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 2021

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 2021. 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 status according to AHL 2016/429, 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/ .

The questionnaire was delivered to 36 laboratories, out of these 33 replied. When sensible, data from previous years were used to fill gaps.

Production data for 2020

The most update data on aquaculture production in Europe refer to 2020 on the website of Federation of European Aquaculture producers. We decided to refer to the dataset provided by FEAP .

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.

According to data provided by FEAP, there has been a reduction in the growth of the Aquaculture sector in Europe.

The total fish production in aquaculture in Europe, including Turkey and Norway, increased slightly from 2019 and is now at 2,570,650 t. The total production of EU countries has reduced in 2020 from 515,946 tonns to 505,734 tonns.

The 5 non-EU countries Iceland, Faroe Islands, Turkey, UK and Norway produced 2,064,916t and also experienced a slight increase since 2019.

The Atlantic salmon production, accounts for 1,801,388t in 2020, and is by far the largest contingency in Europe. The production of large rainbow trout in sea water accounts now for 176,158 t while the production of portion rainbow trout was of about 228,881 t in 2020 .Turkey is still the largest contributor of portion size rainbow trout production with 95.000 t; while Norway the largest contributor of large size rainbow trout with 90.000 t.

Poland, Czech republic and Hungary are the main contributors of Carp production, which is estimated to be 58,815 t in 2020 according to FEAP.

The production of sea bass also decreased in the Mediterranean countries with a production of 189,023t , the one of Gilthaed sea bream slightly increased from 202,897 to 208,021 t . Among other fish species of interest are eel (with 4,533t in 2020 in decline from 2016); also sturgeon represents a promising species (slight decline in 2020

with 2,374 t) especially in view of its caviar production. Data about caviar production are sourced from World conservation sturgeon society.

Interestingly both African Catfish (*Clarias gariepinus*) (6849 t) and Wels Catfish (*Silurus glanis*) (1,189 t) are being produced consistently in Europe.

Turbot production experienced a decrease (10,940 in 2020), as well as other of the so called "minor species" such as includes halibut (1.570 t), sole (780 t). Whereas production of Arctic charr (7902 t) and meagre (11533 t) increased.

The production of cleaner fish as lumpfish and wrasse for lice control is increasing significantly. According to the Norwegian Directorate of Fisheries 34.3 million lumpsucker were deployed at sea in 2020, as part of 51,5 million of total cleanerfish deployed at sea..

In Scotland, 4 sites are reported to produce cleanerfish (amalgamated data for wrasse and lumpfish), with a total production of 15 million in 2020.

Number of fish farms in Europe

The total number of authorised/licensed fish farms in Europe is estimated in about **36239** farms. This number is a rough estimate as two participants did not provide updated numbers,

Germany provide the largest contribution when it comes to fish farm with 13231 farms, while the second contributor is Poland with 5191. In both cases, this high nubmer of farms reflect a large numbr of small size farms.

When it comes to production, Norway has by far the largest production in Europe and has licensed 1258 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 and therefore nubmer of active farms in 2019 have been used to fill these gaps instaed.

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Health status of fish farms

According to AHL the terminology of health category describe in 2006/88 has been changed to health status. There are currently four possible health statuses:

1) Approved disease free
2) Under eradication/control program
3) In voluntary surveillance program
4) Non approved disease free and not under eradication/control program.

In 2021, a health status was assigned to 13787 farms with susceptible species to VHS, to 13710 farms with susceptible species to IHN, to 5679 farms with susceptible species to ISA.

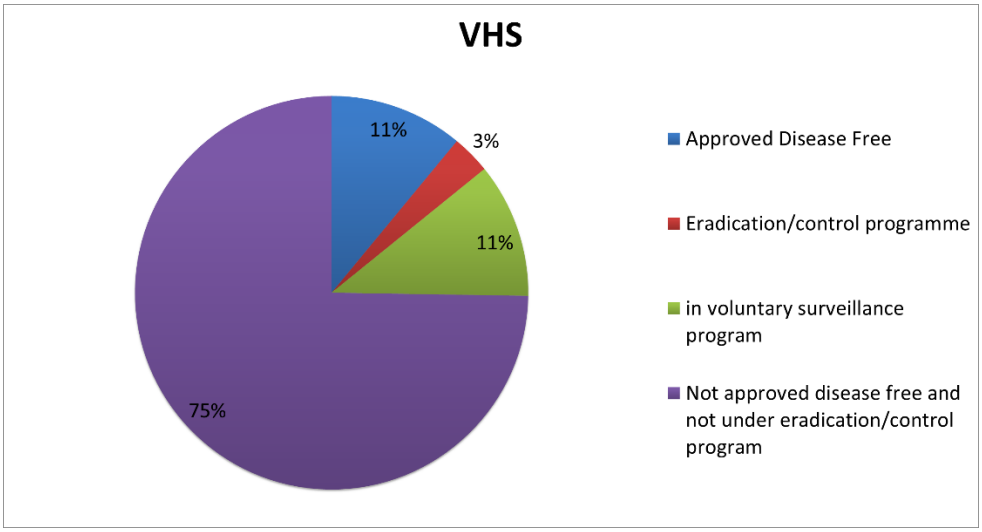
Health status for VHS:

11% of fish farms are approved disease free

3% is under eradication/control program

11% under voluntary program

75% is not approved disease free and not under eradication/control program



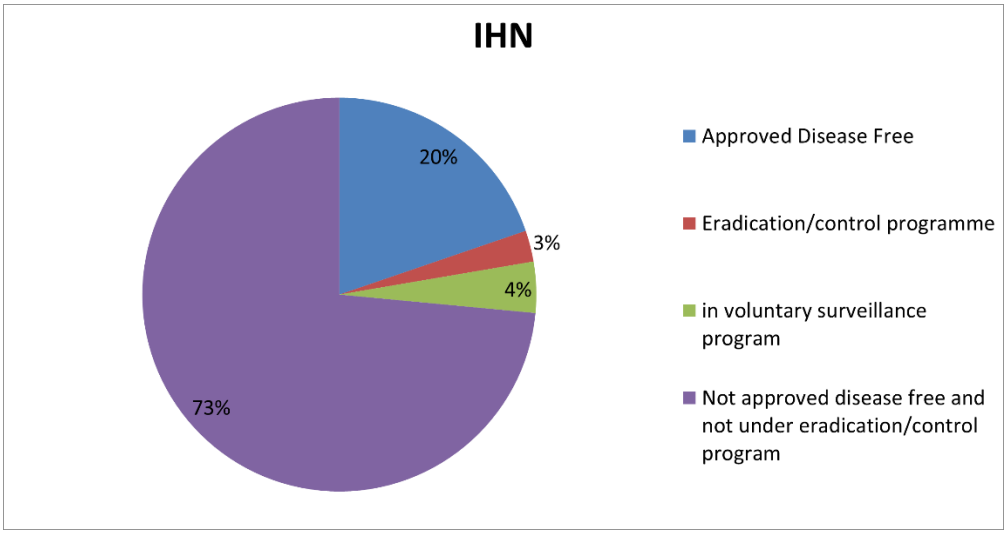
Health status for IHN

20% of fish farms are approved disease free

3% is under eradication/control program

4% under voluntary program

73% is not approved disease free and not under eradication/control program



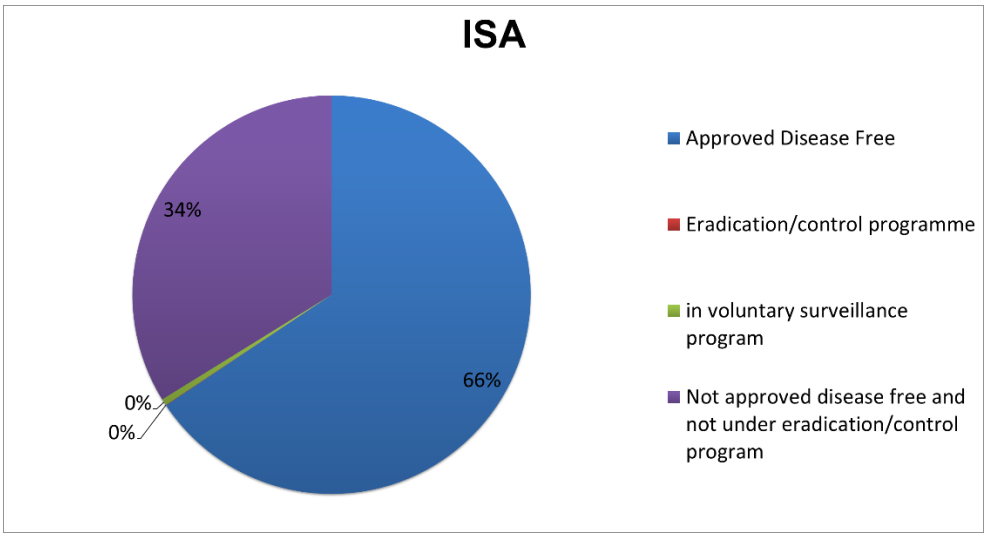
Health status for ISA (Infection with HPRΔ ISAV)

66% of fish farms are approved disease free

0% is under eradication/control program

0% under voluntary program

34% is not approved disease free and not under eradication/control program



Outbreaks and severity of listed diseases in Europe

Out of 33 participating laboratories, 7 reported an increase in the number of fish farm infected with notifiable diseases.

For **VHS**, 24 new outbreaks were reported in Europe in 2021 (11 in 2020), 15 of these were in Germany. The remaining outbreaks were observed in Italy (3), Czech republic (2), Austria, Belgium, France, Romania, (1).

For **IHN**, 104 new outbreaks were reported. The majority was in Germany (82). Denmark experienced the first outbreak of IHN, and recorded in 2021 8 infected farms and 3 put and take lakes (11). The remaining outbreaks were in Finland (5), Austria (4), Italy (1). A series of 4 presentation will focus on IHN situation during 26th Annual workshop for National Reference Laboratories for Fish Diseases.

For **ISA** (Infection HPRΔ ISAV) Iceland reported the first outbreak and Norway reported an increased number of outbreaks compared to 2020 (29). Due to the increase in number of outbreaks 2 specific talks on the topic will be provided at the 26th Annual Workshop for National Reference Laboratories for Fish Diseases.

For **KHVD**, 65 outbreaks were reported in 2021.

Other fish diseases problems in Europe

A whole range of other disease problems in 2021 were reported:

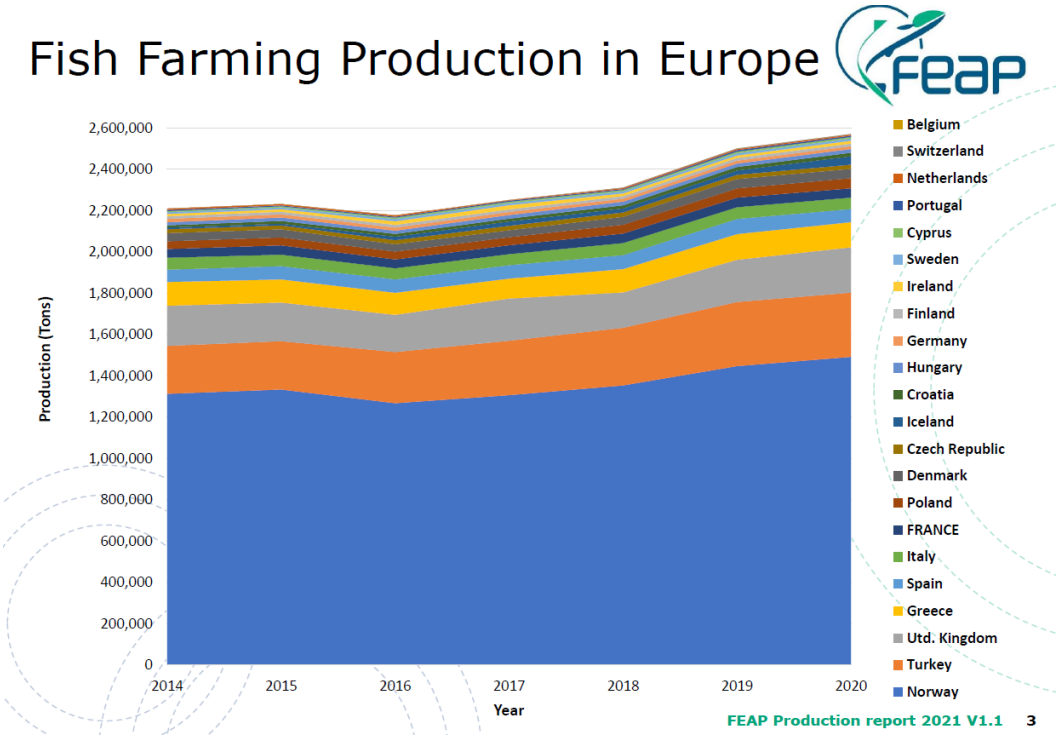
- In **rainbow trout** the major concerns remain flavobacteriosis (RTFS), Enteric Redmouth Disease (*Y. ruckeri*), Furunculosis (*A. salmonicida*), Bacterial kidney disease (BKD), and Infectious Pancreatic Necrosis, with an increase of clinical outbreaks.
- In **salmon** farming the major concern is 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.), infection with *Piscirickettsia salmonis*.
- In **Cyprinid** it is primarily CEV.
- In **seabass** and **seabream** it is primarily VNN/VER, *Photobacterium damselae* subsp. *Piscicida*, tenacibaculosis, *Vibrio harvey*, *Sparicotyle chrysophrii* infection.

