supplied on site. Divers removing dead fish from an infected site before diving on another site, without first thoroughly disinfecting their equipment, pose a serious risk with respect to disease transmission. Fish farm and diving companies should consider allowing for site-specific gear on sites suspect or infected with ISA, VHS or IHN. Dirty and disinfected suits and associated equipment should be kept separate at all times.

Staff servicing sites with the same fish farm vessel should clean and disinfect the vessel to the waterline on leaving each site. Footbaths and brushes should be strategically placed for the disinfection of equipment where this is not site-specific. The site manager should take responsibility for ensuring good practice, including the maintenance of foot baths at an effective concentration.

Diving suits and equipment should be treated as follows:

**Step 1** Remove organic debris, clean with an appropriate detergent and rinse with clean water.

**Step 2** Immerse in fresh water containing iodophor (minimum 100 mg/l free iodine) or an equally effective disinfectant for 20 minutes. Alternatively, heat treat by immersing equipment in clean fresh water so that the gear is maintained at a minimum of 60°C for at least two minutes.

**Step 3** Rinse thoroughly with clean water.

## 5.8 Harvesting

Permission to move fish off sites subject to official controls for notifiable diseases must be sought from the Scottish Ministers prior to harvesting. The form given in Appendix V may be used for such applications. All movements of live fish for harvest should be recorded in the site movement records.

There is a high risk of spread of disease associated with the slaughter of farmed fish. Containment of fish and fish products, including blood, is recommended at all on-site slaughtering operations and is mandatory at sites within a Control or Surveillance Zone for a List I or List II notifiable disease. If necessary, tarpaulins should be placed beneath killing tables and any spillage collected and disinfected using sodium hypochlorite (1,000 mg/l for 10 minutes) or iodophor (1,000 ppm for 10 minutes). Care must be taken to ensure that there are no fish escapes and mortalities must be disposed of in an approved manner.

Harvest bins should be leak-proof, lined with polythene bags and have well fitting lids strapped on tightly. To prevent spillage of blood in transit the bins must not be over filled. Leaking bins or bins with broken straps or poorly fitting lids should not be used. All bins should be labelled for identification purposes and cleaned and disinfected between sites. Separate bins should be used in areas infected with a List I or List II disease.

Vehicles used to transport harvest bins should be fitted with a drainage pipe and sump to collect any spillage. In the event of spillage, the lorry bed and sump must be disinfected. Lorries should carry disinfectant and drivers should be trained in the use of the equipment and chemicals to be applied on leaving a site and in the event of spillage in transit. Contingency plans should be in place to deal with a major spillage or loss of a harvest bin in transit.

If a well-boat is used to transport fish, the valves must remain closed within 5 km or one tidal excursion (whichever is greater) of any fish farm or wild fishery. Fish must be transferred directly from the wells and not held in cages at the processing plant prior to harvest. Well water should either pass through the processing plant effluent treatment system prior to discharge or be discharged out with a tidal excursion or 5 km (whichever is greater) of any fish farm site. If

the processing plant itself is located more than two tidal excursions away from any fish farm site or significant wild fishery then the effluent may be discharged directly from the well, in the absence of blood or blood products.

## 5.9 Processing Plants and Ensiling

Fish blood and viscera may be particularly infectious. Therefore, strict hygiene practices must be maintained during the processing of fish and staff must be trained in observing recommended procedures. In addition, staff must be trained to recognise clinical signs of disease as fish showing clinical signs of disease are not permitted to be marketed for human consumption.

All drains should interconnect to the waste treatment plant to ensure containment of fish products and effluent discharges. Access should be restricted into the plant and between work areas.

Disinfectant foot baths and brushes must be used on entering and leaving the facility. Suitable notices must be in place at entrances restricting access and at disinfection points compelling the use of footbaths. The concentration of disinfectant should be checked and logged at least once a day and maintained at an effective level. Protective clothing should be regularly cleaned and disinfected, at least at the end of each shift, and kept on site. Plant managers may find the checklist in Appendix VI useful.

All equipment associated with the delivery of harvested salmon, mortalities, fish waste, including lorries, tubs, lids, barrels, tote bags, skips and covers, etc, must be thoroughly cleaned and disinfected. Washing and disinfection must be carried out within a designated area, ensuring that all waste is collected and disinfected before disposal.

### 5.9.1 Ensiling

The process of ensiling inactivates ISA virus and many other fish pathogens, such as the causative agents of bacterial kidney disease and furunculosis. Mortalities and viscera may be ensiled by a process of blending the fish to a liquefied state and mixing with formic acid. Ensiling requires a minimum of 24 hours at pH < 4.0. Logs of pH measurements should be kept and made available for inspection.

**Note:** Ensiling does not inactivate Infectious Pancreatic Necrosis (IPN) virus. Consequently, ensiled waste should not be regarded as free from risk with respect to disease transmission.

### 5.9.2 Effluent treatment

All effluent and blood water associated with fish processing should be contained and passed through an approved disinfection procedure. This is mandatory for processing of fish from ISA, VHS and IHN-infected areas and strongly recommended for all fish processing plants. Approved treatments for disinfecting blood water include sodium hypochlorite, ozone and a combination of ozone and UV radiation. All these treatments are inactivated by organic material and it is important to remove as much of this as possible, for example by filtration, before treatment.

Sodium hypochlorite must be added to ensure a residual chlorine concentration of at least 5 mg/l for more than 30 minutes. Generally, an initial concentration of 1,000 mg/l of sodium hypochlorite is sufficient. If the effluent treatment system includes a bacteriological digestion system or a high level of filtration the required concentration of hypochlorite can be reduced.

Ozone and UV treatment are only effective if particulate matter, including red blood cells, is removed prior to disinfection. This can be achieved by eg a bacteriological treatment plant or a filter capable of removing particles down to 7 µm in size. The sludge must be treated as high risk waste and ensiled by mixing with formic acid to a pH of less than 4.0 for 24 hours. Ozone must be added to give a minimum of 8 mg/l/min (equivalent to a Redox potential of 600-750 mV) for three minutes. If UV is to be used the dose must exceed 120 mJ/cm$^2$. It is seldom used on its own, but has proved effective in plant systems employing a combination of ozone and secondary UV treatment. There must be a logging system to monitor the dose and a back-up method must be in place in the event of failure of the disinfection system.

### 5.9.3 Neutralisation of sodium hypochlorite

Sodium hypochlorite should be neutralised with sodium thiosulphate prior to discharge. Five moles of thiosulphate neutralise four moles of chlorine. The molecular proportions are the same for iodine (http://www.oie.int). Care must be taken to ensure adequate mixing, eg by aeration. Treated water must be disposed of through a SEPA-approved location. SEPA will advise on the use of such agents.

### 5.9.4 Movement of waste

The movement of waste must be accompanied either by a waste transfer note, or consignment note if it is high risk waste (available from SEPA). This material must be disposed of at a waste management facility which is licensed to handle high risk waste.

## 5.10 Disinfection of Salmonid Ova

Reference should be made to current OIE guidelines for the disinfection of ova (http://www.oie.int/eng/normes/mcode/en_sommaire.htm). The following procedures are recommended to minimise the risk of extra-ovum transmission of fish pathogens from parent to progeny.

- Contamination of gametes with urine, faeces and blood should be avoided during stripping.

- Disinfection of pre-hardened eggs should take place as soon after fertilisation as possible, using buffered iodophor volume for volume in 0.9% isotonic saline solution to give a free iodine concentration of 100 ppm for 10 minutes. Thorough rinsing of disinfected, fertilised eggs should be carried out using clean isotonic saline followed by fresh water.

- Disinfection of eyed eggs should be carried out using iodophor solution to give a free iodine concentration of 100 ppm, prior to hatch or movement to another water supply.

## 6. DISPOSAL OF DEAD FISH

Subject to safe operating conditions, mortalities should be removed on a daily basis and should be disposed of by an approved method in accordance with Regulation (EC) 1774/2002. Local authorities have responsibility for waste disposal. A list of local authorities is provided in Appendix II.

## 7. PREVENT THE INTRODUCTION OF *GYRODACTYLUS SALARIS* INTO SCOTTISH WATERS

*Gyrodactylus salaris* is a parasite which infests the skin and fins of salmon, trout and some other types of fish in fresh water. It does not occur in UK rivers but our salmon, like those in Norway, are killed by the parasite. It is hardy and may inadvertently be introduced by fishermen, in damp conditions in bags, angling equipment and via dead fish, including bait. It reproduces very quickly, capable of starting an epidemic in a short time. Those responsible for fresh water fisheries should ensure good biosecurity measures are in place and that staff are aware of the risks.

If travelling from affected areas, ensure equipment is disinfected before fishing in UK waters.

Methods of disinfection

- Dry at 20 °C for two days
- Heat for at least 1hour at > 60 °C
- Deep freeze > 24 hours
- Immerse in disinfectant for at least 10 minutes using either:

  Virkon 1%
  Wescodyne 1%
  Sodium Chloride 3%
  Sodium Hydroxide 0.2%

Reference should be made to the leaflet "*Keep Fish Diseases Out – A guide to protecting freshwater fish stocks from gyrodactylosis and other serious fish diseases*" (http://www.frs-scotland.gov.uk/Uploads/Documents/General%20Leaflet%20very%20latest!.pdf).

