

## **ANNEX 10      Useful Contacts**

**The Crown Estate (CEC)**

<http://www.crownestate.co.uk/index.shtml>

**The Scottish Environment Protection Agency (SEPA)**

<http://www.sepa.org.uk/index.html>

**Scottish Executive Environment and Rural Affairs Department (SEERAD)**

<http://www.scotland.gov.uk/pages/default.aspx>

**Fisheries Research Service (FRS)**

<http://www.frs-scotland.gov.uk/>

**Scottish Natural Heritage (SNH)**

<http://www.snh.org.uk/>

**Maritime and Coastguard Agency (MCA)**

<http://www.mcga.gov.uk/>

**Northern Lighthouse Board**

<http://www.nlb.org.uk/>

**Health and Safety Executive (HSE)**

<http://www.hse.gov.uk/>

**Food Standards Agency (FSA)**

<http://www.food.gov.uk/scotland/>

## **ANNEX 11      Welfare Sub Group of AHJWG**

The groups members changed depending upon individual meetings, but everyone who was involved at one time or another is listed below

- Chair:**            Dave Wyman - SEERAD  
                         [Original Chair – Jinnie Hutchison - SEERAD]
- Secretariat:**    Carrol Herbertson - SEERAD  
                         Neil Sinclair - SEERAD
- Members:**      Charles Allan - Fisheries Research Services  
                         Paul Hook - Compassion in World Farming  
                         Paul Stevenson - Compassion in World Farming  
                         Ronnie Soutar - Fish Veterinary Society  
                         Phil Thomas - Responsible Use of Medicine in Agriculture  
                         Andrew Voas - State Veterinary Service  
                         John Webster - Federation of Scottish Aquaculture Producers  
                         Libby Anderson - SSPCA  
                         Brian Speed - SSPCA  
                         Jane Davis - British Trout Association  
                         Richard Slaski - Federation of Scottish Aquaculture Producers

## **ANNEX 12      Risk Assessment Protocol for Risks to Fish Health**

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

### **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 *Code of Practice for Scottish Finfish Aquaculture* will be qualitative rather than quantitative. This means the estimated risk will be expressed in words, e.g. 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. 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.

### **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.

### **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 (or 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/contaminated. Terms commonly used to describe the probability of an event occurring are shown in Box 1 (adapted from AQIS, 1999). Biological, source and item risk factors should be considered (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 this point.

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

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

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 Jarpe and Karlsen (1997) and Infectious Pancreatic Necrosis (IPN) by Murray *et al* (2004) on salmon farms are given 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.

Failure to fallow in synchrony with other farms in the same management area

Equipment/staff/boat shared with other farms without sanitary precautions.

### 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 this 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, part from the aforementioned three cases, when two probabilities are multiplied together the result is the lower of the two (Table 3).

**Table 3. Product of multiplying two qualitative probabilities**

		Exposure assessment (E)				
		High (H)	Moderate (M)	Low (L)	Very Low (VL)	Negligible (N)
Release assessment (R)	High (H)	H	M	L	VL	N
	Moderate (M)	M	M	L	VL	N
	Low (L)	L	L	VL	N	N
	Very Low (VL)	VL	VL	N	N	N
	Negligible (N)	N	N	N	N	N

### Consequence assessment

Consequence assessment consists of identifying the nature of any adverse effect(s) on human or animal health or the environment as a result of 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 this 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.