Laboratory data.

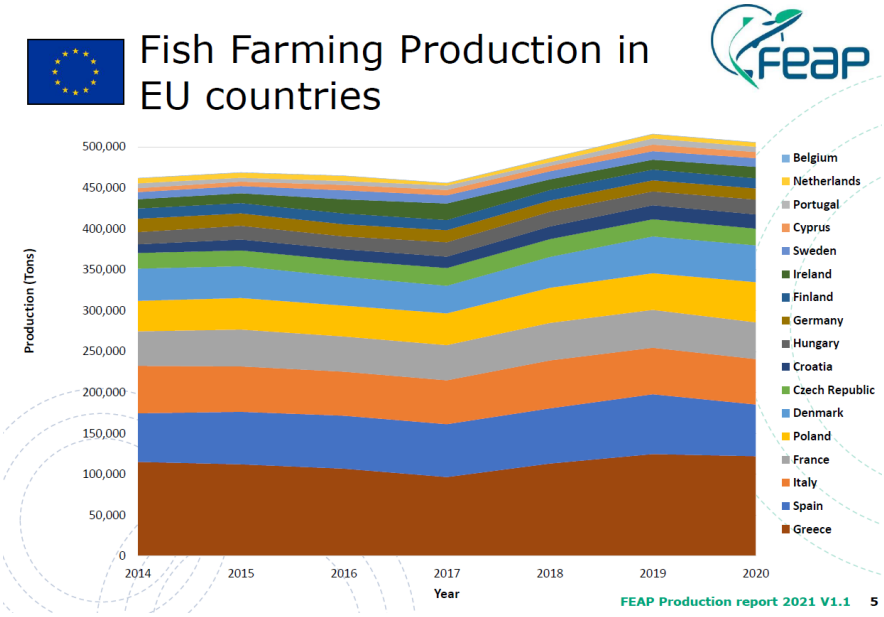
As from previous years, large number of variation across labs is observed in the number of samples tested. Since no large changes are observed these data are not included in the report. They can be however retrieved upon request.

Development of Fish Farming in EU 2008-2020

FEAP data - Fish Farming Production in Europe



FEAP data - Fish Farming Production in EU Countries



Reports from the individual European countries

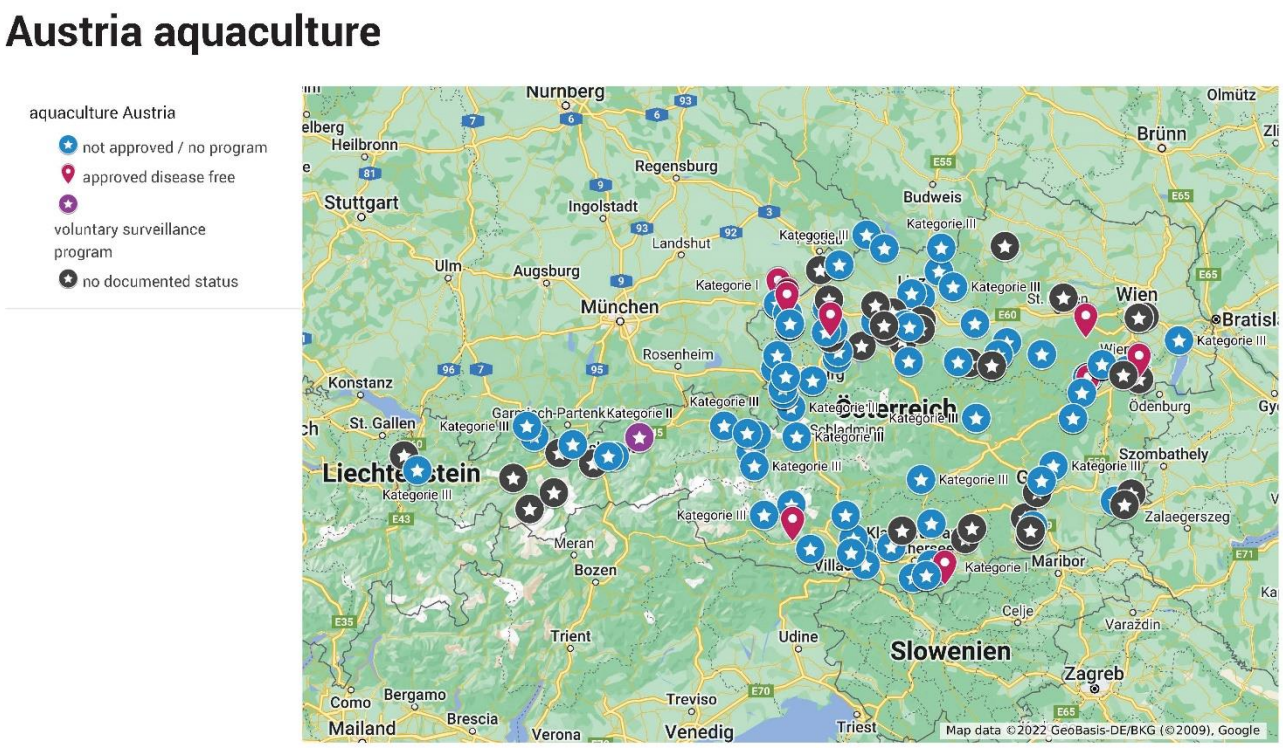
Austria

Author/Institute: Lewisch Eva Vetmeduni Vienna

Aquaculture production: Mostly small and medium fish farms 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. RAS seem to increase, with the production of exotic fish like *Clarias gariepinus* and even salt water fishes and invertebrates.

Health status: currently, one farm is infected with a Cat. C disease (IHN); surveillance is only implemented for farms which are approved disease-free

Other disease problems: none.



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 wellknown farm for sturgeon and caviar production in recirculating system. . Few RAS for pike perch and Jade perch production.

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Health status: Implementation of the new regulation is still in progress.

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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 coomon dentex) as well as molluscs (mussels and oysters). Most of the trout farms breed rainbrow 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: In 2020, the total production of aquaculture (stocking material, fish and other aquatic organisms for consumption) in specialized fish farms amounted to 15,051.83 tons - 8.8% less than the previous year, with a decrease both in the stocking and in the case of fish for consumption. The main reason for the reduced production is the COVID-19 pandemic and its consequences, characterized by lack of markets, difficulties in transport and sale of finished products, as well as reduced demand for fresh aquaculture products. The total production of stocking material in fish farms in 2020 will shrink by 16.4% on an annual basis, to 2,047.9 tons. This is mainly due to the reduced production of stocking material from the main species of fish farmed in the country - rainbow trout (725.14 tons), silver carp (283.3 tons) and carp (544.4 tons). There is also less production of fingerlings of catfish, sturgeon, silver carp. There is an increase in the production of fingerlings of grass carp, river (Balkan) trout and brook trout. In 2020, the production of fish and other aquatic organisms for consumption amounted to 13,003.9 tons - by 7.5% below the level of 2019, mainly due to a decrease in the production of carp (by 22.1 %), silver carp (by 34%), grass carp (by 3.4%) and catfish (by 44.1%). On the other hand, there is an annual increase in the production of fish for consumption of rainbow trout (by 52%), white fish (by 8.4%) and sturgeon (by 10.9%). The production of rainbow trout, common carp and silver carp occupies a major share of Bulgarian aquacultures. The production of fish species that are by-catches in the extensive and semi-intensive warm water farms – common bream, common bleak, perch and red perch has been reported. These species are not subject to targeted breeding and rearing in aquaculture.

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Health status: "Surveillance of fish diseases is carried out under the Exotic and Non-Exotic Fish Diseases Surveillance Program of Bulgaria in 2019 - 2021.

The program includes:

VHS, IHN, IPN, ISA, EHN, KHV and SVC. During 2021 one case of IPN was defected. VHS, IHN, ISA, EHN, KHV and SVC was not detected.

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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 carfish, pike and pike-perch in small quantities in earthern ponds surface from 0,5 to 100 hectars. Some of the carp farms have their own hatcheries. Coldwater freshwater aquaculte 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 Mediterranea according to ICAAT quotas and feeding them until favourable weight. Almost whole production is sold to Japan.

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Health status: During 2021 we were in transition period and the surveillance was organised as previous years. However, in the 2022 we'll switch to the passive surveillance and only farms that have not been infected are invited to apply for surveillance to achieve the status.

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Other disease problems: Nothing has been changed compared to the previous years and the main challenges are bacterial and parasitic diseases in marine aquacultre. The most devastating bacteria in 2021 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 incresed mortalities and requirements for frequent bath treatments. The main problem is shortage of approved medicines for treatments of parasites. .

Cyprus 

Author/Institute: Veterinary Services

Aquaculture production: "In 2021, the aquaculture sector in Cyprus consisted of three marine fish hatcheries, one inland shrimp hatchery/ grow-out unit, nine private offshore cage grow-out units culturing mainly sea bass and sea bream and eight small fresh water aquaculture units, culturing mainly rainbow trout. All units are operating on an intensive basis. The marine hatcheries are using mainly flow-through systems and the freshwater units are using flow-through systems in combination with simple re-recirculation. The total licensed production capacity of Cyprus aquaculture for 2021 was 9,150 tons (marine) and 157 tons (fresh water) table size fish and 21,500,000 fingerlings / fry.

During 2021 the preliminary aquaculture production of table size fish in 2021 is estimated at 7,962 tons with a value of approximately €44m. Out of this production about 5,117 tons with a value of €25,7 m were exported. In 2021, the fry production reached 15.8 m at a value of approximately € 2.34 m. Overall, the value of aquaculture production in 2021 reached € 46,3 m. (Final certified production values for 2021 are expected in the second semester of 2022)

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Health status: In order to maintain the free status in Cyprus, a surveillance program is in place and every year half of the establishments are subject to health visits and 30 fish are sampled from each one for being tested for VHS and IHN (1 visit every 2 years for each establishment).

Other disease problems: Viral nervous necrosis (VNN) and Vibrio spp last present and diagnosed in Cyprus in November 2021.