## 8. FISHERIES

Biosecurity of a fishery is more difficult than in the farm situation. The risk of introduction and transmission of disease may be minimised by avoiding stock transfer between catchment areas, restricting the movement of personnel and equipment; developing and implementing contingency plans for disease outbreaks, prompt diagnosis of disease problems and staff training.

Moribund or dead fish and viscera (fish guts) should not be returned to ponds/the river. They should be disposed of by sealing in a polythene bag and placed in a waste bin destined for an approved landfill.

Sick or recently dead fish showing clinical signs of disease should be submitted to FRS Fish Health Inspectorate for diagnostic investigation (contact fishhealth@marlab.ac.uk or the Duty Inspector at 01224 295525). This may be co-ordinated via the local District Salmon Fishery Board or Fisheries Trust biologist, (contact www.asfb.org.uk/asfb.html).

## 9. DISINFECTANT APPROVAL SCHEME

Under provisions of the Animal Health Act 1981, the Department for Environment, Food and Rural Affairs (Defra) maintains a list of disinfectants that are approved for use in the control of notifiable diseases of terrestrial animals and birds. At present, this system of approval does not extend to the notifiable diseases of fish and shellfish.

Directive 98/8/EC of the European Parliament and of the Council of 16 February 1998 concerning the placing of biocidal products on the market specifies that all biocides should be demonstrably both efficacious and safe for their intended purpose before they can be marketed. Appropriate efficacy testing standards were not specified in the Directive and it will be some time before products that are currently in use are re-evaluated against the standard criteria.

Defra propose to introduce a voluntary listing system whereby companies can demonstrate to Defra that products are effective at inactivating a range of pathogens found in aquaculture. Products that pass appropriate test criteria can then be listed as being effective against the pathogens they have been tested against. This list should be useful, both to companies wishing to market disinfectants for use in aquaculture, as well as to health professionals and fish farmers wishing to select appropriate biocides.

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Scottish Executive and DEFRA *Keep Fish Diseases Out – A guide to protecting freshwater fish stocks from gyrodactylosis and other serious fish diseases*. Crown copyright (2005) 2 pp.
(http://www.frs-scotland.gov.uk/Uploads/Documents/General%20Leaflet%20very%20latest!.pdf)

## APPENDIX I

## SEPA Contact Addresses for Further Information

**North Region**
North Region HQ, Graesser House, Fodderty Way, Dingwall, IV15 9XB
Tel: 01349 862021; Fax: 01349 863987.

Fort William Area Office, Carr's Corner, Lochybridge, Fort William, PH33 6TQ
Tel: 01397 704426; Fax: 01397 705404.

Thurso Area Office, Thurso Business Park, Thurso, Caithness, KW14 7XW
Tel: 01847 894422; Fax: 01847 893365

Western Isles Area Office, 2 James Square, James Street, Stornoway, Isle of Lewis, HS1 2QN
Tel: 01851 706477; Fax: 01851 703510.

Orkney Area Office, 58A Junction Road, Kirkwall, Orkney, KW15 1AG
Tel: 01856 871080; Fax: 01856 871090

Shetland Area Office, The Esplanade, Lerwick, ZE1 0LL
Tel: 01595 696926; Fax: 01595 696946

**West Region**
West Region HQ, 5 Redwood Crescent, Peel Park, East Kilbride, G74 5PP
Tel: 01355 574200; Fax: 01355 264323

Argyll and Bute Area Office, 2 Smithy Lane, Lochgilphead, Argyll, PA31 8TA
Tel: 01546 602876; Fax: 01546 602337

## APPENDIX II

## Local Authority Contact Addresses for Further Information

**Aberdeen City**
Aberdeen City Council, Town House, Broad Street, Aberdeen, AB10 1FY
TEL: 01224 522000 FAX: 01224 644346

**Aberdeenshire**
Aberdeenshire Council, Woodhill House, Westburn Road, Aberdeen AB16 5GB
TEL: 01467 620981 FAX: 01224 665444

**Angus**
Angus Council, Council Headquarters, The Cross, Forfar, DD8 1BX
TEL: 01307 461460 FAX: 01307 461874

**Argyll and Bute**
Argyll and Bute Council Headquarters, Kilmory Castle, Lochgilphead, Argyll, PA31 8RT TEL: 01546 602127, FAX: 01546 604138

**Clackmannanshire**
Clackmannanshire Council, Greenfield, Alloa, FK10 2AD
TEL: 01259 452002, FAX: 01259 452230

**Dumfries and Galloway**
Dumfries and Galloway Council, Council Offices, English Street, Dumfries, DG1 2DD TEL: 01387 260000, FAX: 01387 260034

**Dundee City**
Dundee City Council, 21 City Square Dundee, DD1 3BY
TEL: 01382 434201, FAX: 01382 434996

**East Ayrshire**
East Ayrshire Council Council Headquarters London Road Kilmarnock KA3 7BU
TEL: 01563 576000 FAX: 01563 574062

**East Dunbartonshire**
Environmental Health, East Dunbartonshire Council, Tom Johnston House, Civic Way, Kirkintilloch, Glasgow, G66 4TJ
TEL: 0141 761 4891, FAX: 0141 761 4888

**East Lothian**
East Lothian Council, Council Buildings, Court Street, Haddington,
East Lothian EH41 3HA,
TEL: 01620 827827, FAX: 01620 827888

**East Renfrewshire**
East Renfrewshire Council, Council Headquarters, Eastwood Park, Rouken Glen Road, Giffnock, East Renfrewshire, G46 6UG
Tel. no. 0141-577 3009, Fax no. 0141-577 3890

**Edinburgh, City of**
City of Edinburgh Council, Council Headquarters, Wellington Court, 10 Waterloo Place, EDINBURGH, EH1 3EG
TEL: 0131 200 2000, FAX: 0131 469 3010

**Eilean Siar, Comhairle nan (Previously known as Western Isles Council)**
Comhairle nan Eilean Siar, Council Offices, Sandwick Road, Stornoway, Isle of Lewis, HS1 2BW
TEL: 01851 703773, FAX: 01851 705349

**Falkirk**
Falkirk Council, Municipal Buildings, Falkirk, FK1 5RS
TEL: 01324 506070, FAX: 01324 506071

**Fife**
Fife Council, Fife House, North Street, Glenrothes, Fife, KY7 5LT
TEL: 01592 413998, FAX: 01592 413990

**Glasgow City**
Glasgow City Council, City Chambers, George Square, Glasgow, G2 1DU
TEL: 0141 287 2000, FAX: 0141 287 5666

**Highland**
Highland Council, Glenurquhart Road, Inverness, IV3 5NX
TEL: 01463 702000, FAX: 01463 702111

**Inverclyde**
Inverclyde Council, Clyde Square, Municipal Buildings, Greenock, PA15 1LY
TEL: 01475 717101, FAX: 01475 712777

**Midlothian**
Midlothian Council, Midlothian House, Buccleuch Street, Dalkeith, Midlothian EH22 1DJ
TEL: 0131270 7500, FAX: 0131 271 3050

**Moray**
Moray Council, Council Office, High Street, Elgin, Moray, IV30 1BX
TEL: 01343 543451, FAX: 01343 540183

**North Ayrshire**
North Ayrshire Council, Cunninghame House, Friar's Croft, Irvine, KA12 8EE
TEL: 01294 324100, FAX: 01294 324144

**North Lanarkshire**
North Lanarkshire Council, Civic Centre, Motherwell, ML1 1TW
TEL: 01698 302222, FAX: 01698 275125

**Orkney Islands**
Orkney Islands Council, Council Offices, Kirkwall, Orkney, KW15 1NY
TEL: 01856 873535, FAX: 01856 874615

**Perth & Kinross**
Perth & Kinross Council, PO Box 77, 1 High Street, Perth, PH1 5PH
TEL: 01738 475000, FAX: 01738 635225

**Renfrewshire**
Renfrewshire Council, Council Headquarters, Cotton Street, Paisley, PA1 1WD
TEL: 0141 840 3601, FAX: 0141 840 3349

**Scottish Borders**
Scottish Borders Council Headquarters, Newtown St Boswells, Melrose, TD6 0SA
TEL: 01835 825055, FAX: 01835 825059

**Shetland Islands**
Shetland Islands Council, Town Hall, Lerwick, Shetland, ZE1 OHB
TEL: 01595 744500, FAX: 01595 744509

**South Ayrshire**
South Ayrshire Council, County Buildings, Wellington Square, Ayr, KA7 1DR
TEL: 01292 612170, FAX: 01292 612158

**South Lanarkshire**
South Lanarkshire Council, Council Offices, Almada Street, Hamilton, ML3 OAA
TEL: 01698 454444, FAX: 01698 454275

**Stirling**
Stirling Council, Viewforth, Stirling, FK8 2ET
TEL: 01786 443320, FAX: 01786 443474

**West Dunbartonshire**
West Dunbartonshire Council, Council Offices, Garshake Road, Dumbarton, G82 3PU TEL: 01389 737702, FAX: 01389 737700

**West Lothian**
West Lothian Council, West Lothian House, Almondvale Boulevard, Livingston, West Lothian, EH54 6QG
TEL: 01506 777141, FAX: 01506 777102

