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Fish Health Unit
Report of Activities Undertaken in 2018 and 2019

Bill Dore

Ayesha Power

Eoghan Kenny

Finola Bradley

Deborah Cheslett

Samantha White

Una McCarthy

Neil Ruane

Foras na Mara
Marine Institute

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Bill Dore, Ayesha Power, Eoghan Kenny,

Finola Bradley, Deborah Cheslett, Samantha White,

Una McCarthy and Neil Ruane

Fish Health Unit,

Marine Institute,

Rinville,

Oranmore,

Co. Galway

www.marine.ie

https://www.fishhealth.ie/fhu/

EXECUTIVE SUMMARY

This report summarises the activities undertaken by the Fish Health Unit (FHU) of the Marine Institute (MI) in 2018 and 2019. The services of the FHU, undertaken on behalf of the State, are largely driven by European and national legislation on aquatic animal health. European Council Directive 2006/88/EC on animal health requirements for aquaculture animals lays down rules for the control of aquatic animal health within the EU. The directive is enacted in Irish Law by Statutory Instrument (SI) 261 of 2008. The MI is the Competent Authority (CA) responsible for implementation of aquatic animal health regulation in Ireland as described in these statutes.

Aquatic animal health regulations in SI 261 of 2008 apply to finfish farms, shellfish farms, and put and take fisheries, and require that such aquaculture production businesses (APBs) obtain a Fish Health Authorisation (FHA) from the CA prior to operation. To receive an FHA, APBs must submit a fish health management plan (FHMP) to the CA for review and approval. The plan addresses, amongst other things, how aquatic animal health will be maintained, and diseases controlled, along with the mandatory conditions for record keeping and reporting to the CA. In addition to issuing FHAs to APBs, the CA conducts regular health surveillance of fish and shellfish farms. The CA is also responsible for regulating the movement of aquatic animals within Ireland and during import or export to and from the state.

The MI hosts the National Reference Laboratories (NRLs) for finfish, mollusc and crustacean health. Testing conducted by the NRLs directly supports the implementation of the aquatic animal health controls in Ireland. NRL staff are also actively engaged in applied research to continually address disease diagnosis, treatment and management issues.

This is the first published report of the activities associated with the functioning of the FHU. The aim of the report is to provide all stakeholders with an insight of the role the MI FHU plays in the application of aquatic animal health regulations. Through the publication of this report, the MI hopes to build a greater understanding of the issues relating to aquatic animal health in Ireland with a view to increasing engagement with all stakeholders.

Fish Health Authorisations. During 2018 and 2019, the CA maintained fish health authorisations (FHAs) for 456 APBs involved in the production of fish or shellfish. The majority (319) of these APBs were associated with shellfish farming. In addition, the CA maintained FHAs for 64 put and take fisheries. In total, 16 new FHAs were issued to APBs during the two-year period.

Health Surveillance. A key feature of aquatic animal health control is implementation of effective surveillance programmes for early detection of health issues coupled with inspection to ensure APB compliance with regulations. As part of a risk-based surveillance scheme, Department of Agriculture Food and the Marine (DAFM) Veterinary Inspectors (VIs) and FHU staff undertook 384 (191 in 2018 and 193 in 2019) inspections of FHA holders in

Ireland under the direction of the CA. These inspections resulted in one compliance notice being served to an oyster producer in 2018 for a continued failure to maintain mandatory records. Targeted surveillance was carried out for diseases of national importance. This involved sampling aquatic animals from representative sites and laboratory testing for identified pathogens in the NRLs. Based on this testing, existing disease-free status was maintained for diseases listed as notifiable in EU directive 2006/88/EC.

Aquatic Animal Movements. In order to prevent the introduction or spread of diseases movements of aquatic animals are controlled by the CA. Movements must be approved in advance. Approval is given depending on the health status in the originating and receiving sites which is checked by the CA on a case-by-case basis. The CA approved 2,205 movements of molluscan shellfish, principally oysters, in 2018 and 2019 combined. These approvals included national movements, imports and exports. To facilitate exports, health certification was provided for 552 individual consignments of molluscs requiring physical inspection on 111 occasions. The CA approved 210 movements of salmon and salmon ova (eggs). To facilitate exports, health certification was provided for 108 individual consignments of salmon or salmon ova. In addition, the CA approved 827 movements associated with the importation of ornamental aquatic animals into Ireland.

Disease notifications and outbreaks. In May 2019, an isolated outbreak of koi herpesvirus disease (KHVD) occurred in an enclosed garden pond in in the Midlands. KHVD is listed as a notifiable disease in EU directive 2006/88/EC and Ireland is declared free of this disease. The outbreak was contained, fish culled, and the pond disinfected under the supervision of the CA. These control measures allowed Ireland to maintain disease free status for KHV. No other diseases listed as notifiable were reported in Ireland in 2018 and 2019. There were, however, notable simultaneous outbreaks of koi sleepy disease in two angling venues in Co. Cork in April 2018. This was the first recorded outbreak of this disease in Ireland outside of an enclosed garden pond. Both outbreaks of koi sleepy disease were successfully contained through cross-agency action with Inland Fisheries Ireland and no further spread of disease was detected. There was a further outbreak of crayfish plague in the river Barrow in August 2018. The presence of crayfish plague was first detected in this river system in 2017. Crayfish plague is listed as a notifiable disease by World Health Organisation for Animal Health (OIE) but not in Council Directive 2006/88/EC). Crayfish Plague was also confirmed in new sites on the river Al in Co. Westmeath 2018 and in the River Maigue in Co. Limerick and in the River Slate in Co. Kildare in 2019. These further outbreaks of crayfish plague highlight an increasing spread of this disease in Ireland. In September 2018, an outbreak of oyster herpesvirus 1 microvariant (OsHV-1µVar) was confirmed at a production site in Poulnasherry Bay. Previously this bay was listed as disease free for oyster herpes virus under national measures implemented under article 43 of Directive 2006/88/EC.

In summary, fish health inspection and monitoring activities undertaken in 2018 and 2019 demonstrate a high level of compliance with statutory requirements in EU directive 2006/88/EC and associated national legislation. Furthermore, the continued implementation of statutory controls by state agencies in Ireland and with the support of all stakeholders ensured a high health status for aquatic animals in Ireland was maintained in 2018 and 2019.

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ABBREVIATIONS USED IN THIS REPORT

AGD	Amoebic gill disease
APB	Aquaculture Production Business
BIM	Bord Iascaigh Mhara
BKD	Bacterial kidney disease
CA	Competent Authority
CMS	Cardiomyopathy syndrome
DAFM	Department of Agriculture, Food and the Marine
EU	European Union
EURL	European Union Reference Laboratory
FHA	Fish Health Authorisation
FHMP	Fish Health Management Plan
FHU	Fish Health Unit
INAB	Irish National Accreditation Board
ISO	International Organisation for Standardisation
MI	Marine Institute
NPWS	National Parks and Wildlife Services
NRL	National reference Laboratory
NSAI	National Standards Authority of Ireland
OIE	World Organisation for Animal Health
OsHV1-µVar	Oyster herpesvirus 1 microvariant
PD	Pancreas disease
PMCV	Piscine myocarditis virus
PVP	Private Veterinary Practitioner
SI	Statutory Instrument
SVC	Spring viraemia of carp
TRACES	Trade Control and Expert System

1 INTRODUCTION

This report describes the activities undertaken by the Marine Institute (MI) Fish Health Unit (FHU) in 2018 and 2019 to deliver its responsibilities in the area of aquatic animal health under EU Council Directive 2006/88/EC and Statutory Instrument (SI) 261 of 2008 on behalf of the State. The activities of the FHU is delivered through two complementary services, that of the Competent Authority (CA) which regulates aquatic animal movements and health management; and the National Reference Laboratories (NRLs) for fish and shellfish diseases, which conducts standardised testing and applied research to support the mission of the CA. The purpose of this report is to provide all stakeholders with an improved understanding of the operations of the MI in this area of work, and the findings encountered by the FHU in 2018 and 2019. MI activities associated with the control of sea lice on salmon farms is not included in this report and is reported separately. (Sea Lice Report 2018) (Sea Lice Report 2019)

2 REGULATORY BACKGROUND AND FHU RESPONSIBILITIES

2.1 European and National Regulation

The FHU is the CA responsible for the implementation of aquatic animal health legislation in Ireland. The primary legislation in this regard is EU Council Directive 2006/88/EC. Published in 2006, the directive provides detailed rules on animal health requirements for aquaculture animals and products thereof, and on the prevention and control of certain diseases in aquatic animals. Directive 2006/88/EC was enacted in Irish Law in SI 261 of 2008 (as amended). The Council directive and associated national legislation provides a comprehensive risk-based approach to aquatic animal health management. Amongst other conditions, detailed rules and controls for aquatic animal health are given for the following areas:

- Authorisation and registration of aquaculture production businesses (APBs);
- Fish health surveillance;
- Control of the movement of aquatic animals;
- Disease notification and control

The CA office in the FHU of the MI is responsible for the overall implementation of these controls in Ireland.

2.2 Authorisation and Registration of Aquaculture Production Businesses (APBs)

All aquaculture production businesses (APBs), put and take fisheries, plants processing round (i.e. ungutted) fish, and specialist transporters of aquatic animals must register with the CA. The CA issues a fish health authorisation (FHA) once it is satisfied that the establishment meets all relevant regulatory fish health requirements. As part of the authorisation process, each APB must produce a Fish Health Management Plan (FHMP). A FHMP plan requires APBs to identify biosecurity measures relevant to their operation and demonstrate how it will comply with regulatory animal health requirements. The FHMP is approved by the CA. A register of authorised establishments is available on the FHU website (APB Register). In addition, importers of cold-water ornamental aquatic animals to closed facilities that do not discharge to the environment must register with the CA but are not required to hold a fish health authorisation.