Czech Republic 

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

Aquaculture production:

Aquaculture production in the Czech Republic consists of pond fish farming, salmonoid 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 2021, annual fish production in the Czech Republic reached 20,000 tonnes. Exports of live fish represented 45,3% 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 85,1% of total production in 2021. Herbivorous fish accounted for 4,9% 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

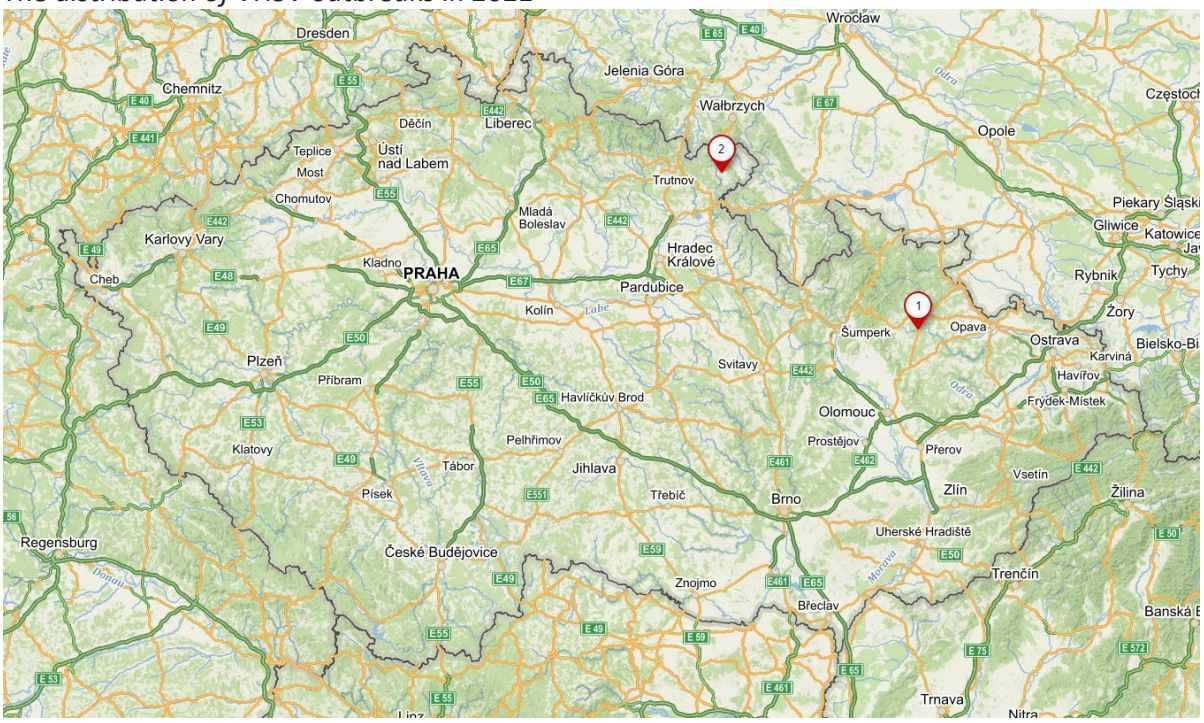
Health status:

According to Commission Delegated Regulation (EU) 2020/689 the Czech Republic belongs to following zones:

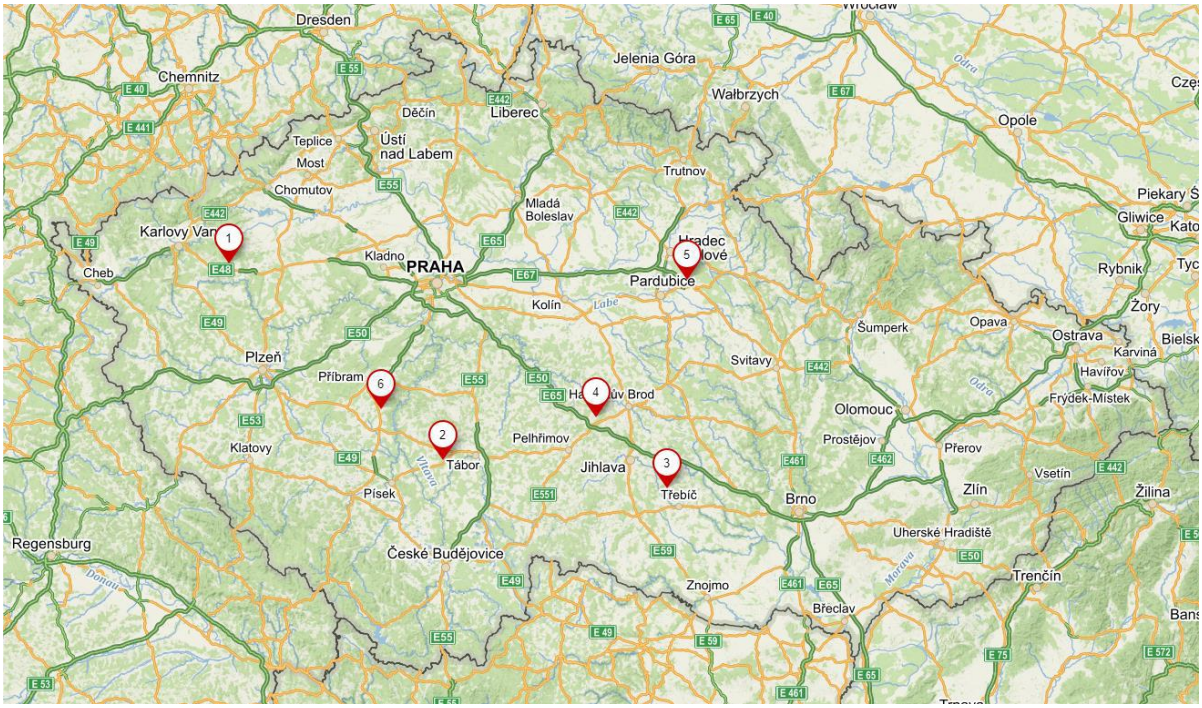
- *disease free status* for ISAV
- *voluntary surveillance program* for VHSV and IHNV

In 2021 the Czech Republic performed surveillance program for VHSV, IHNV and KHV.
In connection with legislative changes KHV surveillance program was finished at the end of the year.
In 2021 two outbreaks of VHSV and six outbreaks of KHV were confirmed. The distribution of outbreaks is represented on the following maps.

1. *The distribution of VHSV outbreaks in 2021*



2. The distribution of KHV outbreaks in 2021



Other disease problems: In 2021, the monitoring of the occurrence of carp oedema virus (CEV) continued in the Czech Republic at the Veterinary Research Institute. A total number of 413 samples were examined. CEV was detected in 38 cases

Denmark 

Author/Institute: Torben Grubbe (FVST) and Tine Iburg DTU Aqua

Aquaculture production: In Denmark, there is appproximately 205 active farms. The most farmed fish species in Denmark is rainbow trout. A major part of the production take place in fresh water farms. Production numbers from 2021 is not available yet, but based on 2020 numbers it is expected to be a total of approximately 45.000 tonnes of which approximately 42.000 tonnes is from rainbow trout including fry. Egg production is a major production and the numbers in 2021 are expected to be at least the same as in 2020. However, the coronapandemic and the IHN outbreak in 2021 is likely to affect both production and export. Minor production focus on Atlantic salmon, pike, eel and a few other species.

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Health status: All farms with susceptible species are inspected at least once every second year, once a year or twice a year by veterinary authority depending on the risk catagorizing made 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 approved disease free of ISA. From 31-12-2013 the whole continental area is approved disease free of VHS, while the marine farms are in an eradication program for achieving status of free of VHS. Due to the IHN outbreak Denmark has lost its approved disease free status for IHN and is now categorized as not disease free of IHN except for the 28 approved disease free compartments. At a national level, Denmark conducts a surveillance plan for IPNV and SVCV. Furthermore some farms have achieved disease 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. There is an increased focus on gill problems, these are often very complex and NRL are involved in several projects regarding gill health. Among others there is an inceasing focus on fresh water gill amobae.

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Estonia 

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

Aquaculture production: Estonia has very versatile aquaculture industry. Farmed species include rainbow trout (around 85% of total production), sturgeon, eel, arctic char, carp and others. Fish farming is seasonal because Estonia is a nordic country and winter months are cold (natural waters covered with ice) and in the summer months water temperature might get too high. The Majority of production units are flow-through raceway systems, but there are also some semi- and full recirculation systems. Small part of trout is farmed in seawater cages and cage farming is being actively developed.

Health status: Estonia has multi-annual surveillance and eradication programme for fish diseases VHS and IHN for a period 2020-2023. Samples from fish farms and put and take ponds are collected and fish health visits are being made according to the table presented in Commission delegated regulation 2020/689 chapter 1, section 2, table 1.B. More samples are collected from wild salmonid populations from the Kunda and Pärnu rivers and from baltic sea sprat and herring annually.

Other disease problems: - Outbreaks of bacterial diseases mainly caused by Aeromonas salmonicida; as the sector is small we have lack of fish health veterinarians

Faroe Islands 

Author/Institute: Debes Christiansen - FVO

Aquaculture production: A total of 95.000 tons of Atlantic salmon was produced in 2021 in the 28 marine farms with open net cages (10 - 25 at each site) in the Faroese fjørds and straits. This is an increase of approximately 10.000 tons from 2020

Health status: No outbreaks of the listed fish diseases were recorded in 2021. 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 disease problems: 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 2020, 15,1 million kilograms of fish were cultivated for human consumption in Finland. This represented an decrease of about 0,2 million kilograms compared to 2019. Some 14,3 million kilograms of rainbow trout were produced, representing ca 95 % of all the food fish produced in Finland. Also 0,58 million kilograms of European whitefish were produced, which was about 25% less than last year. A total of some 0,2 million kilograms of the other species, including trout, arctic charr, sturgeon and pike perch, were also 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 natures. Some 49 million 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. Farmers are interested in RAS and offshore techniques to get a (environmental) permit for bigger production amouts. .

Health status: "- Finland is free of VHS, IHN and ISA excluding VHS-eradication programme still in place in Åland Islands and IHN-restriction zone also in Åland Islands for which an eradication programnme was declared in early 2022.

'- VHS was last time found in Åland Islands in 2012. Eradication was finnished in the beginning of 2020 and the surveillance program is about to end in 2022. Åland Islands will thus be decleread free of VHS in 2022.

'- IHN was found in six farms in 2017/2018. Eradication program was carried out in the three zones and one compartment and IHN free status was restored in 2021.

'- IHN was found in Åland Islands 2021 in rainbow trouts imported from Denmark. IHN spread to altogether 5 farms and one slaughter house that was used to slaugher fish from infected establishments. Eradication has been carried out in all infected establishments and surveillance to restore the freedom will start spring 2022.

'-KHV or ISA have never been found in Finland

'- Risk-based surveillance is in place in authorized establishments. Passive surveillance is in place in all establishments.

'- Beyond 2020/689 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 37,500 tons produced each year (Ministère de l'Agriculture, 2020). Rainbow trout represents 95% of this production. Half of the production is carried out by three regions: Nouvelle-Aquitaine, Hauts-de-France and Brittany. The main part of this production (80%) is destined to human alimentation, the balance consisting of live fish for restocking and recreational fishing.

The French marine fish farming consists of about 34 companies which produce about 6,000 tons of fish, mainly intended to be exported.

The pond fish farms were surveyed in 2020. The production has decreased in 2020, with a production of about 3,000 tons, far behind the previous productions : 8,000 tons in 2008 and in 2013. This extensive production consists mainly of live fish for human consumption, restocking and put and take fisheries. As a consequence of the decreasing production, the introduction of fish for recreational activities has increased in the last few years." .

Health status: The whole French territory is free of ISA. The declaration of suspicions is mandatory. Abnormal mortalities and symptomes related to ISA would be investigated and financed by the Authority.

With respect to SHV/IHN/KHV, disease-free zones and compartments are recognized and the national eradication plan is ongoing. To achieve or maintain disease-free health status with regard to VHS and IHN, fish farms are subject to programs in accordance with R (EU)2020/689.

In 2021, official disease-free status was recognised in 49 farms and eradication programs in 48 farms.

Despite the increase in the number of new facilities with targeted surveillance, only one detection of VHSV was reported on northern pike, in one specific area, following sampling performed for the national eradication plan ; no clinical signs had been observed before. Sequencing of complete G gene showed a high identity level (99.2%) between the present isolate and an isolate from rainbow trout detected in the same area in 2016 .

No outbreak of IHN was reported in 2021.