## Checklist for Cleaning and Disinfection of Well-boats

| Cleaning | Tick | Disinfection | Tick |
|---|---|---|---|
| Hull below waterline | | Hull below waterline | |
| Hull above waterline | | Hull above waterline | |
| Wells | | Wells | |
| Grid plates | | Grid plates | |
| Pumps (including vacuum pump) | | Pumps (including vacuum pump) | |
| Bilge pumps | | Bilge pumps | |
| Sea valves | | Sea valves | |
| Deck | | Deck | |
| Railings | | Railings | |
| Bulkhead/casings | | Bulkhead/casings | |
| Hatches and covers | | Hatches and covers | |
| Derrick | | Derrick | |
| Crane | | Crane | |
| Ladders | | Ladders | |
| Counting table | | Counting table | |
| Ballast tanks | | Ballast tanks | |
| Other equipment (specify): | | Other equipment (specify): | |
| Water temperature used: | | Disinfectant used: | |
| Detergent used: | | Disinfectant concentration: | |
| I, | | Skipper of the | |
| have overseen the Cleaning and Disinfection procedures outlined in the Disinfection Guide with regard to ISA virus (Version II). | | | |
| Signed: | | (Skipper) | (Witness) |
| Date: | | Date: | |

## APPENDIX IV

## Application for Approval to Move Equipment

This form may be copied and used when making an application for approval to move equipment to or from site subject to official controls. Fill in the details required and fax or post to: The Duty Inspector, FRS Marine Laboratory, PO Box 101, Victoria Road, Aberdeen, AB11 9DB

Fax no: 01224 295620

| | | | | |
|---|---|---|---|---|
| For Official Use only: | | | | |
| Ref no: | | Inspector: | | |
| | | | | |
| Site name: | | | Site no: | FS/ |
| Business name: | | | | |
| Contact name: | | | Tel: | |
| Contact address: | | | Fax: | |
| Equipment source: | | | | |
| Equipment destination: | | | | |
| Proposed date of movement: | | | | |
| Equipment to be moved: | | | | |
| Reason for movement: | | | | |
| For Official Use only: | | | | |
| Approved by: | | Date: | | |

## APPENDIX V

## Application for Approval to Harvest Fish

This form may be copied and used when making an application for approval to harvest fish from a fish farm site with a Designated Area Order (DAO) or other official control notice in respect of a notifiable disease of fish. Fill in the details required and fax or post to: The Duty Inspector, FRS Marine Laboratory, PO Box 101, Victoria Road, Torry, Aberdeen, AB11 9DB

Fax no: 01224 295620.

| | | | | |
|---|---|---|---|---|
| For Official Use only: | | | | |
| Ref. no: | | Inspector: | | |
| | | | | |
| Site name: | | Site no: | | FS/ |
| Business name: | | | | |
| Contact name: | | Tel: | | |
| Contact address: | | Fax: | | |
| | | | | |
| Proposed start date for harvest: | | | | |
| Proposed finish date for harvest: | | | | |
| Number of fish to be harvested: | | | | |
| Process plant for harvested fish: | | | | |
| Proposed method of transport: | | | | |
| | | | | |
| For Official Use only: | | | | |
| Approved by: | | Date: | | |

## APPENDIX VI

### Check List for Processing Plants

| Check | Tick |
|---|---|
| Notices restricting access posted at all entrances | |
| Disinfectant foot baths with brushes provided at all entrances and exits with suitable notices | |
| Disinfectant concentration checked and maintained at effective level | |
| Vehicles entering and leaving the site pass through disinfection procedure | |
| Transport of fish in sealed, clean and disinfected containers | |
| On-site vehicles, forklift trucks routinely cleaned and disinfected | |
| Drains connected to disinfection plant *via* filters | |
| Yard clean and disinfected - no blood water evident | |
| Foot baths in place between discrete work areas, e.g. yard, factory, chill, etc. | |
| Protective clothing cleaned and disinfected (at least after every shift) | |
| Processing equipment, utensils, etc. routinely cleaned and disinfected | |
| System in place to prevent wind blown effluent when emptying fish bins | |
| Fish-receiving hopper/tank designed to prevent spillage of fish and effluent | |
| System in place to prevent access to carcasses by predators, e.g. birds | |
| Cleaning and disinfection system in place for empty bins | |
| Bins from ISA High Risk Areas kept separate from other bins | |
| Eviscerated material pumped into ensilage system and fully contained | |
| Log in place to monitor pH of silage (pH <4.0) | |
| Filter in place to remove particulates from effluent before treatment | |
| Log in place to monitor effluent treatment method (e.g. residual free chlorine level in effluent >5 PPM after 30 minutes) | |
| pH and free chlorine logs kept for inspection by MLA | |

| | | | |
|---|---|---|---|
| Inspected by: | | Date: | |
| Recommendations for improvements: | Y / N | | |
| Specify: | | | |

# ANNEX 5

## MINIMISING RISKS IN WELLBOAT OPERATIONS

### Introduction

The use of well boats for the movement of live fish and for grading and other day to day operations is an inherent part of modern salmon farming. Furthermore, wellboats may be used as a vehicle in the conduct of bath sea lice treatments where a specified biomass of fish is held in a tightly defined volume of water, thus improving flexibility of approach towards treatment.

When wellboats are used to move live fish, they create a link between fish farms and, therefore, present a hazard to be considered in risk management and biosecurity measures. The methodology under which risks associated with hazard may be assessed is outlined in Annex 3.

The guidance on minimising risk in relation to wellboat operations given here is based on the Final Report of the *Joint Government/Industry Working Group on Infectious Salmon Anaemia (ISA) in Scotland (2000)* (www.marlab.ac.uk), on the *Disinfection Guide (Version IV): Practical Steps to Prevent the Introduction and Minimise Transmission of Disease in F*ish and on additional analysis and information.

*Tracking the movement and valve status of wellboats and other vessels moving fish*

As of 1st January 2015, all wellboats engaged in moving live and dead fish should have the capacity to log and record their position.

As of 1st January 2015, all wellboats engaged in moving live and dead fish should have the capacity to log and record the status of their valves.

Positional information and information on valve status should be available in real time and retrospectively.

*Discharge of water from wellboats and other vessels moving fish*

As of 1st January 2015, all water arising from the dead-haul of fish to processing plants should be treated on-shore.

Provision should be made either for the disinfection of water used to transport live fish destined for harvesting, or the safe disposal of the water at sea (i.e. either at the site where it was extracted, or a minimum of two tidal excursions from any other site stocked with fish).

It is recommended that all water remaining after the transport of live fish to a slaughter and processing plant be filtered prior to discharge to the sea.

ⓘ
*Filtration may take place on-shore or onboard the vessel.*

## Minimising the risks

### *Cleaning and Disinfection*

The Disinfection Guide (Annex 4) indicates that wellboats may create a potential for pathogen transmission via a number of routes and these potential routes of transmission should be minimised through the use of sound operating procedures and strict hygiene controls.

Notwithstanding, it is accepted that the greatest risks associated with the use of wellboats arise not from the vessels themselves, but from the live fish they carry and from any pathogens which may be present in these fish. Thus, if a pathogen is present, the 'Probability of Establishment' and risk of spread will increase very significantly:

- where there is any contact between fish that have been brought to a farm and those that are already there; or
- where there is any contact between fish at a farm and potentially contaminated sea water or wash water; or
- where there is any contact between equipment on the boat, or pipes linking the boat to the farm, which have been used to handle one batch of fish and are not properly cleaned and disinfected before being used to handle another batch of fish.

Cleaning and disinfection procedure for well-boats and well-boat equipment are a critical control points in risk management. Guidelines on a three-stage cleaning and disinfection regime for well boats are published in the MSS Disinfection Guide (Annex 4) and for ease of reference are reproduced in Table 1. They are based on a regime focused on the degree of risk that may be encountered under different circumstances. To be fully effective they must be robustly established and must take account of the potential points on each vessel that may harbour contamination. These may vary in detail from vessel to vessel and each vessel therefore requires a robust and 'customised' cleaning and disinfection plan which must be strictly adhered to. Farmers should seek written assurance from well-boat operators that they have an up-to-date cleaning and disinfection plan that is being followed routinely.

**Table 1 Disinfection stages for wellboats under different operating scenarios.**

| Operation | Stage 1 | Stage 2 | Stage 3 |
|---|---|---|---|
| Arriving in UK waters | X | X | X |
| Leaving a site suspected or confirmed infected with a notifiable disease | X | X | X |
| Leaving a Control[1] Zone or Surveillance Zone[2] for a new operating location of greater health status | X | X | X |
| Leaving a Surveillance Zone[2] on shuttle runs, to destinations of greater health status | X | | |
| Operating between sites of equal status within a single management area | X | | |
| Operating on shuttle runs between sites of equal status | X | | |
| Leaving operations in one management area to start in a different area | X | X | |
| Before and after operating at a broodstock site | X | X | |
| Routine anti-fouling (following company inspection) | X | X | X |

Notes:

1. A Control Zone is a zone established for control of notifiable diseases e.g. ISA. In coastal areas it is defined as a circle of radius equal to one tidal excursion centred on the farm that has been diagnosed as infected. In inland areas a Control Zone may comprise all or part of a water catchment area.

2. A Surveillance Zone[4] is defined as an area surrounding the Control Zone e.g. ISA. In coastal areas it is defined as an area surrounding the Control Zone of overlapping tidal excursion zones. In inland waters a Surveillance Zone comprises an extended area outside the designated Control Zone.

