Cleaner fish in aquaculture: Health management and legislative issues

Contents

1. Introduction

With the increasing use of Cleaner fish (both wrasse and lumpfish), health management and disease control have become issues of central importance especially after the VHS outbreak in Scotland in 2012 and Iceland 2015.

The EURL-Fish was asked by the EU Commission to provide a qualified opinion including guidelines and recommendations for management of these fish in EU and assess the possibilities for including cleaner fish in the legislation.

A scientific working group meeting was therefore organized inviting qualified experts to compile available knowledge and organize it on scientific based advice.

On November 1st and 2nd 2016 the following experts attended the meeting:

- Dr. Snorre Gulla DVM PhD from Norwegian Veterinary Institute Oslo
- Dr. Sandy Murray – epidemiologist at Marine Scotland Science
- Prof. Sandra Adams from the Institute of Aquaculture, University of Stirling
- Tamsin Cochrane-Dyet DEFRA- fish health inspector

From the EURL for fish diseases team Prof. Niels Jørgen Olesen, coordinator of the EURL Niccolò Vendramin and Dr. Nikolaj Gedsted Andersen took part in the event.

The meeting aimed to acquire knowledge on current practices in relation to catching, farming, transporting, deployment and re-use of cleaner fish in aquaculture.

It was asked how these new farmed species fit into the legislative framework of CD 2006/88 and whether amendments for current legislation are needed.

Prof. Olesen started the meeting presenting the current legislative framework and highlighting the different articles that are relevant for cleaner fish

After this Niccolò Vendramin presented an overview of listed diseases outbreak occurred in cleaner fish in recent years. This presentation included the VHS outbreak in Scotland in 2012 in wild caught wrasse and isolation of VHSV and ranavirus from lumpfish from Iceland in 2015.

Dr. Gulla from Norway, who recently defended his PhD thesis focusing on diseases of cleaner fish in Norway, provided an overview of current practices with cleaner fish focusing on health issues.

Afterwards prof. Sandra Adams presented the current practices in Scotland with a focus on use of vaccines for preventing disease outbreak in farmed cleaner fish

Dr. Tamsin Cochrane-Dyet from fish health inspectorate in England and Wales provided interesting suggestion for setting up surveillance program for cleaner fish, looking into current gaps in the legislation

Finally Dr. Murray from Marine Scotland Science in Scotland presented a framework for risk assessment on the use of cleaner fish in aquaculture.

On November 2nd the group decided upon a working plan for drafting and finalizing a report collecting all needed recommendation for the EU commission.

The overarching goal of this report is to investigate if in the current legislation there are gaps in the current legislation with regard to the prevention and control of infectious diseases in aquaculture as well as health surveillance for aquaculture animals, currently regulated by Council directive 2006/88/EC.

2 Production and management of cleaner fish

Detailed guidelines in Norwegian language for the perceived best practices for management of cleaner fish are publically available at lusedata.no/for-naeringen/veiledere-leppefisk. The five guides provide advice for capture/storage and transport of wild-caught wrasse, for reception of wrasse, and for management of wrasse (incl. overwintering) and lumpfish in salmon farms. The webpage is managed by a group consisting of representatives from various industrial partners in the Norwegian aquaculture industry, and the guides have been developed in cooperation with scientific institutions. They are focused mainly around practical advice on how to achieve the best possible welfare, and thus also survivability and function, of cleaner fish used for salmon de-lousing. Since the knowledge basis surrounding these fish species, which have only recently been introduced to captivity, is still lacking, continuous revision of the guides will undoubtedly be required in the years to come. The latest available versions of the guides at lusedata.no were revised in 2015/2016.

2.1 Wild-caught wrasse (Labridae)

Indigenous North-European wrass sought after for the purpose of use as cleaner fish in salmon farms include mainly the species ballan-, *Labrus bergylta*, goldsinny-, *Ctenolabrus rupestris*, and corkwing-, *Symphodus melops*, wrasse. Rock cook, *Centrolabrus exoletus*, and cuckoo wrasse, *Labrus mixtus*, are used to a lesser extent. They all represent benthic, inshore fish species, dwelling e.g. in kelp forests during the warmer seasons, and spawning during spring/early summer (special variations). At lower water temperatures (below 5-7 °C) several species are known to enter a state of reduced physiological activity (torpor), accompanied by movement to deeper waters.

2.1.1 Capture and transport to shore

Wild wrasse are usually captured by use of custom-designed creels or fyke nets during the warm months after spawning is concluded. Participating fishing boats must be adequately equipped in order to facilitate sorting and gentle transport back to shore, as these fish are perceived as easily stressed and fragile to all sorts of handling and rough treatment. Notably, stressed fish will consume more oxygen.

Importantly, wild-caught wrasse destined for use as cleaner fish in salmon farms are legally considered aquaculture animals from the time they are captured, with any legal regulatory consequences this may entail.

2.1.2 Temporary local storage

Unless designated for immediate delivery to a nearby salmon farm directly from the fishing boat, most wild-caught wrasse will be subjected to temporary storage (up to one week) in makeshift holding pens, pending transport of larger batches to salmon farms located elsewhere. Thoughtful placement and design of these pens is essential for maintaining fish health and welfare. Dead and moribund fish should be removed daily during such storage.

2.1.3 Transport to salmon farms

Transport of wild-caught wrasse over longer distances usually occurs by truck. Protocols and equipment ensuring safe and gentle transport must be acquired and installed. The fish should be starved at least 1-2 days prior to transport in order to reduce ammonia load in the transport water. Transport out of areas with ongoing outbreaks of infectious fish disease is strongly recommended against, but screening for specific pathogens is usually not conducted.

2.1.4 Reception and stocking

Upon arrival at the destination farm, the cleaner fish are usually unloaded into new tanks for subsequent transport by boat out to the salmon pens. No treatment of the transport water or quarantine for the wrasse is required. On-site veterinary health-inspections prior to stocking are often performed, with destruction of dead/moribund or otherwise unhealthy fish. The number, size, quality and species composition of received wrasse batches should be recorded through sampling.

Again, gentle loading/unloading and transport is essential for maintaining the health of these fragile fish and thus reducing the risk e.g. of activation (and subsequent spread) of any subclinical infections. Unloading of wrasse into the salmon pens is performed close to cleaner fish refuges and after the salmon have recently been fed.

2.2 Farming of ballan wrasse

An English language manual for farming of ballan wrasse was published in 2014. It was developed as a joint effort (the LeppeProd project) between several industrial and research partners involved in Norwegian aquaculture, and was funded by The Norwegian Seafood Research Fund (FHF). The project summary (no. 900554), including the LeppeProd-manual, is publically available through FHF's webpages (fhf.no). Recommended procedures for handling, stocking, environmental enrichment, feed composition, feeding etc. of farmed ballan wrasse during all life stages in the production cycle are given in detail in this manual.

2.2.1 Broodstock

Wild-caught ballan wrasse broodstock represent a risk factor for introduction of infectious agents into aquaculture. The LeppeProd manual recommends a quarantine time of no less than four weeks (after capture), as well as formalin treatment for eliminating ectoparasites.

While most ballan wrasse broodstock used today are wild-caught, efforts at producing consecutive generations in farms have been initiated. This is requested as it would reduce the risk of introduction of infectious agents with wild-caught fish. It would also allow for targeted breeding towards domestication and in favour of other desirable traits such as resistance to infection and lice eating behaviour.

One of the challenges in terms of ballan wrasse generation breeding lies in the fact that all individuals are born female, and spawn as females at first spawning. Knowledge is still scarce regarding what eventually causes development of functional testes (protogynous hermaphroditism) in some individuals.

2.2.2 Roe and milt

Both spontaneous spawning and stripping is believed to be utilised for roe (and milt) collection in ballan wrasse farms today. Neither of these methods are sterile, and this stage represents a critical point with regard to preventing vertical transmission of infectious agents. Surface disinfection of eggs is desirable, but the stickiness of ballan wrasse eggs, which arises following exposure to seawater, makes this difficult. While the safety of the procedures with regard to larval development etc. may require further testing, some suggestive guidelines for removal of stickiness and surface disinfection of ballan wrasse eggs are provided in the LeppeProd manual.

2.2.3 Feeding and nutrition

During the larval stage, ballan wrasse needs live prey for feeding. Organisms belonging to the wild marine zooplankton (including crustaceans- and rotifer species) have commonly been harvested for the purpose of feeding marine fish larvae in captivity. This does however pose a risk for introduction of infectious agents to farms, and most ballan wrasse farms today cultivate their own in-house stocks of such organisms in order to minimise/eliminate this risk.

