European Union Reference Laboratory for Fish and Crustacean Diseases
NATIONAL INSTITUTE OF AQUATIC RESOURCES, TECHNICAL UNIVERSITY OF DENMARK

Report on Survey and Diagnosis of Fish Diseases in Europe 2020

Contents

Introduction

This report is based on the data from the questionnaire on Survey and Diagnosis of the listed fish diseases in Europe (S&D) for 2020. The Questionnaire is provided by the EU Reference Laboratory for Fish and Crustacean Diseases, it is collated annually and is the only comprehensive overview of the disease situation in fish farming in Europe. The information has been made available on the EURL web site (www.eurl-fish-crustacean.eu) , where all raw data can be obtained. The questionnaire comprises 4 parts:

1. General data on aquaculture fish production: Number of fish farms, and the health categorization according to Council Directive 2006/88/EC, and information on national surveillance programmes.
2. Epidemiological data on the disease situation in each Member State with focus on the listed diseases (information on number of outbreaks and increase or decrease in number of infected farms and severity of outbreaks) but also including other diseases of interest.
3. Laboratory data from the NRLs and other laboratories, including the numbers of samples examined, and diagnoses of fish diseases made.
4. A National report describing health and surveillance situation in general. These reports are compiled into one and can be found on https://www.eurl-fish-crustacean.eu/ .

Production data for 2020

The most update data on aquaculture production in Europe refer to 2019 both on the website of Federation of European Aquaculture producers and FAO Figis. We decided to refer to the same dataset of last year, provided by FEAP , it is expected that some changes in the production have occurred due to COVID-19 pandemics.

At global level, the pandemic is considered to affect significantly aquaculture production. According to FAO assessment, the Covid-19 pandemics caused an estimated drop in overall output of 1.3 percent in 2020. Although this figure is yet to be confirmed, it would be the first annual decline in global aquaculture production in almost 60 years. It is expected that large variations occur across the production of different species.

The data available on the aquaculture production and included in this report still refer to 2019, so this changes cannot be appreciated in the current document.

The total fish production in aquaculture in Europe, including Turkey and Norway, increased slightly from 2018 and is now at 2.574.333 t. Among the EU Member states the production has been almost horizontal in the past 10 years whereas has observed an increase of about 50.000 t in 2019 with a total production of 712.648 t.

The 4 non-EU countries Iceland, Faroe Islands, Turkey and Norway produced 1.861.685 t and also experienced a significant increase since 2018.

The Atlantic salmon production, accounts for 1.664.541 t in 2019, and is by far the largest contingency in Europe. The production of large rainbow trout in sea water accounts now for 160.165 t while the production of portion rainbow trout was of about 225200 t in 2019 .Turkey is still the largest contributor of rainbow trout production with 103.000 t. The carp production is mainly in the Eastern part of Continental Europe, the data from FEAP reports approximately 62.000 t. Both the production of sea bream and especially sea bass also increased in the Mediterranean countries with a production of 208.197 t and 199476 t, respectively. Among other fish species of interest are eel (with 4.478 t in 2019 in decline from 2016); also sturgeon represents a promising species (2724 t in 2019) especially in view of its caviar production (166,5 t in 2018, no data updated in 2019).

Turbot production appear in slight increase (11.423 t in 2019 and 10.229 in 2018), the production of other “so called” minor species includes halibut (1.594 t), Arctic charr (6.915 t), sole (1.211 t) and meagre (8.115 t).

The production of cleaner fish as lumpfish and wrasse for lice control is increasing significantly. In 2019, 49,1 million of cleanerfish were deployed at sea. This figure consist of booth wild caught Cleaner fish and farmed ones. Cleanerfish currently used are lumpsuckers (*C.lumpus*) and various species of wrasse. According to the Directorate of Fisheries 22.6 million lumpsucker were produced in 2019. In Scotland production of lumpfish was assessed as equivalent to 660.000 fish and 4 sites producing 4 tonnes of wrasse with 59,000 fish.

Number of fish farms in Europe

The total number of authorised/licensed fish farms in Europe was reported to be around **33260** farms, with the largest contingency in Germany with 10.813 farms having a high number of small producers. Compare to 2019 data there is an important decrease in number of fish farms in the country, (13911 were reported in 2019). This reduction has been associated with reduction of water resources and climate change.

In more general terms, is is also possible that the pandemic has made some operations non economically viable.

From Austria, the numbers of registered farms were included in the report for the first time, thus cumulating to 4862

The estimate number of fish farm is considered to be conservative.

When it comes to production, Norway has by far the largest production in Europe and has licensed 1249 farms/sites. An overview of the number in each country can be found in Annex 1. It has to be ackowledged that it was not possible to retrieve the total number of active farms for all participants in the survey (2 missing).

Health categorization of fish farms

Almost all Member States did reply to the questionnaire and provided very clear and correct answers.

In 2020, 11700 farms with species susceptible to VHS were reported in categorized zones, 11502 to IHN, 6.601 to ISA and 12578 farms with cyprinids susceptible to KHV.

69% of the authorised trout farms in Europe are situated in Category III zones for VHS and 69% for IHN, with 27% respectively in Category 1 for both diseases. For both diseases the remaining of the farms are situated in Category II, IV or V.

73% of the authorised farms in Europe with susceptible species for ISA are in Category I, whereas 23% are in Category III (including 1042 farms in Norway and 34 farms in Faroe Islands).

Only very few carp farms are approved KHV free in Category I (40 farms reported in Europe) and almost all are placed in Category III (94%) or in Category II 6%.

With the implementation of the new Animal Health Law AHL, a new categorisation system is to be set up, this will be reflected in the S&D report of next year.

For the time frame which this report refers to, Commission Implementing Decision (EU) 2015-1554 provide the guidelines for obtaining disease-free health statuses with regard to ISA and to contain infection with HPR deleted ISAV, saying that detection of isavirus HPR0 will not compromise the health status of a fish farm and is not notifiable to the EU (in contrast to OIE where detection of ISAV HPR0 is still notifiable). Some Member states do not include small registered APBs in the categorisation (e.g. hobby farms) but according to Council Directive

2006/88/EC, Annex III, health categorisation comprises all APBs in the Member states, zones and compartments for each category. Only fish species listed as susceptible for the given listed disease shall be included in the categorization. Therefore, important aquaculture species as sea bass, sea bream, meagre, eel and pike-perch are not included in the European health surveillance for specific diseases.

The new Animal Health Law is now adopted and includes all aquatic animals; in this connection the categorisation system will be simplified and be made more transparent on the other hand more lists will be adopted compared to the present lists of exotic and non-exotic diseases (from present 2 to 5 lists). Annex 2 provides the full list of farms in categorized zones.

Outbreaks and severity of listed diseases in Europe

Only few participants reported that they observed major changes in the epidemiological situations in their respective countries. For **VHS**, 11 new outbreaks were reported in Europe in 2020, 5 of these were in Germany. The remaining outbreaks were observed in Belgium (5), Czech Republic (1), France (2), Italy (1).

For **IHN**, 24 new outbreaks were reported. The majority was in Germany (21). The remaining outbreaks were in Croatia (1), Slovenia (1) and France (1)

For **ISA** Norway was the only country reporting outbreaks, and reported 23 new infections with ISAV HPRΔ in 2020. Due to the steep increase in number of outbreaks 2 specific talks on the topic will be provided at the 25th Annual Workshop for National Reference Laboratories for Fish Diseases.

For **KHVD**, 71 outbreaks were reported in 2020. The vast majority (42) in Germany, and England (11) in the latter case specifically in recreational fisheries and ornamental imports. The virus was reported also in Czech Republic (4), Hungary (4), Romania (2), Scotland (1), Croatia (5), Switzerland (1) and Denmark (1). Outbreaks of KHVD were reported from 9 countries in all. Annex 3 provides the full list of reports.

Other fish diseases problems in Europe

A whole range of other disease problems in 2020 were reported:

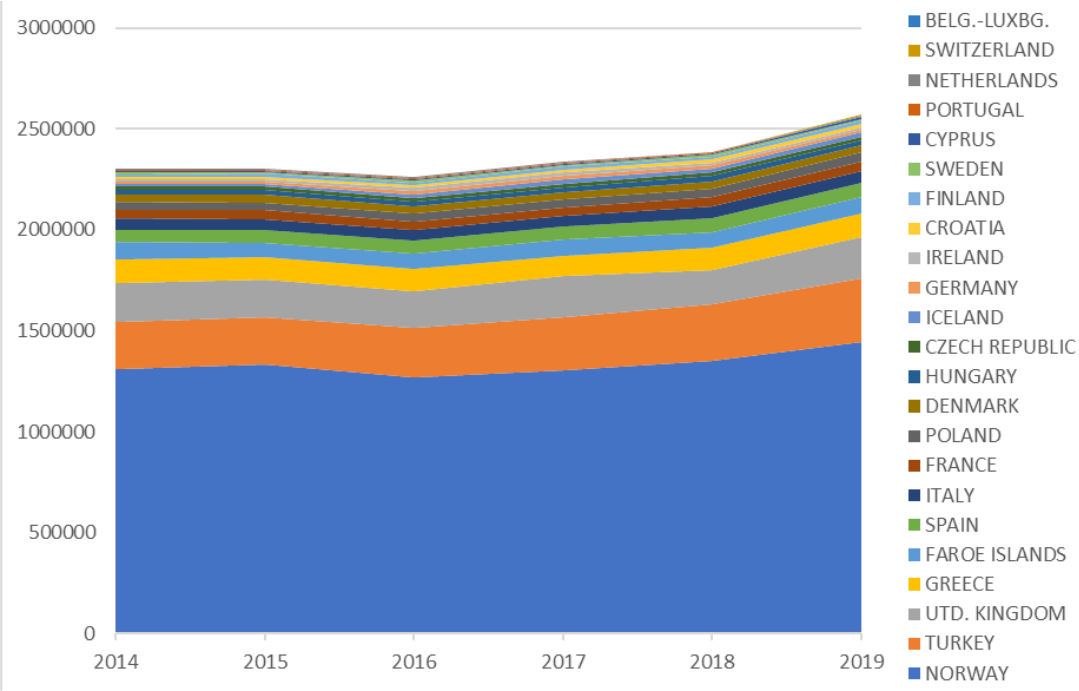
- In **rainbow trout** the major concerns remain flavobacteriosis (RTFS), Bacterial Gill Disease (BGD), Red Mark Syndrome, Enteric Redmouth Disease (*Y. ruckeri*), Furunculosis (*A. salmonicida*) and IPN, with an increase of clinical outbreaks.
- In **salmon** farming the major concern is sea lice; after the ectoparasite a number of disease problems cause concerns and includes pancreas disease, heart and skeletal muscle inflammation, cardiomyopathy syndrome, amoebic gill disease and complex gill disease CGD (amoebic gill disease, salmon gill poxvirus, *Paranucleospora theridion* etc.) and winter ulcers.
- In **Cyprinid** it is primarily CEV, SVCV, *Aeromonas hydrophila* and CyHV-2 in *carassius* species
- In **seabass** and **seabream** it is primarily VNN/VER, tenacibaculosis, *Vibrio harvey*, *Sparicotyle chrysophrii*, *Aeromonas veronii* and *Lernathropus kroyeri* infection.
- In Lumpfish bacterial infections are becoming of relevance. Cases of pasteurellosis, infections with Tenacibaculum and Moritella are reported.

Laboratory data.

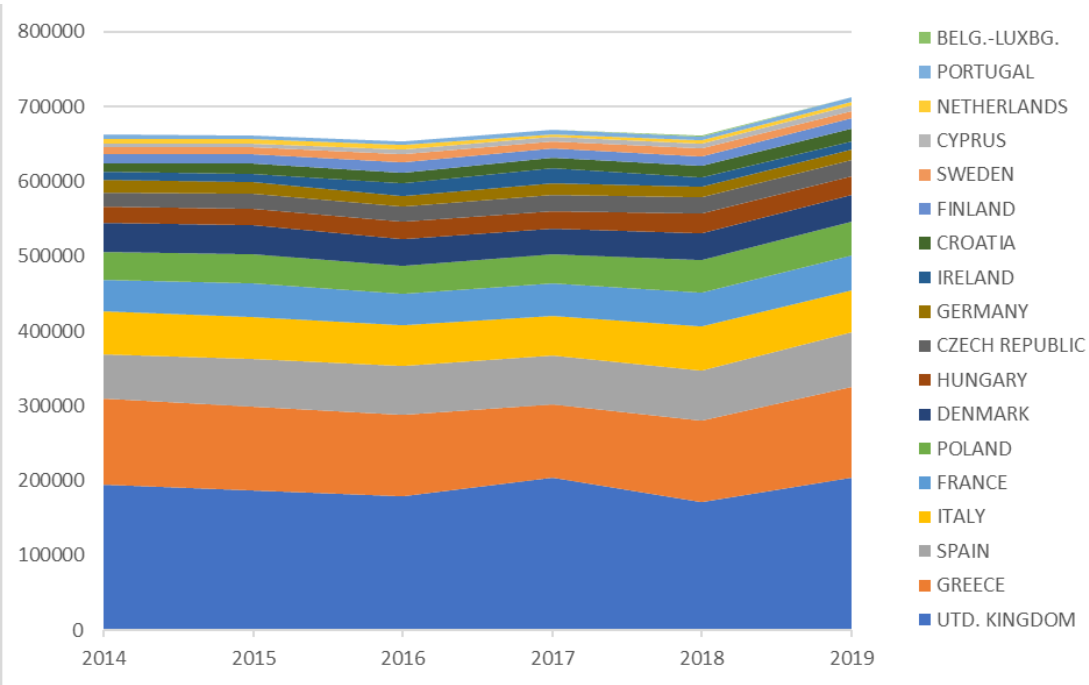
As from previous years, large number of variation across labs is observed in the number of samples tested. Since no large changes are observed these data are not included in the report. They can be however retrieved upon request.

Development of Fish Farming in EU 2008-2019

FEAP data - Fish Farming Production in Europe



FEAP data - Fish Farming Production in EU Countries



Reports from the individual European countries

Austria 

Author/Institute: Lewisch Eva Vetmeduni Vienna

Aquaculture production: Mostly small and medium fishfarms for growing out, only a few of them with breeding station. Predominantly production of salmonid fish (rainbow trout, brown trout, *Salvelinus fontinalis*, *S. alpinus*) in extensive and semi-intensive flow through systems. Carp are produced in extensive ponds The carp porduction has slightly decreased. RAS seem to increase, with the production of exotic fish like *Clarias gariepinus* and even salt water fishes and invertebrates.

Health status: 11 farms in cat.I declared VHS and IHN free; 1 farm under VHS/IHN surveillance cat.II; one farm in cat V for VHS/IHN; all other in cat. III

Other disease problems: none reported.

Belgium 

Author/Institute: F. Lieffrig- CER groupe

Aquaculture production: Salmonid production is located in the South part of Belgium. Cyprinid production in the North part. Few sites for bait fish production. One well known farm for sturgeon and caviar production in recirculating system. Development of burbot (*Lota lota*) production. Few RAS for pike perch and Jade perch production.

Health status: For the third year, different new outbreaks of VHS. The precise origine of all these infections have never been determined.

Other disease problems: N/A.