3. Not all farm sites necessarily will have equal status within a Surveillance Zone[5.]

4. Subject to MSS approval, Stage 2 disinfection may be acceptable in the case of a vessel leaving a Surveillance Zone or a Control Zone, or a suspicious site, if a self-polishing type of anti-foulant paint is used on the hull, and the hull is foulant free.

The cleaning and disinfection regime outlined in ANNEX 9 involves the following three stages.

**Stage 1 (Daily hygiene procedure when working with fish)**

Brush/clean solids from all surfaces. All pipe work, including vacuum pumps, must be cleared of fish or fish waste. Pressure clean (with detergent) areas which have been in contact with fish and water with which fish have had contact:

- deck;
- wells;
- protective clothing;
- fish pumps and piping;
- all other relevant on-board equipment

Hot water cleaning may give optimum performance but check manufacturers' instructions and/or recommendations on specific items of equipment or clothing.

**Stage 2**

Complete Stage 1 then steam clean and disinfect all surfaces, including hull down to the water line.

**Stage 3**

Complete Stage 1 and Stage 2 plus slip the vessel and clean and disinfect the hull below the water line. While travelling to the slip, the vessel must be routed to minimise contact with fish farms.

Well-boat operators should complete and sign a check list of cleaning operations (see Appendix 3, Annex 4) which will indicate that cleaning and disinfection procedures have been conducted according to the appropriate schedule(s). Well-boat operators and farmers should receive a signed copy of the documentation, which should be retained at the farm site for auditing purposes.

***Operating Procedures***

In minimising the risks of wellboat operation there are important risk control points relating to the design and method of operation of the well-boat (closed valves for example), the standard operating procedures that are adopted by the farming company and the well-boat operator, and the way that the wellboat is deployed and used, as follows.

1. All wellboat operations should be subject to general or specific risk management assessment the degree of detail varying with the wellboat movement plan and planned use. In undertaking these assessments and in minimising risk the following points should be taken into account.

    - Operations in which fish are removed from a site by well boat are of lower risk than those that involve delivery of fish to, or return of fish to, an already occupied fish pen.
    - Deliveries or pick-ups of fish within a single management area limit between area risk exposure.
    - Deliveries or pick-ups should be made to farms of similar health status or, alternatively, to the farm with highest health status first.

It follows that farming companies should systematically allocate a status grading to each farm within an area so well-boat operations can be optimised to minimise risk.

2. Bus stop deliveries/collections are recognised to present a risk of disease transmission and should be subject to a documented risk assessment and agreement with all other operators within the same Farm Management Area. Where a well-boat has delivered fish to or collected fish from a site already containing fish, it should not then proceed directly to another farm without appropriate procedures to manage the risk.

3. Wellboats must travel closed (i.e. with no water exchange) when located within 5km of any finfish farm site.

4. Ballast water must not be discharged within 5km or one tidal excursion (whichever is greater) of a farm site. This means that ballasting and pump cleaning need to be part of a vessel's passage plan, and are sequential operations.

5. Procedures at farms should be designed to minimise risk of disease spread.
   - Access by farm personnel to the well-boat and by the well-boat personnel to the farm and farm equipment should be restricted.
   - Equipment should not be shared between well-boat and farm operations.

6. Compliance with the above procedures should be audited by the receiving farm-site management using the well-boat movement records, the disinfection logs and the corresponding fish movement records as a basis for their assessment of risk.

# ANNEX 6

## NATIONAL STRATEGY FOR SEA LICE CONTROL

### THE 1998 NATIONAL STRATEGY

At the Scottish Salmon Growers Association's Technical Seminar in November 1997, industry scientists reported on the findings of research on the survival and viability of the salmon louse during the course of the year. This research, which demonstrated that the reproductive capacity of female lice is compromised in the spring, resulting in reduced survival in their offspring, offered opportunities for a strategic approach to sea lice control via a coordinated late winter treatment offensive to lower the number of adult females to the lowest possible levels. This research gave rise to the *National Treatment Strategy for the Control of Sea Lice on Scottish Salmon Farms* and, through this, the formation of farm management areas, agreement on treatment criteria and strategic coordinated treatments within such areas.

### BACKGROUND TO THE REVISED STRATEGY

The 1998 Strategy was based exclusively on the use of bath treatments, with their accepted limitations in terms of the life stages targeted and the absence of prolonged efficacy. The addition of in-feed medicines to the armoury has significantly improved the farmers' ability to target and control lice on farms to the extent that it is now possible to control all life stages of the salmon louse for extended periods of time. This, coupled with accepted non-therapeutic health management approaches to sea lice control, has extended the farmers' ability to manage and control sea lice on farmed fish beyond what was possible in 1998.

The 1998 Strategy was reviewed prior to the First Edition of the CoGP. Several additional initiatives were taken into account.

- The advice of the Integrated Sea Louse Management (ISLM) Group in maximising the efficacy of licensed sea louse treatments medicines and minimising opportunities for the development of resistance. The objectives of the ISLM Group are:
    - to facilitate the free exchange of information amongst stakeholders including farmers, regulators, research scientists, pharmaceutical companies, wild fishery and environmental interest groups.
    - to identify current best practices in lice control and resistance management and to promote their use in the Scottish salmon farming industry
    - to provide practical guidance to salmon farmers;
    - to provide information and advice on policy to government and non-governmental organisations and to identify research priorities.

- Further recognition by the industry of the importance and benefits of non-therapeutic approaches to sea louse management and control.

- Recognition by the industry of the importance of minimising ovigerous lice at times of the year critical for wild salmonid populations.

- Industry concerns about continued re-infection of farmed fish by lice from fish in the wild, despite industry's best endeavours to control lice on farmed fish.

- Industry concerns about legislative controls which limit access to sea lice treatments and the impact of this on fish welfare.

- Recognition that sea lice can never be eradicated, that the use of medicines will be limited by regulation and that the range of unrelated actives will be limited.

- The distinction between *L. salmonis* and *C. elongatus* with regard to biology and epidemiology and the differing approaches to their treatment and control on farms.

- The development and implementation of the CoGP, allowing the National Strategy to be included as an integral part of the CoGP, with benefits and efficiencies in terms of independent auditing and compliance inspection which flow from that.

On the basis of experience, further minor changes in approach have been adopted and the following reflects the present principles and approaches that are currently adopted and underpin the 2nd Edition of the CoGP.

## PRINCIPLES OF THE NATIONAL STRATEGY

### Defining the farm management area

Farm Management Areas (FMA) on which the CoGP and the related National Sea Lice Strategy are based are shown in the final section of the CoGP.

### Identifying all the salmon farmers in the areas and obtaining written undertakings to observe the provisions of the National Strategy

Salmon farmers throughout Scotland have worked together to define areas within which cooperation and exchange of information on sea lice and their treatment and control takes place (see foregoing paragraph). A nominated farmer is appointed within each area to act as the coordinator and point of contact. Each farming company within each area should provide a written undertaking that its farms will observe the provisions of the National Strategy.

### Forming a farm management group

Farm Management Groups, including appropriate veterinary involvement, should be formed within each area. These Farm Management Groups will have the role of i) agreeing the basis for the monitoring of lice populations on farms and treatments, carried out in cooperation between participating farms; and ii) overseeing and coordinating monitoring and treatment activities.

### Agreeing the monitoring protocol and the frequency of monitoring

Lice numbers on all the farms should be counted weekly in accordance with scientific and statistical advice. The following sets out a suggested monitoring protocol based on scientific and statistical advice (*Sampling Strategies for Estimating Sea Lice Levels on Farmed Atlantic Salmon: Fryer, Revie & Gettinby*, personal communication).

- Weekly monitoring is necessary throughout the year.
- Pens and fish should be sampled at random.
- Personnel carrying out lice counts should have appropriate training in lice recognition and recording, and demonstrate post-training competence.
- Where there are more than five pens per site, five fish should be sampled from each of five pens to give a total of 25 fish.
- Where a site contains less than five pens all pens should be sampled to give a total of 25 fish. A similar number of fish should be selected from each pen.
- Fish should be netted from the cage and put straight into the anaesthetic.
- Each life cycle stage of *Lepeophtheirus salmonis* should be counted in turn, i.e. adult females, mobiles, chalimus (see Figure 1). All identifiable stages of C*aligus elongatus* should be grouped together (see Figure 1).
- After completing the lice counts on the fish from each pen, the tub containing the anaesthetic should be examined for sea lice which may have been shed from the fish and any lice found should be added to the total.
- The name of the person carrying out the counts, the date, the pen number and the water temperature at a depth appropriate to the depth of the pens used on the site should be recorded.
- Minimum recording requirements during sea lice counts are *L. salmonis* chalimus, mobiles and adult females (with or without egg strings) plus all identifiable stages of *C. elongatus* grouped together.

Alternative sampling regimes are acceptable, provided that they i) produce good estimates of lice numbers on fish held on the farms; and ii) that the results are periodically benchmarked against data gathered using the suggested protocol set out above.

Results should be communicated weekly to other farmers within the defined area. Nominated coordinators within each area should liaise with coordinators in adjacent areas.