Weaning onto formulated feed takes 1-10 days, and may be completed by 50-80 days of age. The digestive system of juvenile and adult ballan wrasse lacks a stomach and caeca, and has a short intestine. The species is also perceived as a ‘picky’ eater. This presents some challenges with regard to feed composition during the on-growing phase, after weaning. Commercial diets are available. Farmed ballan wrasse may, depending on required size, be ready for delivery to salmon farms between 9-15 months after hatching (from 30 g).

2.2.4 Water supply and treatment

Marine fish farming requires constant access to aerated seawater in sufficient amounts. Farmed ballan wrasse are commonly kept at water temperatures ranging between 12-16 °C, depending on life stage. Intake water represents an obvious source for introduction of infectious agents to farms, and procedures and instrumentation for adequate water treatment (filtering, UV etc.) must therefore be employed. Such are already widely used in commercial farming of other fish species, and have been adopted from here.

2.2.5 Vaccination

Vaccination against bacterial pathogens has been shown to be effective for Ballan wrasse and therefore vaccination is recommended where possible. Optimal vaccines and vaccination strategies are, however, still currently being developed and pathogen profiles in the UK appear different to those in Norway. In the UK autologous vaccines are currently being used, with vaccination by dip, bath and injection. Vaccination (by injection) of farmed ballan wrasse in Norway is currently being tested.

2.2.6 Transport and stocking

Transport and stocking of farmed ballan wrasse essentially follows the same principals as previously mentioned for wild-caught wrasse (see paragraph 2.1.3). Having spent their entire life in captivity however, these fish may show a higher tolerance towards transport and handling. It is also easier to document their health status through screening prior to transport. They should not be stocked in salmon farms when seawater temperatures are low.

2.3 Farming of lumpfish

The use of wrasse in Norway has declined in recent years as lumpfish have become more popular. It is only relatively young (small) lumpfish individuals which are used as cleaner fish and these are entirely of farmed origin. The increasingly high popularity of farmed lumpfish, compared to wrasse, for delousing purposes, seems essentially to derive from a perception of them as being more robust to handling etc. They also grow faster and maintain lice-eating activity at lower water temperatures. They have no swim bladder, and will spend a lot of time attached to surrounding structures by use of an adhesive ventral ‘sucker’ (modified pelvic fins). This presents some challenges in terms of equipment designing for lumpfish farming and transport etc. Moreover, lumpfish usually display little or no reaction towards being handled.

Three research projects mainly funded by FHF have particular focus on for lumpfish farming. The projects investigate, respectively, broodfish stocking and breeding (project no. 900977; concluded), methods for safe harvest and handling of roe and milt (project no. 901234; ongoing), and water quality and first feeding (project no. 901174; ongoing). Updated Norwegian language project descriptions and overviews of achieved results can be accessed at fhf.no. As of yet however, no comprehensive English language manual for farming of lumpfish (as the LeppeProd manual provides for ballan wrasse) exists to our knowledge although a number of research projects have recently started in Scotland. These are funded by the Scottish Aquaculture Innovation Centre (SAIC) to improve in the production and implementation of farmed lumpfish in the Scottish Salmon industry. This covers the full production on lumpfish, nutrition and health (including vaccine development) as well as welfare. The project, which is being conducted with industrial partners, is providing useful information on pathogens in lumpfish in the UK. Pathogens profiles appear to differ from Norway.

2.3.1 Broodstock

Lumpfish broodstock are still essentially wild-caught, and the same biosecurity considerations as for ballan wrasse (see paragraph 2.2.1) are obviously equally applicable for this species. Several lumpfish producers have now however, in cooperation with commercial breeding companies with extensive experience in salmon breeding, successfully produced consecutive lumpfish generations. Familial differences in lice eating behaviour have been documented experimentally. We believe that lumpfish broodstock of farmed origin will become entirely dominating within few years. FHF project 900977 has developed several practical protocols for the different broodstock stages.

2.3.2 Roe and milt

Lumpfish roe is usually collected by stripping (non-terminal), while milt collected from dissected gonads (terminal) have been shown to yield higher fertilisation rates and is thus recommended. As for ballan wrasse (see paragraph 2.2.2), lumpfish eggs also become very sticky after exposure to seawater, making disinfection difficult. Methods for removal of stickiness and disinfection are tentatively under development in FHF projects 901234 and 900977.

2.3.3 Feeding and nutrition

In contrast to wrasse, lumpfish larvae do not require live feed, and commercial formulated dry feeds with high energy content are usually used during this stage. This result in significant food spillage in the tank water however, representing a good basis for microbial proliferation. Live feeds are now also being tested for lumpfish larvae in FHF project 901174.

From approximately 1 g onwards, the growth of juvenile lumpfish accelerates, and regular sorting must be performed due to differences in growth rate. Commercial on-growing diets are available. From 5-9 months of age (≥7 g) they may be ready for delivery to salmon farms. One challenge in this regard lies in achieving sufficient vaccine response within this time (see paragraph 2.3.5 below).

2.3.4 Water supply and treatment

Essentially the same principles apply here as for farming of ballan wrasse (see paragraph 2.2.4). Water temperatures may range from 2-16 °C depending on seasonal changes and the life stage of the fish. The perception is that lumpfish require particularly well oxygenated water of high quality. FHF project 901174 also focuses on water quality in lumpfish farming.

2.3.5 Vaccination

Vaccination against bacterial pathogens has been shown to be effective for lumpfish and therefore vaccination is recommended where possible. Optimal vaccines and vaccination strategies are, however, still currently being developed and pathogen profiles in the UK appear different to those in Norway. In the UK autologous vaccines are currently being used, with vaccination by injection. A common regimen in Norway today involves both dip and injection vaccines. FHF project 901264 seeks to develop/refine and evaluate vaccination regimens for lumpfish.

As mentioned, lumpfish grow very fast and may reach a desirable size (for use as cleaner fish) as early as 5 months of age. This presents some challenges e.g. with regards to allowing an appropriate immunisation period after vaccination.

2.3.6 Transport and stocking

Essentially the same considerations apply for transport and stocking of lumpfish as for wrasse (see paragraphs 2.1.3 and 2.2.6). The lumpfish's ability and willingness to adhere to any firm surfaces must however be considered when designing transport equipment and pipes for loading/unloading. Also, starving may allegedly lead to increased aggression. Sedation of lumpfish during transport is specifically recommended against. Lumpfish can tolerate stocking at lower water temperature than wrasse.

2.4 Cleaner fish management in salmon farms

Stocking proportions in salmon farms vary greatly depending on experienced lice burden and the size and species of cleaner fish used. Recommendations range anywhere from 2-20% (numerical) of the total fish stock. The aforementioned guides available at lusedata.no provide species specific (wrasse and lumpfish) practical advice for management of cleaner fish in salmon farms. It is stressed that all involved farm personnel must receive adequate training in cleaner fish management.

2.4.1 Refuges

Installation of refuges (e.g. mimicking kelp forests) in salmon pens holding cleaner fish is essential for reduction of cleaner fish stress and predation from salmon, and these should be custom designed for the respective species in use. For wrasse, which have a closed swim bladder, access to hideouts is also important for the reason of minimising their residence in mortality nets at the bottom of the pens, where they may seek refuge among dead fish. This represents a particular problem during hoisting of the mortality nets, when the swim bladder may explode or prolapse anally due to rapid inflation. The lumpfish for their part require firm surfaces in refuges for attachment.

2.4.2 Feeding

Access to alternative food should be minimised, prompting frequent and thorough fouling removal (except during winter when the wrasse should be left undisturbed). Controlled supplemental feeding is nevertheless recommended, especially during periods when lice loads are low. Different feeds (see paragraphs 2.2.3 and 2.3.3) and administration techniques are required for wrasse and lumpfish, respectively. Lumpfish are generally perceived as less ‘picky’ than wrasse in terms of feed preferences, although the lumpfish will allegedly only eat feed that is in motion (e.g. sinking).

2.4.3 Cleaner fish health

Being by definition aquaculture animals, regular health controls of cleaner fish in salmon farms are obligatory, and these are usually carried out simultaneously with salmon health controls. During such controls it is important to be aware that a large proportion of cleaner fish mortalities will presumably never be found in the mortality nets. Legally, onset of high cleaner fish mortalities dictates that fish health services are to be contacted. Aside from infectious diseases (see paragraph 2.5), cleaner fish losses due to mechanical injury and/or stress (e.g. following pharmaceutical delousing) are common.