Bosnia and Herzegovina 

Author/Institute: T. Eterovic - University of Sarajevo, Veterinary Faculty

Aquaculture production: - Bosnia and Herzegovina has a very long tradition in the production of freshwater fish, trout and carp, due to the significant water wealth of seven water basins, a large number of river and mountain lakes and groundwater. Hatcheries and on-growing farms in Bosnia and Herzegovina have numerous and unequal capacities, surface area and annual production. According to the locality and species of fish breeding, fish ponds and on-growing farms are divided into salmonid, cyprinid and marinas. In the aquaculture sector of Bosnia and Herzegovina, the most important fish species are: trout (rainbow trout and brook trout), carp (carp, grass carp, silver carp), and marine (European bass, gilt-head bream and common dentex) as well as molluscs (mussels and oysters). Most of the trout farms breed rainbow trout, but mixed farms breeding brown, brook and softmouth trout are also widespread. Capacity for production and exploitation of fish in BiH, water resources, hydrological and ecological conditions, physico-chemical properties of watercourses, highly developed technologies such as breeding and fish processing, tradition in fish farming and production as well as constant growth of fish exports represent exceptional preconditions to increase fish production. According to a rough estimate, 65% of trout production in BiH is in the Federation, and 35% in the Republic of Srpska. Nearly all carp production is carried out in the Republic of Srpska. Production of marine species is concentrated in Neum where there are two cage farms with a total area of 0.36 ha. The total usable area of aquaculture installed capacity in BH is about 3,113 ha.The size of fishery exploitation in Bosnia and Herzegovina for trout fish farms is 91,026 m2 and for carp fisheries 2,278 ha. The average production of table fish in Bosnia is about 5,000 tons.

Health status: - Because of the complicated government structure, farms are controlled by different levels of government, and surveillance fully covers only farms dedicated for fish export. Import of spawn is under strict surveillance program. At the national level Bosnia and Herzegovina is classified as IHN/VHS free country.

Other disease problems: - Furniculosis, vibriosis, BKD and Bacterial gill disease are commonly encountered in allmost all fish farms. Of the parasitic diseases common are *Gyrodactylus*, flagellates and ICH. IPN without clinical signs is constantly present in most of the tested fisheries

Bulgaria 

Author/Institute: Pety Orozova - National Diagnostic and Research Veterinary Medical Institute

***Aquaculture production*:** The ratio of fresh warm water to fresh cold water aquaculture is predominated of fresh warm water species. The most significant production remains that of carps, followed by trout. The species structure of Bulgarian aquaculture industry is determined by both climatic and hydrological conditions in the country and the traditional preference of the population for these species. Warm water fish farms are: ponds, cages and RAS. Cold water fish farms are: raceways, cages and RAS.

Health status: During 2020 in the National Reference Laboratory for Fish, Mollusc and Crustacean Diseases according to council directive 2006/88/EC were tested 408 carp samples, 82 rainbow trout samples and 6 sturgeon samples. Just 2 rainbow trout samples were confirmed as positive for IPNV. The COVID-19 pandemy made difficult sending samples from March till the end of 2020.

Other disease problems: N/A

Croatia 

Author/Institute: Snježana Zrnčić - Croatian Veterinary Institute, Zagreb

Aquaculture production: Warmwater freshwater aquaculture is cultivating common carp, grass carp, bighead and silver carp as well as catfish, pike and pike-perch in small quantities in earthern ponds surface from 0,5 to 100 hectares. Some of the carp farms have their own hatcheries. Coldwater freshwater aquaculture consists of farming rainbow trout and brown trout in concrete raceways. Some of the farms consists of hatchery and ongrowing units while other import eggs from USA and Denmark. Marine aquaculture is the most represented activity in Croatia with cultivation of European sea bass, Gilthead sea bream, dentex and meagre in farms with production from of 60 tons to 7000 tons. Tuna farming is represented by 5 farms that is based on the catching of small tuna in Mediterranean according to ICAAT quotas and feeding them until favourable weight. Almost whole production is sold to Japan.

Health status: National surveillance program consists of clinical inspection of farms twice a year and sampling and sending to the lab, once. All authorized farm are included in surveillance program. Out of 261 samples tested for the presence of KHV, 13 tested positive; 3 from authorized farms and 2 from put and take fisheries. Single outbreak of IHNV in sea water.

Other disease problems: Same as in the previous year the main challenges are bacterial and parasitic diseases in marine aquaculture. The most devastating bacteria in 2020 were *Vibrio harveyi* and *Tenacibaculum maritimum* in both sea bass and sea bream producing some mortalities, growth retardation etc. In sea bream it is parasitic infection with *Sparicotyle chrysophrii* with increased mortalities and requirements for frequent bath treatments.

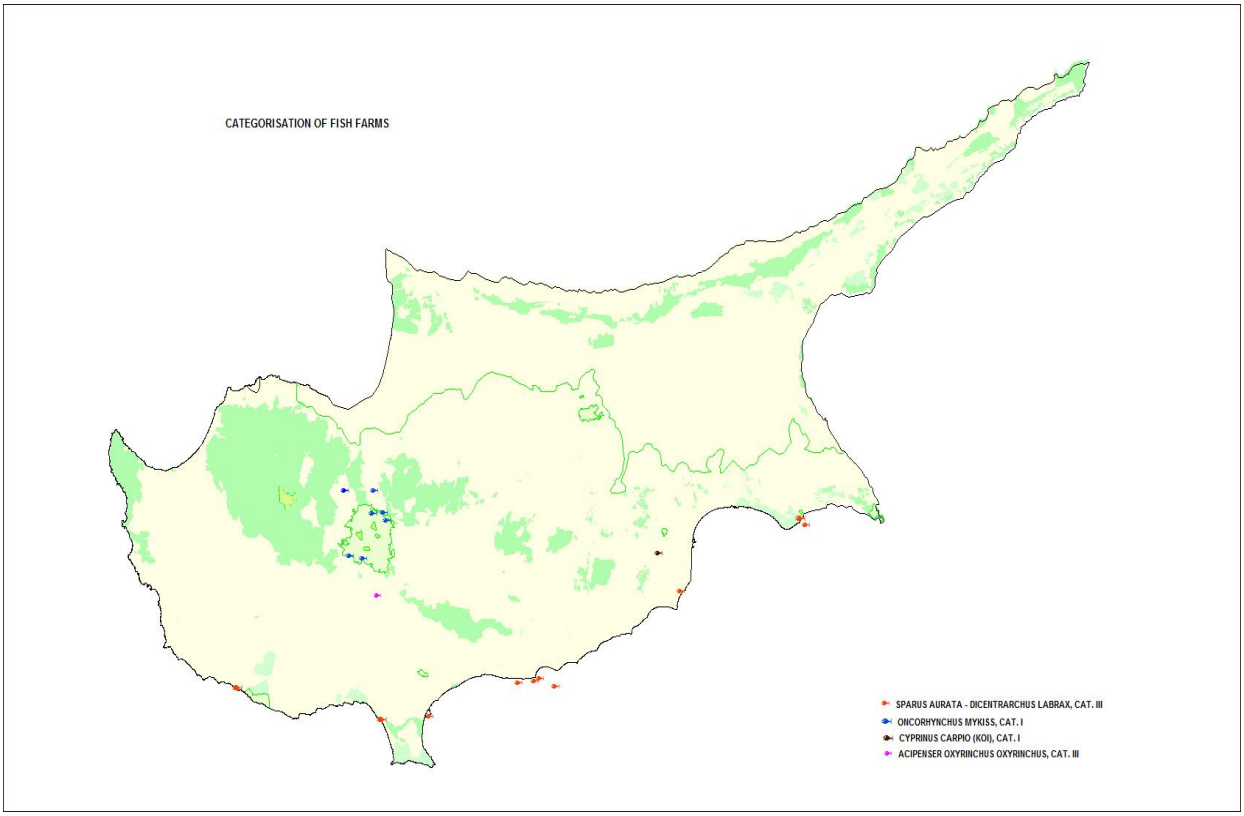
Cyprus 

Author/Institute: Veterinary Services

Aquaculture production: In Cyprus there are 9 licensed marine open sea cage farms culturing mainly european sea bass (*Dicentrarchus labrax*) and gilthead sea bream (*Sparus aurata*), 3 marine hatcheries, 1 land-based shrimp hatchery/farm and 8 small rainbow trout farms.

Health status: No update since 2018

Other disease problems: No update since 2018



Czech Republic 

Author/Institute: MVDr. Kateřina Mikulášková - STATE VETERINARY INSTITUTE JIHLAVA

Aquaculture production:

Aquaculture production in the Czech Republic consists of pond fish farming, salmonid fish farming, and farming within fishing grounds. The main part of production is pond fish farming. There are more than 24-thousand ponds in the country, totalling an area of almost 52-thousand hectares.

In 2020, annual fish production in the Czech Republic reached almost 21,000 tonnes. Exports of live fish represented 49.1% of total production whilst the rest of production was supplied domestically.

The species representation of market fish is relatively stable, and has not changed significantly compared to previous years. A common carp *(Cyprinus carpio*), which is still the most commonly kept species in the country, represented 85,5% of total production in 2020. Herbivorous fish accounted for 5,2% of total production. The salmonids, that are produced in recirculation or flow-through farms, made up for around 4,5% of total aquaculture production. The rest of production consisted of other fish species reared in carp ponds (tench, predatory fish).

Aquaculture in the Czech Republic also includes farming within fishing grounds, which is managed by the Czech Anglers Union.

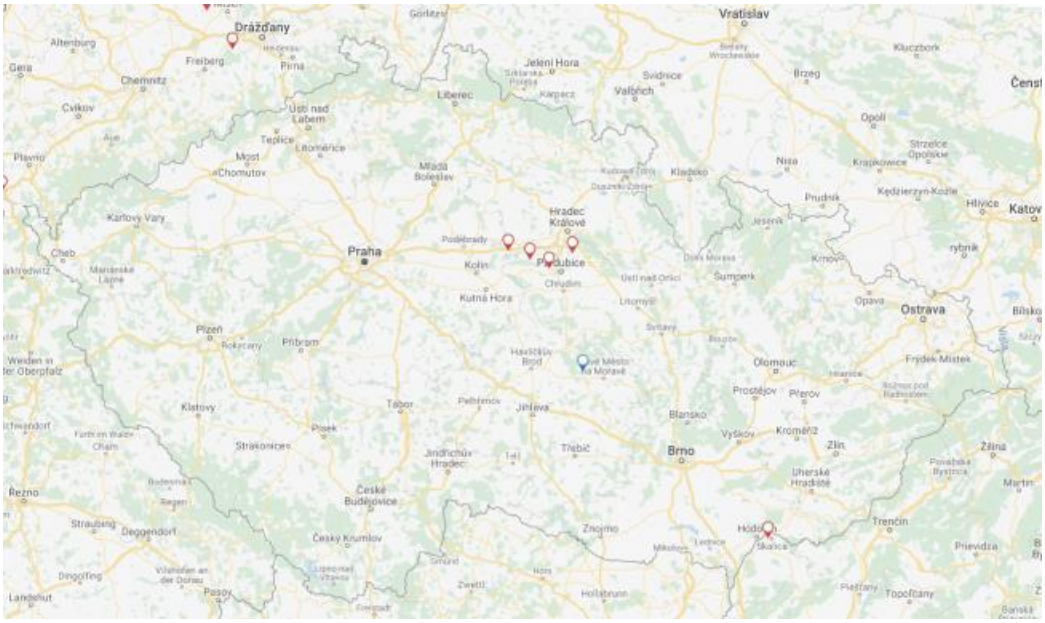
The Czech Anglers Union manages more than 2,000 fishing grounds covering approximately 42,000 hectares and plays a minor role in fish production in the Czech Republic.

Health status:

According to Council directive 2006/88/EC the Czech Republic is category I for ISA and category III for VHS (1 outbreak in 2020), IHN (no outbreak in 2020) and KHV (4 outbreaks in 2020). There was a slight decrease in koi herpesvirus outbreaks compared to last year. There is one farm which was classified as a category V for KHV.

On a national level, the Czech Republic performs monitoring programs for VHS, IHN and KHV.

Other disease problems: In 2020, the monitoring of the occurrence of carp oedema virus (CEV) continued in the Czech Republic at the Veterinary Research Institute. A total number of 686 samples from 124 locations were examined. CEV was detected in 17 cases in a total of six locations. Compared to 2019, there was a significant decrease in the incidence of CEV (17 positive locations in 2019). In connection with high mortality and economic losses, carp oedema virus is a current disease in our country and surveillance of this disease will continue for another year.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Ústí nad Labem
Liberec
Jelení Hora
Vratislav
Opolí
Katov
Olomouc
Zlín
Žilina
Trenčín
Prievidza
Topoľčany
Karlovy Vary
Kutná Hora
Kolín
Jihlava
Třebíč
Znojmo
Hodonín
Frýdek Místek
Přerov
Prostějov
Kroměříž
Uherské Hradiště
Blansko
Sumperk
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Nisa
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Kladsko
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Krapkowice
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Kędzierzyn-Koźle
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Hradec Králové
Podébrady
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Kutná Hora
Chrudim
Ústí nad Orlicí
Litomyšl
Svitavy
Česká Třebová
Havlíčkův Brod
Pelhřimov
Tábor
Jindřichův Hradec
Písek
Strakonice
Klatovy
Plzeň
Příbram
Rokycany
Cheb
Mariánské Lázně
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Chemnitz
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Cvikov
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Zwickau
Zwettl
Hollabrunn
Horn
Gmünd
Waidhofen an der Thaya
Vimperk
Lipno nad Vltavou
Český Krumlov
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Schwandorf
Furth im Wald
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Bodenmais
Deggendorf
Straubing
Dingolfing
Landshut
Passau
Vilshofen an der Donau
Rezno
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VIRAL HAEMORRHAGIC SEPTICAEMIA
KOI HERPESVIRUS

Denmark 

Author/Institute: Morten Fruergaard-Andreasen (FVST) and Tine Iburg DTU Aqua

Aquaculture production: In Denmark, there is approximately 215 active farms. The most farmed fish species in Denmark is still rainbow trout. A major part of the production take place in fresh water recirculating farms. Production numbers from 2020 is not available yet, but based on 2019 numbers it is expected to be a total of approximately 43.000 tonnes of which approximately 33.500 tonnes is from rainbow trout . Egg production is still a major production and the numbers in 2020 are expected to be at least the same as in 2019. However some effect of the Covid-19 pandemic might be seen affecting both production and export. Minor production focus on Atlantic salmon, pike perch and eel.

Health status: All farms with susceptible species are inspected at least once pr year by veterinary authority. Samples for targeted surveillance are delivered to the NRL that perform accredited analysis for certifying freedom of listed diseases. All of Denmark is category I for IHN and ISA. From 31-12-2013 the whole terrestrial area is category I for VHS while the marine farms all are category III for VHS. At a national level, Denmark conducts a plan for IPNV and SVCV. Furthermore some farms have achieved free status for BKD. The national plan relies on historical data and targeted surveillance.

Other disease problems: PRV-3 and IPNV is still widespread in production farms with occasional disease outbreaks. Projects on PRV-3 is on-going at the NRL. Among bacterial diseases, Rainbow trout Fry Syndrome caused by *Flavobacterium psychrophilum* and Enteric Red Mouth Disease caused by Yersinia Ruckeri are considered relevant in the fresh water phase, whereas clinical outbreaks of furunculosis (*Aeromonas salmonicida* subsp. *salmonicida*) can occur in the salt water production of rainbow trout. However, in many of these cases the NRL are not involved and it is difficult to know the real effect of these diseases on the Danish Aquaculture. Red Mark Syndrome is still a relevant problem in Danish Aquaculture, but the farms are now more experienced in handling the disease outbreaks than the last years. Projects on Red Mark Syndrome is still on-going at the NRL.