To notice that since 2020, French laboratories have begun to perform VHS and IHN diagnosis by real-time RT-PCR as official methods recognized by the ministry of agriculture. One positive of detection of IHNV with late Cts was reported in 2021, corresponding to sampling on asymptomatic fish. Homogenates were sent to NRL for confirmation which remained unsuccessful (no isolation neither

confirmation by conventional RT-PCR for sequencing). In that case, the involved farm was not declared infected.

Surveillance of KHV:

Four outbreaks of KHV were reported in 2021, in four different areas of France, in ornemental fish and put and take fisheries. The genotype profiles obtained for the viruses were U/I profile (genotyping PCR (Bigarre et al, 2009)). In accordance with French regulation in 2021, the movments were limited."

Other disease problems:

"Several outbreaks of Carp Edema Virus (CEV), located in distant French areas, were reported mostly during spring 2021, 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). To notice that three veterinarian laboratories adopted the CEFAS qPCR method to perform first intention analysis whereas until now, only the NRL was able to display this analysis. In parallel, a european project was initiated in order to improve our knowledge regarding CEV epidemiology in France (qPCR analysis perfomed by vet labs and further sequencing analysis to be done by the NRL).
There were still a significate number of outbreaks induced by PRV which were reported on rainbow trout or atlantic salmon in various farms.
EVEX has been less regularly detected on elver after analysis as part of restocking program but unknown viruses were sometimes detected in co-infection or alone on sampled eels.
"

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 (drum, 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:	N/A
Brandenburg:	There is a pike perch closed circulation system, groundwater fed. Rearing facilities are ponds (mainly carp) and runways/pools (mainly rainbow trout and other salmonids). Two warm water facilities use water from the cooling circuit of coal-fired power plants. All other systems/pond farms are tied to surface water. Due to water scarcity or restrictions in connection with the enforcement of the Water Framework

	Directive, channel systems must be operated temporarily or entirely in a partial circuit.
Bremen:	NO farms
Hamburg:	NO farms
Hesse:	"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)"
Meckl.-W. Pomerania:	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" .
Lower Saxony:	In NI, fish are kept in 728 aquaculture farms with different forms of production. In 79 farms, an activity that requires a license is carried out. In terms of economic returns, trout production in ponds and partial recirculation systems is the most important form of production. Carp and associated fish are usually produced extensively and often as a sideline. In addition to eels, European catfish, African catfish, zander and ornamental fish are kept / produced in recirculation systems.
North Rhine-Westphalia:	In NRW, salmonids are mainly kept in conventional flow-through systems. Aquaculture is concentrated in the low mountain ranges. Depending on the direction of production, the degree of mechanization is low to medium. Due to the effects of climate change, traditionally run aquaculture farms face considerable challenges, especially in terms of water availability and temperature management. Occasionally, technical systems (RAS) for keeping freshwater fish are being built
Rhineland-Palatinate:	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
Saarland:	almost only fishing ponds; one salt water circulation system
Saxony:	Traditional carp pond farming with secondary fish such as catfish, tench, whitefish, sturgeon, etc. Aquaculture of salmonids in rows, tanks and ponds Indoor recirculation systems for African catfish, tilapia, pangasius, maraena whitefish[
Saxony-Anhalt:	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, partially roofed or fully closed facilities
Schleswig-Holstein:	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
Thuringia:	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.

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:	The farms are monitored by the state veterinary administration, the Fish Health Service Bavaria e.V. and the Qualified Service Bavaria (QD).
Brandenburg:	In 2021, the aquaculture farms approved according to national regulation / AHL 2016/429 were monitored for risk assessment according to Decision 2008/896/EC. Targeted surveillance was carried out with regard to IHN, VHS, IPN and KHV. The risk assessment in approved aquaculture facilities is updated in accordance with Delegated Act 2020/689.
Bremen:	No farms.
Hamburg:	No farms.
Hesse:	6 farms have the status approved disease-free: monitoring was targeted, includes sampling; remaining farms are not in approved disease-free status and are not under an eradication/control program: monitoring was mostly active (routine controls, sampling); Monitoring of individual farms was carried out by means of targeted monitoring (mandatory sampling and testing)
Meckl.-W. Pomerania:	passive surveillance
Lower Saxony:	The health status can be seen from the information under 1.2 and the provided map material. Official identification of KHV-I was made exclusively in non-commercial ornamental fish stocks. The active health monitoring of approved aquaculture operations is carried out by the Vet School Hannover or by qualified

	health services. Official surveillance is carried out by the competent municipal veterinary authorities. The LAVES and the Vet School Hannover are responsible for health monitoring (clinical examinations, laboratory examinations) in order to maintain the "disease-free" health status. With respect to the ISA, monitoring is passive.
North Rhine-Westphalia:	The majority of aquaculture farms is not classified in any disease category. Few farms are disease-free. The possibility of classification into the disease category is closely linked to the trade structures and the geographical location. Monitoring is carried out by the veterinary offices. These are supported by the national fish health service. The company's own controls are occasionally carried out by resident veterinarians. Here, in particular due to the lack of specialists, support from the fish health service is necessary.
Rhineland-Palatinate:	A zone approved as disease-free (zone Nims in the Eifel district of Bitburg-Prüm) with one farm, all other farms are in areas that are not approved disease-free and are not subject to an eradication/control program. In accordance with the risk level determined, official controls are carried out in the approved establishments, during which fish are also removed and examined for fish diseases in the state's diagnostic institute. All companies, including those subject to registration, are recorded in national databases and are checked at regular intervals to ensure that the data are up to date.
Saarland:	no reporting
Saxony:	With the exception of the recognized disease-free and demonstrably infected establishments (according to 1.2 and 2.1), the approved or approved establishments corresponds to the former Category III - now "Not recognized disease-free and not under an eradication/control program". However, many fish faremers regularly take part in voluntary programs run by Saxony and the Animal Disease Fund for VHS, IHN and KHV, including laboratory tests. They would therefore meet the requirements for a voluntary monitoring program. The official controls are carried out by the responsible veterinary authorities, the animal health controls by the fish health service of the Saxon Animal Disease Fund.
Saxony-Anhalt:	Disease-free status for VHS, IHN: Bode water catchment area with 4 aquaculture facilities; The companies are specifically monitored. The clinical examination with sampling is carried out by a qualified service (national fish disease control service) in cooperation with the responsible veterinary surveillance office. Virological tests are carried out at the Saxony-Anhalt State Office for Consumer Protection using accredited methods in accordance with the recommendations of the official collection of methods. In the buffer zone below the farm, wild fish are regularly examined and stocking with fish is only permitted with fish from Category I farms. Status not recognized as disease-free and not in an eradication program: here, too, risk-oriented monitoring is carried out by the state fish disease control service. Some farms will participate in a voluntary monitoring program.
Schleswig-Holstein:	Two farms with disease-free status: Rainbow/brook trout. Other farms are in formerly category III status (not recognized disease-free and not under an eradication/control program). Monitoring is carried out in Schleswig-Holstein by the responsible veterinary offices, supported by the qualified service at the Chamber of Agriculture .
Thuringia:	Inconspicuous, fish health service and official veterinary surveillance according to those of the other federal states with a focus on approved aquaculture facilities

	according to the operational risk level including laboratory diagnostic tests in the sense of a monitoring.

Other disease problems:

Baden-Württemberg:	ERM: Yersinia ruckeri is endemic in some river systems and adjacent trout farms (various Yersinia strains - Hagermann and EX5), rainbow trout of all ages are mainly affected, diagnosis is carried out using classic bacteriological examination methods (pathogen cultivation and differentiation), i.e. examination of diseased fish (active monitoring); in problem farms vaccinations using immersion vaccines; after the IHN epidemic, increase in farms that keep 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; Therapy with oral antibiotics CEV: in koi / other carp species, disease occurrence (multifactorial disease) especially in spring, detection by PCR Flavobacteriosis (RTFS): specifically Flavob. psychrophilum; Rainbow trout hatchlings are usually affected during the hatchery phase. Diagnosis with classic 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, vitamin supplements, disinfection of the inlet water. Therapy: antibiotic medication via feeding. In the again very hot summer of 2020, problems caused by lack of water and high water temperatures as well as increased parasitosis and bacterial diseases.
Bavaria:	no changes to previous years
Brandenburg:	No reporting.
Bremen:	No farms.
Hamburg:	No farms.
Hesse:	Flavobacterium psychrophilum in the brood of salmonids: diagnostic methods cultural-bacteriological and using MALDI-TOF-MS, currently no control and preventive measures to minimize the negative effects available; Ichthyophthirius multifiliis in salmonids in all stages of development: native diagnostic methods, using a light microscope, currently no control and preventive measures to minimize the negative effects; herpes viruses (sturgeon, goldfish): Diagnostics at the FLI, currently no control and preventive measures to minimize the negative effects
Meckl.-W. Pomerania:	No issues.
Lower Saxony:	A slightly decreasing incidence of carp sleepy disease (KSD / CEV) can be observed compared to the previous year. The occurrence of vibriosis remained almost unchanged compared to the previous year. With regard to fish-pathogenic bacterioses (furunculosis, red mouth disease), a significant decline was recorded in the year under review. One ISKNV and one Red Mark Syndrome finding in the year under review are worth mentioning.

North Rhine-Westphalia:	No reporting.
Rhineland-Palatinate:	No issues.
Saarland:	No reporting.
Saxony:	Electron microscopic detection of Iridoviridae in perch (Perca fluviatilis) at the state veterinary institute was examined at the FLI with negative results for EHN. Attempts were made to counteract the problem of furunculosis in whitefish maraena (Coregonus maraena) with a herd-specific vaccine by immersion and oral booster - with unsatisfactory success. Therefore, at the end of 2021, switch to intraperitoneal application and in the medium term to commercial vaccines from other EU countries (i.p. application).
Saxony-Anhalt:	Aquaculture in Saxony-Anhalt was again primarily affected by drought and high temperatures in 2021. The high water temperatures and the lack of water forced the farms to massively reduce their stockings 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 treetment to reduce infection stages during the production process.

Greece 

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

Aquaculture production: Mediterranean species- Cage culture in seawater

Health status: Greece (whole territory) has obtained a disease-free status from infection with HPR-deleted ISAV. For the rest of listed fish diseases neither a disease-free status has been granted nor an optional eradication/surveillance programme has been implemented so far according to Commission Delegated Regulation (EU) 2020/689. A horizontal passive surveillance system in conjunction with risk-based surveillance in certain approved aquaculture establishments (part 1 of Annex VI to Reg 2020/689) is currently implemented at the national level. Listed fish pathogens have never been reported in Greece.

Other disease problems: N/A. .

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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.

The fishing industry has been producing approximately the same amount of fish on the same size of area for many years. The 30 thousand hectares of fishery lakes are supplied by Hungary's excellent natural resources: good quality fresh water and geothermal energy.

Extensive fish farms are still the main form of production in the aquaculture. They produce 80% of the entire Hungarian fish production. The remaining 20 percent of the fish come from intensive farming. A third of the production serves breeding purposes, while the remaining 67 percent is for consumption. The total production was 26 630 tons according to the latest data.

The carp is the main species in Hungarian extensive fish production. Of the 382 fish production companies in Hungary, 217 companies produced carp among other fish species. The 82,7% of the edible fish production constitutes common carp, 6,3 % silver carp, 3,3% grass carp, 1,8 % catfish, 5,3 % wild fish, 0,3 % pikeperch, 0,2% pike, 0,1 % others.