2.4.4 Termination and re-use

Re-use of cleaner fish within the same farm following salmon being sent to slaughtering is practiced to some extent, except when the salmon have experienced serious infectious disease outbreaks. Re-use at other farms is recommended against. There may, however, be exceptions for reuse on sites within the same management area provided the MA undergoes a synchronized fallow (including cleaner fish) after the last site is harvested This local reuse can have strong benefits in that sites approaching harvest cannot use chemical controls on lice and pose lower risk because of the limited time for emergence. It must, however, be treated with care and not undertaken if cleaner fish are to be reused in the next production cycle. Intentional release of all live fish, including cleaner fish species, from aquaculture facilities is prohibited. It seems apparent that these regulations are not consistently followed nor enforced in at least one of the salmon producing European countries.

Internal risk assessment in each individual case is however encouraged in the guidelines. Surviving cleaner fish not destined for re-use should be appropriately euthanized and destroyed according to applicable legislations.

Intentional release of all live fish, including cleaner fish species, from aquaculture facilities is prohibited. It seems apparent that these regulations are not consistently followed nor enforced.

2.5 Infections in cleaner fish species

Cleaner fish mortalities in salmon farms are often high, and very few cleaner fish presumably survive through a full salmon production cycle. Individual episodes of increased mortality are often related to infectious diseases, most commonly caused by bacterial agents. Losses of entire batches due to bacterial disease are also occasionally observed in cleaner fish farms. While lumpfish appear more robust than wrasse towards handling, they seem equally (or perhaps even more) susceptible to infectious disease in captivity. Moreover, clinical signs of disease in lumpfish are often absent until mortality occurs, with the fish sometimes feeding right up until the time of death.

While many microbial agents are pathogenic towards both wrasse and lumpfish, some differences are seen. At the end of this section follow three paragraphs (2.5.1 – 2.5.3) listing the infectious agents considered most relevant to fish health with regard to today's practices in use of cleaner fish. The agents are sorted in descending order with the ones perceived as posing the greatest fish health risk towards wrasse (2.5.1), lumpfish (2.5.2) and Atlantic salmon (2.5.3), respectively, listed on top. This risk-assessment is based on available literature and the overall impression – considering frequency of detection and seriousness of disease – as observed following the use of cleaner fish in Norway and the British Isles in recent years. Notably, the order and content of the lists may vary considerably between geographical regions and over time. Clinical signs of the respective diseases will not be covered in detail here. Aside from personal correspondence with experts in relevant fields, particularly at the Norwegian Veterinary Institute, some central references include the following:

- The Norwegian Fish Health Report of 2015 (available at vetinst.no)
- A review on wrasse diseases by Treasurer *et al.* 2012 (ncbi.nlm.nih.gov/pubmed/22625226)
- FHF project 901120 on disease-related risks associated with use of cleaner fish in Norway (final report with English summary available at fhf.no)

On a general basis it should also be noted that much remains unknown yet with regard to the susceptibility (as biological and/or mechanical vectors) of cleaner fish species to various established fish pathogens. This particularly applies to viral agents, for which the carrier status of wild wrasse- and lumpfish populations has not been broadly investigated. Cleaner fish species may also harbour presently undescribed pathogens. For these reasons among others, the demand for farmed, vaccinated cleaner fish is increasing.

2.5.1 Significant pathogens of wrasse used as cleaner fish

- Atypical *Aeromonas salmonicida* A-layer types V and VI (disease: atypical furunculosis)
- *Vibrio anguillarum* serotype O2a (disease: classical vibriosis)
- *Paramoeba perurans* (disease: amoebic gill disease/AGD)
- *Tenacibaculum* spp. and/or *Moritella viscosa* (disease: skin ulcers)
- *Vibrio splendidus*-clade and/or *Aliivibrio* spp. (disease: presumed opportunists)

2.5.2 Significant pathogens of lumpfish used as cleaner fish

- Atypical *Aeromonas salmonicida* A-layer type VI (disease: atypical furunculosis)
- Unnamed *Pasteurella* sp. (disease: pasteurellosis)
- *Vibrio anguillarum* serotype O1 (disease: classical vibriosis)
- *Paramoeba perurans* (disease: AGD)
- *Vibrio ordalii* (disease: vibriosis)
- *Pseudomonas anguilliseptica* (disease: haemorrhagic septicaemia)
- Unnamed *Flaviviridae* sp. (disease: liver necrosis)
- *Nucleospora cyclopteri* (disease: renal granulomas)
- *Tenacibaculum* spp. and/or *Moritella viscosa* (disease: skin ulcers)
- *Vibrio splendidus*-clade and/or *Aliivibrio* spp. (disease: presumed opportunists)

2.5.3 Pathogens of Atlantic salmon reported from cleaner fish species

Agents in the following species-specific (wrasse and lumpfish) lists are typed in different fonts depending on the (currently perceived) health risk imposed upon farmed salmon by use of cleaner fish (**significant risk**, **possible risk**, low or negligible risk).

Wrasse:

- ***Paramoeba perurans***: Regularly detected in Norwegian wrasse species used as cleaner fish, and showing symptoms consistent with AGD.
- **VHSV type III**: Detected in 2012 in diseased wild-caught Scottish wrasse (various species) destined for use as cleaner fish and in apparently healthy wrasse held on salmon farms as cleaner fish.
- ***Aeromonas salmonicida* ssp. *salmonicida*:** Detected from various wrasse species stocked with Atlantic salmon suffering from furunculosis during the 1980s/90s, prior to implementation of salmon vaccination. Farmed salmon today are vaccinated.
- ***Vibrio anguillarum*:** Regular disease outbreaks in wrasse species used as cleaner fish. Farmed salmon are vaccinated.
- SAV: Detected by RT-PCR from apparently healthy wrasse stocked with Atlantic salmon suffering from PD in Norway in 2015. Sample contamination can, however, not be ruled out.
- ISAV: Detected by PCR from apparently healthy goldsinny wrasse stocked with Atlantic salmon suffering from ISA in Norway in 2016. Sample contamination cannot be ruled out.

- IPNV: Infection experimentally established in wrasse, but never detected systemically in individuals used as cleaner fish.

- *Yersinia ruckeri*: Detected from one corkwing wrasse stocked with Atlantic salmon suffering from yersiniosis in Norway in 2016.
- *Tenacibaculum* spp., *Moritella viscosa*, *Vibrio splendidus*-clade, *Aliivibrio* spp.: Occur ubiquitously in marine environments.

Lumpfish:

- ***Paramoeba perurans***: Regularly detected in Norwegian lumpfish used as cleaner fish, and showing symptoms consistent with AGD.
- ***Aeromonas salmonicida* ssp. *salmonicida***: Regularly detected from diseased lumpfish used as cleaner fish in a single fjord in Norway since the autumn of 2015. No symptoms seen in vaccinated Atlantic salmon in the farms. The strain has been verified as one endemic to the local populations of wild salmonids.
- **VHSV type IV**: Detected in 2015 in diseased wild Icelandic lumpfish broodstock and progeny destined for use as cleaner fish.
- ***Vibrio anguillarum*:** Regular disease outbreaks in lumpfish used as cleaner fish. Farmed salmon are vaccinated.
- IPNV: Infection experimentally established in lumpfish, but never detected systemically in individuals used as cleaner fish.
- *Tenacibaculum* spp., *Moritella viscosa*, *Vibrio splendidus*-clade, *Aliivibrio* spp.: Occur ubiquitously in marine environments.

In addition to the above, the relevance of the unnamed *Flaviviridae* sp. and *Nucleospora cyclopteri* (see paragraph 2.5.2) with regard to farmed Atlantic salmon remains unknown.

3 Trade and management of cleaner fish

3.1Trade

3.1.2 Transport guidelines

Farmers have a legal responsibility to ensure their animals are transported in a way that won't cause injury or unnecessary suffering to them. European law that governs the welfare of animals during transport applies to anyone who transports live, vertebrate animals in connection with 'economic activity' - ie a business or trade - including:

- farmers
- livestock
- markets
- slaughterhouses

- assembly centres

FAO has published a practical guide in regards to transportation of live fish (Berka 1986)

3.1.3 Health certificate

Intra-community and third country trade are controlled through legislation at the Union and National level to prevent the introduction and spread of diseases listed in Part II of Annex IV of Council Directive 2006/88/EC.

Regulation EC 1251/2008 sets out the certification requirements for aquatic animals susceptible to one or more of these listed diseases. Under this legislation, aquaculture animals that intend to be introduced into a Member State, zone or compartment declared disease-free in accordance with Part A of Annex III must be accompanied with an animal health certificate. Where specific aquaculture animals are not identified as susceptible or vector species for any of the listed diseases, they do not require animal health certification, but are subject to notification under the computerised Traces system in accordance with the Commission Decision 2004/292/EC (as amended by Decision 92/486/EEC).