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Estonia 

Author/Institute: Triin Tedersoo Chief specialist on animal health Veterinary and Food Laboratory

Aquaculture production: Estonia has fairly good prerequisites for the production of aquaculture products, both in terms of water resources and the amount of land. The fish farmers have invested in closed fish farming facilities which reuse water and enable farmers to grow and offer product all year. At the same time, there are fish farms which use so-called traditional methods of production with flow-through systems where the water flows through the farm to the estuary. Aquatic organisms were produced in ponds, raceways and recirculation systems. Also fish have been raised in the sea cages. Currently, there is one cage farm in Estonia, located in Tagala Bay in Saaremaa, where the permitted volume of fish growth is 100 tons per year. The majority of the aquaculture product in Estonia is derived from land-based farms. Interest in offshore fish farming is growing and an increase in the production of fish species which are farmed offshore is to be expected in the future, especially Salmonidae. The main species farmed in Estonia is the rainbow trout, which is in competition with imported salmon and rainbow trout. The production volume of rainbow trout accounts for 85% of the fish farming production of Estonia. In addition to rainbow trout, other fish species have been farmed in Estonia, e.g. eel, sturgeon, carp, African catfish, silver carp, catfish, Acipenseridae, grass carp, common whitefish, etc. Mollusc farming areas, which are widespread in Europe, have not been registered in Estonia, but there are several ongoing scientific projects in that field. Farmed crustaceans include the European crayfish, which is also common in the wild. The aquaculture establishments sold 1062 tonnes of product in 2019 for a total worth of 3.7 million euros. The sales volume of rainbow trout farmed in Estonia in 2019 was 927 tonnes which accounted for 87% of the total fish farm production. Up to 5% of the aquaculture product has been exported abroad in the previous years. The main exported aquaculture product has been eel, which has been sold to a processing establishment in the Netherlands. Small quantities of Acipenseridae, rainbow trout, and European crayfish have also been exported.

Health status: During 2019 the competent authority of Estonia submitted a surveillance and eradication programme for viral haemorrhagic septicaemia (VHS) and infectious haematopoietic necrosis (IHN) to the Commission for approval and asked that the areas subject to that programme be listed in Annex I to Decision 2009/177/EC. Estonian State programme for VHS/IHN was approved by the European Commission on 6 August, 2020 by the amendment of the Commission Decision 2009/177.Due to the Implementation Measures of National Infectious Animal Disease Control Programmes in 2020 there were plan for 23 approved fish farms for surveillance of VHS/IHN (21 fish farms in Category II and 2 fish farm in category I). Also, for two small registered farms and 9 put-and-take fisheries; and wild salmonids populations from the rivers Kunda, Narva and Pärnu and from the Baltic Sea. After the IHN outbreaks diagnosed in 2018 two rainbow trout farms were dealing with the eradication of the disease (category IV) and in one case all restrictions were finished in May 2020. Also samples from wild salmonids populations were taken from the rivers Kunda and Pärnu near the infected farms. In addition to the surveillance of the fish farms, the Veterinary and Food Board also conducts testing of

fish in the Baltic Sea (sprat and Baltic herring) for VHS as of 2016. All results for surveillance of VHS/IHN were negative. Also two fish farms took part in surveillance for KHV (category II). All results were negative. By the Commission Decision 2009/177, the whole territory of Estonia is declared disease-free of the Infectious salmon anaemia (ISA).In total, there were 33 approved fish farms and 24 crustacean farms in Estonia in 2020 for which the cultivation of aquatic organisms is the principally important activity. There were next fish farms by species and by location actively operated in Estonia in 2020: 21 rainbow trout farms, two carp farms, two eel farms, four sturgeon farms, two arctic char farms, one African catfish farm and one state-financed farms for the cultivation of salmonids for restocking.

Other disease problems: - From other, than fish diseases, we could have a problems with such crustacean disease, as Crayfish plague. There were outbreaks of the disease in the past in the wild populations and in some crusacean farm in 2018, which was emptied after that due to the high mortality. Aetiological agent - *Aphanomyces astaci*, susceptible species in Estonia - European crayfish (*Astacus astacus*). Unfortunately, Crayfish plague is not a listed disease by Directive 2006/88, and not listed in the new Animal Health law Regulations. Prevention measures- to follow the biosafety measures in the farms and to try to avoid the importation of an invasive alien species of crayfish to the country.

Faroe Islands 

Author/Institute: Debes Christiansen

Aquaculture production: A total of 85.000 tons of Atlantic salmon was produced in 2020 in the 24 marine farms with open net cages (10 - 25 at each site) in the Faroese fjørds and straits. This is an decrease of approximately 6.000 tons from 2019

Health status: No outbreaks of the listed fish diseases were recorded in 2020. Official inspectors are inspecting and sampling each marine site four times a year and each freshwater smolt farm two times a year. Samples are routinely tested for ISAV, SAV, PMCV and AGD. In addition to official inspections private vets. are inspecting each site 12 times per year

Other diseases and health related issues: Sea lice infestations and treatment in heated water is the main fish health and welfare issues. Cases of CMS are increasing. Clinical HSMI has been observed in a few cases

Finland 

Author/Institute: Tuija Kantala – Finnish Food Authority

Aquaculture production: In 2019, 15,3 million kilograms of fish were cultivated for human consumption in Finland. This represented an increase of about one million kilograms compared to 2018. Some 14.2 million kilograms of rainbow trout were produced in 2019, representing over 90 per cent of all the food fish produced in Finland. Also 0.8 million kilograms of European whitefish were produced, which was almost the same as in the four previous years. A total of some 0.3 million kilograms of the other species of fish being farmed, including trout, arctic charr, sturgeon and pike perch, were produced. Some 0,4 million kilograms of rainbow trout roe were produced for food. In addition to fish consumed as food, fish is also farmed in order to be stocked in natural waters. Some 50 million specimens of fry – excluding newly hatched individuals – were produced for the purposes of stocking and further farming. National aquaculture strategy aims at strong increase in the production by 2022. Farmers are interested in RAS and offshore techniques to get a (environmental) permit for bigger production amounts.

Health status: - Finland is free (class I) of VHS, IHN and ISA excluding class IV status for VHS in Åland Islands and class II IHN status in three zones and one compartment (31.12.2020).

- VHS was last time found in Åland Islands in 2012. Eradication program was finished in the beginning of 2020 and 2-year surveillance program has been started to restore VHS free status.

- IHN was found in six farms in 2017/2018. Two-year surveillance program has been started in the three zones and one compartment to restore IHN-free status.

-KHV or ISA have never been found in Finland'- Risk-based surveillance is in place in authorised, VHS/IHN/ISA free farms and also in KHV farms. - Finland is free of SVC, continental parts are free of IPN (genogroup 5) and SAV, River Tenojoki and River Näätämöjoki catchment areas are free of G. salaris. The water catchment areas of the Paatsjoki, Tuulomajoki, and Uutuanjoki are considered as G salaris buffer zones.

Other disease problems: N/A.

France 

Author/Institute: Lénaïg Louboutin -*ANSES Unité Virologie Immunology et Ecotoxicologie des Poissons VIMEP*

Aquaculture production: " In France, the trout farming dominates production of continental fish farms with about 35,000 tons produced each year (Ministère de l'Agriculture, 2013). Rainbow trout represents 95% of this production. A total of 600 sites are actives and correspond to 400 companies. Half of the production is carried out by two regions: Nouvelle-Aquitaine and Brittany. The main part of this production (80%) is destined to human alimentation, the balance consisting of live fish for restocking rivers and recreational fishing. The French marine fish farming consists of about sixty companies which produce about 9,000 tons of fish, more particularly sea bass (4,300 tons), sea bream (1,900 tons) and salmon (1,500 tons), mainly intended to be exported. Sturgeon farming (200 tons) has been increasing in the past years, and might grow again in the future. The pond fish farms, whose business is harder to identify, produce about 12,000 tons of which 9000 tons consist of live fish for restocking rivers and lakes.

Health status: " The following listed fish diseases: VHS, IHN, and KHV are present on French territory, but free-disease zones are recognized, and to achieve or maintain disease-free health status with regard to VHS and IHN, fish farms are subject to surveillance programs.

Surveillance of VHS: In 2020, only two outbreaks of VHSV were detected, in one specific area, following sampling performed for the national eradication plan ; no clinical signs had been observed before. epidemiological investigations led to additional sampling in a fish farm located downstream, on the same river. Once again, VHSV was isolated. Sequencing of complete G gene showed an almost perfect identity between the 2 isolates (99.9%).

Surveillance of IHN: Two outbreaks were detected in 2020, one through targeted surveillance, and the other following an increase of mortality in a salmonid fish farm. To notice that in 2020, French laboratories began to perform VHS and IHN diagnosis by real-time RT-PCR as official methods recognized by the ministry of agriculture. Some late Cts were observed for samples corresponding to asymptomatic fish. Homogenates were sent to NRL for confirmation, but despite an effective sequencing,

the isolation of the virus was not so obvious. This lack of consistence between cell culture and PCR analysis triggered some interrogations, notably regarding the real status of the farm and the necessary fallowing of facilities. The French administration is still trying to find a consensual way of considering those borderline samples.

Surveillance of KHV: One outbreak of KHV was reported in 2020, in South-West of France, where mortality was observed on koi in a private pond. The genotype profiles obtained for the virus was U/I profile (genotyping PCR (Bigarre et al, 2009).Another case was detected by a French laboratory, but with a low level of detection (very late Cts), and the NRL could not confirm the case by qPCR but conventional PCR (Jeffrey et al, 2007) confirmed the presence of a virus closely relative to CyHV3 (isolate HG420983).

Other disease problems:

Several outbreaks of Carp Edema Virus (CEV), located in distant French areas, were reported mostly during spring 2020, when temperature increased after winter period. CEV was detected either in Koi carps or common carps. The number of cases seems to be increasing each year (fish farmers and owners are more and more informed about the disease and contact the NRL to perform analysis). An increasing number of outbreaks induced by PRV were also reported on rainbow trout or Atlantic salmon in various farms (9 sites). Sequencing could be performed and epidemiological data collection could bring more information about its prevalence in French fish farming. EVEX has been regularly detected on elver after analysis as part of restocking program.

Germany 

Author/Institute: Uwe Fischer, FLI

Aquaculture production:

Lander	**Production**
Baden-Württemberg:	cultured species: mainly salmonids (rainbow trout, brown trout, char), carp, pike, pike-perch, sturgeon environmental conditions: temperate climate; mainly well water or close-to-well stream water technologies: partially intake of atmospheric oxygen (Flobull, paddle aeration) or technically (liquefied oxygen); partially automatic feeding (also PC-based); degassing by irrigation or aeration; partial use of filters (barrel, biological) salmonids: natural ponds; runways, partially with recirculation; brood houses with runways and round tanks; few egg producers with hatcheries carp: natural ponds; mainly extensive use
Bavaria:	Bavaria's aquaculture is basically divided into carp pond management and salmonid pond management. With about 20,000 ha pond area, half of the German pond area is located here. It produces about 6,000 t of carp on average over the years, and other species are kept as minor fish in the carp ponds, e.g. tench, pike, catfish, pike-perch, other cyprinid and small fish species. They are exclusively family businesses that manage pure earth ponds in a traditional, extensive manner. Since the ponds are largely filled with rainwater, low-precipitation years and pronounced summer heat periods are increasingly causing problems as a result of climate change, as is the increase in fish-eating wild animals. Salmonids are also produced in family businesses. Rainbow trout is still of the greatest economic importance, although the production volume has been falling continuously for several years. This is due to concerns about virus outbreaks or virus-related restrictions. Instead of rainbow trout, the companies are increasingly relying on the production of char and brown trout. In addition, climate change in particular affects domestic salmonid production. The long-lasting summers with record temperatures and the relatively low-water winters lead to a local reduction in the water supply. The result is a lack of water, excessively high water temperatures and a lack of oxygen in the farms This leads to premature fishing and a decline in production. More and more farms are reacting to the change in climatic conditions with the increased use of additional equipment, for example additional oxygenation or reuse of water. High-tech re-circulation systems exist in Bavaria for the shrimp *Litopenaeus vannamei* (4), African catfish (*Clarias gariepinus*, 2) and the pike-perch (*Sander lucioperca,* 2).
Berlin:	holdings with susceptible species according to directive 2006/88/EC: ponds (predominantly carp) und runways/ponds (predominantly rainbow trout and other salmonids). Two warm-water facilities use coolant water from coal power stations. All others use surface water. Due to the lack of water some runways do occasionally or permanently use semi-closed circular systems.
Brandenburg:	No reporting.

Bremen:	No reporting.
Hamburg:	cultured species: rainbow trout and other salmonids, sturgeon, pike-perch environmental conditions: low mountain range, many forests, common well water, rainbow trout technologies: occasionally circular systems; predominantly ponds (river and lake fisheries: Rhine, Main, Weser)
Hesse:	cultured fish species: rainbow trout, sea trout, char, pike, carp, sturgeon, maraene, tench, europ. and African catfish, eel, pike-perch, noble crayfish, burbot, white shrimp (Litopenaeus vannamei) technologies: ponds, concrete and natural runways and ponds, cold and warm water circular systems, net cages
Meckl.-W. Pomerania:	In NI there are 735 fish farms using different production forms. Of these 91 farms are certified; in terms of the amount of production: predominantly rainbow trout; carp and other fish species are extensively cultured (side-line production); in circular systems are kept: eel, europ. and African catfish, pike-perch and ornamental fish.
Lower Saxony:	mainly salmonids are kept in conventional flow-through systems. Aquaculture is mainly concentrated in the low mountain ranges. The degree of technology is low to medium, depending on the direction of production. Due to the low rainfalls in recent years, the level of technology in the plants has increased slightly. This results in new structural challenges for aquacuclear businesses.
North Rhine-Westphalia:	cultured species: rainbow trout, brown trout, char, other salmonids, carp, eel, koi, pike-perch, sturgeon, tench, orfe, goldfish, whitefish, roach, gudgeon, stone loach environmental conditions: fresh water, ponds, well water technologies: predominantly hobby holdings; sometimes use of seed fish; mostly private use; fishing ponds; sometimes use of filters and oxygen supply. aquaculture systems: traditional pond farms, predominantly ponds with connection to running natural waters, for certified farms also tanks/ponds
Rhineland-Palatinate:	almost only fishing ponds; one salt water circulation system
Saarland:	several aquaculture systems, from traditional carp and trout ponds to closed circular systems; cultured species of economical importance in carp aquaculture: Cyprinus carpio, Tinca tinca, Ctenopharyngodon idella, Acipenser spec. cultured species of economical importance in trout aquaculture: Onchorhynchus mykiss, Salvelinus fontinalis cultured species in closed circular systems: Sander lucioperca, Litopenaeus vannamei, Pangasianodon spec, Tilapia, Clarias gariepinus, Perca fluviatilis
Saxony:	cultured species: predominantly rainbow trout, carp; also brown trout, char, pike-perch, sturgeon, maraene etc. environmental conditions: rainbow trout and carp in ponds, runways and net cages; middle European climate technologies: ponds, runways and net cages supplied by well or surface water; flow through or semi-circular systems; net cages in lakes; warm water circular systems; systems for the supply of oxygen protection from predators: covering with nets, sometimes roofs or indoor ponds
Saxony-Anhalt:	cultured species: salmonids, cyprinids, coregonids, Acipenser spp., percids, noble crayfish, eel, shellfish, oysters etc. environmental conditions: well and surface water

	technologies: net-cages, earthen ponds, pools, shellfish culture aquaculture systems: open, semi-circular and closed circular systems
Schleswig-Holstein:	Carp farms predominantly extensive ponds and in runways; Rainbow trout production in only three larger aquaculture farms with runways, or in natural ponds as a sideline or for the restocking of open waters, brown trout and char mostly only as "side fish" or for restocking measures. A new addition is aquaculture, which raises arapaimas in an in-house recirculation system and markets them as food fish. Stocking is done by imported larvae.
Thuringia:	cultured species: mainly salmonids (rainbow trout, brown trout, char), carp, pike, pike-perch, sturgeon environmental conditions: temperate climate; mainly well water or close-to-well stream water technologies: partially intake of atmospheric oxygen (Flobull, paddle aeration) or technically (liquefied oxygen); partially automatic feeding (also PC-based); degassing by irrigation or aeration; partial use of filters (barrel, biological) salmonids: natural ponds; runways, partially with recirculation; brood houses with runways and round tanks; few egg producers with hatcheries carp: natural ponds; mainly extensive use

Health status:

Baden-Württemberg:	VHS and IHN with numerous disease free compartiments and zones targeted surveillance for VHS and IHN in Cat I and III KHV: all Cat. III, partially active and targeted surveillance ISA: disease free status; usually passive surveillance of farms; for farms keeping salmons: targeted surveillance
Bavaria:	Official controls acc. to EU and national legislation: competent authorities; Examinations for risk-oriented animal health surveillance acc. to EU and national legislation: Animal Health Service Bavaria; Fish vetd, qualified services
Brandenburg:	Surveillance of aquaculture facilities in accordance with the German Fish Disease Regulation (§3 FSVO) based on risk determination in accordance with Directive 2006/88 / EC and Decision 2008/896 / EC (guidelines for risk-oriented monitoring). Targeted survaillance is carried out with regard to IHN, VHS, IPN and KHV. Two compartments are in a voluntary survaillance program with the aim to gain freedom from disease in accordance with Directive 2006/88 / EC with regard to VHS and IHN. The monitoring procedures were completed by the end of the year. Due to the geographical location, the enforcement of the Water Framework Directive and i. Due to lack of water, however, the requirements cannot be consistently met.
Bremen:	No reporting.
Hamburg:	No reporting.