Health status

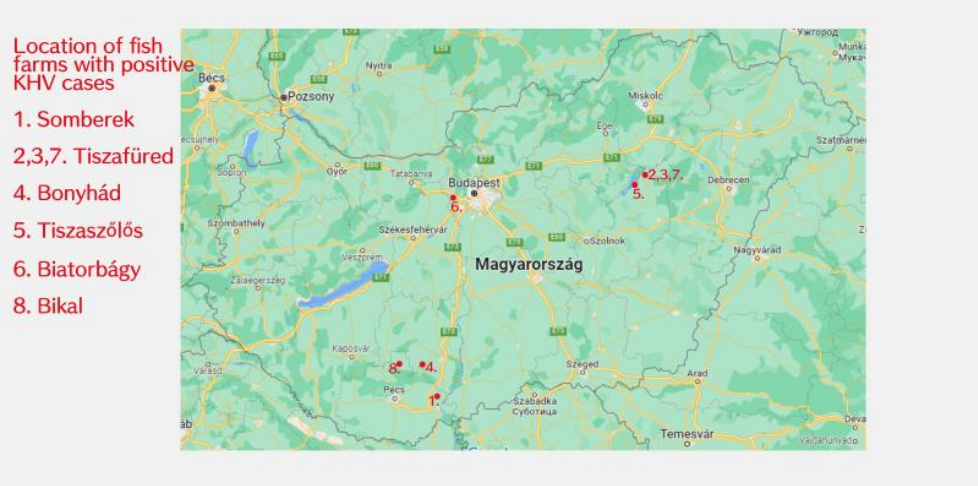
The implemented and approved targeted surveillance program in Hungary for KHV (Koi Herpes Virus Disease) was discontinued (2009/177/EK). The majority of fish farmers require testing for their fish for KHV because the KHV free certificate is often required to sell the fish. Samples from 72 farms – which were from 65 epidemiological unit – were subject of examination, of which 8 farms were found positive for KHV in 2021. According to 2018/1882/EU, the Koi Herpes Virus Disease is in category E.

Due to the (EU) 2021/620, the whole territory of Hungary has disease-free status from infection with HPR-deleted ISAV.

According to Commission Implementing Decision (EU) 2021/260 of 11 February 2021, Hungary is free from SVC (Spring Viraemia of Carp), and continues monitoring based on risk assessment. In 2021, 22 fish farms were sampled for control tests within the process of the monitoring control program. Based on the control and diagnostic tests, all samples were tested negative.

There are surveillance program for IHN and VHS. The farms with susceptible species (like trouts and pike) are examined yearly by virological methods. In 2021, 19 fish farms were sampled and all samples were tested negative.

Other disease problems: A significant part of the sector has outdated technical conditions. In classical pond fish husbandries, the lack of water and bad water quality can cause mass mortalities or just very slow growing. Fish-eating water birds are also causing harm to the industry, not only by eating the fishes but they can also spread the diseases found within other lakes.



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 2021 was as follows:

Atlantic salmon: 46.458 t.

Arctic char: 5.390 t.

Rainbow trout: 951 t.

Senegal sole: 337 t.

Total: 53.136 tonnes"

Health status: The general health status is promising, but we got the first outbreak of ISA HPR-del in a seacage farm in November 2021. 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 2021 there were taken totally 8.403 samples for ISAV-testing, 3.437 for PD/SAV-testing, 1.683 for VHSV-testing and 1.255 for IHNV-testing. All results were negative excluded the before mentioned ISA HPR-del positive farm.

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 2021: totally 3.790 samples in 26 farms) - and also from wild salmonids used as broodfish for the rivers (797 samples in 4 farms, out of them 16 positives). Eggs from positive wild females are destroyed.

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Ireland

Author/Institute: Samantha White, Marine Institute

Aquaculture production: Finfish aquaculture production in Ireland in 2021 totalled 13,904 tonnes. This was dominated by marine Atlantic salmon production of 12,844 tonnes. Freshwater rainbow trout farming takes place mainly in flow through pond farms and produced ca. 500 tonnes. Regarding non-salmon species, one perch farm was operational in 2021 and one farm specialising in the production of ornamental fish including koi carp. .

Health status: According to Commission Implementing Regulation (EU) 2021/620 Ireland has disease free status for all listed disease i.e ISA, IHN and VHS. All farms containing susceptible species categorised as high risk are sampled on an annual basis (freshwater only). In addition, under Commission Implementing Decision (EU) 2021/260 Ireland has additional guarantees for BKD, SVC, KHV and G. salaris. All farms with susceptible species are sampled every year (high risk) or every two years (moderate risk) dependent on risk category. Additionally, wild Atlantic salmon from six river systems in Ireland are sampled annually for G. salaris surveillance.

Other disease problems: For 2021, disease occurrence in salmonid aquaculture has remained in line with trends noted in 2020. In Ireland, over the last two years there has been an increase in the occurrence and impact of infection with Piscirickettsia salmonis (9 sites) and cardiomyopathy syndrome (5 sites). Outbreaks associated with P. salmonis infection occurred during the summer and autumn months. Infection was generally prolonged (3 months) when untreated, with chronic low to moderate mortality. There are currently no vaccines licensed in Ireland for P. salmonis. Cardiomyopathy syndrome (CMS) outbreaks remains a significant issue in salmonid aquaculture in Ireland. The number of sites affected with CMS, the disease associated with piscine myocarditis virus (PMCV), were the same as reported in 2020 (5 sites). Clinical impact of CMS was described as moderate. Amoebic gill disease (AGD) is currently endemic on all sites in Ireland. The causative agent of AGD, Neoparamoeba perurans, was detected in 11 of 13 sites, for which samples were submitted for testing by the Marine Institute. Management has been through regular freshwater treatment which are part of routine husbandry procedures at these sites. Treatment of AGD in Ireland, also includes, the increased use of desalinated water on the majority of sites which is proving an effective method of treatment. Cases of SAV infection for 2021 were low and are in-line with reports from 2018 - 2020. Aeromonas salmonicida, the causative agent of furunculosis was detected in 3 sites following transfer of fish to seawater. All sites were stocked with vaccinated fish and the impact was minimal. Moritella viscosa infection (winter ulcer disease) occurred at one site in Ireland in 2021. Mortality levels in affected fish were reported as moderate. This was the only site in Ireland that did not receive a vaccine with M. viscosa as a component. Two sites in 2021 reported significant impacts of a noxious phytoplankton bloom in the south west region of Ireland. The species has been previously undescribed in Irish water and is thought to be Pseudochattonella verruclosa (pending confirmation). High mortality was reported at both sites. Aside from the above event, the impacts from phytoplankton blooms and zooplankton swarms were less than recorded in previous years.

Italy 

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

Health status: In 2021 due to the SARS-COV-2 pandemic and the consequent movement restrictions the decrease in finfish exportation observed in 2020 continued. Rainbow trout farms have experienced an increase in the duration of cycles production due to difficulties to sell the product. Housing fish beyond the targeted size has lead to overstocking in raceways and to a locally increase of health problems. 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 acquaculture in Italy during the last years.

Health status: Despite the long history of implementation of eradication programs, IHNV and VHSV are still persistent in Italy, causing recurrent disease outbreaks. in 2021 there have been 3 outbreaks of VHS and 1 of IHN. Most of them were related to the release of fish for angling activities. Although in Italy all salmonid fish released into natural environment must come from a disease free establishments, several factors, such as entry in force of AHL, SARS-COV-2 pandemic, lack of human resources, have lead to difficulties in controlling all the activities related to restocking movements. Italy is declared free for ISAV and no detection of Cat A disease, listed according to EU Regulation 429/2016, has been made so far.

Other disease problems: "In 2021 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 reduction in infectious diseases impact in freshwater aquaculture. The most frequent pathogen detected in Rainbow trout was Yersinia ruckeri and some autologous vaccines have been used in some establishments. Aeromonas salmonicida have been detected more frequently than previous year in Rainbow trout, due to increase of production cycle (see point 3.3). Flavobacterium impacts severely rainbow trout juvenile stages and a slight decrease in the diagnosis of Lactococcus garviae has been detected, compared to 2020.

Brook trout (Salvelinus fontinalis) and brown trout (Salmo trutta) farming is increasing in Italy and furunculosis caused by A. salmonicida is the main disease affecting this species. Autologous vaccines are used in some farms.

AcIV-E has been detected more frequently in sturgeon farms with varying degree of mortality. It should be noted that an important increase in n° of analysis performed for sturgeon viruses diagnosis has been noticed in 2021 (485 analysis) compared to 2020 (179). In marine species, the most frequent diseases detected were vibriosis, in particular caused by Vibrio anguillarum and harveyi, and VER. Several Photobacterium damselae outbreaks has been registered in both sea bass ans sea bream farms. "


Germany
Austria
Liechtenstein
Switzerland
Hungary
Slovenia
Croatia
France
Bosnia and Herzegovina
Serbia and Montenegro
Monaco
Albania
Adriatic Sea
Tyrrheanian Sea
Ionian Sea
Mediterranean Sea
Malta
Valle D'Aosta
1
Piemonte
29 1
Lombardia
23
Trentino-Alto Adige
52 1
Veneto
26 1
Friuli Venezia Giulia
15
Liguria
3
Emilia-Romagna
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Toscana
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Marche
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Umbria
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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, arctic char, african catfish, 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 800 tons per year. Only few fish farms produce production what exced 30tns.

Health status: Until now VHS, IHN and KHV were not confirmed during the active and passive surveilance. On the political and aquaculture level decision to achiev disease freestatus were not taken. In the surveilance programme annualy are included aproxomately 25 farms.

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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 clinicaly 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 ichtiophtiriusare 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: The main production systems in Lithuania are represented by warm-water and cold-water fish ponds. The main cultured species is the common carp (Cyprinus carpio). According to the Lithuanian register of the water bodies, the following water bodies are used for fisheries and aquaculture purposes: the Curonian lagoon covering 413 km2; 2 827 lakes covering 88 279.1 ha or 1.5 per cent of the country's territory; 1 589 fish ponds, which cover 24 434 ha and 733 rivers longer than 10 km covering 32 559.1 ha. In Lithuania, there were registered: 18 fishery and aquaculture enterprises, two aquaculture closed-systems enterprises for eel rearing, one natural salmon breeding farm and over 50 farmers who carry out fish pond aquaculture or closed-systems on a commercial scale.

Health status: In Lithuania, the general surveillance for VHS, IHS, Koi herpes virus, ISA is provided by the state in the framework of active surveillance in the fishery enterprises. The other diseases and pathogens are included in self-control programs established by the enterprises. The passive surveillance system is in place in case of suspicion of any of the fish disease and is covered by the state surveillance programme as well.

Other disease problems: N/A

Malta 

Author/Institute: Ornella Falcioni Veterinary Regulation Directorate

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 fed with pellet. Four companies are focuses on the ranchinhg of wild bluefin tuna (*Thunnus thynnus*) caught from wild stocks and fattened inside offshore cages fed with mackerels and herrings bought frozen. "

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Health status: passive surveillance is implemented for all farms

Other disease problems: -N/A

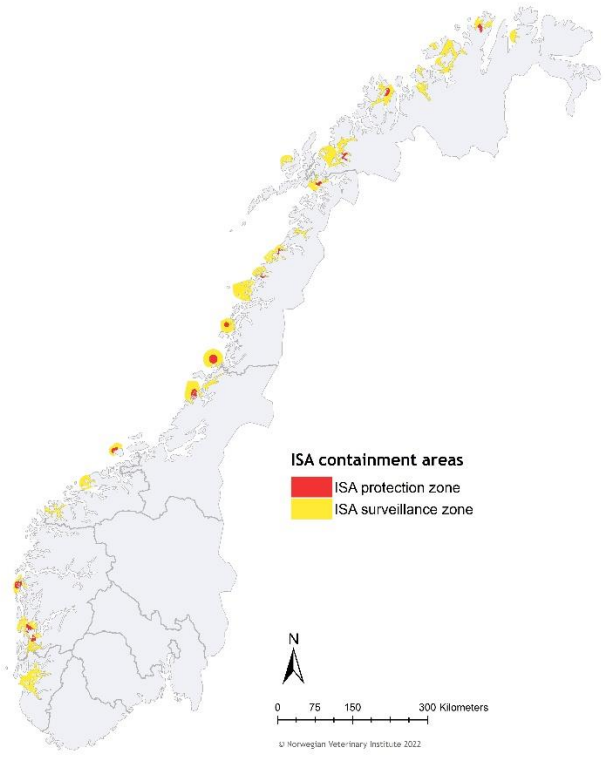
Norway

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 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. The number of samples from rainbow trout at freshwater sites and pink salmon was increased in 2021 due to the detection of IHNV in Denmark. 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 still concerning. Complex gill diseases are on rise.