### Agreeing the timing and criteria for treatments

The aim of non-therapeutic management practice and treatment with veterinary medicines is to disrupt the life cycle of *L. salmonis* and minimise the quantity of lice present on farms throughout the year. Research by salmon farmers clearly demonstrates that this is best achieved by coordinated louse treatments, particularly in early spring and early winter. Such treatments may also be effective in reducing the risk of infection to wild salmonids. A primary objective of the strategy should be a target of zero adult female lice on the farmed fish in the spring period when wild salmonids are migrating, hence:

- Coordinated spring treatments between week 8 and week 10 should be conducted by all farms within a management area that are in their second year

of production, or have put fish to sea in the previous year, if lice numbers are above threshold levels.

In general, treatments should be guided by the build-up of pre-adults as indicated by weekly counts, the objective being to prevent the development of gravid females. Suggested criteria for other treatments on individual farm sites are as follows:

- During the period 1st February to 30th June inclusive, the criterion for treatment is an average of 0.5 adult female *L. salmonis* per fish.

- During the period 1st July to 31st January inclusive, the criterion for treatment is an average of 1.0 adult female *L. salmonis* per fish.

Treatment for episodic *C. elongatus* infestations should be applied, as appropriate, to protect the welfare of farmed fish.

### Carrying out the treatments

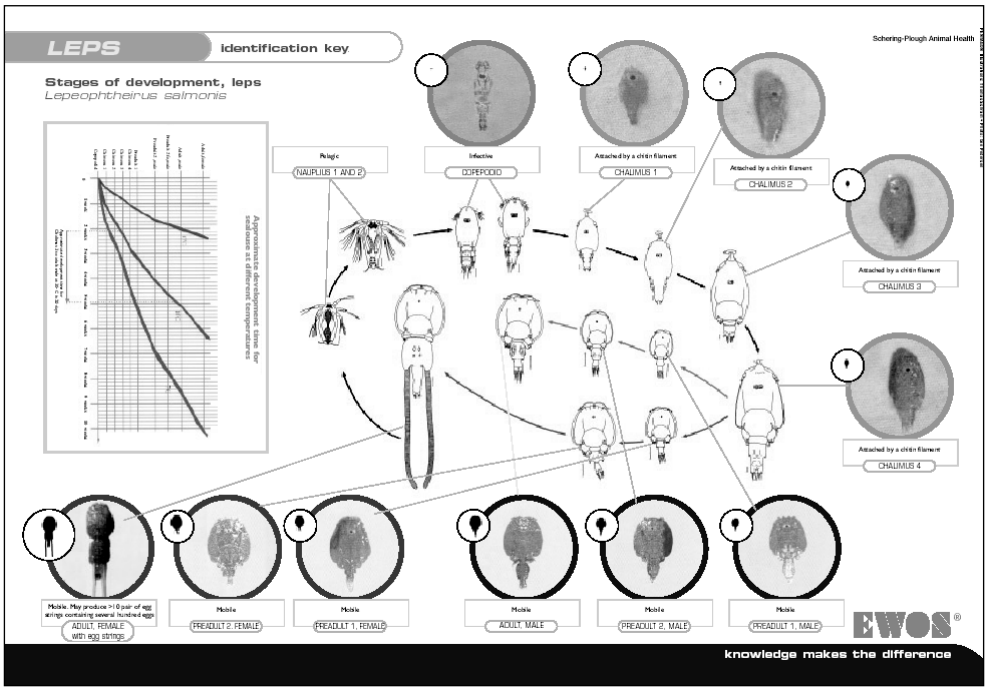
Treatments should be carried out promptly and in accordance with principles to maximise the effectiveness of treatments, promote the minimal use of medicines consistent with the maintenance of high standards of fish welfare and help preserve their efficacy. All farms should have CAR licence approval for a full suite of sea lice treatment products and should have provision for fully closed containment procedures, if medicants requiring such procedures are intended to be adopted.

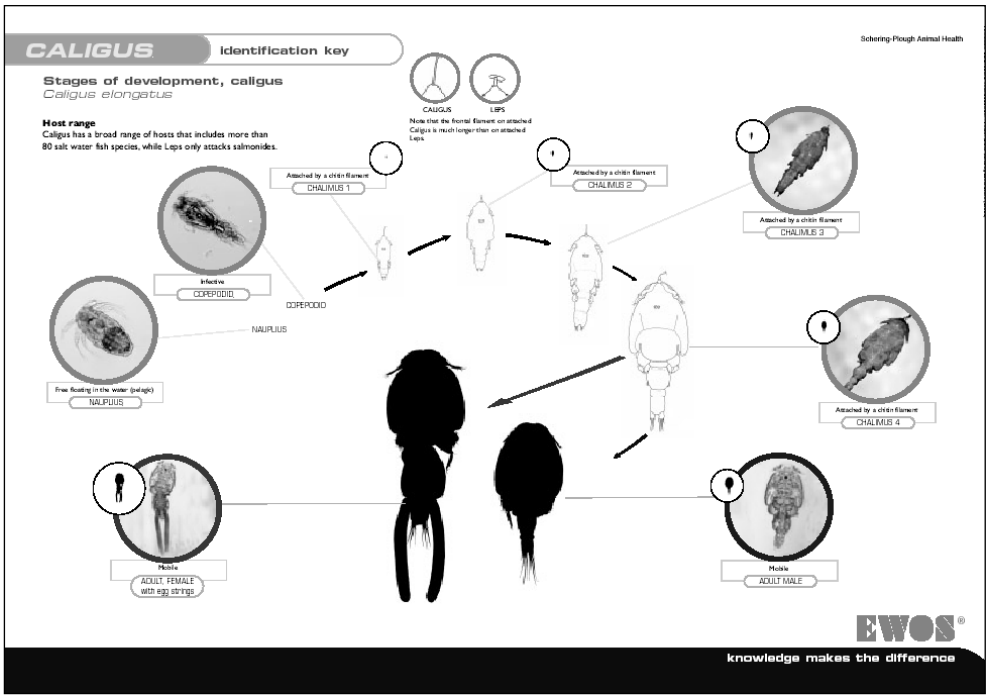
### Performance review and benchmarking

Annual review meetings should be convened by Farm Management Groups to evaluate the performance of the farms within the areas against the foregoing criteria.

Auditing compliance against the provisions of the National Strategy will be carried out by independent UKAS accredited inspection bodies as part of the audit process for the CoGP. From 2010, sea lice monitoring data will be analysed on a regional basis and published at (www.scottishsalmon.co.uk) to allow benchmarking to be undertaken.

## Figure 1 Sea lice identification.



# ANNEX 7

## PROCEDURES AND STANDARDS FOR HOLDING FACILITIES

### Design and Construction

Pens, including all ancillary and swim-though pens, should be designed and constructed so as to be capable of dealing with the weather and other environmental conditions likely to be experienced at the specific farm site. They should be selected with a sufficient safety margin to allow for year to year variations in weather patterns. Farmers should obtain from the manufacturers or other suitable qualified persons full information on the installation; on the important design features and the suitability of design for the planned mounting of additional equipment; on the materials used in construction; and on the strength of the design and its suitability for the environment in which it is to be deployed.

For planning approval on all new sites MS will seek 'attestation statements' in support of the equipment to be used (see *Delivering Planning Reform for Aquaculture* (2010). It is also recommended practice to obtain similar written assurances during any major replacement of existing equipment. This may be used as information supporting the choice of particular designs or enclosure choices during any subsequent MS statutory 'enhanced inspection' of the facility.

### Guide to Minimum Net Strengths

The Containment Working Group that advised the development of the 1st Edition of the Code provided guidance on the minimum net strengths that should be adopted in relation to mesh size. This guidance is shown in the table below. Since that time, a variety of new materials has been introduced for the manufacture of nets. In these cases farmers should seek detailed specifications on net strengths from the suppliers and seek, with the aid of expert advice where necessary, to ensure that the net strengths will be fully adequate for the intended purpose and location, allowing a sufficient safety margin.

| Mesh Size (mm) | Minimum Breaking Strength (kg/m) |
|---|---|
| 6 | 15 |
| 8 | 20 |
| 10 | 24 |
| 15 | 36 |
| 25 | 60 |

NB.
For 15mm mesh net: 1000mm/15mm = 66.66 meshes/m
Full 'new' strength set at 4000kg: 4000/66.66 = 60kg/m new net
Minimum 60% full strength required at any time = 36kg/m

## Anti - Predator Measures

A variety of predators have been known to attack farmed fish, but incidences of attack are comparatively low and highly unpredictable; they differ between farms at any given time and at a given farm may fluctuate widely from year to year. Farms that have not experienced a predator attack for a long period cannot take the view that they are safe from an attack occurring.

It is important in designing fish farming facilities to take a precautionary approach to the hazard of predator attack, to plan the location and the design of the facility accordingly and to use local knowledge, observation at the farm and good record keeping as a basis for developing a risk assessment. Facility designs and netting systems should be adjusted accordingly. An active approach to address any emergent issues of predator control is required.

There is no universal solution to avoiding the risk of predator attack. In practice, based on industry surveys, the most effective facilities-based measures to manage risks vary from farm to farm. There are also continuous developments in pen design, net materials and deterrent technology, such as that used in Acoustic Deterrent Devices (ADD), which create an ever changing situation.

Against this background, it is important to continuously review the available approaches and technologies and, where appropriate, to change and up-date those in use. This should especially be considered when any substantial change or refurbishment of facilities is proposed or where there is any indication that the approaches being adopted are not proving effective.

