26th September 2016

Risk analysis for the movement of wild caught wrasse in Ireland

1. Identification of Hazards: identification of pathogens that: (a) are notifiable and/or (b) could cause disease in wrasse*or farmed Atlantic salmon (*Salmon salar)* in co-habitation with wrasse.

*Unless otherwise specified, "wrasse" will refer to the following species: Ballan wrasse (*Labrus bergylta*), Corkwing wrasse (*Symphodus melops*), Rock cook (*Centrolabrus exoletus*), Goldsinny wrasse (*Ctenolabrus rupestris*) and Cuckoo wrasse (*Labrus mixtus*).

Potential hazards:

1.1. Viruses:
- 1.1.1. Viral haemorrhagic septicaemia virus (VHSv)
- 1.1.2. Epizootic haematopoetic necrosis virus (EHNv)
- 1.1.3. Infectious salmon anaemia virus HPR deleted (ISAv-HPR deleted)
- 1.1.4. Infectious haematopoetic necrosis virus (IHNv)
- 1.1.5. Salmonid alphavirus (SAV)
- 1.1.6. Infectious pancreatic necrosis virus (IPN)
- 1.1.7. Piscine reovirus (PRV)
- 1.1.8. Piscine myocarditis virus (PMCv)
- 1.1.9. Viral nervous necrosis virus (VNNv)
- 1.1.10 Iridovirus (ranavirus)
- 1.1.11. Novel viral infections of wrasse

1.2. Bacteria:
- 1.2.1. *Renibacterium salmoninarum*
- 1.2.2. *Aeromonas salmonicida* (atypical subspecies)
- 1.2.3. *Aeromonas salmonicida* (subspecies *salmonicida)*
- 1.2.4. *Vibrio anguillarum*
- 1.2.5. *Vibrio splendidus*
- 1.2.6. *Vibrio tapetis*
- 1.2.7. *Vibrio salmonicida*
- 1.2.8. *Moritella viscosa*
- 1.2.9. *Mycobacterium* spp.
- 1.2.10. Novel bacterial infections of wrasse

1.3. Parasites
- 1.3.1. *Gyrodactylus salaris*
- 1.3.2. *Neoparamoeba perurans*
- 1.3.3. Novel parasitic infections of wrasse

1.4. Fungi:
- 1.4.1. Novel fungal infections of wrasse

2. Risk assessment: the risk assessment for every hazard is made using the 5 components outline below.

2.1 Release assessment (R): an estimation of the probability (i.e. likelihood) of fish movement resulting in hazard introduction. Biological risk factors, source risk factors and item risk factors are considered. See table 1 for definition of terms. **If the risk is considered negligible the assessment is ended at this point.**

2.2. Exposure assessment (E): the probability of a pathogen release resulting in infection of Atlantic salmon or wrasse. Biological risk factors, destination risk factors and item risk factors are considered. See table 1 for definition of terms. If there are differences in risk for salmon and wrasse the higher risk category is used. **If the risk is considered negligible the assessment is ended at this point.**

Table 1: terms used to quantify risk in 2.1, 2.2 and 2.3.

Scale for release assessment, exposure assessment and the probability of establishment	
High (H)	Event would be expected to occur
Moderate (M)	There is a less than even chance of the event occurring
Low (L)	Event would occur occasionally
Very low (VL)	Event would occur very rarely
Negligible (N)	Chance of event occurring is so small it can be ignored.

2.3. Probability of establishment (PE): the risk of a disease being introduced, calculated through a conversion chart using the release assessment and the exposure assessment (table 2). See table 1 for definition of terms.

Table 2: conversion chart used to calculate the probability of establishment.

		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

2.4. Consequence assessment (C): an evaluation of the consequences of introduction considering potential hazards to human health, fish health and the environment. See table 3 for definition of terms.

Table 3: terms used to describe the significance of consequences.

Scale for 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.

2.5. Risk estimation (Risk): an estimation of the overall risk posed by a hazard, calculated from the probability of establishment and the consequence assessment through a conversion table (Table 4). If the result is "Yes", the risk is considered acceptable, "No" means the risk is not acceptable **in the absence of risk management measures** and "Yes/No" means the risk is uncertain.

The risk determined is the **unrestricted estimate of risk, i.e. the risk based on the absence of risk management)**. Each hazard is considered separately in the risk evaluation (table 4).