Poland

Author/Institute: Marek Matras - Pulawy

Aquaculture production: In Poland aquaculture production consist from traditional common carp farming and salmonids fish farming. Main produced species in aquaculture are common carp, rainbow trout, cat fish, and sturgeon. Common carp (Cyprinus carpio) is the main fish species kept in traditional ponds (about, 48% of total production).The most farmed salmonid fish species in Poland is rainbow trout (about 42% of total production and 89% in salmonids production). Salmonids are kept in natural and concrete ponds; few recirculation systems, Common carp mostly in natural ponds.

Health status: According to 2020/689 Poland has free health status for ISA and 15 VHS free compartments, 18 IHN free compartments, rest of farms have undetermined health status for VHS, IHN. In 2021 weren't reported outbreaks of ISA, VHS or IHN. At the national level Poland performed the monitoring for ISA, SDV and KSD .

Other diseases and health related issues: N/A


LITHUANIA
RUSSIAN FEDERATION
Gulf of Gdansk
Słowiński National Park
Gdańsk
Elbląg
Braniewo
Bartoszyce
Masurian Lake District
Suwałki
Ełk
Augustów
Grajewo
Malbork Castle
Mrągowo
Olsztyn
Ostróda
Białystok
Łomża
Łapy
Biebrza National Park
Ostrów Mazowiecka
Mława
Grudziądz
Chełmno
Toruń
Bydgoszcz
Sierpc
Płońsk
Siemiatycze
Royal Castle
Łazienki Park
King Zygmunt's Column
WARSAW
Płock
Włocławek
Gniezno
Wielkopolska National Park
Poznań
Koło
Głowno
Grójec
Garwolin
Włodawa
Nowy Tomyśl
Leszno
Kalisz
Łódź
Radom
Lublin
Rawicz
Ostrów Wielkopolski
Bełchatów
Starachowice
Zamosc
Centennial Hall
Legnica
Wrocław
Radomsko
Kielce
Sandomierz
Tomaszów Lubelski
Jelenia Góra
Opole
Częstochowa
Świętokrzyski National Park
Lezajsk
Mielec
Wałbrzych
Chorzów
Gliwice
Wawel Castle and Cathedral
Rzeszów
Tychy
Kraków
Tarnów
Rybnik
Wieliczka Salt Mine
Krosno
Wodzisław Śląski
Sanok
Bielsko Biała
Carpathian Mountains
CZECH REPUBLIC
SLOVAKIA
2014 www.mapsofworld.com
Compartment (farm) declared IHN free
Farm infected with IHN

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	18	0	1	0	(1)*	19
DSAVR Centro	9	0	15	1	(2)*	25
DSAVR Lisboa e Vale do Tejo	0	0	19	2	0	21
DSAVR Alentejo	1	0	2	0	0	3
DSAVR Algarve	0	0	6	0	0	6
Madeira	**0**	**2**		**0**		**2**
Total	**28**	**48**				**76**

*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)	**In Voluntary 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 to (ISA)

* Actually, two are temporarily inactive.

* *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.

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 Commision Delegated Regulation (EU) 2020/689, the health status of fish listed diseases in Romania is Not approved disease free and not under eradication/control program for VHS, IHN for the most of the fish farms and, category I for ISA according of Commission Decision 177/2009.

Fish farms are under a risk based surveillance program. 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.

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 

N/A

Slovakia 

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

Aquaculture production: Aquaculture production in our country was the similar as last year 2020. Traditional species are carp and rainbow trout. We don´t have new farms - the number is similar as last year.

Health status: Health status of fish is relative stable in Slovakia. We have surveillance for diseases VHSV,IHNV,KHV and CEV. We don´t have a lot of outbreaks. This year - 2021 - we don´t have any outbreaks of VHSV and IHNV, but we have 3 outbreaks of CEV and 1 outbreak of KHV.

Other disease problems: without other significant changes compered to last year 2020

Slovenia 

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

Aquaculture production: According to the Statistical Office of Slovenia, the production of rainbow trout in 2020 (data for 2021 is not available, yet) was 864 tonnes, of other salmonids 119 tonnes, of carp 127 tonnes, of other warm-water fish 100 tonnes, and of marine fish and molluscs together 507 tonnes. Compared to 2019, fish production was 22% lower. Most fish farms have low production capacity, only a few are above 100 tonnes. Most of them have traditional tanks, but we also have high-tech recycling technology. .

Health status: "In Slovenia 34 farms/compartments/zones are declared free of VHS/IHN and 2 fish farms/compartments/zones are in eradication/control programme for VHS/IHN free status. There is no active infection of VHS or IHN going on at the moment, however there are still 26 fish farms which are not in eradication/control programme, but were VHSV or IHNV was detected in the past. The majority of fish farms in Slovenia are at the moment in former category III - and will go under voluntary surveillance programme under AHL.

All fish farms, selling live fish have been annually checked for the presence of IHNV and VHSV under the National surveillance programme prepared by AFSVSPP. According to the Order on the systematic monitoring of animal health status, disease eradication programmes and vaccination in 2022, all approved establishments will be checked for the presence of VHSV and IHNV."

Other disease problems: The fish health veterinary service is organised by NVI FV UL, where three veterinarians specialised in fish diseases cover all fish production in three NVI units. They take samples for diagnostic and monitoring purposes, inspect farms regarding the risk levels, treat fish, and advise fish farmers. In year 2021 the vaccination against red mouth diseases was introduced.

Spain 

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

Aquaculture production:

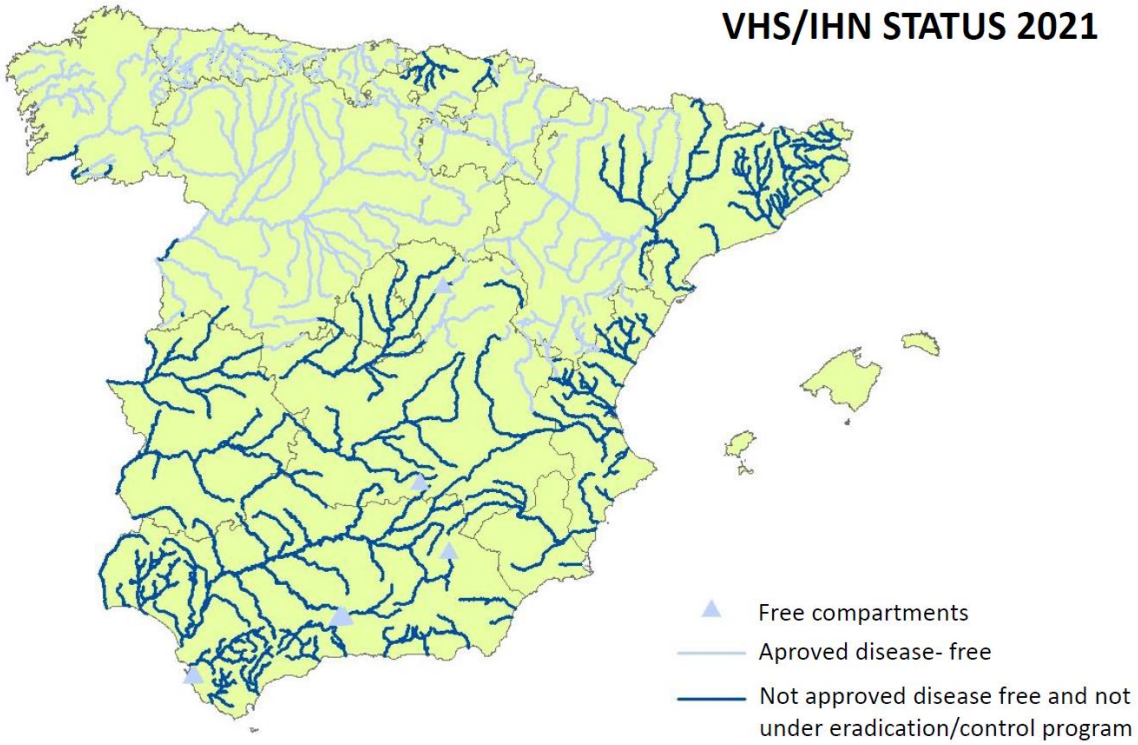
"Spain has a wide variety of hydrological resources, where aquaculture is possible either in continental, brackish as well as sea water. Different aquaculture system can be found:
In continental water
1) Tanks are located beside a river. These tanks are usually rectangular and concrete made out, operating 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, 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) (2020/689) and are coordinated by Central Authority (MAPA / Ministry of Agriculture, Fisheries and Food)."

Other disease problems:

No update since 2019


VHS/IHN STATUS 2021
Free compartments
Aproved disease- free
Not approved disease free and not under eradication/control program

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. Landbased flow-through systems most common for fry and parr production, older fish in cages. Landbased RAS systems for warm water species, sturgeon, RT, salmon, perchpike, perch. A few aquaponic farms

Health status: Listed salmonid viruses not present in farms. Surveillance according to EU 2020/689 and diagnostic manuals published by the EURL. ISA monitored from 2021 in Baltic sea cage farms with RT, sampling method under evaluation (extraction robots not set for samples in RNAlater). 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, samping 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. A new risk classification based on nine main categories was developed in 2021, and all farms should be classified according to the new system at the end of 2022. An extra sampling level (every third year) is to be added to the previous routine

Other disease problems: ASS - reoccuring each year in a few farms (within one farm in several locations, and in this farm associated with BKD that is not handled/eradicated but continue to thrive). Other Aeromonas infections have increased in the last years and were at a steady state in 2021. Some restocking farms had issues with fungal infections in 1- and 2-year-olds during spring and autumn, without sneakers being present (common problem with sneakers). In a few cases that were sent for diagnostics there was concurrent RTFS.

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 2021. 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: Our country works most with RAS systems for indoor fish culture, with heated and recirculated water, up to 26 dregrees. Farms registered at the Dutch Society of Fish farmers (NEVEVI.nl): Eel (10x), African catfish/calresse (6x), turbot (1x), pikeperch (2x), kingfish tuna/yellowtail (1x), sturgeon (2x), tilapia (1x), other (2x). Furthermore, we have 65 trout put-and-take ponds, to have a total of appr. 90 farms.

Health status: The Netherlands does not have an active surveillance of fish diseases. In case of suspicion of a notifiable disease, the Dutch Veterinary Authority (NVWA) takes samples which are tested at our laboratory, according to the legislation. There are no fish farms with a disease-free status. There are many private koi ponds in home gardens. Furthermore, NL has a huge import and transfer of ornamental fish. The further implementation in detail of the AHL is still being elaborated, with frequent meetings, in which also our laboratory is represented. Still some questions are there from the authorities regarding implementation of the AHL. These were sent to EURL separately, as requested by EURL, for AHL discussion at the NRL-meeting in June 2022.

Other disease problems: Goldfish herpes virus CyHV-2 has not been diagnosed in 2021, nor were there suspicious cases. In earlier years there were a few outbreaks of CyHV-2 in gibel carp, *Carassius auratus gibelio*, with high mortalities and test wise with very low Ct-values (~12) in open water in West-Netherlands. This virus is also diagnosed in imported goldfish from third countries, as published by T. Ito et al. 2017 with our group. We hypothetized, that through non-permitted release of infected goldfish into the open water gibel carp was infected with CyHV-2, but this cannot be proven.

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Turkey 

Author/Institute: Gulnur Kalayci – NRL Turkey

Aquaculture production: Aquaculture production in our country has being carried out as cage fishing in open sea, and natural and artificial dam lakes, and as pond fishing in inland waters.

Health status: We don't have any categorisation of fish farms. We have been carrying out regularly the targeted surveillance for listed pathogens in regional levels in susceptible fish species every year.

.

Other disease problems: We haven't detected any other disease which have an important impact on fish production in our country.

England and Wales 

N/A .

Scotland 

Author/Institute: Silvia Soares Marine Scotland Science

Aquaculture production:

There are 21 businesses operating 50 active sites for the production of rainbow trout. In 2020, 7,576 tonnes of rainbow trout were produced, 7,032 tonnes for the table market and 544 tonnes for restocking angling waters. Of the 50 active sites, 32 sites reported production in 2020. Freshwater production accounted for 3,387 tonnes and seawater production the remaining 4,189 tonnes. Freshwater production was from sites operating cages, ponds, raceways, tanks and hatcheries and seawater production was all from cage site facilities. In 2020, 6.2 million ova were laid down to hatch with 4.7 million being imported from foreign sources and the remaining 1.5 million from Scotland or other GB based fish farms.