Hesse:	5 companies are in Category I: targeted monitoring was carried out including sampling. The rest of the farms are in Category III: monitoring was largely active (routine checks, sampling); Monitoring of some farms was carried out by means of targeted monitoring (mandatory sampling and examination of samples)
Meckl.-W. Pomerania:	healthy, passive surveillance
Lower Saxony:	The health status of LS is shown in the information under 1.2 and the map material. Officially positive diagnosis on KHV-I was made only in non-commercial ornamental fish stocks. The active health surveillance of approved aquaculture companies is carried out by the Vet Uni Hannover or by qualified health services. The official monitoring is carried out by the responsible local veterinary authorities. The diagnostic laboratory of LS and the Vet Uni Hannover are responsible for health monitoring (clinical examinations, laboratory examinations) to maintain health status I. With regard to the ISA, monitoring is passive.
North Rhine-Westphalia:	The majority of aquacultures are either not classified in any disease category (registered companies) or in disease category III. Few farms are in category I. The options for grouping into the categories are closely linked to the commercial structures and the geographical location. Monitoring is carried out actively, passively or targeted by the veterinary offices in accordance with Directive 2006 / 88EC. These are supported by the nationwide fish health service. Operational self-checks are carried out occasionally by local veterinarians. Support from the fish health service is particularly necessary due to the lack of specialists.
Rhineland-Palatinate:	Health status cat. III (according to Annex III, part A RL 2006/88, twice per year control by "qualified service"; once a year control by veterinary office Official inspections are carried out in approved establishments in accordance with the determined risk level, in which fish are also removed and examined for fish diseases in the states vet diagnostic lab. All farms including registered, are recorded in corresponding national databases and are checked at regular intervals to ensure that the data are up to date.
Saarland:	The entire Saarland is in category III (health status undetermined); Monitoring is carried out by the State Office for Consumer Protection.
Saxony:	No reporting.
Saxony-Anhalt:	Category I for VHS, IHN: Bode water catchment area with 4 aquaculture facilities (see Appendix 1: Map); The farms are monitored in a targeted manner. The clinical examination with sampling is carried out by a qualified service (= state fish disease control service) in cooperation with the responsible veterinary inspection office. Virological tests are carried out at the State Office for Consumer Protection in Saxony-Anhalt using accredited methods in accordance with the recommendations of the Official Method Catalogue of FLI. Wild fish inspections are carried out regularly in

	the buffer zone, and fish stocking is only permitted with fish from category I farms. Category III for VHS, IHN, KHV: here too, risk-based surveillance is carried out by the state fish disease control service. According to the state-specific legislation, fish of susceptible species are examined in risk-oriented establishments requiring approval. In addition to the clinical controls, this usually includes at least once a year also laboratory diagnostic tests for pathogens of notifiable fish diseases.
Schleswig-Holstein:	Two farms in Cat I: rainbow and brown trout, sturgeon. All other farms in Cat. III. Surveillance by States Vet Authorities in collaboration with Qualified Services attached to the Chamber of Agriculture.
Thuringia:	Inconspicuous. Surveillance is made according to directive 2006/88/EC in collaboration with the fish health services of other German states.

Other disease problems:

Baden-Württemberg:	ERM: Yersinia ruckeri is endemic in some river systems and adjacent trout farms (different Yersinia strains - Hagermann and EX5), rainbow trout of all ages are affected, diagnosis is carried out using classical bacteriological methods (pathogen cultivation and differentiation), i.e. examination of diseased fish (active monitoring); in problematic farms vaccinations by means of immersion vaccines; after the IHN epidemic, there was an increase in farms that kept char instead of rainbow trout after the remediation; furunculosis increased in char farms in the summer months, depending on the water temperature and the stress level; Diagnosis by means of bacteriological-cultural examination and differentiation by means of MALDI-TOF; Oral antibiotic therapy CEV: in Koi / other carp species, disease events (factor disease), especially in spring, detection by means of PCR Flavobacteriosis (RTFS): especially *F. psychrophilum*; Mostly rainbow trout larvae are affected during hatching. Diagnostics with classical bacteriological methods (pathogen cultivation from organ material on Anacker Ordal agar at 15 ° C). Preventive measures: Optimization of hatchery hygiene, reduction of stocking density, salt baths, addition of vitamins, disinfection of the inlet water. Therapy: antibiotic medication through feeding. During another very hot summer in 2020, problems due to lack of water and high water temperatures as well as increased parasitosis and bacterial diseases in some cases.
Bavaria:	no changes to previous years
Brandenburg:	No reporting.
Bremen:	No reporting.
Hamburg:	No reporting.

Hesse:	Flavobacter sp./*Flexibacter psychrophilum* in rainbow trout fry; diagnostic methods: bacterial culture and MALDI-TOF-MS; no control and prophylactic measures taken. *Ichthyophthirius multifiliis* in salmonids in all stages of development; diagnostic methods native, using a light microscope; there are currently no control and preventive measures to minimize the negative effects.
Meckl.-W. Pomerania:	No issues.
Lower Saxony:	For sleepy disease in carp (KSD / CEV), a significant increase in the incidence of both "wild / farm carp" and koi can be determined compared to the previous year. The PRV 3, CyHV 2 and Rickettsia-like findings are also worth mentioning.
North Rhine-Westphalia:	No reporting.
Rhineland-Palatinate:	No issues.
Saarland:	No reporting.
Saxony:	No Reporting.
Saxony-Anhalt:	In 2020, aquaculture in Saxony-Anhalt was again primarily affected by droughts and high temperatures. The high water temperatures and the lack of water forced the farms to massively reduce their stocks in order to prevent bacterial and parasitic infections.
Schleswig-Holstein:	No abnormalities reported.
Thuringia:	Proliferative kidney disease (PKD) in rainbow trout: A project is currently underway in a larger trout farm with supraregional partners that is testing the suitability of technologies for water treatment to reduce infection stages during the production process.

Greece

Author/Institute: Dr Athanasios Prapas/VETERINARY CENTER OF ATHENS

Aquaculture production: Marine farming of mediterranean fish species in cages-mainly dominated by seabream and seabass.

Health status: The health status has not changed since last year. We are applying mainly passive surveillance for the listed diseases.

Other disease problems: The main problems challenging the industry are the monogenean trematode *Sparicotylae chrysophrii* affecting seabream and VNN-virus affecting mainly seabass. I would include as emerging pathogens *Aeromonas veronii* and *Lernathropus kroyeri* both affecting seabass. .

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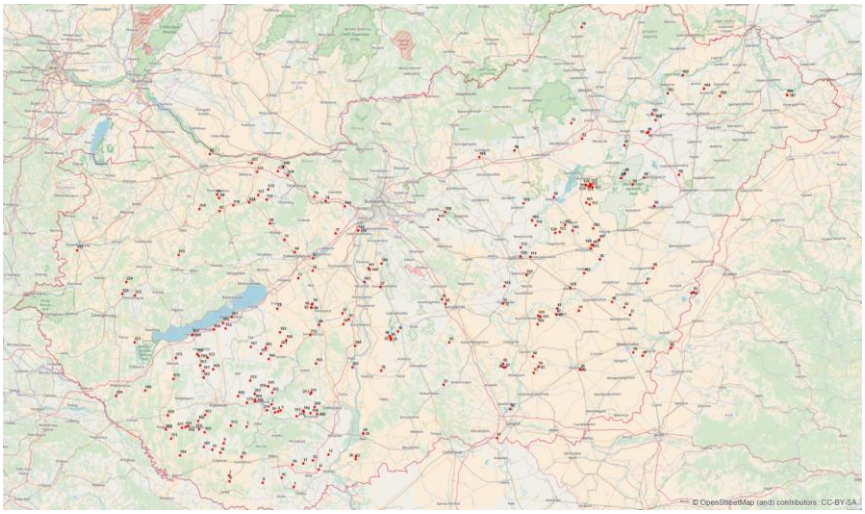
Hungary

Author/Institute: Dr. Sréter Tamás NRL Fish Hungary, National Food Chain Safety Office Food Chain Safety Laboratory Directorate National Reference Laboratory for Parasites, Fish and Bee Diseases

Aquaculture production: The geographical, water and climate conditions in Hungary are suitable for traditional pond fish husbandry and in some cases for intensive fish production. Fish farms are mainly situated on the northern and southern part of the Great Hungarian Plain and on the south Transdanubian Region.



Extensive fish farms are still the main production units in the aquaculture. They produce 81% of the whole Hungarian fish production. There are 283 fish farms producing carp. Intensive and extensive farms production was 25359 tons.

The major farmed species is carp. The 84.5% of the edible fish production constitutes common carp, 7% silver carp, 3.1% grass carp, 1.5% catfish, 3.2% wild fish, 0.2% pikeperch, 0.2% pike, 0.3% others.

There are 23 intensive farms in Hungary. The fish production by intensive farms was 4740 tons. The African sharptooth catfish and sturgeon are provided by the intensive fish farms. The 94% of the intensive fish production constitutes African catfish.

Historically the fish consumption is low in Hungary. It is around 6.45 kg/person/year.

Health status: In 2020 Hungary has implemented an approved targeted surveillance program for KHV (whole territory of Hungary) in accordance with Comission Decision 2010/171/EU.

The sampling process at farms is supervised by the district veterinary officer. The farms producing fish only for consumption are not involved in the surveillance program. Put and take fisheries are also excluded. Last year, 231 fish farms were sampled, diagnostic samples are included. In 2020 four fish farms were found positive for KHV.

Due to the 2009/177/EC, the whole territory of Hungary is declared disease-free of infectious salmon anaemia (ISA).

According to Annex I to Decision 2010/221/EU, the whole territory is free of SVC (due to 2010/761/EU). Hungary continues monitoring based on risk assessment. In 2020 46 fish farms were sampled.

There are surveillance programm for IHN and VHS, the farms with susceptible species (like trouts and pike) are examined yearly by virological methods. In 2020 20 fish farms were sampled.

Other disease problems: The problem in aquaculture industry is the availability of very few-authorized antiparasitic medicines.

Iceland

Author/Institute: Árni Kristmundsson Institute of Experimental Pathology at Keldur NRL Iceland

Aquaculture production: 90% of all fish farms in Iceland are landbased (flow-through system), but the salmon production is mostly increasing in sea-cages the last years. The total production in 2020 was as follows:
Atlantic salmon: 34.341 t.
Arctic char: 5.493 t.
Rainbow trout: 490 t.

Senegal sole: 271 t.
Total: 40.595 tonnes

Health status: The health status is very promising and no listed diseases have been detected the last years. The fish disease authority is performing targeted surveillance, with focus on the broodfish farms, with intensive samplings for detection of the most serious diseases. For instance, in 2020 there were taken totally 7.078 samples for ISAV-testing, 4.323 for PD/SAV-testing, 2.762 for VHSV-testing and 1.990 for IHNV-testing. All results were negative.

Other disease problems: The biggest challenge in the Icelandic aquaculture in the last decades is Bacterial kidney disease, both in Atl. salmon and Arctic char. BKD is found to be widespread in the wild salmonids, both in freshwater and seawater. BKD is an important part of the Icelandic national health program and a huge amount of samples are taken in a number of fish farms (in 2020: totally 5.196 samples in 21 farms) - and also from wild salmonids used as broodfish for the rivers (728 samples in 4 farms, out of them 10 positives). Eggs from positive wild females are destroyed.

Ireland 

Author/Institute: Samantha White, Marine Institute

Aquaculture production: Finfish aquaculture increased in 2020 to a total of 13, 474 tonnes, of which 12, 870 tonnes was accounted for by marine Atlantic salmon production. Freshwater rainbow trout farming takes place mainly in flow through pond farms and produced around 600 tonnes. Regarding non-salmon species, one perch farm was operational in 2020 and one farm specialising in the production of ornamental fish including koi carp.

Health status: Ireland has category I status for listed diseases according to council directive 2006/88/EC i.e. ISA, IHN, VHS and KHV. All farms containing susceptible species are sampled on an annual basis. In addition, under commission decision 2010/221/EU Ireland has additional guarantees for BKD, SVC and infection with *Gyrodactylus salaris*. All farms with susceptible species are sampled on an annual basis. Additionally wild Atlantic salmon from seven rivers are sampled annually for *G. salaris* surveillance.

Other disease problems: For 2020, disease occurrence in salmonid aquaculture has remained in line with previous years, with some exceptions. In Ireland, an increase in the frequency and impact of infection with *Piscirickettsia salmonis* was noted on 9 sites, peaking in September 2020. Infection was generally prolonged (3 months) with chronic low to moderate mortality. A rise in the occurrence of cardiomyopathy syndrome was also noted for 2020 (5 sites), in comparison to case reports from the last three years. Clinical impact of CMS was high for most sites (> 5% mortality). *Neoparamoeba perurans*

was detected in 9 of 11 sites, for which samples were submitted for testing by the Marine Institute, the parasite was reported on a further 6 marine sites. Management has been through regular freshwater treatment which are part of routine husbandry procedures at these sites. In April through to September 2020, aquaculture sites experienced significant impacts relating to phytoplankton blooms (7 sites) and zooplankton (2 sites). The most sever impacts from phytoplankton blooms were noted during August and September causing high level mortality (30 -100%) at 3 sites. With one site entirely wiped out by the bloom. Infection with salmonid alpha virus remained low in 2020 (2 sites), with only one outbreak having significant clinical impact (> 5 % mortality), this occurred in unvaccinated fish. The low numbers recorded for SAV infection for 2020 are in-line with reports from 2018 and 2019. *Aeromonas salmonicida*, the causative agent of furunculosis was detected in 2 sites following transfer of fish to seawater. Both sites were stocked with vaccinated fish and the impact was minimal. Minor occurrences for winter ulcer disease were recorded for 2 sites with no significant mortalities reported. Red skin disease was observed in June and July in returning wild Atlantic salmon (8 fish) to two river systems in Ireland. Fish were screened for pathogens, including those listed under 2006/88/EC. No causative agent was identified.

Italy 

Author/Institute: Arcangeli G.; Toffan A; Manfrin A.; Dalla Pozza A.- IZSVe

Health status: In 2020 due to the SARS-COV-2 pandemic and the consequent movement restrictions there was a decrease in finfish exportation. This was particularly evident in freshwater aquaculture and can be assumed in a decrease of rainbow trout production of nearly 25-30%. Marine aquaculture was less affected by the economic crisis because the production does not cover national consumption. A remarkable effort has been made in reducing the use of antibiotic in aquaculture in Italy during the last years.

Health status: In Italy the first eradication program started in the late ‘70s for VHS as a voluntary campaign and only in the regions where trout farming was more widespread. In 1992 voluntary eradication programs in line with the European legislation (91/67/CE) were put in place on a national level. In 2008 the eradication campaigns were further implemented following the EU Council Directive 2006/88/EC.