Since lumpfish and wrasse species are not listed as susceptible species or vector species in accordance with Part II of Annex IV of the Council Directive 2006/88/EC, these species can be traded between aquaculture sites in Europe, including those in Member states, zones or compartments declared disease-free, and are only subject to notification under the Traces system. Therefore, these species can be freely traded between intra-community and third country without any certification declaring VHS freedom.

3.2 Risk of spreading diseases

The use of cleaner fish creates risks of spreading existing pathogens and the evolution of new pathogens through processes of transport of cleaner fish under intensified population density and stress (Murray 2016). These pathogens can potentially affect both the cleaner fish and their salmonid clients.

3.2.2 Risk of spreading pathogens

3.2.2.1 Spread of existing pathogens

The transport of cleaner fish to salmonid farms creates a potential new route for pathogens to be spread to salmonid farms. Known pathogens of cleaner fish may obviously be spread by this route and this may be associated with spread of pathogen variants in Norway. It is possible that cleaner fish could carry pathogens of salmon too, both shared pathogens affecting both cleaner fish and salmonids, but also salmonid only pathogens if the cleaner fish act as vectors. Salmon are only transported relatively short distances between marine farms (Wallace et al. 2016) but cleaner fish are often transported over hundreds of kilometres (Hall et al. 2014) and therefore cleaner fish use could greatly increase the risk of long-distance spread of marine pathogens. If cleaner fish are moved between different salmonid farms, the risk of their spreading infection is increased as they could have become infected on the farm.

Cleaner fish should be moved under conditions of good biosecurity and equipment used for transport disinfected after use. Sourcing should preferably be from hatcheries to reduce the risk that the cleaner fish are infected. If cleaner fish are held on marine on-growing sites, these should be in the same region as the salmonid sites they will be deployed on. If moved between farms, this should only be within epidemiologically defined local areas, such as Scottish farm management areas.

3.2.1.2 New Pathogens

The intensification of population density and the mixing of species create conditions under which new diseases can emerge. It should be noted that many of the key diseases of farmed salmonids (e.g. ISA or VHSV) emerged from viruses or microorganisms that were unknown and largely non-pathogenic. Therefore the diseases that emerge as a result of cleaner fish use may also be from sources that are currently unknown.

Under intensification increased transmission occurs and this can lead to more rapid and widespread development of infection, which may lead to disease even from normally innocuous infections. Moreover, the condition can also lead to selection for increased virulence via transmission versus morbidity/mortality trade off (Frank 1996). If there are plenty of alternate hosts, a pathogen that spreads rapidly while damaging its host will outcompete one which preserves it existing host but spread more slowly. Thus aquaculture can provide conditions under which new diseases can emerge (Murray and Peeler 2005).

Mixing of species in close proximity create conditions in which pathogens can transfer from one host to a new one. This is similar to zoonosis, which is the major source of the emergence of new diseases in humans, some of them very virulent diseases. Pathogens that spread with limited efficacy in their new host (R0) may evolve the capacity to spread effectively (R0 >1) with passage (Antia et al. 2003) given a high enough initial level of infection and time.

Unfortunately intensification of population density and close mixing of cleaner fish and salmonids are intrinsic to their use. This risk therefore cannot be entirely avoided, but it can be reduced. Good surveillance for morbidity or mortality in cleaner fish or salmonid populations can lead to rapid detection of emergence. Risk can be reduced by the separation of farms into epidemiologically relevant management areas with no movement of fish between these areas, thereby limiting the consequence should an emergence occur. Increased use of farmed rather than wild-caught cleaner fish will facilitate improved infection control in general, and thus presumably also reduce the risk of novel pathogens emerging.

3.3 Risk of the reuse of cleaner fish

Evolution of virulence greatly increases the potential for new diseases to emerge (Antia et al. 2003), this applies both to diseases of cleaner fish and salmonids (Murray 2016). The process of evolution requires time and so evolution of virulence can be broken by fallowing of sites to eradicate the emerging pathogens before they cause a problem.

However, there are valid reasons to reuse cleaner fish. The benefits of controlling lice are substantial, indeed control is generally necessary for sustainable aquaculture and likely to outweigh risks from emerging disease

(Murray 2016), so sheer limit to supply may mean that reuse is better than not having cleaner fish available at all. Similarly, and related, the cost of cleaner fish is substantial and this must be considered in balance with risk associated with reuse. Thirdly, new cleaner fish may be carrying pathogens of their own and so reducing input can reduce disease risk if the current stock has exhibited no significant health problems. Fourthly, more mature and experience fish may be better at eating lice than would naïve cleaner fish, many of whom are quite ineffective in this role. Fifth, and related, it has been suggested that naïve cleaner fish can learn from watching experienced fish. While breeding more, better health status, and better adapted (and possibly trained) to feed on lice, cleaner fish will reduce all these benefits there are valid reasons why reuse can occur. Net risk is a balancing of these benefits against disease emergence risk, so decisions whether or not to reuse cleaner fish need to consider both costs and benefits.

If reuse does occur, it should be under conditions of stringent biosecurity. It should not occur in the presence of substantial morbidity or mortality, in particular in the presence of notifiable disease, even if the cleaner fish are not listed as susceptible. Movement of either salmon or cleaner fish off sites that reuse cleaner fish should be discouraged or prohibited. In particular movement outwith local epidemiologically relevant areas should be avoided. If reuse is to occur this should be taken into account in risk-based surveillance with a higher risk status, and hence more frequent inspection on such sites. These controls can be managed by a mixture of code of practice and legislation, with legislation focused on reporting and surveillance, with prohibition focused on notifiable infections and more flexibly on emerging disease. However, many of the day-to-day decisions are best left to industry, provided they are supported by valid risk assessments.

4 Legislative issues and recommendation

Council Directive 2006/88/EC lays down the animal health requirements needed for placing on the market, importation and transit of aquaculture animals and products thereof.

The main principles driving such regulatory framework are:

- To prevent and control outbreaks of diseases in aquaculture animals that could cause severe loss and to minimise the economic impact on the aquaculture industry
- To provide support and guidance on diseases in aquaculture animals for the competent authorities, aquaculture production business operators and other related aquaculture sector
- To support active health surveillance by reducing the impact of listed diseases in Europe contributing to the increase of sustainability of the European aquaculture sector

The surveillance and control of specific diseases are listed, and detail for sampling and laboratory procedures are given in council implementing decision 2015-1554.

Health management and disease control is meant to be wider and have a holistic approach on all aquaculture animals. When there is a suspicion of a listed disease and/or an increased mortality event the obligation to notify the competent authority is on the aquaculture production business operator. The competent authority can then implement initial control measures while they investigate the mortality.

It is noteworthy that cleaner fish, although their limited involvement in the human consumption chain are destined for aquaculture and are therefore regarded as aquaculture animals and thereby subjected to all related requirements in CD 2006/88.

CD2006/88 congruently addresses the use of cleanerfish, their health management, disease control and transport in the following prerequisites to the Directive (Annex 2):

- With regards to authorization of Aquaculture production business Prerequisites 13 and 14.
- With regards to disease prevention and health status improvement. Prerequisite 16 ,17,20,21,23,24
- With regards to early detection and warning system for emerging diseases. Prerequisites 27,30,31,32
- With regards to disease control and eradication measures. Prerequisites 34,35
- With regards to transport of live animal Prerequisite 37.

By scrutinizing Council Directive 2006/88/EC it appears that there is no need for amending the directive provided that cleaner fish are included in the list of fish species susceptible to VHS.

'Susceptible species' means any species in which infection by a disease agent has been demonstrated by natural cases or by experimental infection that mimics the natural pathways;

Based on scientific demonstration of natural and experimental cases of VHS in lumpfish (*Cyclopterus lumpus*), ballan wrasse *Labrus bergylta* (Ascanius), corkwing wrasse, *Symphodus melops* (L.), cuckoo wrasse, *Labrus mixtus* (L.), goldsinny wrasse, *Ctenolabrus rupestris* (L.), and rock cook wrasse, *Centrolabrus exoletus* (L.) these species should therefore be immediately included in the list of susceptible species for VHS in CD 2006/88/EC Annex IV part II.

As soon as included the competent authorities in the respective Member States can take the appropriate provisions.

5 Specific recommendation due to scientific evidence on susceptibility of cleanerfish to VHS virus

CD 2006/88 Annex IV part I provides criteria for listing diseases in aquatic animals and part II, the listed diseases and susceptible species.