2.3 Disease Notification and Control

A fundamental element of the EU Council Directive 2006/88/EC is the requirements for APBs to monitor the health of their animals and to notify the CA on the presence or suspected presence of a disease listed in Annex IV of the directive. In the event of detection of a notifiable disease, the directive provides specific details on the obligations of the member state, through the CA, to report the outbreak to the EU and take measures to prevent the spread of the disease within member states and the EU.

In addition, over and above the regulatory reporting requirements, notification schemes exist in Ireland for increased mortalities in aquatic animals present in APBs in both the oyster and salmon aquaculture sectors. These schemes are voluntary and are currently facilitated and monitored by the CA and NRLs in the FHU. These reporting schemes are described further in the relevant mortality reporting sections in this report for each of these aquaculture sectors.

2.4 Aquatic Animal Health Surveillance

A key requirement of fish health controls under EU Council Directive 2006/88/EC is for member states to implement an active health surveillance programme. This programme is based primarily on inspection of APBs supported by targeted surveillance for specific diseases.

The frequency of the health surveillance inspections is risk-based and is determined on the likelihood of disease introduction or spread at individual sites. Generally, high-risk sites are inspected annually, medium risk sites every two years and low risk sites every four years. The major factors for determining the risk of introduction and spread of disease, the criteria by which sites are categorized for inspection frequency, is the number of movements of aquatic animals in and out of the site and the proximity to other sites in the production area. To implement the health surveillance inspection programme, DAFM veterinary inspectors (VIs) conduct on-the-ground site inspections and health visits at aquaculture sites under the supervision of the CA. In addition, targeted surveillance is carried out for certain diseases for which Ireland is declared free, either on a countrywide basis or in identified zones. This involves testing susceptible aquatic animals for specific disease pathogens using test methods recognised in EU regulation or in the World Organisation for Animal Health (OIE) Manual of Diagnostic Tests for Aquatic Animals.

In addition to the health surveillance programme implemented by the CA, APBs are required in 2006/88/EC to undertake their own health surveillance, using Private Veterinary Practitioners (PVPs) where appropriate for the aquaculture production system. As well as advising APB operators directly on aquatic animal health issues, PVPs undertaking this surveillance are required to report immediately the suspicion of notifiable or unexplained emerging diseases to the CA. This industry-based surveillance forms a critical part of the overall health surveillance programme in Ireland and elsewhere in Europe.

2.5 Control of the Movement of Aquatic Animals

Directive 2006/88/EC and SI 261 of 2008 provide detailed rules on the control of the movement of aquatic animals between aquaculture sites to protect the health status of the receiving aquaculture site. Any movement of aquaculture animals from one APB to another for farming or restocking purposes requires approval by the CA prior to that movement occurring. Other movements of aquatic animals may also require approval. Online applications to move aquatic animals are facilitated through the MI Fish Health Website.

2.6 Internal (national) Movements

Movements of aquaculture animals within Ireland may only occur between authorised APBs. An application for approval of such movements must occur at least 72 hours prior to the intended movement. Each application is assessed by the CA considering the following details where relevant:

- The health status of the zones of origin and destination. (The originating area must have at least the same or better health status as the final destination).
- The susceptibility to disease of the species moved and at the receiving site.
- Whether or not there are clinically diseased animals or unresolved mortalities at the origin site.
- Veterinary inspection reports.
- Any other factors relevant to aquatic animal health.

Figure 1. Specialised transport wellboat for moving salmon between sites. Such movements require approval by the CA office in the Marine Institute and strict biosecurity measures are applied to prevent potential spread of aquatic pathogens.

2.7 Imports and Exports within the EU

Any cross-border movement of live aquaculture animals that will be re-immersed in the aquatic environment must be notified to the CA in the receiving country via the EU's Trade Control and Expert System (TRACES). TRACES is a web-based veterinary certification tool used by the European Union for controlling the import and export of all live animals and animal products within and without its borders. Approved imports are reconciled with the corresponding TRACES certificate from the country of origin by the CA. TRACES certificates are, in-turn, generated by the CA for exports originating from Irish APBs. On many occasions,

a TRACES notification is sufficient for the CA to approve an import into Ireland. However, for movements of susceptible or vector species between areas subject to disease surveillance programmes, full health certification and inspection within 72 hours prior to departure may be required. In such cases, inspection and health certification for export is performed on the ground by Department of Agriculture Food and the Marine (DAFM) VIs at the request of the CA.

2.8 Competent Authority Office Operations

The CA office is responsible for delivery of all tasks associated with the implementation of aquatic animal health controls in Ireland. To deliver this programme the MI works closely with DAFM VIs who undertake on the ground inspections of APBs on a regionalised basis. A Service Level Agreement is in place between the MI and DAFM veterinary services to ensure inspections are delivered to agreed protocols and standards. The CA Office maintains a quality management system which was first certified by the National Standards Authority of Ireland (NSAI) in 2014 and transitioned to the requirements of ISO 9001:2015 which the CA are now certified to. This commitment to quality has enabled the CA Office to ensure that best operational practices are adhered to. Under this certification scheme delivery of the work programme is audited independently by NSAI on an annual basis. In 2018 and 2019, the CA office successfully passed the annual audit visits by the NSAI, as it has every year since initial certification in 2014.

2.9 National Reference Laboratories

The National Reference Laboratories (NRLs) for aquatic animal health in Fish, Molluscs and Crustaceans in Ireland reside in the FHU in the MI. The NRLs form part of a network of reference laboratories in EU member states under the direction of the relevant EU Reference Laboratory. The roles of the NRLs are set out in Annex VI part II of EU Council Directive 2006/88/EC. Most importantly, the NRLs provide the CA with testing services for the notifiable aquatic animal diseases listed in EU Council Directive 2006/88/EC and other diseases of national importance using internationally recognised and standardised methods. Tests used to detect the major diseases of concern in the directive and of national importance to Ireland are accredited to ISO 17025 standards. Accreditation is awarded by the Irish National Accreditation Board (INAB). The MI passed its annual ISO 17025 surveillance inspection in 2018 and 2019.

Figure 2. Delivery of regulatory programmes for aquatic animal health in Ireland is a collaborative approach between the competent authority, NRLs and DAFM veterinary services.

2.10 Significant Aquaculture Sectors in Ireland

Aquaculture is a significant economic activity in Ireland and in 2019 primary aquaculture production was worth €172 million BIM The Business of Seafood 2019. The primary products were salmon (€110 million), oysters (€44 million) and mussel (€14 million) with other fish (€2 million) and shellfish (€2 million) species making up the rest of the production. In addition to aquaculture production, significant industries exist around put and take fisheries (angling) and the trade in ornamental aquatic animals that are also subject to control under EU Council Directive 2006/88/EC.

Figure 3. Salmon (top) and Pacific oyster (bottom) production are the two largest aquaculture activities in Ireland and much of the work of the FHU is directed to application of legislation and control of aquatic animal health in these two sectors.

3 MOLLUSCAN SHELLFISH ACTIVITIES

3.1 Fish Health Authorisations (FHAs)

In 2018 and 2019, the CA maintained 319 FHAs for shellfish APBs. These were divided between APBs producing Pacific oysters (54%), mussels (32%), multiple species (13%) and other species. During 2018 and 2019, 16 new authorisations were issued, and 24 authorisations were revoked. Revocations of all FHAs that occurred in 2018 and 2019 were due to business closures, not violations of FHA conditions.

3.2 Shellfish Health Surveillance Programme Inspections

There is a relatively high frequency of animal movements associated with the majority of APBs producing Pacific oysters in Ireland. Consequently, APBs producing Pacific oysters are generally categorised as 'medium risk' sites and are therefore inspected every two years. Conversely, APBs producing mussels and other shellfish species are associated with fewer movements of animals and are therefore categorised as 'low risk' site and are generally inspected every four years. This inspection frequency may increase at individual sites where ongoing compliance issues are identified. In 2018 and 2019, 258 shellfish APBs were inspected as part of the annual surveillance programmes (Table 1). Minor non-compliances were detected during 81 inspections. These were primarily associated with failure to keep certain records. Seven inspections were associated with medium non-compliances which, in all cases, were triggered by continuing lack of record keeping over two successive inspections. One inspection was associated with a serious non-compliance based on a continuous and ongoing lack of any record keeping by the operator. In this case, the operator was issued with a compliance notice requiring them to comply with all requirements associated with their FHA and were re-inspected to ensure compliance.

Table 1. Shellfish Health Surveillance Inspections in 2018 & 19 and associated non-compliance findings.

Year	Inspection Type	No. Inspected in 2018	No. of APBs inspected with non-compliances (% of FHAs inspected)		
			Minor	Medium	Serious
2018	Pacific oysters	86	30 (35)	4 (5)	1 (<1)
	Mussels	29	6 (21)	0 (0)	0
	Multiple species	15	4 (27)	1 (7)	0
	Other	1	0 (0)	1 (100)	0
	Total	131	40 (31)	6 (5)	1 (<1)
2019	Pacific oysters	78	27 (35)	1 (1)	0
	Mussels	21	6 (29)	0	0
	Multiple species	20	6 (30)	0	0
	Other	3	2 (67)	0	0
	Total	127	41 (33)	1 (<1)	0

Minor non-compliance – *Minor shortfalls in record keeping. Minor housekeeping issues*
Medium non-compliance – *Ongoing and repeated issues with record keeping or housekeeping issue*
Serious non-compliance – *Operator has failed in his duties to an extent that the health status of bay or country may be affected (e.g., failure to inform CA of movements of shell or failure to report mortalities). This designation may also be used where there has been a continued disregard of minor or medium non-compliances identified in previous inspections. A serious non-compliance will normally result in in a compliance notice being issued. Failure to implement the compliance notice within the specified time limit can result in a revocation of the FHA.*

3.3 Targeted Surveillance

During 2018 and 2019, targeted surveillance continued for a number of shellfish diseases listed in EU Council Directive 2006/88/EC and those covered under national measures specifically applicable for Ireland. Specific monitoring was undertaken to maintain disease free status for two mollusc diseases, namely *Bonamia ostreae* and OsHV-1µVar. *Bonamia ostreae* is a listed disease in EU Council Directive 2006/88/EC that affects native oysters (*Ostrea edulis*) and is caused by a *haplosporidia* protozoan parasite. The only active native oyster fishery in Ireland that is recognised to be free from *B. ostreae* is Tralee Bay. A sample of 150 native oysters from Tralee Bay was tested for the presence of *B. ostreae* in both 2018 and 2019 by microscopic examination. Results confirmed that the site remains free from the presence of the parasite.