Despite the long history of implementation of eradication programs, IHNV and VHSV are still persistent in Italy, causing recurrent disease outbreaks. In Italy in 2020 there were 13 VHS and 12 IHN infected farms. Italy is declared free for ISAV and no detection of exotic disease listed in Annex IV according to EU Council Directive 2006/88/EC has been made so far. In 2020 the Monticolo lakes compartment, a mountain region in South Tirol, reached the KHV-free status, and it was the first campartment in Italy to achieve the certification for Category I KHV zone.

Other disease problems: In 2020 the decrease of production due to the SARS-COV-2 pandemic and the abundance of freshwater related to the copiousness of rain/snow precipitations, produced a remarkable reduction in infectious diseases impact in freshwater aquaculture. The most frequent pathogen detected in rainbow trout was *L. garviae* for which a reduction of efficacy of the commercially available vaccines has been reported. *Yersinia ruckeri* biotype 2 appeared to be much more common than biotype in rainbow trout farms and no vaccine against this biotype is currently available. *Aeromonas salmonicida* and atypical aeromonads remain the main patogens for the other samonid species (*Savelinus* spp., *Salmo* spp.). An increase in CEV detection in carp, both common and koi, was observed. In marine species, the most frequent viral disease detected was vibriosis, in particular caused by *Vibrio harveyi*.


Germany
Austria
Liechtenstein
Switzerland
Hungary
Slovenia
Croatia
France
Bosnia and Herzegovina
Serbia and Montenegro
Albania
Monaco
Adriatic Sea
Tyrrheanian Sea
Ionian Sea
Mediterranean Sea
Malta
Trentino-Alto Adige
48 2
Friuli Venezia Giulia
14
Valle D'Aosta
1
Lombardia
22
Veneto
22 1
Piemonte
33 2
Liguria
2
Emilia-Romagna
8
Toscana
23
Umbria
2
Marche
3
Abruzzo
1
Lazio
1
Molise
Campania
1
Puglia
Basilicata
2
Calabria
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Sardegna
Sicilia
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Latvia 

Author/Institute: Laura Krikvo - Institute "BIOR"

Aquaculture production: Aquaculture in Latvia produced only freshwater fish species in large artificial pounds (about 5000 ha total surface), through-flow facilities and recirculation facilities. Main produced species in aquaculture are carp, rainbow trout, cat fish, sturgeon. There are five governmental fish farms which implement activity of the Fish Resources reproductive state program, mainly producing salmon and sea trout smolts in the framework of national restocking program. Total aquaculture production are about 700 tons per year.

Health status: Each aquaculture animal establishment shall conclude a contract with veterinarian, according to which vet ensures the veterinary surveillance of aquaculture animals. In the case of suspicion farmer is obliged to inform veterinarian about mortality of aquatic animals and veterinarian must investigate cause of mortality or inform FVS what will ensure epidemiological investigation. FVS veterinary inspectors are visiting farms annually to ensure the welfare and health status of fish. Within the framework of State infections disease surveillance plan, all aquaculture farms which distribute fry and fishes for further growing and restocking shall be sampled and tested for VHS, IHN and KHV annually. Laboratory surveillance program are performed for the IHN, VHS and KHV since year 2005. According to COUNCIL DIRECTIVE 2006/88/EC Annex IV part II (non-exotic fish disease list), aquaculture farms belong to the category 3 (Not known to be infected, but not subject to surveillance program for achieving disease free status).

Other disease problems: Additional virological, bacteriological or ichtiopathological investigations are not mandatory in Latvia. The most common bacterial disease problems are Aeromonosis and Pseudomonosis, mainly *Aeromonas hydrophyla*, sobria and uncommon salmonicida. Factors contributing the clinical diseases are: stress, inadequate welfare and water quality problems. Myxobacteriosis are often clinically diagnosed in salmonids. Some parasitic diseases such as argulosis, philometroidoses, ergasilosis, lerneosis, piscicolosis and monogenetic flukes (such as *Gyrodactylus*) are presented in ponds. The protozoa parasites, chilodonella, trichodina and less frequently ichtiophtirius are diagnosed often in through-flow facilities. These diseases usually affect young fish.The general protection measures should be used for disease control: prevention, sanitation of ponds and fish treatment. Various chemical and disinfection substances are the most common medical treatment products against ectoparasites, antibiotics- against microbial diseases.

Lithuania 

Author/Institute: Darius Nienius-National Food and Veterinary Risk

Aquaculture production: In Lithuania 94 companies are engaged in fish farming. Farmed fish species are: Carp, grass carp, sturgeon, catfish, pike, tench, silver carp, koi carp, rainbow trout, eels. Fish farming process takes place in closed recirculation systems, inlands ponds and flow-through / raceways.

Health status: In 2020 during official monitoring of infectious fish diseases (listed) 62 fish samples were selected from Lithuanian aquaculture companies. All tests results were negative. All laboratory results were negative after laboratory tests at the National Institute for Food and Veterinary Risk Assessment.

Other disease problems: No update since 2018

Malta 

Author/Institute: Benedetto ZangrilliVeterinary and Phytosanitary Regulation Division

Aquaculture production: Two Companies are mainly involved in the farming of Gilt-head Sea Bream (*Sparus Aurata*) and rarely Seabass (*Dicentrarchus labrax*). Both farms rear fish in cages at sea. Juveniles are bought from EU hatcheries and feeded with pellet. Four Companies are focuses on the fattening of wild bluefin tuna (*Thunnus Thinnus*) cought from wild stocks and fattened inside offshore cages fed with mackarels and herrings bought frozen. .

Health status: passive surveilance is implemented for all farms

Other disease problems: -N/A

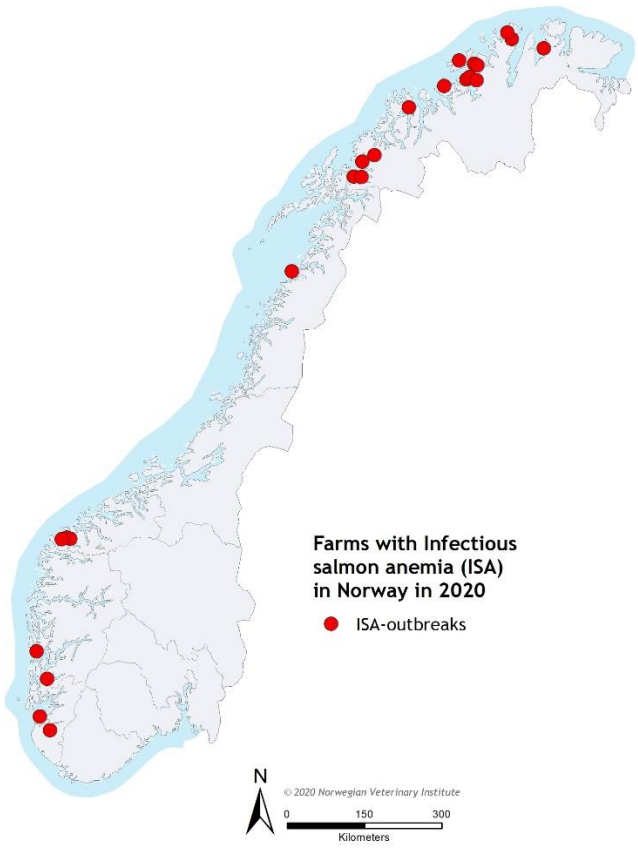
Norway

Author/Institute: Norwegian Veterinary Institute

Aquaculture production: Atlantic salmon is the major species in aquaculture. A high number of cleaner fish is used for biological delousing.

Health status: We have a surveillance programme for VHSV and IHNV based on PCR. Most of the included samples are selected from those that are submitted for diagnostic investigation, while some samples from rainbow trout and pink salmon are taken exclusively for the surveillance programme. There is surveillance in ISA-free compartments and farms in control zones that are established due to ISA-outbreaks, and a surveillance programme for detection of ISAV HPR0 in hatcheries was put in place in 2019.

Other disease problems: The high mortality after sea transfer and welfare related to lice treatments are concerning. Complex gill diseases are on rise.



Poland

Author/Institute: Marek Matras - Pulawy

Aquaculture production: No significant changes from 2019.

Health status: According to Council directive 2006/88/EC Poland has free health status for ISA and 15 VHS free compartments, 18 IHN free compartments and one KHV free farm, rest of farms have undetermined health status for VHS, IHN a KHV. In 2020 weren't reported outbreaks of KHV, VHS or IHN. At the national level Poland performed the monitoring for ISA, SDV and KSD.

Other diseases and health related issues: In 2020, carp edema virus was detected in 1 common carp farm. The presence of the IPNV and SAV2 has also been confirmed.

- Compartment (farm) declared IHN free
- Farm infected with IHN

- Compartment (farm) declared KHV free
- Farm infected with KHV

Portugal 

Author/Institute: Direção Geral de Alimentação e Veterinária (DGAV)/Instituto Nacional de Investigação Agrária e Veterinária

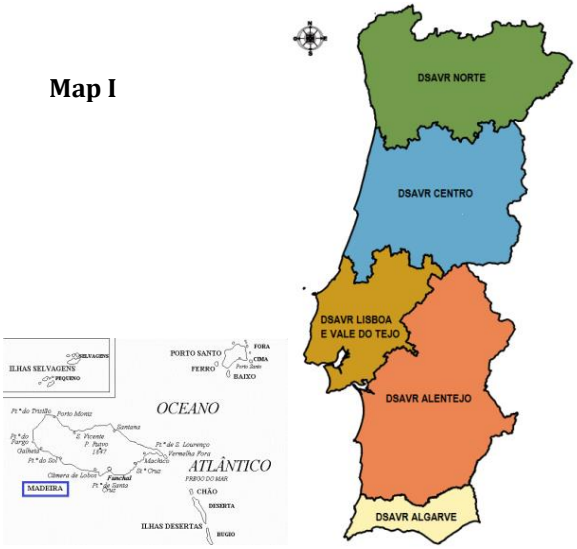
Aquaculture production:

Table I - Number of active fish farms per region (Map I), species and system

Region	**Fish farms**					**Total nº**
	Trout and carp	**Marine fishes** (sea bass, gilthead seabream)				
		Intensive	Semi-intense	Extensive	Sole and Turbot *	
	Active	Active	Active	Active		
DSAVR Norte	13	0	1	0	(1)*	14
DSAVR Centro	9	0	16	1	(2)*	26
DSAVR Lisboa e Vale do Tejo	0	0	21	2	0	23
DSAVR Alentejo	1	0	3	2	0	6
DSAVR Algarve	0	0	7	0	0	7
Madeira	**0**	**2**		**0**		**2**
Total	**23**	**55**				**78**

*Included in the marine fish farms

Map I



Heath status

CATEGORIZATION OF PORTUGUESE FISH FARMS

Table II

FISH (Species)	**Disease- free status to *(VHS/IHN*) (Number of fish farms)**
Trout	**24**
Turbot	**3 ***
FISH (Species)	**Surveillance Programme *(VHS/IHN*)(Number of fish farms)**
Trout	**2**
FISH (Species)	**Disease- free status to (*KHV*) (Number of fish farms)**
Carp	1

- ✓ The whole country is declared disease-free (Category I) to (ISA)

* Actually one is producing only sole

In Portugal, by means of an official sanitary surveillance taken annually for the DGAV, in the species of culture with the highest production, one confirms that diseases that are required by law to notify, have never been diagnosed. The marine fishes of seabass, gilthead seabream and sole are controlled under a passive surveillance, and categorized as Category II.

Other disease problems: N/A

Romania

Author/Institute: Costea Mihaela /Institute for Diagnosis and Animal Health

Aquaculture production: Aquaculture production in Romania consists mainly from salmonid, cyprinid and sturgeon species. In aquacultured species of Salmonids rainbow trout prevails, followed by brown trout. A particularity of Romanian aquaculture is breeding of common carp together with Asiatic species of carp, crucian carp, pike, pikepearch and European catfish. Farming systems for salmonids and sturgeon are both land based system as tanks, with rarely recycling systems in high control enclosed system and water-based systems (cages and pens). For cyprinids are land-based systems with rainfed ponds, irrigated or flow-through systems). Environmental condition are specific for trout, sturgeon and cyprinids species rearing, as well as for pike, pikeperch and European catfish.

Health status: According the Council Directive 2006/88/EC, the health status of fish listed diseases in Romania is category III for VHS, IHN and KHV and category I for ISA, according of Commission Decision 177/2009. The surveillance of fish listed diseases is based on active surveillance. Details about who and what have to do relating every fish diseases are mentioned in the Surveillance Programme that are approved by National Sanitary Veterinary and Food Safety Authority. Inspection, examination and sampling of aquatic animals are performed by county veterinary services and samples analyzing for fish listed diseases are carried out by National Reference Laboratory.

Other disease problems: The most frequent diseases in salmonids farms are those that involve the myxobacteria group in fry and in adult stage followed by yersiniosis. In ciprinids ponds bacterial infection with opportunistic agents are prevalent. Diagnosis of bacterial diseases are performed by bacteriological exams. Control and prevention measures put in place to mitigate the impact of bacterial diseases on production are: desinfection, reducing of stress from manipulation, decreasing density of population, treatments with antimicrobial substances, optimization of rearing condition.

Serbia 

Author/Institute: Vladimir Radosavljevic - University of Sarajevo

Aquaculture production: No update since 2019

Health status: No update since 2019

Other disease problems: No update since 2019

Slovakia 

Author/Institute: Miriam Maceková *Veterinary and Food institute Dolný Kubín*

Aquaculture production: In comparison with year 2019, obvious increase of registered farms was noticed. The majority of them present farms with small production, however they play important role in epidemiologic situation. Traditional farmed species in Slovakia are carp and rainbow trout. Fish farms use natural water streams.

Health status: The national surveillance programmes for VHS/IHN and KHV are performed. In 2020 surveillance for CEV was realised for the first time. All examined samples were tested negative. In general health status is without significant changes, but two outbreaks of KHV were revealed. Restrictive measures were taken.

Other disease problems: no update since 2019

Slovenia 

Author/Institute: Vlasta Jencic / National Veterinary Institute, University of Ljubljana

Aquaculture production: With regard Statistical office of Slovenia, data from 2019 the production of rainbow trout was 937 tonnes, other salmonids 49 tonnes, carps 112 tonnes, other warm water fish 126 tonnes and marine fish and mollusc together 798 tonnes.

Health status: In Slovenia 32 farms/compartments/zones are declared free (Category I) and 5 fish farms/compartments/zones are in the category II (approved surveillance programmes for VHS/IHN free status). Most of farms are officially in the Category III, however in fact these farms are not of unknow health status. Fish farms trading with live fish are for many years annually checked for the presence of IHNV and VHSV with regard the National surveillance programme paid by AFSVSPP (Annual Decree on the systematic monitoring of animal diseases and vaccination). There are no fish farms in Category IV while in the Category V, there are 3 VHSV infected, 23 IHNV infected and 3 KHV infected fish farms.

Other disease problems: See above

Spain 

Author/Institute: Pilar Fernández Somalo /Central Veterinary Laboratory (MAGRAMA)

Aquaculture production:

Spain has a wide variety of hydrological resources, where aquaculture is possible either in continental, brackish as well as sea water. Different aquaculture system can be found:

In continental water

1) Tanks are located beside a river. These tanks are usually rectangular and concrete made out, operating on two techniques:

a) flow-through, an open system where river water flows through the units via a race. The rainbow trout is the most important specie produced by this system followed by carp and sturgeon

b) The recirculation, a closed system that consists of circulating water in the tanks and recycling it via pumping and processing units, are used in the rearing of eel and tilapia.

2) In ponds: the fish live in ponds where they feed off the ecosystem, this technique is used in the rearing of tench and carp

Sea water

1) Cage systems. Net-pens (cages) can be of different kinds but the principle is the same; every type is based on a natural exchange of water through pens. The most important specie cultivated in this system are:, seabass, seabream, tuna, meagre, blackspot.