The following outbreaks has been reported and notified:

In 2012 wild wrasse held as cleaner fish in Shetland Isles, Scotland experienced mortality due to VHSV Genotype III. Wrasse species involved included Ballan *Labrus bergylta* (Ascanius), corkwing, *Symphodus melops* (L.), cuckoo, *Labrus mixtus* (L.), goldsinny, *Ctenolabrus rupestris* (L.), and rock cook, *Centrolabrus exoletus* (L.) (Munro et al. 2015).

In 2015 wild lumpfish (*Cyclopterus lumpus*) broodstock and their progeny held in a farming facility, experienced mortality due to VHSV Genotype IV (new subclade), in Iceland. http://www.oie.int/wahis_2/public/wahid.php/Reviewreport/Review?reportid=19020. S. Guðmundsdóttir et al. Manuscript in preparation.

The pathogenicity of VHSV isolates from both outbreaks was tested experimentally in Atlantic salmon, rainbow trout, lumpfish and wrasse respectively.

VHSV genotype III and IV are both regarded as listed pathogens as no strain discriminations are conducted between the various VHS genotypes. None of the cleanerfish are however, included in the list of susceptible species to VHS in CD 2006/88. For instance the list consist of the fish species: Herring (*Clupea spp*.), whitefish (*Coregonussp*.), pike (*Esox lucius*), haddock (*Gadus aeglefinus*), Pacific cod (*G. macrocephalus*), Atlantic cod (*G. morhua*), Pacific salmon (*Oncorhynchus spp*.) rainbow trout(*O. mykiss*), rockling (*Onos mustelus*), brown trout (*Salmo trutta*), turbot (*Scophthalmus maximus*), sprat (*Sprattussprattus*) and grayling (*Thymallus thymallus*).

On the background of available information we therefore propose the inclusion of aforementioned wrasse species and lumpfish in the list of susceptible species for VHS given in CD 2006/88 Annex IV part II.

The inclusion of cleanerfish in this list of susceptible species for VHS fulfil the requirements given in the OIE Aquatic Code (Chapter 1.5)

This implies that such species, once held captive for the purpose of use as cleanerfish, are considered susceptible aquaculture species with the related consequences in terms of surveillance, screening and control measures for preventing spread of listed and emerging diseases.

6 Knowledge gaps and needs for further studies on cleanerfish

The use of cleanerfish in the aquaculture industry is still a quite recent development with significant gaps in knowledge with regard to life cycles, management, health monitoring and vaccinology etc.

With regard to health issues future research is needed e.g. on:

1. Infectious diseases and pathogens in wrasse and lumpfish. e.g. flaviviruse, *Nucleospora cyclopteri* etc.
2. Susceptibility of cleaner fish to infection with listed pathogens- primarily ISAV, VHSV and IHNV
3. Susceptibility of cleaner fish to infection with other pathogens -e.g. PRV, PMCV, IPNV, SAV, nodavirus.
4. Susceptibility of A. salmon with pathogen from Cleaner fish (Flavivirus, Atypical Aeromonas etc)
5. Risk assessment for intra-specific transmission of pathogen from Cleaner fish to A. salmon and vice-versa
6. The immunology of cleaner fish species, and their response to vaccination

7. Disease transmission through gametes / investigation of vertical transmission of infectious diseases in cleaner fish
8. Disinfection of fertilized cleaner fish eggs

In addition general international guidelines for health monitoring and certification of cleaner fish is needed

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Cleaner fish guides at lusedata.no/for-naeringen/veiledere-leppefisk (in Norwegian)

Cleaner fish-related FHF projects (project descriptions and reports available at fhf.no; most with English summary): 900554, 900977, 901234, 901174, 901264, 901120

The Norwegian Fish Health Report of 2015 (available at vetinst.no)

ANNEX I – Abstracts of presentations

OUTBREAKS OF LISTED DISEASES IN CLEANER FISH

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Abstract:

The use of cleaner fish in aquaculture in aquaculture has been considered in the recent past as one of the most promising control measures for reducing the impact of Sea lice in Atlantic salmon farming.

The culture of new species (i.e. Wrasse and lumpfish) starting from wild population has encountered some challenges in terms of occurrence of infectious diseases. Noteworthy the appearance of listed disease Viral Haemorrhagic Septicaemia caused by Viral Haemorrhagic Septicaemia Virus VHSV has occurred both in Wrasse and in Lumpfish.

The first documented outbreak of VHS in Wrasse occurred in Scotland in 2012 and was caused by VHSV strain belonging to genotype III.

In 2015 two different viral pathogens were isolated from Lumpfish in Iceland.

The first viral pathogen isolated from wild lumpfish caught off the south coast of Iceland and identified as a new iridovirus isolate. A sequence of the MCP gene was obtained and when blasted in NCBI database showed high homology with *Ranavirus* isolates from cod (*Gadus morhua)* and turbot (*Psetta maxima*) isolated in Denmark.

The second virus isolated was identified as VHSV, genotype IV. That brood fish was caught in July in Breidafjördur, a bay in west Iceland and immediately brought to a land based farm. Samples were confirmed positive by the EURL lab in Denmark. Afterwards a notification to member states was issued on October 23rd, 2015. Measures taken were stamping out and disinfection of the facilities. This is the first time that a notifiable fish virus has been detected in Iceland.

Genetic characterization of the isolate performed by sequencing the G, N and NV gene revealed that the isolate belong to genotype IV but constitute a new sub-clade.

In vivo experiments to characterize the pathogenicity of this virus in farmed salmonids rainbow trout and atlantic salmon and lumpfish (*Cyclopterus lumpus*) were carried out at the experimental facilities of DTU-VET.

Infection trials.

<u>Risk assessment for farmed salmonids</u>

Infection trials in Rainbow trout and Atlantic salmon were performed to test the pathogenicity of the Icelandic VHSV strains in these species. The fish were infected by immersion (bath) or by intraperitoneal (i.p.) injection.

Virus isolates:

1) The virus isolate Icelandic strain 15-19852 was passaged once in BF-2 cells and titrated on the same cell type according to standard procedures
2) Positive controls: The VHSV strain DK-3592B, highly pathogenic for Rainbow trout was used as a positive control by immersion only for Rainbow trout, and both by immersion and IP in AS. Furthermore VHSV strain isolated from Atlantic salmon genotype IVa isolated from Port Angles WA was used as reference for VHS genotype IV both by immersion and IP for RT and AS.
3) As a negative control, EMEM with tris-buffer and 10% newborn calf serum (dilution medium) was likewise used by immersion only.

Trials: All groups of RT and AS, were tested in triplicates 31 fish in each tank.

<u>Pathogenicity in cleaner fish</u>

Infection trials in lumpfish were performed to test the pathogenicity of the Icelandic VHSV strains in this species. In order to assess the pathogenicity of this trial for lumpfish triplicate of 30 fish of lumpfish will be infected by:

1) Bath infection: 6 hours both for salmon and trout. Negative controls will be mock infected with naïve cell culture supernatant
2) Intra Peritoneal IP Injection fish will be anesthetized with benzocaine and injected with 0,1 ml VHSV. Negative controls fish will be anesthetized as well and IP injected with naïve cell culture supernatant.

PRODUCTION AND MANAGEMENT PROCEDURES OF CLEANER FISH IN NORWAY, WITH FOCUS ON HEALTH ISSUES, DISEASES AND PATHOGENS

Snorre Gulla

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Abstract:

The use of cleaner fish for delousing of farmed salmon has expanded rapidly in Norwegian aquaculture since the introduction of strict legislations in 2009, regulating legal salmon louse infestation levels. In 2015, over 25 million cleaner fish were reported sold in Norway. While in 2011 this consisted entirely of wild-caught wrasse (mainly goldsinny, corkwing and ballan), the proportion of farmed cleaner fish has increased steadily over recent years. In 2015, approximately half of the cleaner fish used were farmed, with lumpfish being the dominant species (>90%).

Common guidelines (most in Norwegian language) have been developed and are publicly available advising fishermen, salmon farmers, cleaner fish farmers and fish health personnel on the currently perceived best practice conduct for hold and management of cleaner fish. These species are relatively new to captivity and breeding however, and knowledge about their biology is still scarce, so much optimisation work remains. Cleaner fish stocks are constantly replenished during the warm months, in order to maintain stocking proportions ranging anywhere from 2-18 cleaner fish per 100 salmon.

Cleaner fish losses in salmon farms are seldom carefully monitored, but there is an overall agreement that extremely few of these fish survive through a full salmon production cycle. One study from 2014 followed the fate of almost 1 million cleaner fish, and registered 33% cumulative mortality within 6 months of stocking. The actual proportion was however estimated to be nearly twice as high. This study found bacterial infections to dominate in diagnosed cases, which corresponds well with the findings from routine diagnostics at The Norwegian Veterinary Institute (NVI).