At the beginning of 2018, six areas in Ireland were declared free from OsHV-1µVar. This virus generally infects juvenile Pacific oysters (seed and spat) and can cause significant mortalities in this population. OsHV-1µVar is not a listed disease agent in Directive 2006/88/EC, however, it is controlled under national measures for Ireland. Hence, the FHU monitors Pacific oyster growing areas for its presence or absence (*aka* disease free status). This allows Ireland to place restrictions on oysters moving in and out of these disease free bays. Targeted surveillance testing of 30 animals was conducted for the presence of OSHV-1 µVar in each bay declared disease free in 2018. This targeted surveillance demonstrated that the 6 areas were free from the virus. However, in September 2018, a separately reported oyster mortality event in Poulnasherry Bay was confirmed to be caused by OsHV-1µVar. Previously, this production area was designated OsHV-1µVar disease free. The EU commission (DG SANTE) was informed of the outbreak on 26th September 2018 and Poulnasherry Bay was removed from the list of OsHV-1µVar disease free areas in Ireland. All the production areas now designated as OsHV-1µVar disease free in Ireland are shown in Figure 4. All these five areas were tested for the presence of the virus during 2019 and laboratory analysis demonstrated that all areas remained free of OsHV-1µVar.

In addition to targeted surveillance for *B. ostreae* and OsHV-1 µVar, fifteen bays were screened in both 2018 and 2019 for general pathology by histological examination. No significant pathology was associated with this screening.

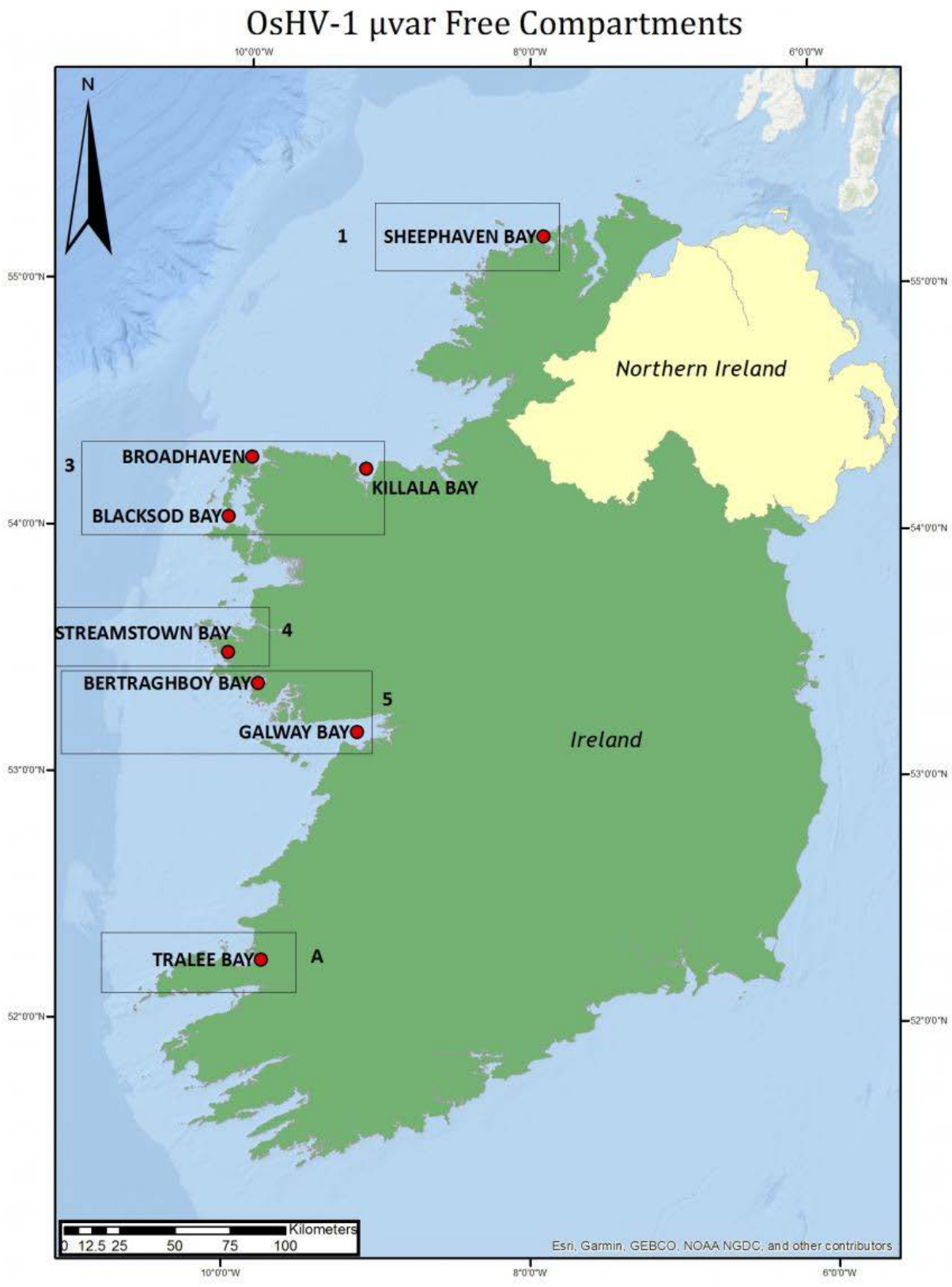

Figure 4. Oyster growing areas (compartments) in Ireland designated free of oyster herpesvirus (Os-HV-1 µVar) at the end of 2019. In 2018, Poulnasherry Bay was confirmed as a OsHV-1 µVar positive site and was removed from the list of disease free sites in Ireland.

3.4 Shellfish Movements

3.4.1 Internal (national) Movements

In total, over 2018 and 2019 the CA approved 777 movements of molluscan shellfish within Ireland. Most of these shellfish movements (751) were associated with the trade in Pacific oysters reflecting both the size and nature of Pacific oyster culture in Ireland.

3.4.2 Imports and Exports within the EU

The number of international movements of shellfish approved by the CA in 2018 and 2019 are shown in Table 2 below. Overall, in the two years, over 1.3 billion seed oysters were imported into Ireland in 682 approved movements. Most of these importations were from France. This highlights the reliance of the Irish oyster industry on supply of seed from France and the importance of the health status of the oyster seed originating from France.

Table 2. National and International Movements of Shellfish Approved by the Competent Authority of the Marine Institute in 2018 and 2019

Year	Species	No. national approvals issued (weight in tonnes or No. in millions)	No. import approvals issued (weight in tonnes or No. in millions)	No. export approval issued (weight in tonnes or No. in millions)
2018	Pacific oyster	320 (2,068 T)	50 (549 T)	278 (1,729 T)
	Pacific oyster seed	38 (26.7 M)	337 (664.7m)	13 (15 M)
	Mussel	10 (1,101 T)	3 (538 T)	7 (49.34 T)
	Mussel seed	4 (36.4 T)	2 240 T)	6 (348 T)
	Total movements	372	392	304
2019	Pacific oyster	370 (2,554 T)	44 (398 T)	309 (2,024 T)
	Pacific oyster seed	23 (35.5 M)	345 (677 M)	6 (4 M)
	Mussel	5 (465 T)	2 (203 T)	12 (74 T)
	Mussel seed	7 (124 T)	3 (609 T)	11 (370 T)
	Total movements	405	394	338

For most mollusc movements into and out of Ireland, a TRACES notification is sufficient to allow movement as the molluscs are moving to an area of equivalent or lesser health status to that in the bay of origin. TRACES notifications are monitored and approved by the CA office. To facilitate shellfish exports, in 2018 and 2019 757 applications were processed and notifications posted on TRACES by the CA. In addition, 114 physical inspections by DAFM VIs and FHU staff was required to sign health certificates. It should be noted that a movement approval issued by the CA can often cover more than one consignment of molluscs and

therefore the number of notifications posted on TRACES is greater than the number of movement approvals issued for exports by the CA.

3.5 Shellfish Disease Notifications

3.5.1 Mortality reporting

Oyster producers are required to keep details of all increased mortalities. Where mortalities at a given point in the production cycle are significantly above those expected under prevailing conditions, mortalities are notified to the CA. For Pacific oyster related mortalities, reporting trigger levels have been introduced:

- Seed and spat – report at mortalities of 30% or above
- Half-grown and adults – report at mortalities of 10% or above

In 2018, reports of increased mortalities associated with seed and spat oysters were received from 16 APBs operating in seven different bays. Mortalities associated with half-grown and adult oysters were reported from 26 APBs operating in 14 different bays. In 2019, reports of increased mortalities associated with seed and spat oysters were received from 15 APBs operating in 9 different bays. Mortalities associated with half-grown and adult oysters were reported from 28 APBs operating in 16 different bays (Table 3). Over the two years, laboratory investigations were completed on 18 samples associated with mortality in oyster spat and seed and OsHV-1µVar was detected in seven samples. The endemic bacterial pathogen of oysters, *V. aestuarianus* was also detected in seven of these samples. *V. aestuarianus* was further detected in 31 of 34 samples associated with increased mortality in half-grown or adult oysters.