2) Onshore tanks. Square or circular cement tanks are used, with open-circuit pumped seawater. Aeration or oxygenation systems are normally used to maintain the water at oxygen saturation. Turbot and sole are reared in this system.

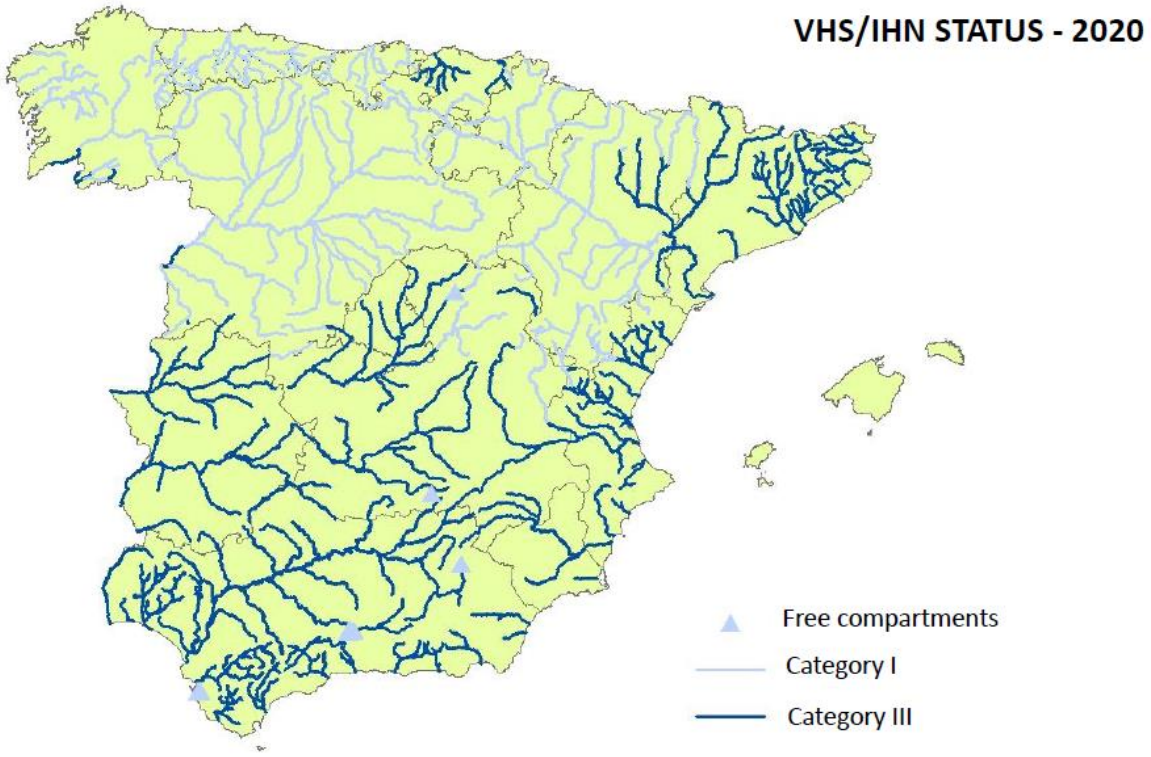
3) Esteros. the principle of esteros in southern Spain is as follow: fish were allowed to enter lagoons, after which the entrance was closed off, trapping them inside. The trapped fish fed naturally until they were harvested. In this system seabass is usually cultured in polyculture with seabream, mullets, eels and meagre.

Health status:

Spain is a country free of ISA. Around 90% of fish farm with susceptible species to VHS and INH are located on free zones for these diseases, according with annex V, part II of council directive 2006/88/EC and also the basin of main rivers on the northern half of Spain is considered as officially free, since the source of water to the estuary. In the frame of official surveillance for these diseases the competent authorities of Community Autonomies (CCAA) have developed specific surveillance programs in accordance with the sampling plans and diagnostic methods laid down in Commission Implementing Decision (EU) (2015/1554) and are coordinated by Central Authority (MAPA / Ministry of Agriculture, Fisheries and Food).

Other disease problems:

No update since 2019


VHS/IHN STATUS - 2020
Free compartments
Category I
Category III

Sweden 

Author/Institute: Charlotte Axén-SVA

Aquaculture production: Mainly RT, second most common species arctic char. A few farms with other species carp, tilapia, african catfish, strugeon, salmon. Land-based flow-through systems most common for fry and parr production, older fish in cages. Land-based RAS systems for warm water species, sturgeon, RT, salmon, pikeperch, perch. A few aquaponic farms

Health status: Listed salmonid viruses not present in farms. Surveillance according to EU 2015/1554, cell cultures. ISA not monitored (will be monitored from 2021). Farms are categorized into risk classes by the Board of Agriculture. RC 1= two control visits per year, sampling for virus and BKD every year, RC 2=one control visit per year, sampling every two years. RC 3= one control visit every second year, sampling only upon suspicion. RC 4 = no control visits or sampling unless there is suspicion

Other disease problems: ASS - the number of cases continue to increase from one/year 2018 to four cases in 2019 and six in 2020. Four of the cases related to the same company, has spread to two new sites in 2020. The farm also has BKD in one site since 2015, and we can see that they also transfer this between sites, i.e. they have a serious biosecurity problem. The fifth case is a repeated occurrence in another farm and the last case is wild fish (spawning salmon with concurrent saprolegniosis). Other Aeromonas infections seem to be increasing whereas RTFS that is usually a problem was not common (6 cases 2019 and 7 in 2020 compared to the regular 15-30 confirmed cases/year).

Switzerland 

Author/Institute: Heike Schmidt-Posthaus, Centre for Fish and Wildlife Health

Aquaculture production: The main aquaculture species in Switzerland produced for human consumption is rainbow trout, mainly in raceway farms. Perch and pike perch are increasingly raised, mainly in recirculation systems. A low number of farms (< 5) have started to produce salmon. Brown trout, char and whitefish are bread for stocking purposes.

Health status: No listed viral disease has been diagnosed in 2020. In some cantons, regular controls of farms are established.

Other disease problems: Perch rhabdovirus is a disease of growing concern as it has been increasingly demonstrated in perch producing farms.

The Netherlands 

Author/Institute: Olga Haenen, Wageningen Bioveterinary Research

Aquaculture production: The Netherlands has appr. 50 fish farms: indoor 25°C: 13 eel, 10 African catfish, 3 claresse, 2 tilapia, 2 pike perch, indoor, colder: a single turbot-, and sole farm, and a new big yellow tail kingfish farm; out/indoor 8 trout farms. Plus 56 put and take trout fisheries. In total 106 farms, production appr. 8500 ton/year. Data based on list of registered fish holding sites from the Ministry, supplemented with own experience.

Health status: Our country has a passive surveillance on the listed fish diseases of 2006/88/EC. So, only when there is a suspicion, samples are taken for diagnosis and the 2006/88/EC measurements are taken. All trout and one single carp farm(s) are in Cat. III.

Other disease problems: No particular fish disease in 2020. CyHV-2 occurred in wild gibel carp. CEV was dubiously tested in two batches of private hobby koi.

Turkey 

Author/Institute: Gulnur Kalayci – NRL Turkey

Aquaculture production: no update since 2019

Health status: We don't have any categorisation of fish farms in our country according to council directive 2006/88/EC.

Other disease problems: No update since 2019.

England and Wales 

Author/Institute: Kevin Denham/ Centre for Environment, Fisheries and Aquaculture Science (Cefas)

Aquaculture production: " The two main aquaculture sectors in England and Wales in terms of production volume are salmonid species and coarse and ornamental (carp family) fish species. Production data given below is for 2019, the 2020 data is still being collected. In England and Wales there were 102 active sites (90 in England, 12 in Wales) producing rainbow trout, of these 99 reported production in 2019. In 2019, 4974 tons of rainbow trout were produced - 3332 tons for the table market and 1369 tons for restocking angling waters. 41 of these sites also produced 140 tons of brown trout for restocking angling waters. Production systems vary - from cages, ponds, raceways, tanks, and hatcheries. There are two commercial salmon sites in E&W and produced 2.2 million smolts for on growing by the Scottish industry. There are also 10 non-commercial salmon hatcheries run by Agencies and a range of rivers trusts and local angling societies, producing 438 thousand juvenile salmon for mitigation and stock enhancement schemes. England and Wales has 100 active farms producing a range of coarse fish, primarily for restocking of angling waters, and ornamental species such as koi carp and goldfish for the ornamental fish pet trade. In total 15 different coarse fish species are produced - with carp making up a significant part of the production, 66 farms produced 140 tons of carp for angling. For the ornamental sector 1.2 million koi and nearly 250 thousand goldfish were produced. Coarse and ornamental species are produced in a mixture of earth ponds and intensive indoor/ outdoor tank systems. A relatively new species being produced in both England and Wales are lumpfish (*Cyclopterus lumpus*) for biological lice control in the European salmon industry. There are 2 sites in Wales and 4 in England which produced in 2019 a combined total of over 3.7 million fish.

Health status: The status of England and Wales (as part of the Great Britain zone under the UK Member State) with regard to the listed fish diseases is as follows:

EHN – Category I (Exotic to the EU)

VHS, IHN, ISA – Category I

KHV – Category III (and with three KHV approved compartments at Category I - 1 farm and 2 ornamental importers)

England and Wales are also officially recognised as having freedom from SVC and *G. salaris* under national measures. There are no diseases subject to surveillance for control and eradication. A statutory programme of risk-based targeted surveillance is implemented for all of the listed diseases, including those subject to national measures, and to audit industry compliance with the requirements of the Aquatic Animal Health Regulations. The risk-based programme consists of a minimum annual stock health inspection for high risk sites, and minimum biennial (every other year) for medium or lower risk sites. The compliance and disease surveillance inspections are carried out by the Official Service for Aquatic

Animal Health (the Fish Health Inspectorate, Cefas) at the time appropriate for disease expression. Industry compliance with legislation and disease status remains high and with no major changes in recent years. Passive surveillance systems are implemented through fish farmers, fishery managers, fish health consultants, veterinarians, members of the public, and the obligation to report suspicion of notifiable or emerging disease to the Official Service is enshrined in national legislation.

Other disease problems: COVID-19 restrictions reduced overall activity in the aquaculture sector during 2020 and it was a quieter year than usual for reported mortalities and investigations on suspicion of disease. Overall the health status of farmed fish in England and Wales remains high, important contributory factors include good supplies of water through 2020, continued good husbandry, increased use of vaccination and lower stocking densities on farms. In addition, the Fish Health Inspectorate (FHI) work with all APB's to ensure each site has its own Biosecurity Measures Plan appropriate to their activities and associated risk, these are reviewed annually during compliance inspections undertaken by the FHI.

The two skin diseases/ syndromes of unknown aetiology remain a cause for concern in the rainbow and brown trout farming sector in England and Wales - red mark syndrome (RMS) and puffy skin disease (PSD) - although reports have been significantly lower during 2019 and 2020 than in previous years. Other diseases that are recognized by fish health professionals as important in rainbow trout production in England and Wales are rainbow trout fry syndrome (RTFS) caused by the bacterium *Flavobacterium psychrophilum*; white spot disease caused by the ectoparasite *Ichthyophthirius multifiliis*; and bacterial gill disease (BGD) caused by *Flavobacterium* spp. Lesser impact of Enteric redmouth disease (ERM) caused by the bacterium *Yersinia ruckeri* - due to the increased use of vaccines, and proliferative kidney disease caused by the myxozoan parasite *Tetracapsuloides bryosalmonae* - which is being controlled through management practices.

Northern Ireland 

Author/Institute: Donna Lyons - Department of Agriculture, Environment and Rural Affairs

Aquaculture production: There is no data available for 2020. However, in 2019 the finfish sector in Northern Ireland produced approximately 1,127 metric tonnes of finfish, valued at £6.5 m. Of the 23 active aquaculture production businesses, 21 are inland and 2 are marine sites. The main species cultivated is Atlantic Salmon (*Salmo salar*). There is a also significant production of Rainbow trout (*Oncorhyncus mykiss*) produced for the table market and for restocking angling waters. In addition Brown trout (*Salmo trutta*) is also produced mainly for restocking purposes.

Health status: Northern Ireland has Category 1 status in respect of the finfish listed diseases. All farms are authorised by DAERA and operate to agreed biosecurity plans. DAERA carry out an annual programme of compliance inspection and disease testing. The disease testing is carried out by Agri-Food

and Biosciences Institute (AFBI) on behalf of DAERA, to an agreed Service Level Agreement. The sampling programme includes the testing of finfish frams and wild fisheries for listed diseases which Northern Ireland has Article 43 measures in place for.

Other disease problems: Currently Northern Ireland do not have any challenges to report in this respect.

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Scotland

Author/Institute: Eann Munro-Marine Scotland Science

Aquaculture production:

There are 22 businesses operating 52 active sites for the production of rainbow trout. In 2019, 7,405 tonnes of rainbow trout were produced, 6,906 tonnes for the table market and 499 tonnes for restocking angling waters. Of the 52 active sites, 28 sites reported production in 2019. Freshwater production accounted for 3,322 tonnes and seawater production the remaining 4,083 tonnes. Freshwater production was from sites operating cages, ponds, raceways, tanks and hatcheries and seawater production was all from cage site facilities. In 2019, 6.6 million ova were laid down to hatch with 6.5 million being imported from foreign sources and the remaining 0.1 million from Scotland or other GB based fish farms.

51.4 million Atlantic salmon smolts were produced by 23 businesses operating 76 active sites during 2019. The principal types of facility used for the production of smolts in freshwater were cages (27 sites) or tanks and raceways (49 sites). Over 71 million ova were laid down to hatch with 64 million of these ova coming from foreign sources.

In 2019, the total production of Atlantic salmon was 203,881 tonnes, the highest ever level of production recorded in Scotland. These fish were produced by 11 businesses operating 226 active sites. Fish production of 203,853 tonnes was from seawater cage sites (224 sites) while 28 tonnes was reported from seawater tank sites (2 sites). Most seawater tank capacity has been re-deployed for the production of other species or salmon broodstock.

As well as Atlantic salmon and rainbow trout the Scottish aquaculture industry also produces a small quantity of brown/sea trout, halibut, lumpsuckers and wrasse. **Species Farmed**	**Number of Businesses**	**Number of active Sites**	**Production (Tonnage)**
Sea/Brown Trout	8	9	25
Halibut	1	3	*
Lumpsucker	2	3	13
Wrasse	2	3	3

Health status: " The status of Scotland (as part of the Great Britain zone under the UK Member State) with regard to the listed fish diseases is as follows:

EHN – Category I (Exotic to the EU)
VHS – Category I
IHN – Category
I KHV – Category III
ISA (HPR deleted) – Category I

Fish health inspectors carry out statutory inspection and testing programmes on fish farms throughout Scotland to:

• maintain the approved status of Great Britain as a disease-free area for ISA, VHS and IHN

• prevent the spread of listed diseases, through epizootic investigations and application of movement restrictions

• fulfil the monitoring required in support of the national measures for the control of SVC and *Gyrodactylus salaris*

• fulfil the monitoring required in support of the domestic controls for bacterial kidney disease

• enable detection of emerging diseases of fish

To meet the statutory requirement for maintenance of areas listed as free from listed diseases, we inspect all farms holding susceptible species as part of a risk-based active surveillance programme. The frequency of visits to individual farms is based upon the level of risk of disease emergence, or spread that they pose. Those farms posing the highest risk are visited every year, medium risk every second year and low risk every three years. Having areas listed as disease-free and national controls mean that only fish of equivalent health status can be imported into Great Britain, thereby safeguarding the health of our stocks.
In addition, passive surveillance is carried out between scheduled farm inspections by contacting sites, and also from the receipt of information from industry and health experts in the course of their work. Inspections and sampling are carried out on notification of the suspicion of listed or emerging diseases at a farm. Passive surveillance also allows an assessment to be undertaken on the current production status of a farm and on the most appropriate surveillance frequency for the farm.