50.5 million Atlantic salmon smolts were produced by 24 businesses operating 78 active sites during 2020. The principal types of facility used for the production of smolts in freshwater were cages (27 sites) or tanks and raceways (51 sites). Over 78 million ova were laid down to hatch with 67 million of these ova coming from foreign sources.

In 2020, the total production of Atlantic salmon was 192,129 tonnes, the second highest level of production recorded in Scotland. These fish were produced by 11 businesses operating 232 active sites. Fish production of 192,111 tonnes was from seawater cage sites (231 sites) while 18 tonnes was reported from seawater tank sites (1 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	24
Halibut	1	3	*
Cleanfish	2	4	19

*Production occurred in 2020 but cannot be shown without revealing the figure for an individual business.

Cleanerfish (Lumpersucker and wrasse) are produced for use as biological controls for parasites in the marine Atlantic salmon farming industry. There was also very small amounts of brook charr and tiger trout produced in Scotland during 2020. In 2020, all trout production took place in freshwater tanks, ponds and raceways although in previous years small amounts have been produced in seawater cages. Halibut, wrasse and lumpsuckers were all produced at seawater tank sites.

Health status: " " The UK left the European Union on 31 December 2020, therefore the Animal Health Regulations (2016/429) and all implementing and delegated regulations have not been implemented in Great Britain (Scotland, England and Wales) as these came into force after Brexit. We retained and amended some of the EU legislation that applied at the time of Brexit e.g. Decision 2015/1554 (diagnostic manual), Decision 2009/177 (surveillance and eradication for exotic and non-exotic diseases) and Regulation 1251/2008 (trade and susceptible/vector species) and we continue to implement a surveillance programme in accordance with these regulations. We have retained the disease categorisation from Directive 2006/88 and have not applied the new categorisation as per regulation 2018/1882 or surveillance/eradication programmes as per regulation 2020/689.
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 2021 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 2021, 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." .

Annex 1: Number of fish Farms

Country	Total Number of fish farms authorized or active in 2021 in the country (farms/sites that were active in 2021 or part of 2021).
Austria	4871; the number includes all active farms, out of which 277 are authorized, while the remaining 4594 are registered farms (no new data for registered farms for 2021 avilable). Some of the autorized farms operate with several different registration numbers, which leads to a higher number of farms in the disease-free status than there actually are. Published disease-free for VHS and IHN according to EU 2006/88 are 11 farms all data are retrieved from the national authorities data retrieved from: http://aquakultur.ehealth.gv.at/
Belgium *	140
Bulgaria	619
Cyprus	21
Czech Republic	1937
Denmark	205
Estonia	38 finfish farms and 23 grayfish farms.
Finland	977
France	670
Germany	13.231
Greece	366
Hungary	382
Ireland	63
Italy	914
Latvia	187
Lithuania	99
Malta	6
Netherlands	appr. 90
Poland	5191
Portugal	76
Romania	672
Slovakia	100
Slovenia	312 (including ciprinid farms, mixed farms)
Spain	353
Sweden	190
England and Wales *	241
Scotland	394
Northern Ireland	19 active fish farms
Croatia	107
Turkey	Marine farms: 432 Freshwater farms:1707 Marine+Freshwater farms: 96 Total number of fish farms: 2139
Albania	0
Bosnia and Herzegovina	34
Iceland	54
Norway	1258 (227 salmonid hatcheries, 990 salmonid sea sites, 41 marine sea sites)
Switzerland *	365
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	Approved disease-free	Eradication/control programme	In voluntary surveillance program	Not approved disease free and not under eradication/control program
	VHS			
Austria	17		1	259
Belgium				
Bulgaria	84	84	9	
Cyprus	8			
Czech Republic			1168	
Denmark	163	27		
Estonia	2	32		
Finland		28		
France	353	48		222
Germany	178	13	73	7037
Greece				63
Hungary		20		
Ireland	44			
Italy	207	14	239	188
Latvia				20
Lithuania				13
Netherlands				66
Poland	15			752
Portugal	26		2	
Romania		1	24	212
Slovakia		96		

Slovenia	34	2		193
Spain	111			22
Sweden	172			
England and Wales				
Scotland	80			
Northern Ireland	19			
Croatia		39		
Turkey				
Bosnia and Herzegovina		34		
Iceland	3		12	
Norway				1258
Switzerland				
Faroe Islands				
Malta				
Albania				
Serbia				
Republic of North Macedonia				
Total	1516	438	1528	10305

Country	Approved disease-free	Eradication/control programme	In voluntary surveillance program	Not approved disease free and not under eradication/control program
	IHN			
Austria	17		1	259
Belgium				
Bulgaria	84	84	9	
Cyprus	8			
Czech Republic			229	
Denmark	28	2		175
Estonia	2	32		
Finland				7
France	353	48		222
Germany	151	4	83	6689
Greece				63
Hungary		20		
Ireland	61			
Italy	206	10	226	183
Latvia				20
Lithuania				13
Netherlands				66
Poland	18			749
Portugal	26		2	
Romania			24	205
Slovakia		93		
Slovenia	34	2		193
Spain	92			16
Sweden	167			

England and Wales				
Scotland	371			
Northern Ireland	19			
Croatia		22		
Turkey				
Bosnia and Herzegovina		34		
Iceland	54			
Norway				1217
Switzerland				
Faroe Islands				
Malta				
Albania				
Serbia				
Republic of North Macedonia				
Total	1691	351	574	10077

Country	Approved disease-free	Eradication/control programme	In voluntary surveillance program	Not approved disease free and not under eradication/control program
	Inf. With HPRΔ ISAV			
Austria				277
Belgium				
Bulgaria		1		
Cyprus				
Czech Republic	255			
Denmark	182			
Estonia				
Finland				
France				
Germany	1079			300
Greece				63
Hungary				
Ireland	61			
Italy	601			
Latvia	5			
Lithuania				
Netherlands				66
Poland	767			
Portugal				
Romania	207			
Slovakia				
Slovenia				
Spain				
Sweden	174	not relevant	not relevant	not relevant

England and Wales				
Scotland	374			
Northern Ireland	19			
Croatia				
Turkey				
Bosnia and Herzegovina				
Iceland	3		30	
Norway	1 + 1 suspended zone	1		1214
Switzerland				
Faroe Islands				
Malta				
Albania				
Serbia				
Republic of North Macedonia				
Total	3727	2	30	1920

Specifics of KHV control program

Country	Are there control programs for the Cat. E disease KHVD ? (Y/N)	If yes, please specify how the program is implemented
Austria	No	
Belgium	No	
Bulgaria	Yes	no disese detected
Cyprus	No	
Czech Republic	Yes	The surveillance program was performed on selected farms once a year. In connection with legislative changes it was the last year of KHV surveillance program in the Czech Republic.
Denmark	No	
Estonia	No	
Finland		No
France		The program is implemented based on the previous program (directive 2006/88/CE)
Germany		Saxony: Program of the Saxon State Ministry for Social Affairs and Social Cohesion and the Saxon Animal Disease Fund for risk-based monitoring and voluntary control of koi herpesvirus

		infection (KHV-I) in carp in Saxon aquaculture farms (KHV program) from November 11th, 2021 (Saxony Official Journal 2022 No. 1 p. 12).
Greece	NO	
Hungary	No.	-
Ireland	Yes	Ireland has disease free status for KHVD under Commission Implementing Regulation (EU) 2021/260. One farm specialising in the production of ornamental fish including koi carp which is sampled every 4 years.
Italy	Yes	The Monticolo zone, a mountain region in South Tirol which achieved the KHV-free status in 2020, is performing the surveillance for maintaining the disease free status according to former EU Dec 2015/1554, that Italy has taken as reference for the national surveillance program for KHV in zone/compartment declared free.
Latvia	Yes	National active and pasive surveilance programme for KHV, VHS and IHN are in place since 2006. In active surveilance programmme are included only largest fish farms or those who pose a disease risk (restocking etc)
Lithuania	Yes	38 aquaculture establishments have carps and self-control as well state surveillance programme is implemented, ensuring, that the establishments are healthy.
Netherlands	No	
Poland	No	
Portugal	Yes	Active surveillance for KHVD. A notification system is also implemented

Romania	YES	1 sample/year
Slovakia	Yes	In our country we have a control for KHVD every year, in sommer. We examine samples of each fish farms is registered. It is 32 farms of carps now.
Slovenia	No	
Spain	NO	
Sweden	NO	
England and Wales		
Scotland	Y - KHV is still a listed disease in GB, as 1251/2008 is retained in GB law.	See 3.4
Northern Ireland	Yes	Disease testing of 4 sites
Croatia	Yes	During the transition period, CA supported active surveillance for 2021 and totally samples from 12 farms were submitted and all tested negative
Turkey	No	
Bosnia and Herzegovina		No
Iceland		

Norway	N	
Switzerland		

Faroe Islands

Malta	No	

Albania

Serbia

Republic of North Macedonia

Annex 3: Outbreaks of listed diseases

COUNTRY	2.1 Number of outbreaks			
	VHS	IHN	KHVD	ISA
Austria	1	4	2	
Belgium	1			
Bulgaria	no	no	no	no
Cyprus				
Czech Republic	2		6	
Denmark		8 farms, 3 put and take	2	
Estonia				
Finland		5		
France	1		4 in ornamental fish or put and take fisheries	
Germany	15	82	42	0
Greece				
Hungary			8	
Ireland				
Italy	3	1		
Latvia				
Lithuania				
Netherlands			3	
Poland				
Portugal				
Romania	1		1	
Slovakia			1	
Slovenia				
Spain				

COUNTRY	2.1 Number of outbreaks			
	VHS	IHN	KHVD	ISA
Sweden				
England and Wales				
Scotland				
Northern Ireland				
Croatia		1		
Turkey				
Bosnia and Herzegovina				
Iceland				1
Norway				25
Switzerland				
Faroe Islands				
Malta				
Serbia				
Total	**24**	**93**	**65**	**26**

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	no disesed fish detected							
Cyprus	Sea bass	In November 2021, high mortality rates on fish establishments were investigated in young and older fish with lesions on their eyes and snouts. Abnormal behaviour especially abnormal posture was presented in a big number of fish. Laboratory diagnosis was VNN.	Sea bass	Vibrio spp.				
Czech Republic	Common carp	carp oedema virus (CEV)						

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**
Denmark								
Estonia								
Finland	Several Salmonid species; land-locked salmon, brown trout, Baltic salmon and Coregonids affected most severely	Saprolegniosis: occurrence unpredictable, often associated with maturation of broodfish/spawning.	Rainbow trout	IPN genogroup 2 widely spread in many inland watersheds. May increase mortality, when in combination with bacteria (especially with flavobacteria).				
France								
Germany	See annex							
Greece	seabass-seabream	Pasteurellosis	seabream	Sparicotyliasis	red seabream	Myxosporidiasis	0	0
Hungary	-	0	0	0	0	0	0	0
Ireland	Atlantic salmon	Piscirickettsia salmonis	Atlantic salmon	Amoebic gill disease	Atlantic salmon	Cardiomyopathy syndrome	Atlantic salmon	Piscine reovirus
Italy	Acipenser gueldenstaedtii	AcIV-E infection: typical clinical sign include lethargy, anorexia, discoloration (yellowish or pale),	0	0	0	0	0	0

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**
		emaciation. Anatomopathological lesions may include skin and gill hemmorhages and hypermucosity, ascites, spleen atrophy.						
Latvia	Aeromonosis	lesions	0	0	0	0	0	0
Lithuania	0	0	0	0	0	0	0	0
Netherlands	Cyprinus carpio	1x CEV-disease (KSD) in private koi, 1x in pond carps with standard symptoms	Oncorhynchus mykiss	1x IPN in rainbow trout	0	0	0	0
Poland	0	0	0	0	0	0	0	0
Portugal	0	0	0	0	0	0	0	0
Romania	rainbow trout	Yersiniosis	rainbow trout	IPN	rainbow trout	mixobacteriosis	rainbow trout	Ichthyophthirius multifiliis
Slovakia	0	0	0	0	0	0	0	0