Mortality reporting and associated laboratory investigations indicated a significant increase in mortality events associated with *V. aestuarianus* in both 2018 and 2019 compared with the previous two years. However, mortality events associated with *V. aestuarianus* in the either 2018 or 2019 did not reach the peak recorded mortalities that occurred in 2015. The number of bays recording mortalities were similar in 2018 and 2019. However, it was notable that mortality events in 2019 impacted bays with a larger production of oyster compared with those impacted in 2018. *V. aestuarianus* associated mortalities cause a severe economic impact on the oyster industry. *V. aestuarianus* is not a listed disease in EU Council Directive

2006/88/EC nor is it controlled by national measures in Ireland. The cause of the increased mortalities in 2018 and 2019 compared with 2016 and 2017 are unclear. However, it is recognised that factors influencing the extent of oyster mortalities are multifactorial and links to several environmental factors are possible.

In 2019, bacteria belonging to the *Vibrio splendidus* clade were also co-isolated with potential pathogens during mortality events in both spat and adults. The potential involvement of *Vibrios* belonging to the *V. splendidus* clade during mortalities has been described in France since the late 1990s and whilst they have been detected on several occasions in Ireland the evidence for their involvement in mortality events in 2019 is stronger than previously observed. Further investigation of the potential role of the *V. splendidus* clade on oyster mortalities is warranted.

In 2018 and 2019, mortality events associated with OsHV-1µVar were less significant than those associated with *V. aestuarianus* infections. However, OsHV-1µVar infection can cause significant mortality in seed and spat oysters and remains economically devastating on an individual APB basis. Despite this, there is increasing evidence that some oysters produced in French hatcheries in recent years may have an increased resistance to the virus. There is also practical evidence from industry that improved management procedures have been adopted that have reduced the impact of this virus in Irish oyster production. It is now clear that infection with *V. aestuarianus* is the more significant challenge to the industry, compared to infections associated OsHV-1Var infection.

Table 3. Mortality Reports for Pacific Oysters received by the Competent Authority in the Marine Institute in 2018 & 2019

year	Age Class	No Bays reporting mortality	No. Mortality reports	No. of samples received	Primary Pathogen Detected	
					OsHV-1µVar	*V. aestuarianus*
2018	Spat/Seed	7	16	8	5	4
	Half Grown/Adult	14	26	16	0	15
2019	Spat	9	15	10	2	3
	Half Grown/Adult	16	28	18	0	16

No mortality or disease events were reported to the CA for other molluscan shellfish species in 2018 and 2019.

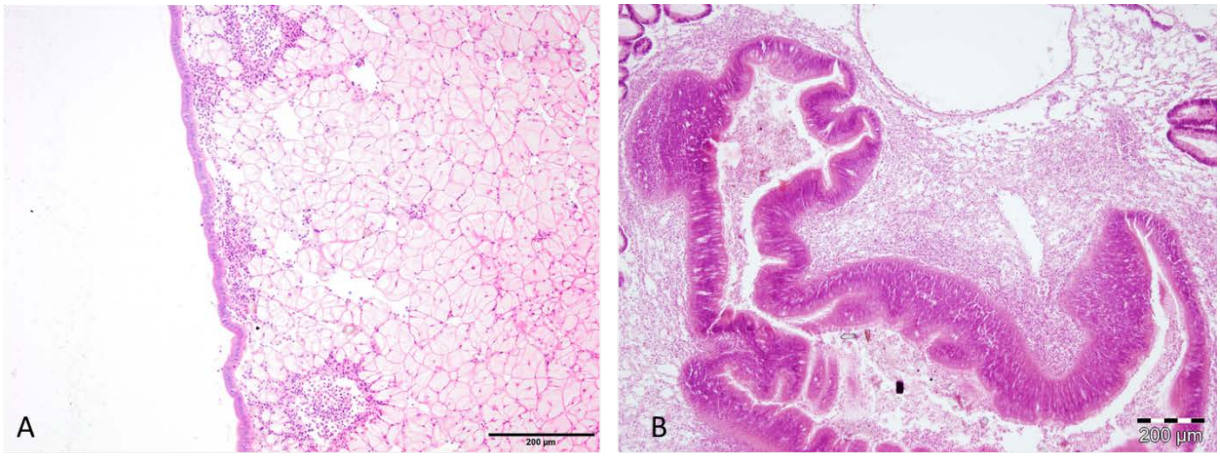

Figure 5. Histopathology associated with the two major pathogens causing disease in Pacific oysters. Haematoxylin and eosin stains of (A) Sinus and mantle pathology associated with *Vibrio aestuarianus* infection and (B). Haemocytic infiltration of the connective tissue associated with the presence of oyster herpes virus.

4 SALMON FARMING ACTIVITIES

Atlantic salmon production is the largest aquaculture activity in Ireland by value. In 2019, it is estimated that salmon production was worth €110 million at the point of first sale. Salmon are usually farmed in two stages. First, the salmon are hatched from eggs and raised in land-based freshwater tanks. When they are 12 to 18 months old the juvenile salmon, called smolts, are transferred to floating sea cages or net pens anchored in sheltered bays along the coast. For fish health purposes the term smolt is considered to relate to salmon that have undergone the physiological changes required to adapt to the marine setting through the process of smoltification and are ready to transfer to sea. Once in sea cages the salmon are then held for another 12 to 24 months, when they are harvested for processing. This production cycle influences where health surveillance is targeted in the salmon aquaculture sector.

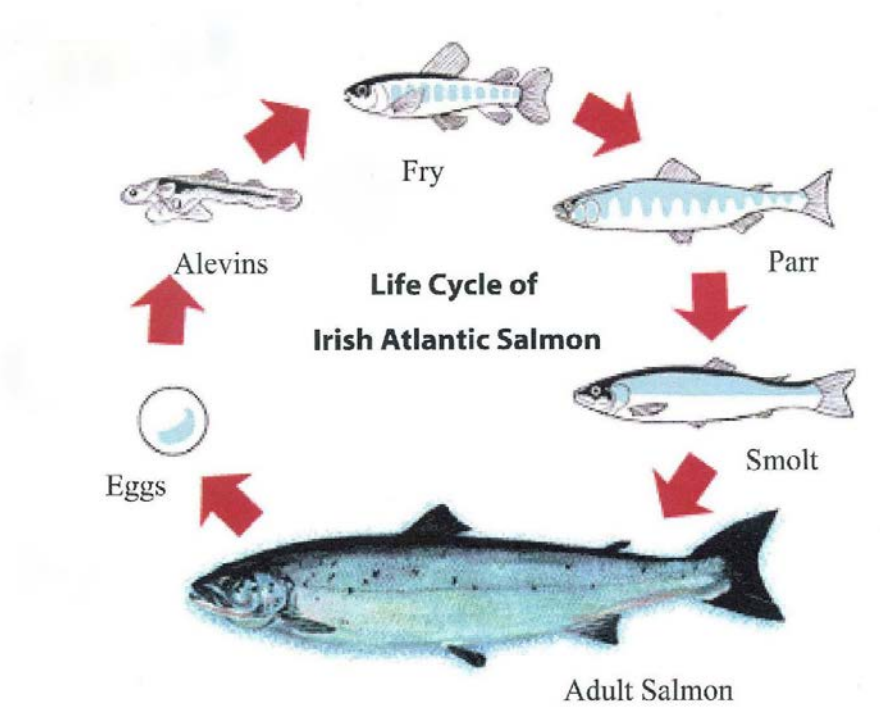

Figure 6. Life cycle of Atlantic salmon. Salmon have a juvenile freshwater stage and an adult seawater stage. This life cycle determines how salmon aquaculture production is performed and therefore how the Competent Authority organises health surveillance activities for this aquaculture sector in Ireland.

4.1 Fish Health Authorisations for Salmon Sites

During 2018 and 2019 a total of 57 production sites held a FHA related to salmon production in Ireland. Of these sites, 47 were operational in 2018. This included 22 freshwater/hatchery sites and 25 marine farm sites. Fifty-three sites were operational in 2019, 23 of these were freshwater /hatchery sites and 30 marine farm sites.

4.2 Salmon Health Surveillance

4.2.1 Inspections

All marine production sites and most land-based freshwater sites including hatchery sites are designated as high-risk facilities for the purposes of the health surveillance programme. These high-risk sites are therefore inspected annually. In 2018, all operational marine sites (25) and 16 freshwater sites were inspected as part of the annual health surveillance programme. In 2019, all operational marine sites (30) and 21 freshwater sites were inspected as part of the annual health surveillance programme (Table 4.).

Minor non-compliances, primarily associated with failure to keep fully completed records, were observed during 25 of inspections undertaken in 2018 and 2019. These non-compliances included:

- Sites where records of fish movements etc. were maintained but were not readily available onsite on the day of inspection. At all of these sites records were supplied subsequently to the day of inspection;
- instances where well boat arrival logs were not maintained on site but were subsequently made available;
- records of disinfectant usage not fully maintained;
- Changes to the type of disinfectant used not recorded.