Table 3: risk estimation table.

		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

Table 4: risk estimation for the specific hazards. See table 1 for risk quantifying abbreviations.

Hazard	R	E	PE	C	Risk	Notes
Viruses						
1.1.1 (VHSv)	VL	H	VL	H	Not acceptable	• Detected in wrasse in Scotland, associated with clinical disease. • Very rarely isolated from AS (susceptibility unclear), can affect RBT (present in RBT in Norway) • Endemic in wild fish populations in Europe (type 3) • Notifiable.
1.1.2 (EHNv)	N	N/A	N/A	N/A	acceptable	• Not present in Ireland. • Not detected in wrasse to date. • Can affect redfin perch and RBT (freshwater). • AS only infected experimentally. • Notifiable
1.1.3 (ISAv – HPR deleted)	N	N/A	N/A	N/A	acceptable	• Not present in Ireland. • Can affect AS. • No natural infection detected in wrasse to date. • GS could not be experimentally infected and their role as potential vectors was considered highly unlikely. • Notifiable.
1.1.4 (IHNv)	N	N/A	N/A	N/A	acceptable	• Not present in Ireland. • Not detected in wrasse to date. • Can affect AS. • Notifiable.
1.1.5 (SAV)	VL	H	VL	M	uncertain	• Present in Ireland (AS and wild fish) • Studies concluded that the virus is inactivated in GS. • Has been isolated from wrasse cohabited with AS during PD outbreak in Norway, significance unknown. • Can affect AS
1.1.6 (IPNv)	VL	H	VL	M	uncertain	• Present in Ireland (AS). • Experiments showed that GS are susceptible and can shed the virus, though overall risk is considered low • Can affect AS
1.1.7 (PRV)	L	H	L	unknown	uncertain	• Present in Ireland (AS and possibly wild fish). • Has been detected in wrasse gill samples, significance unknown • Can affect AS (high prevalence in Ireland, not always associated with disease)
1.1.8. (PMCv)	VL	H	VL	M	uncertain	• Present in Ireland (AS). • Not detected in wrasse to date. • Can affect AS
1.1.9. (VNNv)	VL	M	VL	L	acceptable	• Present in UK and Norway (Halibut and Cod). • Detected in B in Norway, significance unknown. • Does not affect AS
1.1.10 (ranavirus)	unknown	unknown	unknown	unknown	uncertain	• Only detected in lumpfish to date (Ireland, Scotland, Iceland) • Significance unknown
1.1.11 (Novel viruses)	unknown	unknown	unknown	unknown	uncertain	• Unknown.

Hazard	R	E	PE	C	Risk	Notes
Bacteria						
1.2.1 *(R. salmoninarum)*	VL	L	N	H	acceptable	▪ Present in UK and Norway (AS and RBT). ▪ Not detected in wrasse to date. ▪ Can affect AS ▪ Notifiable.
1.2.2 *(A. salmonicida (atypical))*	H	H	H	M	not acceptable	• Present in Ireland (wrasse, LF and AS). • Research indicates that salmon are not susceptible to the same subtype as wrasse and lumpfish. • Not vertically transmitted.
1.2.3 *(A. salmonicida (typical))*	VL	H	VL	M	uncertain	▪ Present in Ireland (AS) ▪ Can affect AS, LF and wrasse ▪ Mortalities documented in wrasse in Scotland
1.2.4. *(V. anguillarum)*	VL	H	VL	M	uncertain	• Present in Ireland (cod). • Can affect AS, LF and wrasse.
1.2.5 (*V. splendidus*	H	L	L	L	acceptable	• Ubiquitous in marine environment. • Opportunistic pathogen of CW. • Considered opportunistic in AS.
1.2.6 *(V. tapetis)*	M	L	L	L	acceptable	• Ubiquitous in marine environment. • Opportunistic pathogen of CW. • Not known from AS.
1.2.7 (*V. salmonicida)*	VL	M	VL	M	uncertain	• Present in Ireland (AS). • Not detected in wrasse to date. • Can affect AS.
1.2.8 *(M. viscosa)*	VL	M	VL	M	uncertain	• Present in Ireland (AS). • Detected in wrasse in Scotland. • Can affect AS.
1.2.12 (*Francisella* spp.)	VL	VL	N	L	acceptable	• Present in Ireland (cod). • Not detected in wrasse to date. • Does not affect AS.
1.2.13 (*Mycobacterium* spp)	VL	M	VL	L	acceptable	• Present in Ireland (ornamental and wild fish). • Not detected in wrasse to date. • Can affect AS.
1.2.14 (Novel bacteria)	unknown	unknown	unknown	unknown	uncertain	• Unknown.