'Atypical' Aeromonas salmonicida is by far the dominating agent when it comes to causing losses of Norwegian cleaner fish. The bacterium was detected (by bacteriology and/or histopathology) in approximately 30% of the cleaner fish submissions to NVI in 2015, and two subtypes (A-layer types V and VI) are almost entirely dominating. Other more or less well-known fish pathogens regularly detected include Vibrio anguillarum serotypes O1 and O2a, Vibrio ordalii, a new Pasteurella species closely related to P. skyensis, Pseudomonas anguilliseptica, and various Tenacibaculum species. Several other members of the Vibrionaceae family (e.g. V. splendidus-related strains and Aliivibrio spp.) are also frequently isolated from dead or moribund cleaner fish,

although their role as pathogens is less certain. Since the autumn of 2015, several salmon farms in a single fjord in Mid-Norway have also suffered losses of lumpfish due to infection with a local strain of *A. salmonicida* subsp. *salmonicida* (‘typical’ *A. salmonicida*). This salmon pathogen is notifiable in Norway. The cohabitating farmed salmon were not affected.

Cleaner fish from Norwegian salmon farms have sporadically been tested for VHSV, nodavirus, PMCV, IPNV and ILAV with negative results, but no comprehensive screening has been performed. The lumpifsh has been suggested as a potential reservoir for IPNV following experimental challenge. SAV was detected in 2011 in low quantities from wrasse standing together with farmed salmons suffering from PD. Detection of a previously undescribed virus allegedly belonging to the *Flaviviridae* family was very recently (October 2016) reported by a private lab from farmed lumpfish in Norway suffering mortalities, but no further information regarding this possible emerging pathogen has yet been made publicly available. Infection with *Paramoeba perurans* has been identified in cleaner fish (wrasse spp. and lumpfish) showing symptoms consistent with AGD.

While transmission of infectious disease to farmed salmon in Norway has not, according to available literature, been unambiguously linked to introduction of cleaner fish, the possibility for this cannot be ruled out. The cleaner fish may in this regard conceivably function either as biological or mechanical vectors. Moreover, transport over large distances of wild-caught Norwegian wrasse, which represent highly autochthonous species, opens up the possibility for introduction of new pathogens to previously naïve populations of wild wrasse. We do for instance have some indication that A-layer type V of *A. salmonicida* (apparently wrasse-specific) may have become spread along the Norwegian coast by such transport since 2008.

An increased use of farmed cleaner fish will undoubtedly facilitate improved infection control through vaccination and screening. Since 2016, most farmed lumpfish in Norway have received i.p. vaccination against ‘atypical’ *A. salmonicida* (A-layer types V and VI) and *V. anguillarum* (serotypes O1 and O2a). Any effect of this on overall losses remains to be seen however.

PRODUCTION AND MANAGEMENT PROCEDURES FOR CLEANER FISH IN SCOTLAND WITH FOCUS ON HEALTH ISSUES, DISEASES AND PATHOGENS

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Abstract:

Atlantic salmon (Salmo salar) is the UK's largest food export, with a value of over £500 million in 2014 and the Scottish Government has set increased production targets for 2020. It has been calculated that sea lice cost the salmon-farming industry 10–20 cents/kg produced (Costello 2009). In Scotland the current impact of sea lice on the salmon-farming sector is estimated to be in the region of £30 million (€35.3 million) (Rodgers, 2016; Webster, personal communication).

Ballen wrasse (*Labrus bergylta*) and lumpfish (*Cyclopterus lumpus*) are new species being farmed in the UK for application as 'cleaner fish' in the removal of sealice from Atlantic salmon in aquaculture. Wild cleaner fish (wrasse, Labridae) were first used commercially as a biological control against sea-lice as far back as the late 1980s in the UK (Rae, 2002) and their effectiveness has been reported in commercial sea-pens (Costello, 1996). Therapeutic drugs were, however, favoured over the use of wrasse. Recently, the reduction in the efficacy of veterinary compounds due to reduced sea-louse susceptibility (Fallang et al., 2012; Lees et al., 2008) has raised the number of cleaner wrasse captured and deployed. The previous use of wrasse and lumpfish on fish farms has largely involved the collection of wild wrasse, a solution which is not sustainable. However, knowledge of the biology and life cycle of the both wrasse and lumpfish is limited and the culture of these fish is still in its infancy in the UK. Production challenges have therefore restricted the deployment of farmed wrasse, as well as lumpfish, in the UK. These are now active areas of research. Farmed Ballan wrasse have been confirmed as highly effective therapeutic and preventive biological controls against sea-lice. A recent study supported the current minimum hatchery size target (10mm total length) and the use of supplementary feeding to sustain wrasse stocks in operation and the functional predator response and the standardised decline time constant of sea-louse abundance were proposed as useful indicators of delousing efficiency (Leclercq, 2014).

In 2015, lumpfish and various species of wrasse were cultured for use as a biological control for parasites in the marine Atlantic salmon industry in the UK, with 2.3 million and 8 million ova being laid down to hatch, respectively, with an estimated production for 2016 of 15 tonnes for lumpfish and 7 tonnes for wrasse (Scottish Fish Farm Production Survey, 2016) ISBN: 9781786524270). Bacterial diseases currently appear to be the main

problem for cleaner fish in the UK although parasitic diseases (such as amoebic gill disease, AGD) can also problematic and viruses have been detected.

Two large Scottish Aquaculture Innovation Centre (SAIC) funded projects are currently under way to improve in the production and implementation of farmed wrasse and lumpfish in the Scottish Salmon industry. These are being conducted with industrial partners and as part of the projects focus on health management they are providing useful information on pathogens in cleaner fish in the UK. The aim is to develop effective vaccines.
The bacterial pathogens of Ballen wrasse and Lumpfish in the UK are currently poorly characterised and therefore screening was undertaken to collect cleaner fish pre- and post-deployment from sites across the U.K to gain an understanding of the likely threats to farmed cleaner fish. Analysis was performed on skin lesions, gills, liver and kidney sampled from moribund fish and over 300 submissions were subjected to bacteriological analysis (Wallis et al., 2016). Water samples were aloo collected in a time course at one site (Papadopoulou, 2016). Predominant isolates were identified by 16SrRNA sequencing and further genetic analysis was performed to characterise strain variation. A range of pathogens were identified including atypical *Aeromonas salmonicida* vapA typeV, *Vibrio salmonicida*, *Vibrio ichthyoenteri, Vibrio wodanis, Vibrio splendidus, Pasteurella sp, Tenacibaculum dicentrachi*, *Pseudomonas anguilliseptica* and Photobacterium sp. Pathogen profiles in the UK appear different to those in Norway for both lumpfish and Ballan wrasse and the prevalence appears hatchery specific. Some may have the potential to threaten salmon health. Isolates were selected for the development of autogenous vaccines. These are emergency vaccines formulated with farm-specific isolates. A prototype autogenous vaccine based on five variant strains of atypical *Aeromonas salmonicida* was manufactured for use in Ballen wrasse. The vaccine was shown to be safe and results from the field are encouraging. A prototype vaccine based on two variant strains of atypical *Aeromonas salmonicida, Vibrio salmonicida, Vibrio wodanis and Pseudomonas anguilliseptica* was manufactured for use in Lumpfish. The vaccine is safe and results following use in the field also appear to be encouraging. Vaccine formulations for further batches of vaccine for both fish species are being reviewed from the information gained and new vaccines are being formulated. Efficacy testing will be performed in the near future and vaccine strategies still remain to be optimised.

CURRENT PRAXIS AND LEGISATIVE FRAMEWORK FOR FISH HEALTH MANAGEMENT OF CLEANER FISH AT EUROPEAN AND NATIONAL LEVEL

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Abstract:

Lumpfish and Wrasse species are not currently listed as a Viral Haemorrhagic Septicaemia (VHS) susceptible species or as a vector of this disease under Council Directive 2006/88. Therefore, these species can be legally traded between aquaculture sites without any certification declaring these animals as VHS free, including to VHS free zone. In recent years VHS outbreaks in wrasse species from farmed stock in Scotland and lumpfish in a hatchery in Iceland has emphasised this as serious disease risk and highlighted the need for requirements to trade in VHS free stock. Defra has raised a request, to list lumpfish and wrasse species as VHS susceptible species, to the European Commission in order for future trade to be regulated appropriately. At present we await the outcome from the European Commission. Pending such actions, the authorities from Norway and Iceland have been approached by the UK to discuss the current trade in lumpfish. The discussion resulted in an agreement where the trading countries would be required to carry out testing and that any lumpfish traded between them would be sourced and certified free of VHS.