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
Slovenia	rainbow trout	RTFS, Aeromonas infections, red mouth disease, BKD	carp	parasites	0	0	0	0
Spain	Sea bass	Nodavirus	0	0	0	0	0	0
Sweden	Arctic char, brown trout	ASS	salmonids	Aeromonas except ASS or ASA	Baltic salmon and Baltic sea trout (wild, semi-wild)	unknown (see 3.5)	salmonids, inland zone	BKD
England and Wales	0	0	0	0	0	0	0	0
Scotland	Atlantic salmon	As listed in 3.2 plus sea lice and complex gill issues	0	0	0	0	0	0

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**
Northern Ireland	Rainbow and Brown trout	Furunculosis and Saprolegnia Fungus& Exo Parasites, Red Mark Sydrome	Salmon	Pancreas Disease	Goldfish (Closed system)	Cyprinid herpes virus	0	0
Croatia	European seabass	Vibrio harveyi, Tenacibaculum maritimum	Gilthead seabream	Sparicotyle spp., Photobacterium damselae subsp. piscicida	0	0	0	0
Turkey	Rainbow trout	IPN	0	0	0	0	0	0
Bosnia and Herzegovina	0	0	0	0	0	0	0	0

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**
Iceland	Atl. salmon and Arctic char	Some cases of Flavobact./Tenacibact. + winter ulcers	0	Occationally BKD, but just 1 new case in 2021 (Atl. salmon)	0	0	0	0
Norway	Atlantic salmon	0	0	0	0	0	0	0
Switzerland	Perch, Pike perch	Rhabdovirus infections in perch (PRV)	Rainbow trout	RTFS, BGD	0	0	0	0
Faroe Islands	Atlantic Salmon	Sea Lice, CMS, AGD, BKD, Vinter ulsers	Lumpsuckers	Patreurellosis, Tenacibaculum, Moritella viscosis	0	0	0	0
Malta	0	0	0	0	0	0	0	0
Serbia	0	0	0	0	0	0	0	0
Albania	0	0	0	0	0	0	0	0
Republic of North Macedonia	0	0	0	0	0	0	0	0

Annex 4a: Additional information

Germany

2.4. Describe problems with fish diseases in your country other than VHS, IHN, KHV or ISA:		
	State/Fish species	***Please describe disease or symptoms***
	Baden-Württemberg: rainbow trout rainbow trout char, rainbow trout rainbow trout rainbow trout	 RTFS ERM furunculosis ichthyophthiriosis BKD
	Bavaria: char, brown, sea and lake trout salmonids rainbow trout char, brown and lake trout	 bacterial diseases ichthyophthiriosis amoebic gill disease PKD
	Brandenburg: no reporting	
	Bremen: no farms	
	Hamburg: no farms	
	Hesse: salmonids rainbow trout goldfish sturgeons	 RTFS, Flavobacterium psychrophilum, ichthyophthiriosis IPN GHV SHV
	Mecklenburg-W. Pomerania: no reporting	
	Lower Saxony: no reporting	
	North Rhine-Westphalia: no report	
	Rhineland-Palatinate: no reporting	
	Saarland: No reporting	
	Saxony: carp rainbow trout Coregonus maraena other fish species	 CEV PKD, AGD furunculosis Aeromonas salmonicida ssp. salmonicida parasites
	Saxony-Anhalt: no reporting	

	Schleswig-Holstein: No reporting	
	Thuringia: rainbow trout rainbow trout rainbow trout	PKD / Tetracapsuloides bryosalmonaeRTFS / Saddle Back Disease / Flavob. psychrophilumERM / Yersinia ruckeri

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 (Oncorhynchus mykiss)	Rainbow Trout Fry Syndrome-RTFS	22 farms/33 cases
	rainbow trout (Oncorhynchus mykiss)	ERM	3 farms/5 cases
	arctic charr (Salvelinus alpinus), rainbow trout (Oncorhynchus mykiss)	Renibacterium salmoninarum- BKD	4 farms/4 cases
	charr, rainbow trout	furunculosis	8 farms/13 cases
	rainbow trout , brown trout	PKD	5 farms/5 cases
	koi	carp edema virus	2 farms/2 cases
Bavaria	rainbow trout/brown trout/sea trout, chars	*Aeromonas salmonicida*	60 cases
	rainbow trout/brown trout/sea trout, chars	*Yersinia ruckeri*	25 cases
	rainbow trout/brown trout/sea trout, chars	*Flavobacterium psychrophilum* (unter anderem RTFS)	98 cases
	grayling, rainbow trout	*Renibacterium salmoninarum*	7 cases
	rainbow trout/brown trout/sea trout, chars	*Tetracapsuloides bryosalmonae*	8 cases
	rainbow trout	CWSD/Red Mark Syndrome	5 cases

Brandenburg	trout/rainbow trout	Aeromonas salmonicida	2
	koi	Aeromonas hydrophila	3
	koi	Bacillus cereus	1
	perch	Proteus vulgaris	1
Bremen:	no farms		
Hamburg:	no farms		
Hesse	Gibel carp (Carassius gibelio)	Aeromonas salmonicida	1
	3x rainbow trout (Oncorhynchus mykiss)/ 1x trout (Salmo trutta)	cold water disease/Flavobacterium psychrophilum	4
	rainbow trout	Pasteurella langaaensis	1
Meckl.-W. Pomerania:	koi, gold fish, catfish (Clarias gariepinus), sturgeon	Aeromonas spp.	7
	rainbow trout	Vibrio spp.	3
	koi, sturgeon	Morganella morganii	2
Lower Saxony:	carp and koi (Cyprinus carpio)	Carp Edema Virus	14 / 13
	molly	Infectious Spleen and Kidney Necrosis Virus	1 /1
	rainbow trout	Red Mark Syndrome	2 / 1
	carp and koi (Cyprinus carpio)	CyHV-1	3 / 3
	salmon, ornamental fish	vibriosis	9 / 9
	rainbow trout	ERM	1 / 1
	rainbow trout	furunculosis	1 / 1
North Rhine-Westphalia:	rainbow trout	Aeromonas salmonicida ssp. salmonicida	1
	rainbow trout	Yersinia ruckeri	6
Rhineland-Palatinate:	0	0	0
Saarland:	No reporting		
Saxony:	pike	herpesvirus	1
Saxony-Anhalt:	rainbow trout	furunculosis	2

	rainbow trout	ERM	2
	rainbow trout	RTFS	1
Schleswig-Holstein:	No reporting		
Thuringia:	koi	Carp Edema Virus	2
	rainbow trout	Aeromonas salmonicida	2
	rainbow trout	Flavobacterium psychrophilum	4
	rainbow trout	Yersinia ruckeri	9

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***
Adriatic sturgeon (*Acipenser naccarii*)	Streptococcus iniae	1
Arctic char (*Salvelinus alpinus*)	Lactococcus garvieae	6
	Aeromonas salmonicida subsp. salmonicida	15
Barbel (*Barbus barbus*)	Aeromonas hydrophila	1
Brook trout (*Salvelinus fontinalis*)	Aeromonas salmonicida	1
	Pseudomonas fluorescens	1
	Lactococcus garvieae	1
	Carnobacterium maltaromaticum	3
	Renibacterium salmoninarum	1
Brown trout (*Salmo trutta*)	Aeromonas hydrophila/caviae	1 (mortaly in wildlife)
	Aeromonas salmonicida	2
	Yersinia aldovae	1 (mortaly in wildlife)
	Yersinia ruckeri biotipo 1	2
	Yersinia ruckeri biotipo 2	1
	Pseudomonas fluorescens	2
	Carnobacterium spp.	1
	Carnobacterium maltaromaticum	1
	Kocuria rhizophila	1 (mortaly in wildlife)
	Cystidicola farionis	1
	Lactococcus garvieae	1
	Nodular Gill Disease	1
	Gyrodactylus spp.	1
Carp (*Cyprinus carpio*)	Motile aeromonads (A. hydrophila/caviae/sobria/bestiarium/veronii)	52+1 (mortality in wildlife)
	Pseudomonas spp.	3
	Pseudomonas fluorescens	1
	Dactylogyrus spp.	2
	Shewanella putrefaciens	4

	Thricodinidae	1
Chub (*Squalius cephalus*)	Aeromonas hydrophila	1
Crucian carp (*Carassius carassius*)	Motile aeromonads (A. hydrophila/caviae/sobria/bestiarium/veronii)	4 (mortaly in wildlife)
	Vibrio vulnificus	1 (mortaly in wildlife)
	Shewanella putrefaciens	1 (mortaly in wildlife)
	Protozoa cysts	1 (mortaly in wildlife)
Danube sturgeon (*Acipenser gueldenstaedtii*)	Plesiomonas shigelloides	1
European eel (*Anguilla anguilla*)	Motile aeromonads (A. hydrophila/caviae/sobria/bestiarium/veronii)	4
	Streptococcus iniae	1
	Flavobacterium spp.	2
European perch (*Perca fluviatilis*)	Eustrongylides excisus	5
Gilthead seabream (*Sparus aurata*)	Motile aeromonads (A. hydrophila/caviae/sobria/bestiarium/veronii)	1
	Pseudomonas spp.	1
	Vibriosis (V. anguillarum, V. alginolyticus, V. damselae, V. parahaemolyticus)	16
	Vibrio harveyi	4
	Vibrio scophtalmi	1
	Photobacterium damselae subsp. damselae	4
	Photobacterium damselae subsp. piscicida	4
	Photobacterium damselae	2
	Chryseobacterium indologenes	1
	Monogenea	1
	Cryptocarion spp.	2
	Tenacibaculum spp.	2
Goldfish (*Carassius auratus*)	Motile aeromonads (A. hydrophila/caviae/sobria/bestiarium/veronii)	4
Grayling (*Thymallus thymallus*)	Aeromonas salmonicida subsp. salmonicida	1
Largemouth black bass (*Micropterus salmoides*)	Eustrongylides excisus	3
Leucos aula	Aeromonas hydrophila	1
Marble trout (*Salmo trutta marmoratus*)	Aeromonas salmonicida subsp. salmonicida	1
	Aeromonas spp.	1
	Flavobacterium spp.	1
	Monogenea	1
	Tricodina	1
Pumpkinseed (*Lepomis gibbosus*)	Eustrongylides excisus	7
Rainbow trout *(Oncorhynchus mykiss)*	Motile aeromonads (A. hydrophila/caviae/sobria/bestiarium/veronii)	7

	Aeromonas salmonicida	4
	Aeromonas salmonicida subsp. salmonicida	11
	Yersinia ruckeri	29
	Yersinia ruckeri biotype 1	11
	Yersinia ruckeri biotype 2	10
	Flavobacterium spp.	24
	Flavobacterium psichrophylum	2
	Lactococcus garvieae	26
	Plesiomonas shigelloides	2
	Shewanella spp.	11
	Chryseobacterium spp.	6
	Carnobacterium maltaromaticum	2
	Renibacterium salmoninarum	2
	Nodular Gill Disease	10
Salema (*Salpa salpa*)	Vibrio scophthalmi	1
	Vibrio finisterrensis	1
Seabass (*Dicentrarchus labrax*)	Vibriosis (V. anguillarum, V. alginolyticus, V. spp)	16
	Vibrio harveyi	36
	Vibrio anguillarum	4
	Chryseobacterium indologenes	1
	Motile aeromonads (A.veronii/ A.veronii biovar. sobria)	6
	Photobacterium damselae subsp. piscicida	7
	Photobacterium damselae subsp. damselae	1
	Trichodina spp.	2
	Diplectanum spp.	5
	Tenacibaculum dicentrarchi	1
Sturgeon (*Acipenser spp.*)	Motile aeromonads (A. hydrophila/caviae/sobria/bestiarium/veronii).	11
	Pseudomonas spp.	3
	Citrobacter freundii	3