Hazard	R	E	PE	C	Risk	Notes
Parasites						
1.3.1. (*G. salaris)*	N	N/A	N/A	N/A	acceptable	▪ Only in freshwater - no threat to marine species. ▪ Can affect AS in freshwater. ▪ Notifiable.
1.3.2. (*N. perurans*)	M	H	M	M	not acceptable	▪ Present in Ireland (AS and wrasse). ▪ Endemic in Irish salmon farming. ▪ Can affect AS and wrasse.
1.3.3. *(Novel parasites)*	unknown	unknown	unknown	unknown	uncertain	▪ Unknown.

Hazard	R	E	PE	C	Risk	Notes

Fungi						
1.5.1. (Novel fungi)	unknown	unknown	unknown	unknown	uncertain	▪ Unknown

AS: Atlantic salmon, RBT: Rainbow trout, LF: lumpfish, B: Ballan wrasse, CW: Corkwing wrasse, GS: Goldsinny wrasse

The risks posed by following pathogens, is rated "not acceptable" or "uncertain" **in the absence of risk management measures:**

VHSv, SAV, IPNv, PRV, PMCv, novel viruses., typical and atypical *Aeromonas salmonicida*, *Vibrio anguillarum*, Vibrio *salmonicida*, *Moritella viscosa*, novel bacteria, *Neoparamoeba perurans*, novel parasites and novel fungi.

Some of the pathogens listed above are widespread in the marine environment and in Irish salmon aquaculture (SAV, PRV, *M. viscosa, N. perurans*). The risk posed by introduction through wrasse is not always a significant overall increase in risk, depending on disease and vaccination status of salmon, level of prevalence and severity of infections detected.

For example*:* if clinical amoebic gill disease (*N. perurans* infection) is present in the salmon population at the time, introducing wrasse with a low prevalence of *N. perurans* infection will not pose a significant increase in infectious pressure on the salmon. If there is no AGD or only low level AGD on site and *N. perurans* is detected in wrasse, it is advisable to treat the wrasse before movement.

To account for the varying significance of pathogen introduction, **consequences of non-notifiable pathogen identification should always be subject to a case specific veterinary evaluation.** This should take into account the nature of the pathogen, severity of infection detected in wrasse and the health status/vaccination status of salmon on site. Risk management measures should be put in place following evaluation of all factors (See 3.7).

3. Risk management:

Implementation of measures to reduce the risks posed by the particular hazards to an acceptable level.

3.1. **Surveillance of wild wrasse populations**

- A yearly disease screening of all populations (to be defined by hydrographic area) should be conducted to test for the presence of pathogens of concern. 60 fish should be tested as follows:
  - Bacteriology: inoculation of kidney material from loop/swab into bacteria culture media: i.e tryptone soya agar (TSA), tryptone soya agar plus salt (TSASA), Columbia blood agar (BCA) and thiosulfate citrate bile salts sucrose agar (TCBS) (individual fish).
  - Virology: inoculation of kidney, spleen and heart material into tissue culture cell lines: i.e. BF-2 (bluegill fry) and EPC (epithelial papilloma of carp) (maximum of 5 fish per pool).
  - Histology: any fish showing signs of disease and a minimum of 20 fish should be sampled for histology.

No fish should be stocked on to salmon farms before results are evaluated.

3.2. **Storage of wrasse and veterinary health inspection prior to movement:**

- The fish should not be held in close confinement for longer than necessary and wrasse welfare should be optimized in any way possible (see 3.4).
- A veterinary examination of fish from each defined area on a monthly basis is advised. Examination should include:
  - Anaesthesia and clinical examination of a minimum of 30 fish.
  - Full diagnostic evaluation of any fish showing signs of disease and identification of pathogens.

3.3: **Movement of wrasse between hydrographic areas**:

- If possible, wrasse should be sourced from the same hydrographic area as the site they are to be stocked on.
- If wrasse from a hydrographic areas are to be moved to another, a screening as in 3.1 should be carried out two times a year for the area of origin.
- The requirement for health checks as in 3.2 remains.