If a farm is suspected or confirmed as being infected with a listed disease, surveillance is increased. The Fish Health Inspectorate is responsible for overseeing the withdrawal of fish from sites confirmed with a listed disease and the cleaning and disinfection of equipment on site. We will not allow infected farms to be re-stocked until the recommended fallow period has been completed.

If during a site inspection an inspector observes sick, moribund or abnormally behaving on a farm, then diagnostic samples may be taken. The purpose of these samples is to rule out the presence of a listed disease, or to identify other non-listed pathogens, including emerging diseases.

In 2020 the number of on site inspections completed was reduced due to Covid-19 travel restrictions in Scotland. Once inspections could resume sites ranked as high through the surveillance frequency assessment were prioritised for on site inspections. Not all of the sites were inspected due to other constraints such as unsuitable low tides or issues with maintaining social distancing on boats. The number of passive surveillance inspections (conducted remotely) was increased to include sites that had been scheduled for inspection in 2020, but where the on site inspection could not be conducted.

Other disease problems: Sea lice (*Lepeophtheirus salmonis*) - Atlantic salmon (all seawater stages). Still a major control issue in seawater production. On site monitoring by farm staff. Prophylactic treatments or as required when level rise above the suggested criteria for treatment (bath treatments, in-feed, mechanical removal using water jets, heated water and freshwater baths). Many sites using cleaner fish (wrasse and lumpsuckers).

Complex gill issues - Atlantic salmon (all seawater stages). Some seawater sites are experiencing complex gill issues which also impact on treatments for sea lice as gill health is compromised. Fish are affected by multiple pathogens at the same time such as *Neoparamoeba perurans*, salmon gill poxvirus, *Paranucleospora theridion* etc.

Cardiomyopathy syndrome (CMS), caused by piscine myocarditis virus (PMCV), has emerged as a significant disease issue within the sea water phase of Atlantic salmon production over the past 5 years. It has resulted in significant mortality events and the disease presentation can now be observed in fish much earlier after sea water transfer (<2Kg). Pancreas disease also continues to cause disease issues within the A. salmon sector when farming in the marine environment.

Annex 1: Number of fish Farms

Country	Total Number of fish farms authorized or active in 2020 in the country (farms/sites that were active in 2020 or part of 2020).
Austria	4862
Belgium	100
Bulgaria	621 fish farms
Cyprus	21
Czech Republic	1878
Denmark	215
Estonia	33 authorized fish farms, 21 active in 2020
Finland	601
France	564
Germany	10.813
Greece	461
Hungary	383
Ireland	63
Italy	816
Latvia	173 authorized, 79 active
Lithuania	94
Malta	6
Netherlands	appr. 106
Poland	5191
Portugal	78
Romania	725
Slovakia	98
Slovenia	303 (302 freshwater and 1 marine)
Spain	275
Sweden	190
England and Wales	241
Scotland	394
Northern Ireland	23 active fish farms
Croatia	0
Turkey	Marine farms:432 Freshwater farms:1707 Marine+Freshwater farms: 96 Total Farms: 2139
Albania	0
Bosnia and Herzegovina	35
Iceland	53
Norway	1249 (227 salmonid hatcheries, 986 salmonid sea sites, 36 marine sea sites)
Switzerland	0
Faroe Islands	1 brood stock farm, 9 smolt farms, 24 marine production farms
Serbia	107
Total	33260

Annex 2: Number of farms placed in the respective categories according to listed diseases

Country	Category I	Category II	Category III	Category IV	Category V
	Declared disease-free	Subject to a surveillance programme	Not known to be infected but not subject to surveillance programme for achieving disease free status	Known to be infected but subject to an eradication programme	Known to be infected. Subject to minimum control measures
	VHS	VHS	VHS	VHS	VHS
Austria	17	1	186		1
Belgium	1			2	2
Bulgaria		177			
Cyprus	8				
Czech Republic					
Denmark	170		28		
Estonia	2	19			
Finland	427	30			
France	275	42	247		
Germany	155	10	5646		9
Greece			64		
Hungary		22			
Ireland	8				
Italy	190	5	387		13
Latvia					
Lithuania			94		
Netherlands			66		
Poland	15		752		
Portugal	24	2			
Romania			314		

Slovakia		71	24		
Slovenia	32	5	151		3
Spain	123		52		
Sweden	169				
England and Wales	171				
Scotland	75				
Northern Ireland	23				
Croatia		39			
Turkey					
Bosnia and Herzegovina		35			
Iceland	3		30		
Norway	1249				
Switzerland					
Faroe Islands			34		
Malta					
Albania					
Serbia					
Rep. of Macedonia					
Total	3137	458	8075	2	28

Country	Category I	Category II	Category III	Category IV	Category V
	Declared disease-free	Subject to a surveillance programme	Not known to be infected but not subject to surveillance programme for achieving disease free status	Known to be infected but subject to an eradication programme	Known to be infected. Subject to minimum control measures
	IHN	IHN	IHN	IHN	IHN
Austria	17	1	186		1
Belgium	1			2	2
Bulgaria		177			
Cyprus	8				
Czech Republic			223		
Denmark	202				
Estonia	2	17		2	
Finland	276	6			
France	275	42	247		
Germany	139	10	5534		23
Greece			64		
Hungary		22			
Ireland	61				
Italy	186	4	347		12
Latvia					
Lithuania			94		
Netherlands			66		
Poland	18		749		
Portugal	24	2			
Romania			168		
Slovakia		61	34		
Slovenia	32	5	131		23

Spain	104		38		
Sweden	160				
England and Wales	168				
Scotland	380				
Northern Ireland	23				
Croatia		18			1
Turkey					
Bosnia and Herzegovina		35			
Iceland	31				
Norway	1017				
Switzerland					
Faroe Islands			34		
Malta					
Albania					
Serbia					
Rep. of Macedonia					
Total	3124	400	7915	4	62

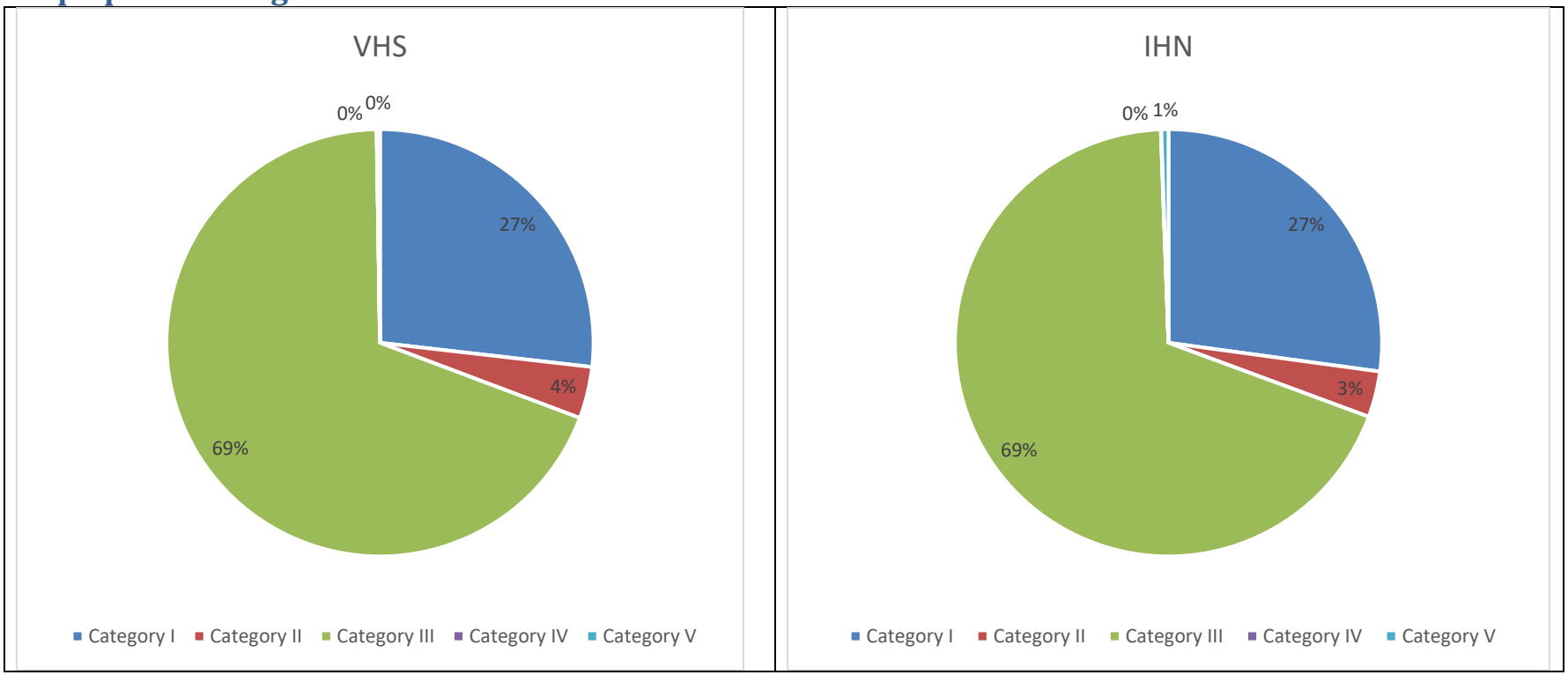
Country	Category I	Category II	Category III	Category IV	Category V
	Declared disease-free	Subject to a surveillance programme	Not known to be infected but not subject to surveillance programme for achieving disease free status	Known to be infected but subject to an eradication programme	Known to be infected. Subject to minimum control measures
	ISA	ISA	ISA	ISA	ISA
Austria					
Belgium					
Bulgaria		116			
Cyprus					
Czech Republic	249				
Denmark	201				
Estonia	21				
Finland	297				
France	564				
Germany	1065	1	188		
Greece			64		
Hungary					
Ireland	61				
Italy	550				
Latvia					
Lithuania			94		
Netherlands			66		
Poland	767				
Portugal					
Romania	204				
Slovakia					
Slovenia	131				
Spain					
Sweden	167				

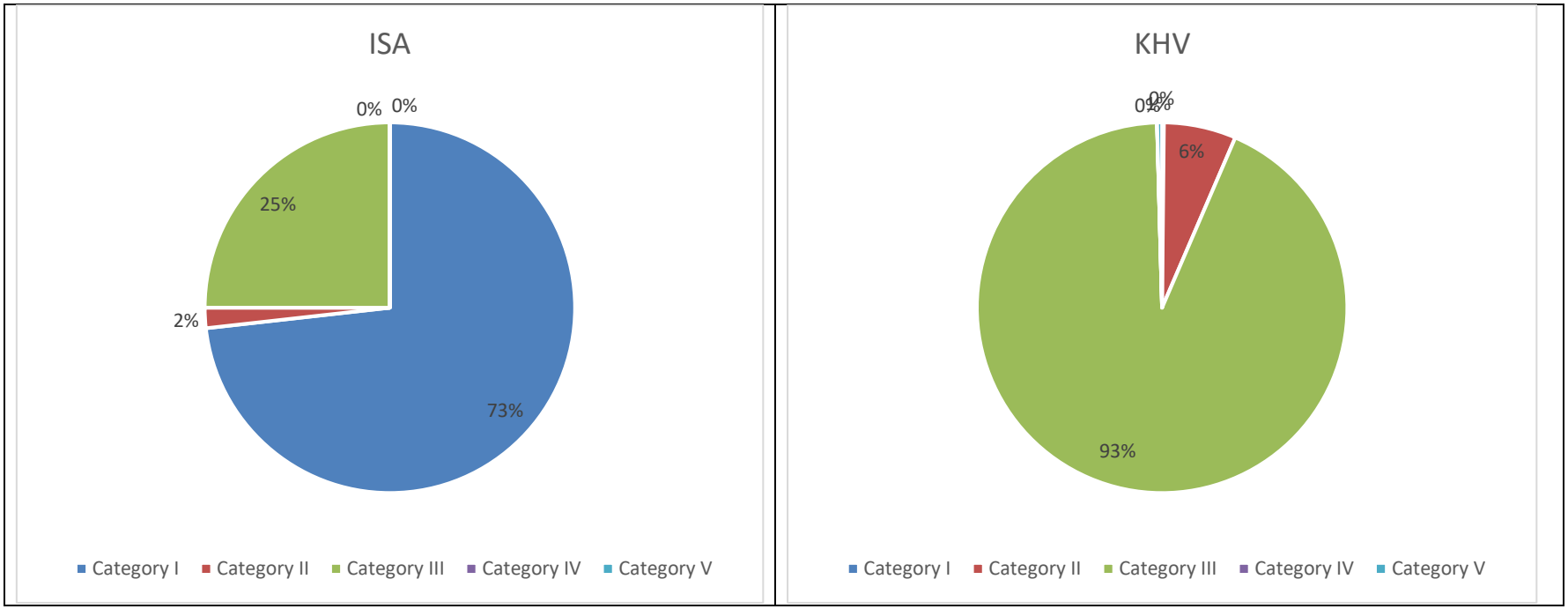
England and Wales	149				
Scotland	382				
Northern Ireland	23				
Croatia					
Turkey					
Bosnia and Herzegovina					
Iceland	3		29		
Norway	3 + 1 suspended		1207		2
Switzerland					
Faroe Islands					
Malta					
Albania					
Serbia					
Rep. of Macedonia					
Total	4834	117	1648		2

Country	Category I	Category II	Category III	Category IV	Category V
	Declared disease-free	Subject to a surveillance programme	Not known to be infected but not subject to surveillance programme for achieving disease free status	Known to be infected but subject to an eradication programme	Known to be infected. Subject to minimum control measures
	KHV	KHV	KHV	KHV	KHV
Austria		1	149		
Belgium					
Bulgaria		444			
Cyprus					
Czech Republic			1686		1
Denmark			3		
Estonia		2			
Finland			14		
France	6				
Germany	6	1	4400		47
Greece			7		
Hungary		283			
Ireland	1				
Italy	1		115		
Latvia					
Lithuania			94		
Netherlands			1		
Poland	1		4423		
Portugal	1				
Romania			441	1	
Slovakia		46	91		
Slovenia			151		3
Spain					

Sweden			3*		
England and Wales	1		132		
Scotland			2		
Northern Ireland	3				
Croatia		17			3
Turkey					
Bosnia and Herzegovina					
Iceland					
Norway					
Switzerland					
Faroe Islands					
Malta					
Albania					
Serbia					
Rep. of Macedonia					
Total	20	794	11709	1	54

Graph plot of categorized fish farms in 2020




ISA
0%
0%
25%
2%
73%
Category I
Category II
Category III
Category IV
Category V
KHV
0%
0%
6%
93%
Category I
Category II
Category III
Category IV
Category V

Annex 3: Outbreaks of listed diseases

COUNTRY	2.1 Number of outbreaks			
	VHS	IHN	KHVD	ISA
Austria				
Belgium	2			
Bulgaria	no	no	no	no
Cyprus				
Czech Republic	1		4	
Denmark			1 (garden pond)	
Estonia				
Finland				
France	2	1		
Germany	5	21	42	
Greece				
Hungary			4	
Ireland				
Italy	1			
Latvia				
Lithuania				
Netherlands			5 (closed ponds)	
Poland				
Portugal				
Romania				
Slovakia			2	
Slovenia		1x		
Spain				
Sweden				
England and Wales			11 (recreational fisheries and	

COUNTRY	2.1 Number of outbreaks			
	VHS	IHN	KHVD	ISA
			ornamental imports only)	
Scotland			1	
Northern Ireland				
Croatia		1	5	
Turkey				
Bosnia and Herzegovina				
Iceland				
Norway				23
Switzerland			1*	
Faroe Islands			N/A	
Malta				
Serbia				