FRAMEWORK FOR RISK ASSESSMENT ON THE USE OF CLEANER FISH IN AQUACULTURE

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Abstract:

Cleaner fish use is proving an effective and practical means of controlling sea lice numbers on salmon farms. However, cleaner fish can carry pathogens that may potentially emerge to cause disease in the salmon. Recently an outbreak of VHSV occurred in wrasse held on Shetland salmon farms. It is very difficult to know what disease may emerge, the pathogens that cause many of the existing salmon diseases were not known before they emerged in aquaculture. All animals carry bacteria and viruses, so a 'bug hunting' approach to controlling cleaner fish use is not appropriate (although it is very useful to obtain data on what pathogens they may carry in case these do emerge). However, in spite of these uncertainties as to exactly what may emerge it is possible to use epidemiological principles to reduce the risk of such emergence. Therefore we have developed a risk framework for identifying pathways of emergence. This considers the pathways of emergence via inputs of cleaner fish, inputs from the environment and evolution of pathogenicity on farms, and places them in the context of risks associated with salmon production that exist without cleaner fish use. This framework has been used to develop a model of pathogen accumulation in cleaner fish. The outcomes from the framework and model have been used to develop specific advice on the use of cleaner fish and particularly their reuse in subsequent salmon production cycles. Risk reduction is identified by increased use of hatchery stock, biosecure transport, surveillance for morbidity or mortality, and limiting reuse and movement of cleaner fish within area managed biosecurity. The framework is used as a guide and restriction on cleaner fish to reduce risk of disease emergence must be considered in balance of reduction of their efficacy as agents of lice control.

Annex 2 Prerequisites in CD 2006/88/EC

All requisites specifically relevant for cleaner fish and comments marked with yellow. Paragraphs marked with green are not specifically relevant for cleaner fish production.

- (1) Aquaculture animals and products fall under the scope of Annex I to the Treaty as live animals, fish, molluscs and crustaceans. The breeding, rearing and the placing on the market of aquaculture animals and products thereof constitutes an important source of income for persons working in this sector.

- (2) In the context of the internal market, specific animal health rules were laid down for the placing on the market and introduction from third countries of the products concerned by Council Directive 91/67/EEC of 28 January 1991 concerning the animal health conditions governing the placing on the market of aquaculture animals and products (2).

- (3) Outbreaks of diseases in aquaculture animals could cause severe losses to the industry concerned. Minimum measures to be applied in case of outbreaks of the most important diseases in fish and molluscs were established by Council Directive 93/53/EEC of 24 June 1993 introducing minimum Community measures for the control of certain fish diseases (3) and Council Directive 95/70/EC of 22 December 1995 introducing minimum Community measures for the control of certain diseases affecting bivalve molluscs.

- (4) Existing Community legislation was drafted mainly to take into account the farming of salmon, trout and oysters. Since that legislation was adopted, the Community aquaculture industry has developed significantly. A number of additional fish species, particularly marine species, are now used in aquaculture. New types of farming practices involving other fish species have also become increasingly common, particularly following the recent enlargement of the Community. Furthermore, farming of crustaceans, mussels, clams and abalones is becoming increasingly important.

- (5) All disease control measures have an economic impact on aquaculture. Inadequate controls may lead to a spread of pathogens, which may cause major losses and compromise the animal health status of fish, molluscs and crustaceans used in Community aquaculture. On the other hand, over-regulation could place unnecessary restrictions on free trade.

- (6) The Communication from the Commission to the Council and the European Parliament dated 19 September 2002 sets out a strategy for the sustainable development of European aquaculture. That Communication outlined a series of measures designed to create longterm employment in the aquaculture sector, including promoting high animal health and welfare standards, and environmental actions to ensure a sound industry. Those measures should be taken into account.

- (7) Since the adoption of Directive 91/67/EEC, the Community has ratified the World Trade Organisation (WTO) Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement). The SPS Agreement refers to the standards of the World Organisation for Animal Health (OIE). The animal health requirements for placing live aquaculture animals and products thereof on the market within the Community set out in Directive 91/67/EEC are more stringent than those standards. Therefore, this Directive should take into account the Aquatic Animal Health Code and the Manual of Diagnostic Tests for Aquatic Animals of the OIE.

- (8) In order to ensure the rational development of the aquaculture sector and to increase productivity, aquatic animal health rules should be laid down at Community level. These rules are necessary, inter alia, in order to contribute to the completion of the internal market and to avoid the spread of infectious diseases. Legislation should be flexible to take into account the continuing developments in and diversity of the aquaculture sector, as well as the health status of aquatic animals within the Community

- (9) This Directive should cover aquaculture animals, and those environments which may affect the health status of such animals. In general the provisions of this Directive should only apply to wild aquatic animals where the environmental situation may impinge on the health status of aquaculture animals, or where necessary in order to fulfil the purpose of other Community legislation, such as Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (1) or to protect species referred to in the list drawn up by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). This Directive should not prejudice the adoption of more stringent rules on the introduction of non-native species.

- (10) The competent authorities designated for the purpose of this Directive should perform their functions and duties in accordance with the general principles laid down in Regulation (EC) No 854/2004 of European Parliament and of the Council of 29 April 2004 laying down specific rules for the organisation of official controls on products of animal origin intended for human consumption (2) and Regulation (EC) No 882/2004 of the European Parliament and of the Council of 29 April 2004 on official controls performed to ensure the verification of compliance with feed and food law, animal health and animal welfare rules (3).

- (11) It is necessary for the development of aquaculture in the Community to increase the awareness and preparedness of the competent authorities and aquaculture production business operators with respect to the prevention, control and eradication of aquatic animal diseases.

- (12) The competent authorities of Member States should have access to and apply state-of-the-art techniques and knowledge in the fields of risk analysis and epidemiology. This is of increasing importance because international obligations now focus on risk analysis in relation to the adoption of sanitary measures.

- (13) It is appropriate to introduce at Community level a system of authorisation of aquaculture production businesses. Such authorisation would enable the competent authorities to establish a complete overview of the aquaculture industry, which would assist in the prevention, control and eradication of aquatic animal diseases. Furthermore, authorisation allows the laying down of specific requirements that should be fulfilled by the aquaculture production business in order to operate. Such authorisation should, where possible, be combined with or included in an authorisation regime which the Member States may already have established for other purposes, for example under environmental legislation. Such authorisation should therefore not be an extra burden to the aquaculture industry.

- (14) Member States should refuse to issue an authorisation if the activity in question would pose an unacceptable risk of spreading diseases to other aquaculture animals or to wild stocks of aquatic animals. Before deciding to refuse an authorisation, consideration should be given to risk mitigation measures or alternative siting of the activity in question. This may also apply for stocking facilities of wild caught wrasse and hatchery and farms.

- (15) The rearing of aquaculture animals for the purpose of human consumption is defined as primary production in Regulation (EC) No 852/2004 of the European Parliament and of the Council of 29 April 2004 on the hygiene of foodstuffs (4). Obligations imposed on individual aquaculture production businesses under this Directive, such as record keeping, and internal systems enabling the aquaculture production business to demonstrate to the competent authority that the relevant requirements of this Directive are being fulfilled, should, where possible, be combined with the obligations laid down in Regulation (EC) No 852/2004.

- (16) More attention should be paid to preventing disease occurrence than to controlling the disease once it has occurred. It is therefore appropriate to lay down minimum measures of disease prevention and risk mitigation which should be applied to the whole production chain in aquaculture, from fertilisation and hatching of eggs to the processing of aquaculture animals for human consumption, including transportation.

  (17) In order to improve general animal health and assist in the prevention and control of animal disease through improved traceability, the movement of aquaculture animals should be recorded. Where appropriate, such movements should also be subject to animal health certification.
- (18) In order to have an overview of the disease situation, to facilitate a rapid reaction in the case of a suspicion of disease and to protect farms or mollusc farming areas having a high animal health standard, a risk-based animal health surveillance should be applied in all such farms and mollusc farming areas.

- (19) It is necessary to ensure that the main aquatic animal diseases at Community level do not spread. Harmonised animal health provisions for placing on the market should therefore be laid down with specific provisions applicable to species susceptible to those diseases. Therefore a list of such diseases and species susceptible thereto should be laid down.

- (20) The prevalence of such aquatic animal diseases is not the same throughout the Community. Reference should therefore be made to the concept of Member States declared disease free, and when dealing with parts of the territory concerned, to the concept of zones or compartments. General criteria and procedures for the granting, maintenance, suspension, restoration and withdrawal of such status should be laid down.