3.4. **Biosecurity and continuous health monitoring of wrasse in sea cages**

- The husbandry and welfare requirements of wrasse remain to be fully determined. However, disease outbreaks are often stress associated and the welfare of wrasse should be maintained at the highest level possible (hide design and quantity, supplementation of feed if necessary). Care should be taken to minimize impact of stressful and events such as transport and movement, grading of salmon, net cleaning, and any process that involves handling fish.
- Wrasse mortalities should be monitored continuously, as with salmon, and categorised by clinical signs (runts, lesions, gill disease, predation, other). Infectious agents should be identified as early as possible to maximise chances of successful treatment and recognition of diseases of concern.
- Wrasse should be screened for *Neoparamoeba perurans* regularly
- If possible, diseases should be treated at an early stage to maximise welfare and survival.
- The health status of wrasse stocks on site should be assessed as in 3.1 once a year for every site.
- Veterinary inspections should be carried out on a monthly basis (routine visits) and when morbidity or mortalities are observed (diagnostic visits).

3.5. **Movement of wrasse between sites or re-use of wrasse**

- The movement of wrasse between sea sites is not advised.
- If movement is to take place or wrasse are to be reused after one production cycle, a screening as outlined in 3.1. is to be carried out.

3.6. **Vaccination**

- Vaccinating salmon is advised if commercial vaccines are available for diseases that have proven problematic in the area.

3.7. **Consequences of hazard detection**

- If hazards are detected, the movement of fish is to be suspended pending a case specific veterinary evaluation and risk management proposal.
- Risk management measures should be implemented if:

  a) movement of wrasse results in a significant risk increase for salmon, or
  b) stress associated with movement and stocking, in combination with pathogen detected, presents a significant disease or welfare concern for the wrasse.

- Measures can include treatment, postponing movement, advising against movement or culling.

It should be noted that this risk analysis, while qualitative, has been undertaken with reference to the available scientific literature and data from industry partners from Ireland, UK, Norway and Iceland. This risk analysis is based on the current state of our knowledge, however, the available information on pathogens affecting these species is scarce.

The risk assessment framework used here has been adapted from AQUIS (1999) and and based on Annex 3, code of good practice, Scottish fin fish aquaculture (2015).

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.

O.I.E. (Office International des Epizooties) (2015) Section 2. Chapter 2.1. Risk analysis. Aquatic Animal Health Code, World Animal Health Organisation, Paris. http://www.oie.int/en/international-standard-setting/aquatic-code/access-online/

4. Summary and conclusions

The main pathogens that have presented disease problems for wrasse are: *Aeromonas salmonicida* A-layer types 5 and 6 (atypical furunculosis), *Vibrio anguillarum* (vibriosis), *Neoparamoeba perurans* (amoebic gill disease) and in one case VHSv (in Shetland).

i) Atypical furunculosis has been the recorded in farmed salmon and wrasse at sea in Ireland and has caused mortality in wrasse. The strains of atypical furunculosis affecting wrasse are variants that have not been reported in salmon and appear to be host species specific. The risk of species cross-over is considered low. Atypical strains are known to be present in wild wrasse populations.

ii) *Vibrio* vaccines and high levels of farm husbandry have ensured that vibriosis has not been a concern in finfish aquaculture in Ireland for over 20 years. Vaccinated salmonid susceptibility to vibriosis is low or insignificant.

iii) *N. perurans*, the causal agent of amoebic gill disease, is endemic in farmed salmon in Ireland and has also been detected in wrasse.

iv) VHSv has been detected in at least 80 marine and freshwater species and can be divided into 4 genotypes. Different types are endemic to northern hemisphere marine waters, correlating to

geographic area rather than to fish species. Genotype III ("European marine strain") has been isolated from all wrasse species commonly used as cleaner fish in Shetland, the infection is thought to have come from wild fish in the area.

This risk analysis is based on the current state of our knowledge. As more data regarding the diseases and welfare requirements becomes available, there may be a need to reassess the current knowledge to enable adequate risk management.

To date there have been no recorded incidents of significant disease problems arising as a result of disease transmission from wrasse to salmon. In general, and as far as the current state of knowledge has established, the disease risks associated with farming and cohabiting the species in Ireland are considered low.