Table 4. Health Surveillance Inspections on Salmon Farms by DAFM Veterinary Inspectors on Behalf of the Competent Authority Office of the Marine Institute in 2018/19

year	Inspection Type	No. FHAs active in 2018/19	No. Inspected (%)	No. of APBs inspected with non-compliances (%)		
				Minor (%)	Medium (%)	Serious (%)
2018	Marine Sites	25	25 (100)	15 (60)	0	0
	Freshwater sites	22	16 (73)	3 (19)	0	0
	Total	47	41 (87)	18 (44)	0	0
2019	Marine Sites	30	30 (100)	-	0	0
	Freshwater sites	23	21 (91)	7 (33)	0	0
	Total	53	51 (96)	7 (13)	0	0

Minor non-compliance – *Minor shortfalls in record keeping. Minor housekeeping issues*
Medium non-compliance – *Ongoing and repeated issues with record keeping or housekeeping issue*
Serious non-compliance – *Operator has failed in his duties to an extent that the health status of bay or country may be affected. E.g. failure to inform CA of movements of fish or failure to report mortalities. This designation may also be used where there has been a continued disregard of minor or medium non-compliances identified in previous inspections. A serious non-compliance will normally result in in a compliance notice being issued. Failure to implement the compliance notice within the specified time limit can result in a revocation of the FHA.*

4.2.2 Targeted Surveillance

Ireland is declared free of all diseases listed as notifiable in EU Council Directive 2006/88/EC for which salmonid species are susceptible. In addition, under national measures described in EU 2010/221/EU, Ireland is declared free from bacterial kidney disease (BKD), gyrodactylosis cause by *Gyrodactylus salaris* (GS) and spring viremia of carp (SVC). In 2018 and 2019, Ireland continued to implement a targeted surveillance programme to demonstrate disease freedom for a number of pathogens affecting, or potentially affecting, salmon. During this targeted surveillance, 26 samples consisting of a total of 757 fish were tested in 2018 and 30 samples consisting of 850 fish were tested in 2019. None of the pathogens targeted during this surveillance were detected. In addition to the targeted pathogen surveillance, these samples were subject to general bacteriological and histological screening and no significant health findings were identified. Therefore, during 2018 and 2019 this targeted surveillance programme did not detect any evidence of the presence of EU listed diseases or diseases controlled under national measures in salmon.

Figure 7. Inspection of authorised salmon site by DAFM veterinary inspector

4.3 Salmon Movements

4.3.1 Internal (national) Movements

In 2018 and 2019, the CA office approved 148 movements of salmon and salmon ova and gametes within Ireland. These movements included approval to move up to 21.3 million salmon ova and gametes, up to 17.7 million fish from freshwater sites includes fish transferring to marine sites, and up to 3.3 million salmon between marine sites for on growing or use as broodstock from marine sites (Table 5.).

4.3.2 Imports and Exports within the EU

During 2018 and 2019, nine imports of salmon ova (4.1 million) were authorised by the CA. Fifteen exports of salmon ova (20.7 million) and 20 exports of smolts and pre-smolts (2.4 million) were approved by the CA. To facilitate the export movements, health certification was provided for 108 individual consignments of salmon and salmon ova prior to export from Irish APBs. It should be noted that a movement approval can often cover more than one

consignment. However, each consignment must be visually inspected and certified before export.

Table 5. Salmon Movements Approved by the Competent Authority Office of the Marine Institute in 2018 and 2019

year	Life Cycle Stage	Movement		
		No. Internal movements (millions)	No. Imports (millions)	No. Exports (millions)
2018	Ova	7 (10.7)[1]	4 (2.4)	8 (9.4)
	Pre-smolts	20 (3.3)	-	9 (1.5)
	Smolts[3]	35 (5.8)	-	11 (0.9)
	On-growing (marine sites)	13 (1.9)		
	Total	**75 (21.7)**	**4**	**28**
2019	Ova	6 (10.6)[2]	5 (1.7)	7 (11.3)
	Pre-smolt	12 (2.6)	-	3 (0.4)
	Smolts[3]	36 (6.1)	-	11 (0.6)
	On-growing (marine sites)	19 (1.4)	-	-
	Total	**73 (20.7)**	**9**	**21**

[1] including 6 million gametes.
[2] Including 8 million gametes
[3] For fish health purposes smolts are considered to be salmon that have undergone the physiological changes required to adapt to the marine setting through the process of smoltification and are ready to transfer to sea for ongrowing.

In addition, the CA approved 178 applications for importations of dead ungutted salmon into Ireland for further food processing.

4.4 Disease Notifications

4.4.1 Mortality reporting

EU Council Directive 2006/88/EC requires APBs to immediately inform the CA of the suspicion and /or confirmation of disease listed in the directive. In 2018 and 2019, there were no reports of diseases listed in EU Council Directive 2006/88/EC from Irish salmon aquaculture sites.

There is no regulatory requirement in fish health regulations to report incidents of diseases that are not listed as notifiable in EU Directive 2006/88/EC to the CA. However, salmon producers operating in marine sites in Ireland participate in a voluntary programme to inform the CA of increased mortalities over certain trigger levels. These are, on a weekly basis:

- 1% for fish >750g in weight
- 1.5% for fish <750g in weight

In 2018, the CA office received a total of 41 weekly reports of increased mortalities for marine salmon sites. These represented nine discreet events ranging from 1 to 10 weeks each in duration. These occurred at eight separate sites. (Table 6). Principle causes of mortality, as diagnosed by private veterinary practitioners engaged by the APBs, are recorded in Table 6. In addition, for the first two mortality events recorded in 2018 cardiomyopathy syndrome (CMS) caused by piscine myocarditis virus (PMCV) was confirmed by diagnostic testing in the NRL. Principle infections associated with the mortality events were amoebic gill disease (AGD) caused by *Neoparamoeba perurans*, pancreas disease (PD) caused by salmon alphavirus, CMS and one event involving an outbreak of piscirickettsiosis caused by the bacterium *Piscirickettsia salmonis*. Mortality was often associated with multifactorial causes and included non-infectious causes such as phytoplankton blooms and jellyfish. The peak weekly mortality recorded at any site in 2018 was 11.55%. This occurred during the longest running event at any site, which lasted for ten weeks between June and August. The reasons for this mortality event were multifactorial including infectious health issues (AGD and PD) which were exacerbated by highly significant impacts from jellyfish swarms. The next highest weekly mortality rate recorded during a five-week event at a single site was 8.55%. This was not associated with infectious disease but was reported to be associated with extensive blooms of phytoplankton at a site during November and December of 2018. Overall, for the 41 weekly mortality reports the mean weekly percentage mortality rate was 3.53% ranging from 1.2 to 11.55% for any given week.

In 2019, 66 weekly reports of mortality were received by the CA, representing 20 distinct mortality events ranging from 1 – 10 weeks in duration. These occurred in ten separate sites. The peak weekly mortality rate of 13.1 % occurred during a five-week event in July and August. This mortality event was primarily associated with gill disorders along with failed smolts. Failed smolts are salmon that do not feed properly after being transferred to sea. This causes progressive weight loss and poor condition. The condition of these fish will be compromised and they are more prone to health issues. The causes of failed smolt syndrome are complex, multifactorial and often not fully identified (Failed Smolt Syndrome). Failed smolts were reported as a feature of three mortality events in 2019. Samples from mortality

events were obtained by the NRL for confirmatory testing on seven occasions. Principle infections associated with the mortality events were AGD, PD and CMS. Furunculosis, caused by the bacterium *Aeromonas salmonicida*, occurred in two instances, while in four cases later in the year, mortalities were associated with piscirickettsiosis. Again, as in 2018, mortality was often associated with multifactorial causes in 2019, and phytoplankton blooms and jellyfish, in addition to failed smolts, were the principle reported non-infectious causes of mortality.

In addition to reported mortalities on salmon farms, in February of 2019 the CA was informed of mortalities during well boat transfer of juvenile salmon from a freshwater site to a marine farm site for on growing. Approximately 60,000 of 208,000 fish moved were reported to have died during transport. Following a subsequent inspection of the fish by a DAFM VI the cause of mortality was inconclusive, but the extent of mortality was likely exacerbated by a prolonged transit time due to bad weather preventing unloading of the fish at the destination site.

Table 6. Mortality Reports for Salmon Marine Sites submitted to the Competent Authority Office of the Marine Institute in 2018

Year	Event no.	Duration (weeks)	Month(s)	Average weekly % mortality (Range)	Reported Primary Cause(s)[1]						
					AGD / gill disorders	PD	CMS	Pisci-rickettsiosis	Failed smolts	Furunculosis	Other[2]
2018	1[3]	6	Mar-Apr	2.0 (1.6-2.3)			*				
	2[3]	7	Mar-Apr	2.9 (1.3-4.3)			*				
	3	1	June	1.6		*					
	4	1	July	1.2	*		*				
	5	2	July	3.8 (2.2-5.5)		*					
	6	10	Jun-Aug	4.1 (2.2-11.5)	*	*					*
	7	7	Aug-Sept	4.39 (2.2-7.4)	*						*
	8	2	Nov	1.2 (1.3-1.3)				*			
	9	5	Nov-Dec	5.0 (1.5-8.3)							*
2019	1	3	Jan	3.7 (2.8-4.5)		*					
	2	1	April	6.4		*			*		*
	3	1	May	1.3		*					
	4	5	July-Aug	9.2 (4.58-13.1)	*				*		
	5	5	July-Aug	3.2 (1.6-4.0)	*	*			*	*	*
	6	1	Aug	2.5	*						*
	7	1	Aug	3.1							*
	8	10	Aug-Oct	4.2 (1.7-7.9)	*		*				*
	9	1	Sept	2.4	*						*
	10	8	Aug-Oct	2.9 (2.2-5.6)	*		*				*
	11	4	Sept-Oct	5.7 (3.2-8.4)							*
	12	6	Sept-Oct	4.9 (3.3-9.9)	*						*
	13	6	Sept-Oct	3.0 (1.2-6.1)	*		*				*
	14	4	Oct	1.4 (1.4-1.4)	*			*			*
	15	4	Oct	1.5 (1.2-1.5)				*			
	16	1	Nov	3.06	*						*
	17	1	Nov	1.6				*			
	18	2	Dec	1.3 (1.3 – 1.4)						*	
	19	1	Dec	1.4		*					
	20	1	Dec	1.2			*	*			

[1]reported primary causes as diagnosed by private veterinary practitioner. [2] other causes including non-infectious causes e.g. most commonly phytoplankton blooms or jellyfish swarms.
[3] two separate locations within the same bay

4.5 The Use of Cleaner Fish on Salmon Farms

Sea lice infestation of salmon is a recognised fish health issue during salmon production. Cleaner fish are being increasingly used throughout the salmon farming sector worldwide as a biological control for sea lice infestations. The use of cleaner fish reduces the use of physical and chemical treatments to control sea lice. The two species of fish commonly utilised in the role are lumpfish and several varieties of wrasse. Cleaner fish may be cultured specifically for the purpose or caught from the wild. Generally, in Ireland, lumpfish originate from cultured sources while wrasse are caught from the wild. However, significant technical efforts are being made by the salmon industry to culture wrasse for use as cleaner fish.