### *Nets*

Surface feeding predators, such as diving birds, take fish from or near the surface of the water and are often more attracted to smaller fish, such as table trout or salmon smolts. The risk of loss or damage to fish can be reduced in these cases by use of a top net on the holding facility. Depending on the facility design such nets may be flat top nets (mounted at the level of the pen guard rail) or raised top nets, which at the extreme may provide a walk-under cover in some facilities.

In all instances it is important that the pen structure allows the net to be appropriately tensioned. A mesh size of between 10cm and 15cm has been recommended as generally effective. However, a smaller mesh of 7.5cm may be required to prevent heron damage through flat top-nets. For some birds, such as gannets, coloured nets which are more visible are sometimes recommended for conservation reasons in areas with a high sea bird population. However, in other parts of Scotland coloured nets raise objections on the basis of a perceived visible intrusion in landscape assessments. Thus farmers should seek local clarification from SNH when planning a new farm facility or undertaking replacement of top nets.

### *ADDs*

To reduce the risk to fish stocks of predator attacks from below the surface of the water, for example seal attacks, recommendations are to use modern tensioned nets for pen construction coupled with ADD, where appropriate and effective, plus additional netting or screening systems where they are effective. In some parts of Scotland current types of ADD are ‘not permitted’, as a condition on planning consent, because of their potential disturbance to cetaceans. In these area farmers should

keep a watching brief on ADD development and seek to have the planning condition lifted if an appropriate ADD comes onto the market.

A variety of anti-predator measures are adopted on marine farm sites; they vary in design and are sometimes customised to the conditions that apply at a particular site. Because of the variability of instances in predator attack and the importance of local conditions, it is difficult to generalise about which options will be most effective at a given site. The options available will also be conditioned by the shapes and types of the fish holding pens in use.

The measures used can be considered under six main headings.

- **Pen net tensioning**
  Tensioning the pen nets with heavy weights significantly increases the protection of stock and is widely used in modern 'Polar Circle' systems. As an example, 25mm mesh netting may be used for the main body of the pen with the lower section consisting of two layers of 15 mm netting. The whole of the netting is kept under tension by cables attached to tensioning weights or rings and mooring weights.
- **Cone nets**
  These are cone shaped nets that minimise the bottom area of the fish pen, which is a prime area for attacks by seals. They also provide protection from diving birds. They can be very effective on sites where the water depth is >30m and allows the deployment of the net and mooring system.
- **False bottom cages**
  These are arrangements whereby the fish pens are modified to have a false bottom so that a 2m deep box of predator netting is positioned below the normal pen net, and is weighted at the sides and middle so that the box-net is appropriately tensioned.
- **Curtain Nets**
  These nets are 'draped' curtain-like around the fish pens to a suggested additional depth of 10m. The nets are easy to deploy and are effective in preventing predator attack from the side but not from below. Additionally, they create a possibility that deep diving birds and marine mammals can become entangled.
- **Box nets**
  Box nets, which are arranged to completely enclose either a single pen or units of up to eight pens – and can be fitted with a false bottom structure - are considered to be more effective than curtain nets as they offer protection from the sides and below. However, they create a major barrier to water flow through the fish pens and can only be deployed in areas where there are strong currents.

In determining the anti-predator systems adopted on a given site, farmers should systematically record the reason why a particular approach was adopted or subsequently changed. Such information may be sought by Marine Scotland in connection with the Seal Licensing provisions of the Marine (Scotland) Act 2010.

### *Screens and Barriers*

In a variety of situations, for both marine and freshwater farms, predator screens may reduce the predator awareness (e.g. canvas seal blinds covering mortality baskets, covers on feed bins) and predator risk. Likewise, physical barriers on easy access points, such as walkways, or the use of electric fences (e.g. to deter otters near to sites) can be a helpful. It is important that the potential need to adopt such measures is considered at the farm-planning stage, so that later adoption is not prevented by earlier decisions.

## ANNEX 8 *(under review)*

# RELEVANT LEGISLATION

## Some Relevant Food and Feed Legislation

The legal requirements that apply to the operation of aquaculture establishments and vessels cover basic issues of food safety, most of which meet requirements set by the European Union and related Scottish regulations. It is the interpretation of these regulations and procedures of best practice which are reflected in this CoGP. Some main components of the relevant food and feed regulations are outlined below.

### *Food Legislation*

**The Food Safety Act, 1990** is the central Act of Food Safety. It establishes the essential principles of food safety, gives powers to the competent authorities to enforce food safety and provides a means of enacting subsidiary Regulations on more detailed aspects of food safety. All persons in the food industry, including farmers, are subject to the Food Safety Act 1990. This Act establishes the basic requirement not to supply food that is considered unsafe, as defined by the Act.

**EC Regulation No. 178/2002** on the General Principles of Food Law came into force on the 1st January 2005. This is enforced by the Food Safety Act 1990 (amendment) Regulations 2004 and the General Food Regulations 2004 which introduce requirements for food traceability and product recall.

**EC Regulation No.852/2004** on the Hygiene of Foodstuffs came into force on 1 January 2006. It established basic hygiene rules for all food businesses and includes a specific set of hygiene rules for primary production, including training requirements. The general rules include the registration of food businesses and the implementation of Hazard Analysis Critical Control Points (HACCP) methodology by food processors, manufacturers and retailers. Full HACCP methodology is not initially being required for primary food production but management systems based on HACCP principles are required. In practice many primary producer businesses have adopted a HACCP approach.

**EC Regulation No.853/2004** laying down specific hygiene rules for food of animal origin also came into force on 1 January 2006. It established additional, more detailed sets of hygiene rules for specific foods, including fishery products. It replaced Council Directive 91/493/EEC which was implemented in the UK by the Food Safety (Fishery Products and Live Shellfish) (Hygiene) Regulations 1998.

These hygiene Regulations do not apply to activities defined as primary production or to the farmer who sells directly to the final consumer or businesses supplying the fish consumer directly. However, such a sale must be within the local or neighbouring food authority and is limited to a total maximum of 25 tonnes per year. Note, Regulation 178/2002 will apply under all circumstances and product supplied must not be unsafe.

**The Food Hygiene (Scotland) Regulations 2006** (and the corresponding regulations for England, Wales and Northern Ireland) came into force on 11 January 2006 and enforced the Regulations EC No 852/2004 and EC No 853/2004 and set penalties for

offences. It also contained national legislation which Member States of the EU are required or allowed to make.

### *Feed Legislation*

Feed purchased from an authorised feed manufacturer or supplier will be provided with batch or package labelling in accordance with legal requirements and will be supported by a formal scheme meeting quality assurance standards. Where feed is supplied from outwith the UK, farmers should seek written confirmation that it will meet all UK legal requirements. Handling and storage of feed on farm or at the shore base is the farmer's responsibility and must be undertaken to maintain feed quality and avoid feed contamination.

**The Feed Hygiene Regulation (183/2005)** came into effect in January 2006. It applies to businesses that make, use or market animal feeds. This includes most livestock farms, arable farms that grow, use or sell crops for feed use, and also fish farms. It replaced existing legislation on approval and registration under the Feeding Stuffs (Establishments and Intermediaries) Regulations 1999. Farmers, as primary producers, have to follow basic hygiene procedures in relation to the feed they use or grow and must ensure that hazards are properly assessed and risks are controlled.

## Fish Health Legislation

The following list of legal instruments is not necessarily exhaustive, but does include the main instruments which pertain to aquaculture in Scotland.

**The Aquatic Animal Health (Scotland) Regulations 2009**

- Requires the authorisation of aquaculture production businesses (APBs) and processing facilities (PFs) wishing to process fish from APBs infected with certain listed diseases and subjects APBs and PFs to conditions associated with their authorisation.

- Requires that non-commercial undertakings, put and take fisheries and specialist transporters are registered.

- Requires that the competent authority establishes and maintains a publicly available register of authorised APBs and PFs.

- Applies certain conditions, certification requirements and provisions on the placing on the market of aquaculture animals.

- Requires disease prevention measures to be taken when aquaculture animals are transported.

- Requires that records are kept when aquaculture animals are transported.

- Obliges relevant persons to report the suspicion or confirmation of diseases or increased mortality in aquatic animals. (Relevant person is defined as the owners or persons attending aquatic animals, persons accompanying aquaculture animals during transport, any veterinarian or other professional involved in providing health services to those aquatic animals and any other person with an occupational relationship with aquatic animals.)

- Requires the competent authority to make initial designation notices (IDNs) or confirmed designation notices (CDNs) where it suspects or knows that a listed or emerging disease is present in aquatic animals in Scotland; stipulates what information and conditions may be contained in these IDNs and CDNs; stipulates what actions an inspector may take where an IDN or CDN is in place, how IDNs and CDNs are published and when they must be withdrawn.

- Gives an inspector powers to enter land and premises, search and examine that land or premises, require the production of documents, seize items and serve enforcement notices. It also lays out when and a person may appeal to the competent authority.

**The Aquaculture and Fisheries (Scotland) Act 2007**

- Gives the purposes that an inspector may carry out inspections of fish farms and shellfish farms with regard to parasites and their control, including the collection of samples and examining and taking copies of documents.