- (21) Without prejudice to Council Directive 90/425/EEC of 26 June 1990 concerning veterinary and zootechnical checks applicable in intra-Community trade in certain live animals and products with a view to the completion of the internal market (1), in order to maintain and improve the general aquatic animal health status in the Community, Member States, zones or compartments declared free of one or more of the diseases listed should be protected against the introduction of such disease.

- (22) Where necessary, Member States may take interim protective measures in accordance with Article 10 of Directive 90/425/EEC and Article 18 of Council Directive 91/496/EEC of 15 July 1991 laying down the principles governing the organisation of veterinary checks on animals entering the Community from third countries and amending Directives 89/662/EEC, 90/425/EEC and 90/675/EEC (2).

- (23) In order to avoid the creation of unnecessary trade restrictions, the exchange of aquaculture animals between Member States, zones or compartments where one or more of such diseases are present should be allowed, provided that appropriate risk mitigation measures are taken, including during transport.
  (24) The slaughter and processing of aquaculture animals which are subject to disease control measures may spread the disease, inter alia as a result of the discharge of effluents containing pathogens from processing plants. It is therefore necessary for the Member States to have access to processing establishments that have been duly authorised to undertake such slaughter and processing without jeopardising the health status of farmed and wild aquatic animals, including in respect of the discharge of effluents.
- (25) The designation of Community and national reference laboratories should contribute to the high quality and uniformity of diagnostic results. That objective can be achieved by activities such as the application of validated diagnostic tests and the organisation of comparative testing and training of staff from laboratories.

- (26) Laboratories involved in the examination of official samples should work in accordance with internationally approved procedures or criteria based on performance standards and should use diagnostic methods that have, as far as possible, been validated. For a number of activities related to such examination, the European Committee for Standardisation (CEN), and International Organisation for Standardisation (ISO) have developed European Standards (EN Standards) and International Standards (ISO Standards) respectively, appropriate for the purpose of this Directive. Such standards relate in particular to the operation and assessment of laboratories and to the operation and accreditation of control bodies.

  (27) In order to ensure early detection of any possible outbreak of an aquatic animal disease, it is necessary to oblige those in contact with aquatic animals of susceptible species to notify any suspect case of disease to the competent authority. Routine inspections should be carried out in the Member States to ensure that aquaculture production business operators are familiar with, and apply, the general rules on disease control and biosecurity laid down in this Directive.

- (28) It is necessary to prevent the spread of non-exotic but serious diseases in aquaculture animals as soon as an outbreak occurs by carefully monitoring movements of live aquaculture animals and products thereof, and the use of equipment liable to be contaminated. The choice of the measures to be used by the competent authorities should depend on the epidemiological situation in the Member State concerned.

- (29) In order to advance the animal health status of the Community, it is appropriate that epidemiologically based programmes to control and eradicate certain diseases are submitted by Member States for recognition at Community level.

- (30) For diseases not subject to Community measures, but which are of local importance, the aquaculture industry should, with the assistance of the competent authorities of the Member States, take more responsibility for preventing the introduction of or controlling such diseases through self regulation and the development of 'codes of practice'. However, it may be necessary for the Member States to implement certain national measures. Such national measures should be justified, necessary and proportionate to the goals to be achieved. Furthermore, they should not affect the trade between the Member States unless this is necessary in order to prevent the introduction of or to control the disease, and should be approved and regularly reviewed at Community level. Pending the establishment of such measures under this Directive, the additional guarantees granted in Commission Decision 2004/453/EC of 29 April 2004 implementing Council Directive 91/67/EEC as regards measures against certain diseases in aquaculture animals (3) should remain in force.

(31) There is a continuous development in knowledge with respect to hitherto unknown diseases in aquatic animals. It may therefore be necessary for a Member State to apply control measures in the case of such emerging disease. Such measures should be swift and adapted to each individual case, but should not be maintained longer than necessary to achieve their goal. As such emerging diseases may also affect other Member States, all Member States and the Commission should be informed of the presence of an emerging disease and any control measures taken. (32) It is necessary and appropriate for the achievement of the basic objective of maintaining and, in the event of an outbreak, returning to a disease-free status in Member States, to lay down rules on the measures to increase disease preparedness. Outbreaks should be controlled as speedily as possible, if necessary by emergency vaccination, in order to limit the adverse effects on the production of, and trade in, live aquaculture animals and products thereof.

- (33) Directive of the European Parliament and of the Council 2001/82/EC of 6 November 2001 on the Community code relating to veterinary medicinal products (1) and Regulation (EC) No 726/2004 of the European Parliament and of the Council of 31 March 2004 laying down Community procedures for the authorisation and supervision of medicinal products for human and veterinary use and establishing a European Medicines Agency (2) require that, with only minor exceptions, all veterinary medicinal products that are placed on the market within the Community are to hold a marketing authorisation. In general, all vaccines used in the Community should have a marketing authorisation. However, the Member States may permit the use of a product without a marketing authorisation in the event of a serious epidemic subject to certain conditions, in accordance with Regulation (EC) No 726/2004. Vaccines against exotic and emerging diseases in aquaculture animals may qualify for such derogation.

- (34) This Directive should lay down provisions to ensure the necessary level of preparedness to effectively tackle the emergency situations related to one or more outbreaks of serious exotic or emerging diseases affecting aquaculture, in particular by drawing up contingency plans to combat them. Such contingency plans should be reviewed and updated regularly.

- (35) Where the control of a serious aquatic animal disease is subject to harmonised Community eradication measures, Member States should be allowed to make use of financial contribution from the Community under Council Regulation (EC) No 1198/2006 of 27 July 2006 on the European Fisheries Fund (3). Any application for Community support should be subject to scrutiny as regards compliance with control provisions laid down in this Directive.
- (36) Live aquaculture animals and products thereof imported from third countries should not present an animal health hazard for aquatic animals in the Community. To that end, this Directive should set out measures for the prevention of the introduction of epizootic diseases.

(37) It is necessary in order to safeguard the aquatic animal health situation in the Community to further ensure that consignments of live aquaculture animals transiting through the Community comply with the relevant animal health requirements applicable to the species concerned.

- (38) The placing on the market of ornamental aquatic animals involves a wide variety of species, often tropical species, solely for ornamental purposes. Those ornamental aquatic animals are normally kept in private aquariums or ponds, garden centres, or in exhibition aquariums, not in direct contact with Community waters. Consequently, ornamental aquatic animals held under such conditions do not pose the same risk to other sectors of Community aquaculture or to wild stocks. It is therefore appropriate to lay down special provisions applicable to the placing on the market, transit and import of ornamental aquatic animals, kept under such conditions.

- (39) However, where ornamental aquatic animals are kept outside closed systems or aquariums, in direct contact with the natural waters of the Community, they could pose a significant risk to Community aquaculture or wild stocks. That is particularly the case for the populations of carp (Cyprinidae), as popular ornamental fish such as koi carp are susceptible to some diseases affecting other carp species farmed in the Community or found in the wild. In such cases, the general provisions of this Directive should apply.

- (40) The setting up of electronic means of information exchange is vital for simplification, for the benefit of the aquaculture industry and of the competent authorities. In order to meet that obligation, common criteria need to be introduced.

- (41) Member States should lay down rules on penalties applicable to infringements of the provisions of this Directive and ensure that they are implemented. Those penalties must be effective, proportionate and dissuasive.

- (42) In accordance with paragraph 34 of the Interinstitutional agreement on better law-making (1), Member States are encouraged to draw up, for themselves and in the interest of the Community, their own tables, which will, as far as possible, illustrate the correlation between this Directive and the transposition measures and to make them public.

- (43) Since the objectives of this Directive, namely to provide for the approximation of the concepts, principles and procedures forming a common basis for aquatic animal health legislation in the Community, cannot be sufficiently achieved by the Member States and can therefore, by reason of the scale and effects of this Directive, be better achieved at Community level, the Community may adopt measures, in accordance with the principle of subsidiarity as set out in Article 5 of the Treaty. In accordance with the principle of proportionality as set out in that Article, this Directive does not go beyond what is necessary in order to achieve those objectives.

- (44) The measures necessary for the implementation of this Directive should be adopted in accordance with Council Decision 1999/468/EC of 28 June 1999 laying down the procedures for the exercise of implementing powers conferred on the Commission (2).

- (45) It is appropriate to update Community animal health legislation concerning aquaculture animals and products thereof. Accordingly, Directives 91/67/EEC, 93/53/EEC and 95/70/EC should be repealed and replaced by this Directive,