To prevent any potential spread of fish pathogens to salmon sites by the introduction of cleaner fish the CA continues to work with industry to develop protocols to reduce the risk. A risk analysis has been completed and control procedures have been developed. The risk analysis and management plans are available in the Farmed Salmonid Handbook. As part of these protocols extensive fish health screening is undertaken on a bay-by-bay basis prior to fishing for wrasse. Prior to movement of cleaner fish onto a salmon farm a veterinary report is required to demonstrate that the fish are clinically healthy. In 2018 and 2019, the CA approved 68 movements of wrasse (involving up to a maximum 732,800 fish), and 35 movements of lumpfish (Approx. 604,800 fish) onto salmon sites for use as cleaner fish (Table 7.) These figures clearly demonstrate an increasing use of cleaner fish to control sea lice numbers of salmon aquaculture.

Table 7. Cleaner fish Movements on to Salmon Farms Authorised by the Competent Authority Office of the Marine Institute in 2018 and 2019 for Sea Lice Control purposes

Year	species	No. Internal movements (No. fish thousands)	No. Imports (No. fish thousands)
2018	Wrasse	28 (370.1)	0
	Lumpfish	8 (36.6)	6 (153.0)
	Lumpfish (ova)	0	2 (450.0)
2019	Wrasse	40 (362.7)	0
	Lumpfish	9 (230.9)	12 (154.3)
	Lumpfish (ova)	0	3 (1,700.0)

To facilitate movements of cleaner fish, in 2018, the NRL undertook fish health screening of 420 wrasse from 8 bays and 450 lumpfish from production units while in 2019, 418 wrasse from 7 bays and 190 lumpfish from production units were tested. Fish were screened for viral

and bacterial pathogens as well as by histological examination for general health purposes. No significant health findings were associated with this screening and all movements of cleaner fish applied for were approved by the CA.

Figure 8. – Lumpfish used as cleaner fish on marine salmon farms to control sea lice infestations. Cleaner fish are increasingly being used throughout the salmon farming sector worldwide as a biological control for sea lice infestations. The two species of fish commonly utilised in the role are lumpfish and several varieties of wrasse.

5 OTHER FINFISH AQUACULTURE PRODUCTION SITES

In 2018 and 2019, there were 18 APBs producing trout (14) or perch (4) which have fish health authorisations to operate issued by the CA. This included one new FHA issued in 2018 for a newly opened perch fish farm. Of these sites, 12 were operational during 2018 and 2019.

5.1 Finfish (other than Salmon) Health Surveillance

In 2018 and 2019, 19 health surveillance inspections were carried on trout and perch farms in Ireland (Table 8.). During those inspections only minor non-compliances relating to record keeping were identified.

Table 8. Health Surveillance in 2018 in finfish farms other than salmon by DAFM Veterinary Inspectors on Behalf of the Competent Authority

Year	Inspection Type	No. sites active	No. Inspected (%)	No. of inspection with non –compliances by grade*		
				Minor (%)	Medium (%)	Serious (%)
2018	Trout	8	8 (100)	4 (50)	0	0
	Perch	1	1 (100)	0	0	0
	Total	9	9 (100)	4 (44)	0	0
2019	Trout	8	8 (100)	2 (22)	0	0
	Perch	2	2 (100)	-	0	0
	Total	10	10 (100)	2 (18)	0	0

Minor non-compliance – *Minor shortfalls in record keeping. Minor housekeeping issues*
Medium non-compliance – *Ongoing and repeated issues with record keeping or housekeeping issue*
Serious non-compliance – *Operator has failed in his duties to an extent that the health status of bay or country may be affected. E.g. failure to inform CA of movements of fish or failure to report mortalities. This designation may also be used where there has been a continued disregard of minor or medium non-compliances identified in previous inspections. A serious non-compliance will normally result in in a compliance notice being issued. Failure to implement the compliance notice within the specified time limit can result in a revocation of the FHA.*

5.2 Finfish (other than Salmon) Movements

Internal movements, imports and exports for trout and perch approved by the CA office in 2018 are shown in Table 9.

Table 9. Finfish movements, other than salmon, approved by the Competent Authority office of the Marine Institute in 2018

year	Species	Movement		
		No. Internal movements (thousands)	No. Imports (thousands)	No. Exports (thousands)
2018	Perch	1 (200)	0	0
	Trout	24 (1,200)	0	10 (4)
	Trout (ova)	1 (500)	7 (2,700)	0
2019	Perch	3 (0.066)	0	0
	Trout	24 (1,400)	0	4 (2.5)
	Trout (ova)	2 (500)	7 (2,500)	0

In addition to the movements of live fish shown in Table 9, the CA approved 305 applications for importation of un-gutted dead trout into Ireland for further food processing.

6 PUT AND TAKE FISHERIES

A put and take fishery is defined in EU Council Directive 2006/88/EC as "a pond or other installation where the population of fish are maintained only for recreational fishing by restocking with aquaculture animals." In 2018 and 2019 there were 64 put and take fisheries with FHAs in Ireland. Three new FHAs was issued for a put and take fishery in during this period. During 2018 and 2019, the CA approved 503 movements of fish on to stocked fisheries in Ireland. Stocked fisheries include put and take fisheries.

Given the enclosed nature of put and take fisheries and the low level of movement of fish to and from them, these operations present a low risk for the introduction and spread of disease. Given this low risk the CA has not undertaken any health surveillance inspections of put and take fisheries since 2016.

6.1 Disease Notifications

In May 2018, the CA was informed of high numbers of carp mortalities in two coarse angling venues in County Cork. One of the venues was a public fishery in Cork City and over the course of the incident, approximately 1,000 carp died. In the second venue, a private fishery about 10 km away from the location of the first outbreak approximately 300 carp died. Following laboratory analysis in the NRL, the causative agent of both outbreaks was determined as carp edema virus (CEV). CEV causes a disease commonly called koi sleepy disease although the disease virus is capable of infecting cyprinid species other than koi carp such as the case with the outbreaks in Cork. Infection with CEV is not a listed disease in EU Council Directive 2006/88/EC but can cause very significant mortalities and rapid reporting and control is desirable. The disease is widespread in Europe but has previously only been detected once in Ireland in koi carp in a garden pond. Further genetic analysis undertaken in the NRL demonstrated that the virus in carp from both venues were similar to each other and fell within the genotype associated with common carp rather than Koi carp. This indicated that the infection was not a result of the release of Koi carp into the venues affected in 2018, which had been considered a possibility, and that the virus was likely to have come from the same origin. In response to the mortalities, Inland Fisheries Ireland closed the fisheries for angling

and ensured disposal of the dead carp in approved facilities to prevent the risk of disease spreading. As a result of these actions no further spread of the disease was observed.

Follow up investigations found no evidence of movements of fish between the two venues or movement of fish into them from elsewhere prior to the outbreak. A possible explanation for the outbreak is that the virus may have been introduced into one of the venues by an angler using contaminated equipment. This could also account for the apparent spread of disease between the two venues by the same route. This re-enforces the need for the consistent and thorough application of biosecurity measures at angling venues and adherence to check clean dry protocols for disinfecting angling equipment when moving between sites.

No outbreaks of disease in angling venues were reported in Ireland in 2019.

Figure 9. Disinfection of angling equipment between uses is a critical control measure to prevent the spread of disease between angling venues.

7 ORNAMENTAL AQUATIC ANIMALS

EU Council Directive 2006/88/EC defines an ornamental aquatic animal is defined as an "aquatic animal which is kept, reared, or placed on the market for ornamental purposes only." Specific regulations are in place to control the risk of potential introduction or spread of disease associated with the trade of ornamental aquatic of disease. The level of control varies between tropical and cold-water animals with particular attention paid to cold-water ornamental animals given that they are capable of surviving in the Irish environment. All importers of ornamental finfish, mollusc and crustacean aquatic animals must register with the CA before importing fish. Details of requirements for importing ornamental aquatic animals in to Ireland are available on the Fish Health Website. During 2018 and 2019, 827 consignments of ornamental aquatic animal imports were approved by the CA. The majority of these consignments were imported from the UK and contained multiple species of ornamental animals destined for several locations in Ireland including private individuals, as well as wholesale and retail establishments.

7.1 Disease Notifications

In May of 2019, the CA was notified of mortalities of koi carp in a garden pond in the Midlands of Ireland. In response to the mortality reports, the FHU carried out a health visit on the 31st May and took samples from three moribund fish for analysis in the NRL. On the same day, the samples were analysed and were found to be presumptively positive for the presence of koi herpesvirus (KHV) by molecular screening methods allowing a suspicion of KHV disease (KHVD) to be declared. KHVD can be a devastating disease of carp and is associated with high mortalities. In this case 60% of the koi carp present died. KHVD is listed as a notifiable disease in EU Council Directive 2006/88/EC and the island of Ireland was declared free of the disease after a targeted two-year surveillance programme completed in in 2013. In this case once a suspicion of KHVD was declared, movement restrictions were placed on the site. The presence of KHV disease was subsequently confirmed by further molecular analysis using diagnostic procedures described in Commission Implementing Decision (EU) 2015/1554. The EU commission was informed of the confirmation of KHVD. On 15th June all koi carp remaining in the pond were culled and the pond was disinfected under the supervision of the CA.