- Gives the purposes that an inspector may carry out inspections of fish farms with regard to ascertaining whether an escape of fish has occurred, ascertaining the risk of an escape, assessing the containment and prevention of escapes measures as well as the measures in place to recover escaped fish. Inspections may include the collection of samples, examining and taking copies of documents and for the carrying out of tests where appropriate.

- Gives the purposes for which enforcement notices may be served. These are: the prevention reduction and reduction of parasites; the containment of fish; the prevention of the escape of fish; and the recovery of escaped fish.

- Details when an inspector may enter a fish farm and for what purpose, whom and what they make take with them and lays out the general offences.

**The Fish Farming Businesses (Record Keeping) (Scotland) Order 2008**

- Exercises powers to make an order in The Aquaculture and Fisheries (Scotland) Act 2007 and requires the maintenance and retention of records in relation to the prevention, control and reduction of parasites; and the maintenance and retention of records in relation to the containment, prevention and recovery of farmed fish.

**The Prohibition of Keeping or Release of Live Fish (Specified Species) (Scotland) Order 2003**

- It is an offence to keep or release any fish of the species listed in the schedules to the Prohibition of Keeping or Release of Live Fish (Specified Species) (Scotland) Order without a licence granted by the Scottish Ministers.

**The Animal By-Products (Scotland) Regulations 2003**

- The Animal By-Products Regulation provides a definition of high risk and low risk material and prescribes the appropriate methods of disposed of such material. High risk material includes fish that have died but were not slaughtered for human consumption. High risk material must be disposed of by rendering, incineration or, in exceptional circumstances only, burial.

### The Importation of Salmonid Viscera Order 1986

- It is an offence to import any viscera of fish of the family Salmonidae, whether or not detached from dead fish, without a licence.

The full text of the Regulations, Acts and Orders listed above can be found in full at the Office of Public Sector Information (OPSI) web-site at http://www.opsi.gov.uk . Details of all the EC legislation pertaining to fish health, including links to Directives, Decisions and Regulations, can be obtained at http://eur-lex.europa.eu/en/index.htm .

## Environmental Legislation

Scotland, through the UK's membership of the EU, is a signatory to a number of international conventions, including the Oslo/Paris convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention) and the Convention for the Conservation of Salmon in the North Atlantic, which is taken forward through the North Atlantic Salmon Conservation Organisation (NASCO). It also has a wide range and depth of environmental legislation and legislation that has environmental management or conservation elements. Much of this legislation derives from European legislation, but is transposed into Scottish law to allow its application in Scotland.

There is not a simple way to classify the legislation of environmental significance. Some EU legislation and related Scottish Acts of Parliament or Scottish Statutory Instruments (SSI) are designed to address a specific issue or topic area; others have a main objective, but also include some subsidiary, but important objectives and yet other represent 'framework legislation' which is essentially cross-cutting, addressing a number of separate issues. The sections which follow are designed to provide a brief summary of relevant legislation and guidance mainly on environmental legislation. It is not exhaustive, but rather covers the main instruments which pertain to the management of aquaculture in Scotland. For ease of presentation only, the legislation has been grouped under four broad headings of: Planning Related; Environmental Protection; Environmental Conservation and Framework. In each, main items are listed alphabetically.

In practice, should farmers have specific questions about particular environmental legislation, these should be addressed to the competent authority for the legislation under consideration; general information and guidance will often be available on their websites.

### Planning-Related Legislation

**The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011.** The Regulations set out the statutory procedures, list the types of project to which they apply, specify the information to be contained in an environmental statement, list the consultation bodies and provide criteria for deciding whether projects are likely to have significant environmental effects.

**Planning Advice Note, "1/2013 - Environmental Impact Assessment"**, supports these regulations.

**EIA Directive - Consolidated: Directive 85/337/EEC, as amended by 97/11/EC, 2003/35/EC and 2009/31/EC,** applies to the assessment of the environmental effects of those public and private projects which are likely to have significant effects on the environment. Environmental Impact Assessment is an integral part of the process for considering applications for marine fish farm leases. Where a development is likely to have significant effects on the environment, the potential effects are systematically addressed in a formal environmental statement.

**Environmental Impact Assessment (Fish Farming in Marine Waters) Regulations (SSI 1999 367)** apply for an application where: (a) any part of the proposed marine fish farm development is to be carried out in a sensitive area; (b) the proposed development is designed to hold a biomass of 100 tonnes or greater; (c) the proposed development will extend to 0.1 hectare or more of the surface area of the marine waters, including any proposed structures or excavations. These regulations effectively mean that all commercial finfish farms require an EIA at the planning development stage.

**Town and Country Planning (Scotland) Act 1997** is the principal legislation governing the use and development of land within Scotland. Later amendments were introduced through the *Planning etc (Scotland) Act 2006* and the *Town and Country Planning (Marine Fish Farming) (Scotland) Order 2007.* From that time, aquaculture development was brought within the scope of the main terrestrial planning system for which Local Authorities are the competent administrative body. The planning approval process has a substantial environmental content, including the Local Authorities undertaking statutory consultations with SEPA, MSS, SNH and the local District Salmon Fisheries Boards. Any planning proposal must take account of the (annually updated) Scottish Government *Locational Guidelines for the Authorisation of Marine Fish Farms in Scottish Waters*.

## Environmental Protection Legislation

The Aquaculture and Fisheries (Scotland) Act 2013: The purpose of the Aquaculture and Fisheries Act is to ensure that farmed and wild fisheries - and their interactions with each other - continue to be managed effectively, maximising their combined contribution to supporting sustainable economic growth with due regard to the wider marine environment.

**European Directive on Dangerous Substances (76/464/EEC), which was codified and repealed by Directive 2006/11/EC on Pollution Caused by Certain Dangerous Substances Discharged into the Aquatic Environment of the Community** defined principles for the control of lists of substances, ranging from those which are toxic, persistent and which bio-accumulate (List I substances) to those which have 'deleterious effects upon the aquatic environment' (List II substances). Some chemicals used in marine fish farming fall within the List II definition.

The Directive requires Member States to introduce programmes to reduce pollution by List II substances by ensuring their authorisation on the basis of emission standards calculated from water quality objectives (in Scotland these are the *Environmental Quality Standards*). The requirements of the Directive may involve product substitution (requiring the use of a less hazardous chemical) and take into account the

'latest economically feasible technical developments'. The provisions of the Directive will be subsumed into the *Water Framework Directive* in 2013.

In the interim period, SEPA has adopted transitional arrangements (see *SEPA Policy: Control of Priority and dangerous Substances and Specific Pollutants in the Water Environment,* www.sepa.org.uk). It has set indicative limits for the substances concerned and publishes information on these and other pollutants in the *Scottish Pollutant Release Inventory (SPRI)* (http://www.sepa.org.uk) an electronic database of releases of pollutants, complying with *Regulation EC No 166/2006 Concerning the Establishment of a European Pollutant Release and Transfer Register.*

**European Directive on the Sustainable Use of Pesticides (2009/128/EC)** (SUD) came into effect on the 25 November 2009 and must be transposed into Scottish legislation by the corresponding date in 2011. So some changes in the present systems of approval and regulation of products such as algaecides, antifouling products, biocidal paints, rodenticides and insecticides may therefore be anticipated.

Key features of the Directive include: the establishment of National Action Plans; compulsory testing of application equipment, certification of operators and distributors, access to certification for advisors; a ban (subject to derogations) on aerial spraying; special measures to protect the aquatic environment, public spaces and conservation areas; minimising the risks to human health and the environment through handling, storage and disposal; and the promotion of low input regimes, including Integrated Pest Management (IPM) and non-chemical alternative products.

The main legislation controlling the sale, supply and use of plant protection products is *Council Directive 91/414/EEC Concerning the Placing of Plant Protection products on the Market* which is implemented in the UK through the *Plant Protection Products Regulations 2005* (PPPR). Active substances which were on the market when the Directive came into force and which have not yet been reviewed by the EU remain regulated under the previous pesticides legislation, the *Control of Pesticides Regulations 1986* (as amended in 1997) (COPR). Non-agricultural products are currently regulated under the same legislation. The *Chemicals Regulation Directorate* of the *Health and Safety Executive* (see http://www.hse.gov.uk/biocides/copr) operates the regulatory systems for pesticides and biocides on behalf of UK Ministers. Scottish Ministers have responsibility for policies on the products in Scotland.

**Environmental Protection Act (1990)** confers on businesses a duty of care on any person who produces, carries, keeps, treats or disposes of controlled waste to take all such measures to prevent the escape of the waste from his control, to transfer the waste to only to an authorised person or to a person for authorised transport purposes. This legislation is reflected in the *Waste Management Duty of Care A Code of Practice*.

**Food and Environment Protection Act 1985 (FEPA)** amongst other wider provisions this Act deals with the licensing of deposition of anything in the sea or under the seabed in UK waters. It applies to marine vessels, such as well-boats, wishing to discharge contaminated waste water or chemicals at sea.

**Integrated Pollution Prevention and Control Directive (96/61/EC)** (known as IPPC) was transposed into Scottish law by the *Pollution Prevention and Control Act 1999, and the Pollution Prevention and Control (Scotland) Regulations 2000* (SI 2000/323) in Scotland (known as the PPC Regulations). The regulations do not apply

to fish farms but are applicable to processing units and may be a consideration where there farm-associated ensiling of mortalities or fish waste.