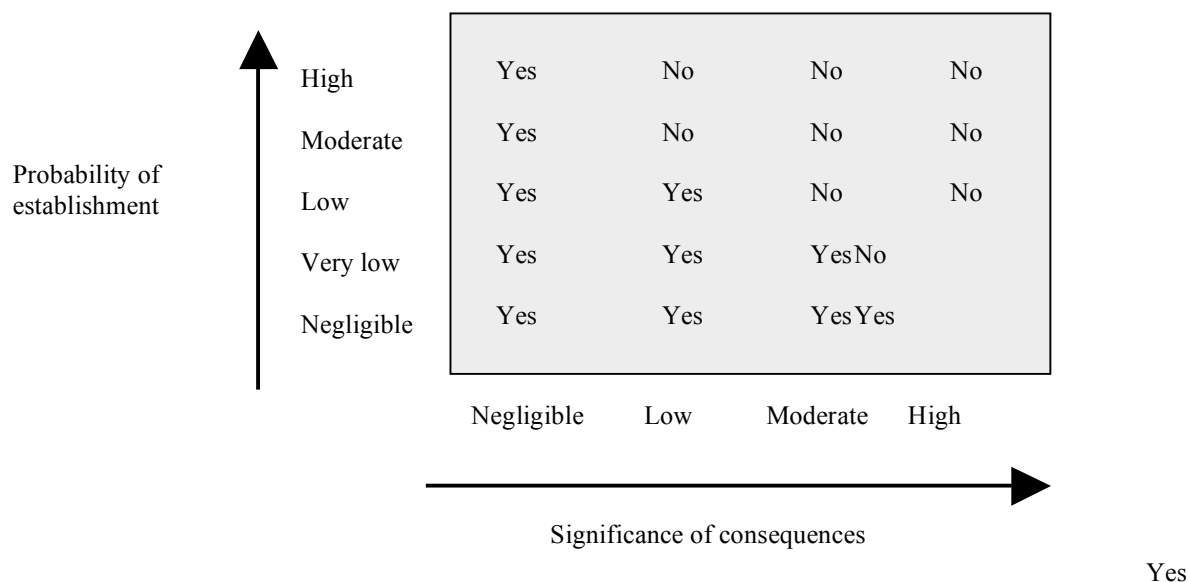
**Low:** Associated with diseases that have mild biological effects and would normally be amenable to control measures. Such diseases would be expected to harm economic performance at an enterprise/regional level. Effects on the environment would be minor or temporary.

**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.

**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 Figure 1 (AQIS, 1999) may aid risk estimation. The risk determined is the unrestricted estimate of risk, i.e. the risk based on no risk management, associated with the hazards identified. Each hazard should be considered separately in the risk evaluation.

**Figure 1. Risk evaluation matrix**



= the risk is acceptable. No = the risk is unacceptable.

**STEP 3 RISK MANAGEMENT**

Risk management is the process of deciding upon and implementing sanitary measures to reducing 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 critique 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.

Conclusion - 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.

Conclusion – 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 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*.

Conclusion - 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 A 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.

Conclusion - 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 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.

### **REFERENCES**

AQIS (Australian Quarantine and Inspection Service), 1999, Import risk analysis on non-viable salmonids and non-salmonid marine finfish. AusInfo, GPO Box 1920, Canberra ACT 2601.

Jarp J and Karlsen E, 1997, Infectious salmon anaemia (ISA) risk factors in sea-cultured Atlantic salmon *Salmo salar*. Diseases of Aquatic Organisms **28**: 79-86.

Murray AG, Leschen WA, Kilburn R and Raynard RS, 2004, A case-control study for the identification of risk factors behind clinical outbreaks of Infectious Pancreatic Necrosis (IPN). Fisheries Research Services Report No 06/04.

Murray N, 2002, Import Risk Analysis - Animals and Animal Products, New Zealand Ministry of Agriculture and Forestry, PO Box 2526, Wellington, New Zealand.

OIE (Office International des Epizooties) Aquatic Animal Health Code, Sixth edition 2003, 12, rue de Prony, 75017 Paris, France.

OIE Risk analysis in aquatic animal health, 2001, 12, rue de Prony, 75017 Paris, France.

## ANNEX 13      Containment

### A13.1 Membership of Containment Working Group

The groups members changed depending upon individual meetings, but everyone who was involved at one time or another is listed below

**Chair:**            George Hamilton - Highlands and Islands Aquaculture Forum

**Members:**      John Webster - Scottish Quality Salmon  
Richard Slaski - Federation of Scottish Aquaculture Producers  
Alistair Prior – SEERAD  
Jane Wright – Association of West Coast Fisheries Trusts  
Tom MacRae – Sunderland Marine (ARM)  
Andrew Wallace – Association of District Salmon Fisheries Boards  
Mark Davies – British Trout Association  
Dave Sandison – Shetland Salmon Farmers Association  
Helen Kennedy – Crown Estate

### A13.2 A Guide to Minimum Net Strengths

MESH SIZE (mm)	MINIMUM BREAKING STRENGTH (Kg/m)
6mm	15 Kg
8mm	20 Kg
10 mm	24 Kg
15 mm	36 Kg
25 mm	60 Kg

NB

For 15mm mesh net –  $1000\text{mm}/15\text{mm} = 66.66$  meshes per metre

Full “new” strength set at 4000kg -  $4000/66.66 = 60\text{Kg}/\text{Metre}$  new net

Minimum 60% full strength required at any time =  $36\text{Kg}/\text{Metre}$