Subsequent investigations indicated that the owner of the pond had personally imported koi carp from an establishment in England that was not certified KHV free. The owner had driven to England and collected the fish personally and thus by-passing regulatory import requirements. It is possible that this was the source of infection in the pond and ornamental fish keepers are reminded of the importance of complying with regulatory import requirements when sourcing koi carp and other ornamental fish. Detail of import requirements are on the FHU website.

8 NRL ACTIVITIES

The NRLs provide laboratory testing services to support the implementation of aquatic animal health controls in Ireland. This involves supporting the health surveillance activities undertaken by the CA and PVP activities undertaken on behalf of APBs. The NRLs in the Marine Institute operate within a quality management system and the majority of tests utilised are accredited to ISO 17025 by the Irish National Accreditation Body (INAB). Testing is conducted using methods required by regulation or recommended in the OIE manual of diagnostic tests for aquatic animals. This ensures the results obtained during testing are reliable and robust as well as being fit for purpose.

8.1 Finfish NRL

In total in 2018 and 2019, the NRL analysed 5,581 fish from 259 samples for a variety of purposes (Table 10). Analysis consisted of histopathological, virological, bacterial and molecular examinations undertaken as required by the relevant programme.

Over the two years Eighty-nine percent of fish analysed in the NRL were associated with salmon farming (cleaner fish 30% and Atlantic salmon 59%) (Figure 10). This is reflective of the extent of salmon farming activities compared to other finfish aquaculture activities in Ireland and the extensive efforts placed on maintaining fish health within the salmon farming sector.

Table 10. Finfish samples tested by the National Reference Laboratory in 2018 and 2019

Testing Programme	Species	2018		2019	
		No. of samples	No. of fish	No. of samples	No. of fish
National Surveillance[1]	Atlantic salmon	21	607	22	630
	trout (rainbow of brown)	5	150	7	150
	Cyprinids	-	-	1	30
Mortality Investigations	Carp	2	9	3	12
	Atlantic salmon	2	20	5	50
	wild Atlantic salmon	-		3	3
Health Checks	Atlantic salmon	6	141	3	46
	coarse fish and stickleback	6	139	1	30
	Trout	1	26	-	-
	carp	-	-	1	14
Screening for cleaner fish movements	wrasse	9	420	7	418
	lumpfish	3	450	3	190
Private testing[2]	Atlantic salmon (includes brood)	41	638	63	885
	lumpfish	13	123	6	54
	wrasse	2	20	-	-
	Miscellaneous	10	14	2	2
Research Projects	Atlantic salmon	5	280	1	1
	Miscellaneous	-	-	5	29
Totals		**126**	**3037**	**133**	**2544**

[1] For diseases listed as notifiable in EU 2006/88 and of concern under national measures

[2] Testing requested by private companies and private veterinary practitioners

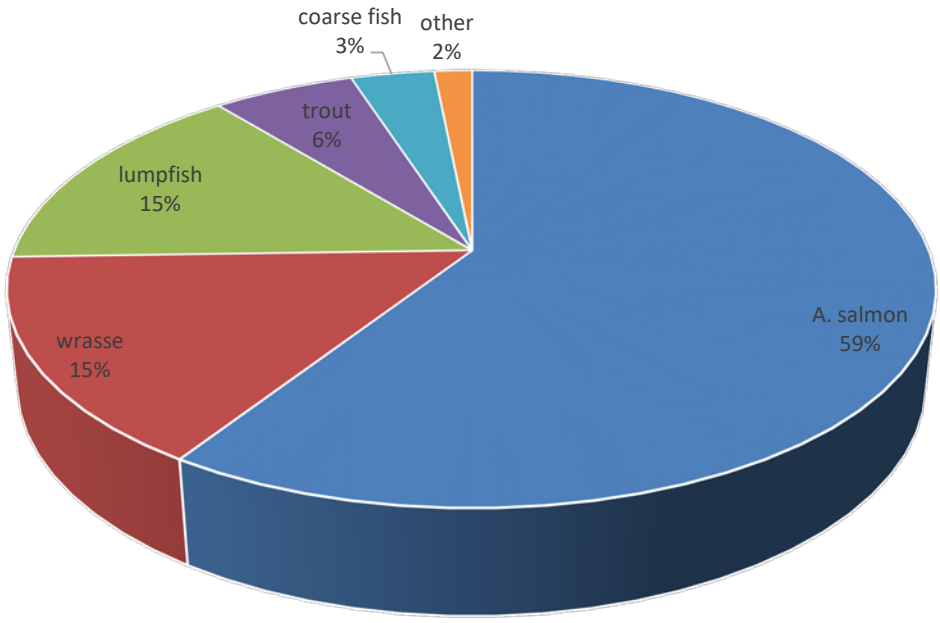

Figure 10. Percentage of 5581 samples tested in the finfish NRL by species in 2018 and 2019. Almost 90% of samples analysed in the NRL was associated with salmon aquaculture (Atlantic salmon 59% and cleaner fish 30%).

8.1.1 Significant findings from finfish NRL testing

No agents responsible for diseases listed as notifiable in EU Council Directive 2006/88/EC or controlled under national measures in Ireland were detected during testing conducted by the NRL in 2018. Analysis by the NRL confirmed cases of koi sleepy disease caused by CEV was associated with two reports of carp mortalities. Further molecular analysis of the virus isolated from fish samples from both venues confirmed that the genotypes were consistent with that found in common carp (rather than Koi carp) and that the viruses probably originated form a common source. Analysis of salmon samples in 2018 the NRL confirmed the association of piscine myocarditis virus two incidents of reported mortalities in marine farms. The NRL also confirmed one case of Proliferative Kidney Disease, an endoparasitic disease of salmonid fish caused by the Myxosporean parasite *Tetracapsuloides bryosalmonae* was confirmed in a freshwater salmon production unit by analysis in the NRL.

In 2019, molecular analysis in the NRL confirmed the presence of KHV in moribund koi carp sampled during an investigation of increased mortality in a private pond. Molecular analysis also detected CEV in these fish. Further details of this outbreak are provided in section 7.1 of this report. The NRL also detected CEV in koi carp in a separate incident of mortality from a

private pond during July. The NRL confirmed gill damage and the presence of CMS or piscine orthoreovirus by histological examination or molecular analysis in samples associated with four incidents of salmon mortality in marine farms. Finally, in both 2018 and 2019, *Yersinia ruckeri* was detected in rainbow trout at a farm associated with persistent problems with enteric redmouth disease, the common name typically applied to *Y. ruckeri* infections.

In June 2019, reports of morbidity and mortality were received in returning wild Atlantic salmon associated with a rash-like discolouration on the abdomen. Similar disease signs in returning salmon were also reported from Scotland and Norway at this time. In late June, samples were collected from a freshly dead salmon by FHU staff for analysis in the NRL. Samples were also provided to the NRL by Inlands Fisheries Ireland from two salmon post-mortem, one in July and one in August. Despite extensive examination and investigation by the NRL no significant aetiological agents were identified. Laboratories in other countries that reported a similar condition in wild salmon were also unable to detect an infectious agent. The Marine Institute will continue to work with Inland Fisheries Ireland in 2020 to obtain samples from any further incidences and investigate morbidity and mortality in returning salmon in 2020.

8.2 Molluscan Shellfish NRL

In 2018 and 2019, the NRL tested a total of 106 samples consisting of 3194 Pacific and native oysters (*C. gigas* and *O. edulis*) for a variety of programmes (Table 11). Testing consisted of general histology and bacteriology examination. In addition, targeted surveillance programmes were undertaken. These targeted direct detection of *V. aestuarianus* and OsHV-1 µvar using molecular procedures and *Bonamia ostrea* using either cytology or molecular analysis as determined by the aims of the programme.

Table 11. Molluscan shellfish samples tested by the National Reference Laboratory in 2018

Year	Programme	Species	No. of samples	No of animals
2018	National Surveillance[1]	native oysters	2	150
		Pacific oysters	20	320
	Mortality report investigations	Pacific oysters	24	698
	Diagnostic investigations	native oysters	6	319
		Pacific oysters	1	30
	Research	Pacific oysters	2	120
		Totals	55	1,637
2019	National Surveillance[1]	native oysters	2	300
		Pacific oysters	18	290
	Mortality report investigations	Pacific oysters	28	878
	Diagnostic investigations	native oysters	1	30
		Pacific oysters	2	39
	Research	-	-	-
		Totals	51	1557

[1] For diseases listed as notifiable in EU 2006/88 and under national measures *(namely Bonamia ostreae,* oyster herpesvirus-1 uVar & emerging diseases).

The most frequently detected pathogen during testing in 2018 and 2019 and which was always associated with mortality was *V. aestuarianus,* with 27 of the 47 samples tested containing the bacterium. In addition, *V. aestuarianus* was detected in five further samples alongside OsHV-1 µVar. *V. aestuarianus* was also detected in 23 of 49 samples tested in 2019 (two in conjunction with OsHV-1 µVar. These results confirm the fact that *V. aestuarianus* infection in Pacific oysters is the most significant molluscan disease issue in Ireland.

An interesting observation during testing in 2019 was the additional isolation of bacteria belonging to the *Vibrio splendidus* clade in five samples associated with mortality in both spat and adults. The potential involvement in mortalities of bacteria belonging to the *V. splendidus* clade has been described in France previously. Their role in the mortalities observed here remains unclear and warrants further investigation.