**Water Environment and Water Services (Scotland) Act 2003** transposed WFD into Scottish legislation and gave Scottish ministers powers to introduce regulatory controls over water activities, in order to protect, improve and promote sustainable use of Scotland's water environment.

This WEWS Act defined the water environment to include wetlands, rivers, lochs, transitional waters (estuaries), coastal waters and groundwater. The Act also defined the duties of SEPA in its protection of the water environment. It provided for the establishment of river basin districts, each requiring an environmental objective and river basin management plan; and for preparation, approval and review of the plans and the monitoring of the status of the water in each river basin district.

The WEWS Act includes provisions for:

- preventing further deterioration of, and protecting and enhancing, the status of aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands directly depending on those aquatic ecosystems;
- promoting sustainable water use based on the long-term protection of available water resources;
- enhancing protection and improvement of the aquatic environment through, amongst other things, specific measures for the progressive reduction of discharges, emissions and losses of priority substances and the cessation or phasing out of discharges, emissions and losses of the priority hazardous substances;
- ensuring the progressive reduction of pollution of groundwater and preventing further pollution of it, and contributing to mitigating the effects of floods and droughts.

The WEWS Act introduced the concept of 'regulation of controlled activities', including:

- activities liable to cause pollution of the water environment;
- abstraction of water from the water environment;
- the construction, alteration or operation of impounding works in surface water or wetlands;
- carrying out building or engineering in the vicinity of inland waters or wetlands which are likely to have an adverse significant effect on the water environment.

It also defined 'pollution' in relation to the water environment as: the direct or indirect introduction, as a result of human activity, of substances or heat into the water environment, or any part of it, which may give rise to any 'harm'. In this context 'harm' was defined as including: harm to the health of human beings or other living organisms, the quality of the water environment, including the quality of the water environment as whole and the impairment of, or interference with, the quality of aquatic ecosystems or terrestrial ecosystems directly depending on aquatic ecosystems. It also included offences to the senses of human beings, damage to property, or impairment of, or interference with, amenities or other legitimate uses of the water environment.

**Water Environment (Controlled Activities) (Scotland) Regulations 2005 (Controlled Activities Regulations) (SSI 2005 No. 348)** which came into effect in April 2006 provided the regulatory controls to put the WEWS Act into effect. They have subsequently amended by *The Water Environment (Controlled Activities) (Third Party Representations etc) (Scotland) Regulations 2006*; and *The Water Environment (Controlled Activities) (Scotland) Amendment Regulations 2007*.These regulations are more commonly known as the Controlled Activities Regulations, or 'CAR'.

Under CAR, SEPA may authorise the carrying on of a controlled activity and impose conditions necessary for the protection of the water environment. Such conditions may be imposed as considered necessary or expedient for the purposes of protection of the water environment. Where a condition is imposed it is the responsibility of the applicant to obtain all consents necessary to allow the condition to be complied with.

When considering whether to grant an authorisation and when imposing conditions in respect of a licence under this regulation, SEPA will have regard to all controlled activities being carried on or likely to be carried on in the area affected and to any agreement reached between different persons concerning controlled activities carried on in the relevant area of the water environment. SEPA will only grant authorisation if it is satisfied that a person has been identified who will be responsible for securing compliance with the authorisation and the conditions specified in it.

CAR introduced three levels of authorisation for 'Controlled Activities': (a) general binding rules: (b) registration; and (c) simple licences or complex licences which are proportionate to the degree of environmental risk. Registrations and licences require assessment and approval by SEPA. Licences can cover linked activities on a number of sites over a wide area, as well as single or multiple activities on a single site. It is an offence to undertake a controlled activity without being authorised and not complying with the conditions of an authorisation. All aquaculture units require therefore require SEPA authorisation in one of the following categories.

**Registration**

- All non-commercial fish hatcheries for native fish.
- Tank fish farms/hatcheries up to 0.5 tonnes capacity.

**Simple Licence**

- Tank fish farms/hatcheries >0.5 tonnes capacity.
- Freshwater cage fish farms ≤2 tonnes capacity.
- Marine cage/tank fish farms ≤50 tonnes capacity.

**Complex Licence**

- Freshwater cage fish farms >2 tonnes capacity.
- Marine cage/tank fish farms >50 tonnes capacity.

For guidance see http://www.sepa.org.uk/customer_information/fish_farming.aspx

**Water Framework Directive (2000/60/EC) (WFD)** is a wide-ranging piece of European environmental legislation that was transposed into Scottish Law as the Water *Environment Water Services Act 2003*. The subsidiary *Water Environment (Controlled Activities) (Scotland) Regulations 2005* introduce the control regimes set out in the Directive. The overall objective of the WFD is to bring about the effective co-ordination of water environment policy and regulation across Europe to:

- prevent deterioration and enhance status of aquatic ecosystems, including groundwater;
- promote sustainable water use;
- reduce pollution; and
- contribute to the mitigation of floods and droughts.

These aims have heavily influenced the way SEPA regulates marine and freshwater fish farming.

## Conservation Legislation

**Aquaculture and Fisheries (Scotland) Act 2007** contains provisions on the control of parasites and disease, the containment of, prevention of escape of, and recovery of escaped fish.

**Conservation (Natural Habitats, &c.) (Scotland) Regulations 1994 (as amended) (SSI 1994 No 2716)** transposed *Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora* (Habitats Directive) and *Council Directive 79/409 on the Conservation of Wild Birds* (Birds Directive) into Scottish law.

The Directives aim to protect the wild plants, animals, birds and habitats that make up our diverse natural environment. The Directives created a European network of protected sites, the Natura 2000 network, which represent areas of the highest value for natural habitats and species of plants and animals which are rare, endangered or vulnerable in the European Community. The network includes area designations:

- Special Areas of Conservation (SAC) where areas support rare, endangered or vulnerable natural habitats and species of plants or animals (other than birds):
- Special Protection Areas (SPA). Where areas support significant wild birds and their habitats:

Some areas may become both (SAC) and (SPA).

**Fish Farming Businesses (Record Keeping) (Scotland) Order 2008 (SSI No 326)** sets out the provisions for the records which must be compiled and retained by those engaged in the business of fish farming in respect of each site in which they farm (see Annex 6).

**Natural Heritage (Scotland) Act 1991** established Scottish Natural Heritage (SNH) 'To secure the conservation and enhancement of, and to foster understanding and facilitate the enjoyment of, the natural heritage of Scotland. The 'natural heritage of Scotland' includes the flora and fauna of Scotland, its geological and physiographical features, its natural beauty and amenity. The Act describes the general functions of SNH with regard to nature conservation, development projects and Natural Heritage areas.

**Nature Conservation (Scotland) Act 2004** sets out a series of measures which are designed to conserve biodiversity and to protect and enhance the biological and geological natural heritage of Scotland. It places a duty on every public body to further the conservation of biodiversity consistent with the proper exercise of their functions and increases protection for Sites of Special Scientific Interest (SSSI), and strengthens wildlife enforcement legislation.

## Framework Legislation

**Environmental Liability (Scotland) Regulations 2009** transposes into Scottish law the provisions of Directive 2004/35/CE 2004 of the European Parliament and of the Council of 21 April 2004 on Environmental Liability with regard to the *Prevention and Remedying of Environmental Damage*. It placed an obligation on operators of any type to take preventative measures where there is an imminent threat of significant environmental damage and also remediate any significant 'environmental damage' caused by their activities. The regulations are not retrospective and do not apply to environmental damage caused prior to the regulations coming into force.

Three categories of 'environmental damage' are covered by the regulations:

- *Biodiversity* (protected species and natural habitats) of European importance in terms of the Birds directive and Habitats Directive;
- *Water* (damage to water bodies) in terms of the Water Framework Directive;
- *Land,* where public health is at a significant risk of being affected.

For protected species and habitats other than the marine habitat, SNH is the competent authority. Likewise SEPA is the competent authority for 'Land' and also for 'Water' as defined under the WEWS Act 2003. MS has a more general responsibility for all three categories as they apply to the marine environment but it is likely to use SNH and SEPA as advisers on matters that cross boundaries of responsibility.

**Marine (Scotland) Act 2010** received Royal Assent in March, 2010. The Act introduced a framework for the sustainable management of the seas around Scotland, seeking to ensure that protection is integrated with the economic growth of marine industries. Implementation of the measures in the Act is in progress, in some cases through secondary legislation. Full measures contained in the Act are unlikely to be in place before 2012. From an aquaculture viewpoint, the Act focuses on the following.

- **Marine planning**: a new statutory marine planning system to manage the demands on the seas. This will operate at a regional level with the planning strategy feeding in to the Local Authority Strategic Plans.
- **Marine licensing**: a new licensing system under Marine Scotland for most marine activities, excepting aquaculture. Aquaculture planning and statutory regulation will remain under the present arrangements of Local Authority planning control and regulation, mainly through SEPA, Marine Scotland and SNH.
- **Marine conservation**: improved marine nature and historic conservation with new powers to protect and manage areas of importance for marine wildlife, habitats and historic monuments. This may impinge on the regional planning strategies for use of marine sites.
- **Seal conservation**: new protection for seals and a new licensing system to regulate the shooting of seals under specific conditions and ensure that all seals shot are reported. The licensing system will come into effect in 2011.