Annex 4: Other Fish diseases problems

COUNTRY	Fish diseases problems other than VHS, IHN, KHV or ISA							
	Fish species	**Disease or symptoms**	**Fish species**	**Disease or symptoms**	**Fish species**	**Disease or symptoms**	**Fish species**	**Disease or symptoms**
Austria								
Belgium							Carp	CEV
Bulgaria							Rainbow trout	Clinical symptoms of IPN and mortality
Cyprus								
Czech Republic							Common carp	carp oedema virus (CEV)
Denmark								
Estonia							Aeromonas spp. (*A.Salmonicida* and *A.hydrophila*)	Rainbow trout, Carps
Finland	Rainbow trout	IPN genogroup 2 nowadays spread in many inland watersheds. May increase mortality, when in combination with bacteria (flavobacteria).					Several Salmonid species; land-locked salmon, brown trout, Baltic salmon and Coregonids affected most severely	Saprolegniosis: occurrence between (and inside) farms rather unpredictable, often associated with maturation

COUNTRY	Fish diseases problems other than VHS, IHN, KHV or ISA							
	Fish species	**Disease or symptoms**	**Fish species**	**Disease or symptoms**	**Fish species**	**Disease or symptoms**	**Fish species**	**Disease or symptoms**
								of broodfish/spawning, problems most common in ca. 2,5-14 degrees C water temperatures.
France								
Germany	Bavaria: carp char, brown and lake trout salmonids rainbow trout char, brown and lake trout	high mortality in farms with CEV bacterial diseases ichthyophthiriosis amoebic gill disease PKD	Baden-Württemberg: rainbow trout rainbow trout char, rainbow trout rainbow trout rainbow trout	RTFS ERM furunculosis ichthyophthiriosis BKD	Hesse: salmonids salmonids goldfish sturgeons	*Flavobacterium psychrophilum* IPN GHV SHV	Saxony: carp rainbow trout Coregonus maraena sturgeons other fish species	CEV ERM; ichthyophtiriosis, PKD, IPN furunculosis Aeromonas salmonicida ssp. salmonicida parasites
Greece	Seabass	Nodavirus infection	Seabream	*Sparicotyle chrysophrii*	Seabream-Seabass	*Photobacterium damsella* subsp. *piscicida*	Seabass	*Aeromonas veronii*
Hungary							-	

COUNTRY	Fish diseases problems other than VHS, IHN, KHV or ISA							
	Fish species	**Disease or symptoms**	**Fish species**	**Disease or symptoms**	**Fish species**	**Disease or symptoms**	**Fish species**	**Disease or symptoms**
Ireland	Atlantic salmon	Amoebic gill disease	Atlantic salmon	Cardiomyopathy syndrome	Atlantic salmon	Piscine reovirus	Atlantic salmon	*Piscirickettsia salmonis*
Italy	(see annex 4a)							
Latvia	Cyprinidae	Aeromonosis					Salmonidae	Aeromonosis
Lithuania								0
Netherlands	1) Koi (hobby) with columnaris disease and possibly CEV; and 2) hobby koi (other casus)	1) Severe gill necrosis at 20-24C with 80% mortality. Result SybrGreen qPCR for CEV was dubious, but *Flavobacterium columnare* was isolated; 2) at 10C: Lethargy, enophthalmus, hemorrhaged skin. Also CEV dubious in SybrGreen qPCR.					*Carassius auratus* gibelio (gibel carp) with CyHV-2	After sudden, steep rise of water temp to 21C: mass mortality with some skin and fin hemorrhages in slightly anorexic gibel carp with many ecotoparasites, in open water, end of May, due to CyHV-2, 2 samples of same entity in 2 weeks. Ct value 12

COUNTRY	Fish diseases problems other than VHS, IHN, KHV or ISA							
	Fish species	**Disease or symptoms**	**Fish species**	**Disease or symptoms**	**Fish species**	**Disease or symptoms**	**Fish species**	**Disease or symptoms**
								in Real Time qPCR.
Poland								
Portugal								
Romania	Rainbow trout	Yersiniosis					Rainbow trout	IPN
Slovakia								
Slovenia	carp	parasites					salmonids	RTFS, Aeromonas infections
Spain								
Sweden	salmonids	Aeromonas except ASS or ASA	Baltic salmon and Baltic sea trout (wild, semi-wild)	unknown (see 3.5)	salmonids, inland zone	BKD	Arctic char, brown trout	ASS
England and Wales	See 3.2 and 3.5 for other diseases and a description of other health issues							
Scotland	As listed in 3.2 plus sea lice and complex gill issues							
Northern Ireland	Salmon	Pancreas Disease	Goldfish (Closed system)	Cyprinid herpes virus			Rainbow and Brown trout	Furunculosis and Saprolegnia Fungus& Exo Parasites, Red Mark Sydrome
Croatia	Sea bream	Sparicotylosis, *Photobacterium*			Rainbow trout	RTFS, yersiniosis	Sea bass	*Vibrio harveyi*, *Tenacibaculu*

COUNTRY	Fish diseases problems other than VHS, IHN, KHV or ISA							
	Fish species	**Disease or symptoms**	**Fish species**	**Disease or symptoms**	**Fish species**	**Disease or symptoms**	**Fish species**	**Disease or symptoms**
		damseale subsp. *piscicida*						*m maritimum*
Turkey	Rainbow trout	IPN						
Bosnia and Herzegovina								
Iceland	Atl. salmon and Arctic char	Occasionally BKD, but no new case in 2020.						
Norway	Atlantic salmon	PD, HSMB and CMS						0
Switzerland	Rainbow trout	RTFS, BGD					Perch, Pike perch	Rhabdovirus infections in perch (PRV)
Faroe Islands	Lumpsuckers	Patreurellosis, Tenacibaculum, *Moritella viscosis*					Atlantic Salmon	Sea Lice, CMS, AGD, BKD, Vinter ulsers

Annex 4a: Additional information

Germany

	3.2. Other diseases or pathogens identified in NRL or regional laboratories (e.g. A. invadans, G. salaris, Piscine reovirus, Piscine myocarditis virus, R. salmoninarum, Francisella, Piscirickettsia, Carp edema virus, Cyprinid herpesvirus 1 & 2, Red Mark Syndrome, Rainbow Trout Fry Syndrome (RTFS), Enteric Red Mouth (ERM), Furunculosis, Vibriosis, Pasteurellosis etc.):		
State	***Fish species***	***Disease or pathogen***	***Number of fish farms/cases***
Baden-Württemberg:	rainbow trout	ERM	15 cases in 10 farms
	salmonids	Furunkulose	24 cases in 13 farms
	rainbow trout	*Flavobacterium psychrophilum*-Infektion (RTFS, Rainbow Trout Fry Syndrome)	29 cases in16 farms
	rainbow trout	*Renibacterium salmoninarum*-Infektion (BKD, bacterial kidney disease)	4 cases in 4 farms
	rainbow trout	Proliferative kidney disease PKD	2 cases in 2 farms
	rainbow trout	Amoebic gill disease AGD	3 cases in 3 farms
Bavaria	rainbow trout/brown trout/sea trout, chars	*Aeromonas salmonicida*	64 cases
	rainbow trout/brown trout/sea trout, chars	*Yersinia ruckeri*	21 cases
	rainbow trout/brown trout/sea trout, chars	*Flavobacterium psychrophilum (unter anderem RTFS)*	71 cases
	grayling, rainbow trout	*Renibacterium salmoninarum*	7 cases
	rainbow trout/brown trout/sea trout, chars	*Tetracapsuloides bryosalmonae*	17 cases
	rainbow trout	CWSD/Red Mark Syndrome	2 cases
Brandenburg	silver molly	*Vibrio algirolyticus*	1
	char	*Aeromonas salmonicida*	1
	rainbow trout	*Yersinia ruckerii*	1
	Characiformes	*Mycobacterium peregrinum*	1
Bremen:	no report		
Hamburg:	no report		
Hesse	rainbow trout	ERM	1
	pike perch, Notopteridae	Vibrio	2
	salmonids (golden trout)	PKD	1

Meckl.-W. Pomerania:	koi, goldfish, trout, barble	Aeromonas spp.	10
	koi, goldfish	Fusarium spp.	2
	koi	*Shewanella putrefaciens*	1
	koi	*Morganella morganii*	1
Lower Saxony:	trout	furunculosis (*Aeromonas salmonicida* ssp. *Salmonicida*)	7 cases in 8 farms
	trout	ERM (*Yersinia ruckeri*)	4 cases in 6 farms
	trout	RTFS (*Flavobacterium psychrophilum*)	8 cases in 16 farms
	koi	CEV	18 cases in 22 farms
	carp	CEV	5 cases in 9 farms
	rainbow trout	rickettsia-like pathogens	1 cases in 3 farms
	eatable fish	vibriosis	3 cases in 4 farms
	ornamental fish	vibriosis	6 cases in 12 farms
North Rhine-Westphalia:	rainbow trout	*Aeromonas salmonicida* ssp. *Salmonicida*	10
	rainbow trout	*Yersinia ruckeri*	3
Rhineland-Palatinate:	No reporting		
Saarland:	No reporting		
Saxony:	No reporting		
Saxony-Anhalt: :	koi	CyHV-1	2
	chichlid	fish tuberculosis	1
Schleswig-Holstein:	No reporting		
Thuringia:	rainbow trout	*Flavobacterium psychrophilum*	7
	rainbow trout	*Aeromonas salmonicida*	1
	rainbow trout	*Yersinia ruckeri*	1
	rainbow trout	*Tetracapsuloides bryosalmonae*	1
	rainbow trout	*Renibacterium salmoninarum*	2

Italy

3.2 Other diseases or pathogens identified in NRL or regional laboratories (e.g. *A. invadans, G. salaris*, *Piscine reovirus*, *Piscine myocarditis virus*, *R. salmoninarum*, *Francisella*, *Piscirickettsia,* Carp edema virus*, Cyprinid herpesvirus 1 &2, Red Mark Syndrome,* etc.):		
Fish species	***Disease or pathogen***	***Number of fish farms/cases***
Arctic char (*Salvelinus alpinus*)	*Aeromonas salmonicida* subsp. *salmonicida*	5
Bleak (*Alburnus alburnus*)	*Aeromonas hydrophila*	1
Brook trout (*Salvelinus fontinalis*)	*Aeromonas salmonicida*	2
	Aeromonas salmonicida subsp. *salmonicida*	2
	Lactococcus garvieae	4
	Carnobacterium maltaromaticum	1 (wildlife)
	Renibacterium salmoninarum	2 (wildlife)
Brown trout (*Salmo trutta*)	*Aeromonas* spp.	1 (mortality in wildlife)
	Aeromonas salmonicida	4
	Aeromonas salmonicida subsp. *salmonicida*	2
	Aeromonas hydrophila	3
	Aeromonas veronii subsp. *sobria*	2
	Carnobacterium maltaromaticum	2
	Gyrodactylus spp.	2
	Monogenea	1
	Citrobacter freundii	2
	Lactococcus garvieae	1
Carp (*Cyprinus carpio*)	Shewanella spp.	5
	Motile aeromonads (A. hydrophila/caviae/sobria/bestiarium/veronii)	5
	Aeromonas veronii subsp. *sobria*	1
	Aeromonas sobria	2
	Aeromonas hydrophila	1
	Pseudomonas spp.	2
	Vibrio cholerae	3
	Dactylogyrus spp.	1
Chub (*Squalius cephalus*)	*Aeromonas hydrophila*	1
Crucian carp (*Carassius carassius*)	*Aeromonas veronii*	1
Danube sturgeon (*Acipenser gueldenstaedtii*)	*Yersinia ruckeri*	1
European eel (*Anguilla anguilla*)	Motile aeromonads (A. hydrophila/caviae/sobria/bestiarium/veronii)	1
	Anguillicola crassus	1
European hake (*Merluccius merluccius*)	*Lernaeocera branchialis*	1
	Vibrio alginolyticus	1
	Vibrio fortis	1
	Vibrio wodanis	1

Gilthead seabream (*Sparus aurata*)	Motile aeromonads (A. hydrophila/caviae/sobria/bestiarium/veronii)	5
	Aeromonas enchelia	1
	Pseudomonas anguilliseptica	3
	Vibriosis (V. anguillarum, V. alginolyticus, V. damselae, V. harveyi, V. parahaemolyticus)	7
	Vibrio harveyi	5
	Vibrio scophtalmi	1
	Vibrio alginolyticus	1
	Photobacterium damselae subsp. *damselae*	7
	Photobacterium damselae subsp. *piscicida*	5
	Flavobacterium tegetincola	1
	Pseudoalteromonas nigrifaciens	2
	Sphingomonas paucimobilis	1
	Sparicotyle spp.	1
Goldfish (*Carassius auratus*)	*Aeromonas sobria*	3
	Aeromonas simiae	1
	Aeromonas veronii subsp. sobria	1
	Aeromonas allosaccharophila	1
	Trichodina spp.	1
Grayling *(Thymallus thymallus)*	*Aeromonas spp.*	2
	Aeromonas salmonicida subsp. Salmonicida	1
Italian barbel (*Barbus plebejus*)	*Aeromonas hydrophila*	1
Mullets (*Chelon spp.*)	*Aeromonas sobria*	1 (mortality in wildlife)
	Aeromonas salmonicida	1 (mortality in wildlife)
	Pseudomonas fluorescens	1 (mortality in wildlife)
	Shewanella putrefaciens	1 (mortality in wildlife)
Northern pike (*Esox lucius*)	*Aeromonas hydrophila*	1
Rainbow trout *(Oncorhynchus mykiss)*	Motile aeromonads *(A. hydrophila/caviae/sobria/bestiarium/veronii)*	32
	Aeromonas hydrophila	2
	Aeromonas sobria	6
	Aeromonas tecta	1
	Aeromonas bestiarum	1
	Aeromonas piscicola	1
	Aeromonas salmonicida	5
	Aeromonas salmonicida subsp. salmonicida	18
	Pseudomonas spp.	2
	Pseudomonas anguilliseptica	1
	Pseudomonas fluorescens	2

	Yersinia ruckeri	17
	Yersinia ruckeri biotype 1	3
	Yersinia ruckeri biotype 2	13
	Streptococcus spp.	1
	Flavobacterium spp.	5
	Flavobacterium johnsoniae	1
	Lactococcus garvieae	65
	Lactococcus lactis	2
	Shewanella putrefaciens	1
	Chryseobacterium spp.	13
	Carnobacterium maltaromaticum	1
	Gyrodactylus spp.	3
	Hafnia alvei	3
	Tetracapsuloides bryosalmonae	3
	Nodular Gill Disease	16
Roach (*Rutilus rutilus*)	*Sphingomonas paucimobilis*	1
	Aeromonas sobria	1
Seabass (*Dicentrarchus labrax*)	*Vibriosis (V. anguillarum, V. alginolyticus, V. spp)*	8
	Vibrio harveyi	14
	Vibrio alginolyticus	1
	Vibrio anguillarum	5
	Vibrio scophtalmi	1
	Motile aeromonads (A.veronii/ A.veronii biovar. sobria)	4
	Aeromonas veronii	2
	Photobacterium damselae	1
	Photobacterium damselae subsp. *piscicida*	5
	Photobacterium damselae subsp. *damselae*	2
	Diplectanum spp.	4
	Monogenea	1
	Tenacibaculum dicentrarchi	1
South european nase (*Protochondrostoma genei*)	*Aeromonas hydrophila*	1
Sturgeon *(Acipenseridae)*	*Streptococcus spp.*	1
	Aeromonas spp.	2
	Aeromonas hydrophila	1
	Citrobacter freundii	1
Twaite shad (*Alosa fallax*)	*Anisakis spp.*	1
Wels catfish (*Silurus glanis*)	*Yersinia ruckeri*	1
White seabream (*Diplodus sargus*)	*Vibrio harveyi*	1
	Vibrio scophthalmi	2
	Vibrio splendidus II	1
	Photobacterium damselae subsp. damselae	1

	Proteus hauseri	1
	Cheratothoa spp.	1