8.3 NRL Research and Projects

In 2018 and 2019, the NRLs were involved in several research projects. In 2018, the NRL for crustacean diseases completed a significant project to assess the health status of velvet crab (*Necora puber*) stocks in three bays in Ireland with a focus on the prevalence of the parasite *Paramarteilia sp.* This project was undertaken in conjunction with the Fisheries and Ecosystem Advisory Services (FEAS) team in the Marine Institute following reports of a general decline of the velvet crab fishery. Initial work indicated high detection rates of the parasite *Paramarteilia sp.* in some populations. To determine the health status of velvet crabs in three important fisheries in Ireland 150 crabs from each site were subject to histopathological and

molecular analysis for the presence of parasites. Differences in the percentage of velvet crabs containing *Paramarteilia sp.* varied from fishery to fishery (Figure 11). Other parasite species most notably *Haematodinium sp*. were also detected.

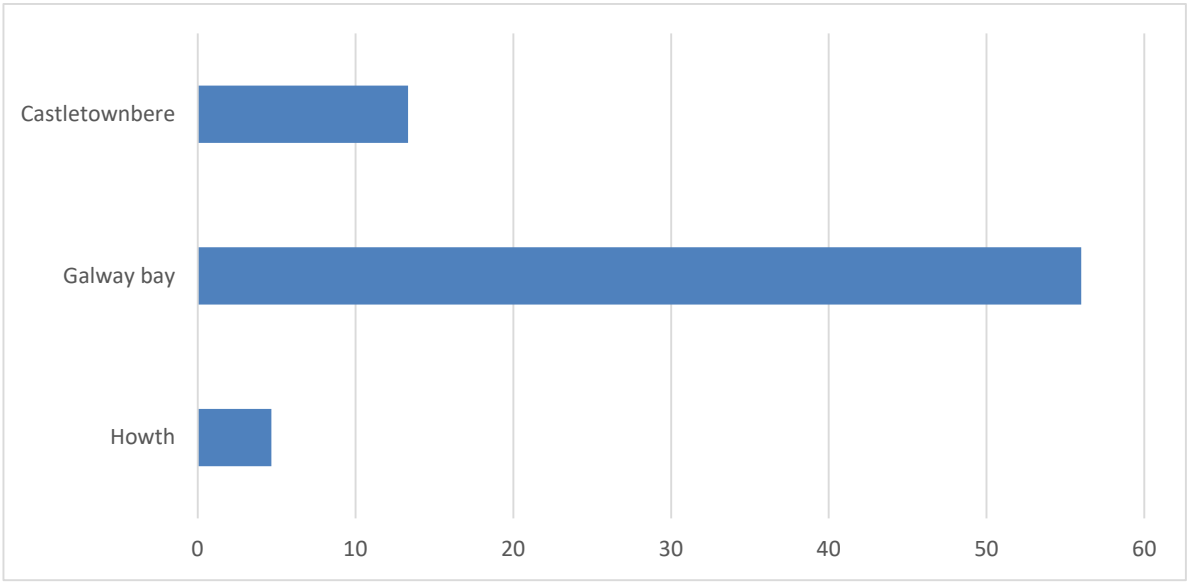

Figure 11. Percentage of velvet crabs containing *Paramarteilia sp.* in three fisheries in Ireland.

While a significantly higher proportion of velvet crabs in the Galway Bay fishery contained *Paramarteilia sp.* compared to the other two fisheries an impact on health associated with this was not directly demonstrated. In general, the impact of the presence of *Paramarteilia sp.* and *Haematodinium sp*. on velvet crab health remains unclear. To further advance our understanding, the MI awarded a fellowship grant to GMIT for a 3-year study. This study commenced in late 2018 and the NRL is working closely with GMIT to support delivery of the project. The specific aims of this research are to investigate the extent to which micro parasite species are impacting crustacean health, with an emphasis on the effect of environmental conditions on the susceptibility of crustaceans and investigating transmission between crustacean species and reservoir hosts. The results from this study will be available in 2021.

Within the area of salmon health, the NRL continues to work with UCD on an MI funded Cullen Fellowship aimed at developing a better understanding of piscine myocarditis virus (PMCV) which is responsible for cardiomyopathy syndrome (CMS). CMS is a significant disease affecting farmed Atlantic salmon and was first reported in Ireland in 2012. The number of clinical cases of CMS had increased in the following years, however, very little information is available on the prevalence of the virus in both farmed and wild fish. The principal aim of this fellowship is the development of improved diagnostic methods for CMS. Work in 2018

focussed on genetic diversity of PMCV present in Irish farmed salmon. Results showed PMCV genotypes to be largely homogenous in Irish samples, showing little genetic diversity. The study further suggests that PMCV may have been introduced into Ireland in two waves, both coming from the southern part of PMCV's range in Norway. Evidence also indicates that either PMCV is evolving to become less virulent in Ireland or Irish Atlantic salmon are developing immunity or resistance to the disease.

In 2019 the focus of the work expanded to cover a new strain of salmonid alphavirus. Using nanopore sequencing, the whole genome of a strain isolated from ballan wrasse in Ireland was sequenced and revealed to be a new subtype of the virus, SAV7. Nanopore sequencing was then used to sequence the genome of an Irish strain of PMCV in combination with Illumina sequencing. The whole genome sequences have revealed that a large amount of the virus's genetic diversity lies outside the regions previously sequenced using traditional sanger sequencing, and a number of mutations, unique to Irish isolates, have been identified. The project will be completed in September 2020.

The NRL also undertook work to support a DAFM funded project on Amoebic Disease of Salmon (ADIOS). This project is led by Galway Mayo Institute of Technology, and the project's consortium includes National University of Ireland Galway, University College Dublin, MI, Fish Vet Group Ireland and several indigenous and foreign-based companies. The overall aim of the ADIOS project is to increase knowledge of host immune response in the Atlantic salmon-amoebic gill disease complex, identifying potential biomarkers and developing preventative and curative measures to minimise occurrence of gill health issues. The project commenced in late 2017. The MI has a minor role in the project and provides laboratory support and testing to project partners. In 2018 and 2019, as part of the ADIOS project, the MI analysed gill and swab samples from 290 salmon for the presence of *Neoparamoeba perurans*, the causative agent of AGD. Results from the project will be published later in 2020.

In the area of molluscan health, the NRL is a partner in a large multi-partner European funded research project aimed at preventing and mitigating farmed bivalve disease (VIVALDI) http://www.vivaldi-project.eu/. In 2018, the MI Shellfish NRL work primarily focused on developing management and mitigating factors for *V. aestuarianus* infections in Pacific oysters. Work to date clearly demonstrates that disease progression is complex. Multifactorial environmental conditions and site-specific factors play a fundamental role in driving disease outcomes. Therefore, specific across the board guidance on mitigating for the disease has

been difficult to develop. However, at some sites management practices were identified that may reduce mortalities. Further work during the year investigate the genetic diversity of OsHV-1µVar. In 2019, the MI activities focussed on the construction of a disease management and biosecurity manual. This process involved scientists, competent authorities and producers from across the major shellfish producing nations in Europe. Publication of the manual is anticipated in the in the second half of 2020. The project will end in early 2020 and a final conference for all stakeholders was held in Brest in France in November 2019 to present the outcomes from the project. VIVALDI

9 ADDITIONAL ACTIVITIES UNDERTAKEN BY THE FHU IN 2018 & 2019

9.1 European Commission Directorate-General for Health and Food Safety mission on implementation of the rules on Irish Aquaculture.

In April 2018, Ireland was subject to a one-week long inspection on the implementation of the rules on bivalve mollusc aquaculture. This was conducted by the European Commission Directorate-General for Health and Food Safety DG (SANTE). This visit was part of a wider fact finding mission conducted in four of the major mollusc producing European Member States, namely, Ireland, Spain, Italy and France. The published report found that controls in Ireland were implemented to a high level and several areas of implementation were highlighted as examples of good practice.

9.2 Transboundary Surveillance Programme in Lough Foyle

As a result of the long-standing negotiation of the international border in Lough Foyle, licences have not been issued for aquaculture activity in the Lough. This means that APBs operating in Lough Foyle cannot be authorised by the CA in Ireland. Despite this situation, in recent years, production of Pacific oysters in the Lough has grown to very significant levels. To evaluate the health status of oysters in Lough Foyle the FHU, in conjunction with DAERA and the Loughs Agency, established a 2-year disease surveillance programme in the Lough in late 2018. In addition, the CA introduced measures aimed at preventing the movement of oysters from the Lough for on growing or relaying and only oysters going directly for consumption are permitted to be moved from the Lough. Monitoring is ongoing and results from the surveillance programme will be available in late 2020.

9.3 National Monitoring Programme for Crayfish Plague

Aphanomyces astaci is a water mould that causes lethal crayfish plague in the white-clawed crayfish *Austropotamobius pallipes* which is the only crayfish species that is native to Ireland. Crayfish plague is believed to have originally entered Europe with the introduction of a non-native North American species of crayfish, which are resistant to crayfish plague. Crayfish plague is listed as a notifiable disease by World Health Organisation for Animal Health (OIE) but not in Council Directive 2006/88/EC. The white-clawed crayfish is considered to be endangered and protected under the EU Habitats Directive EU Habitats Directive. However, in recent years, outbreaks of crayfish plague have occurred in Ireland. The first confirmed outbreak of crayfish plague in Ireland was recorded in the Erne catchment in 2015 although there is strong evidence to suggest there was an outbreak in 1987 in the rivers Boyne and Inny. Between 2015 and the end of 2018, crayfish plague was detected in six geographically distinct river catchments in Ireland with at least three different strains of *A. astaci* genotyped. This genetic diversity suggests there have been at least three separate introductions of the disease into Ireland. To prevent the spread of crayfish plague in Ireland water users should adhere to the check clean dry protocols.

In 2018, the MI and the National Parks and Wildlife Service jointly introduced a 2-year national surveillance programme for crayfish plague in Ireland. Using environmental DNA (eDNA) as a surveillance method, the NRL for crustacean diseases analysed water samples from 84 sites (6 sites per catchment) in 14 water catchments. *Aphanomyces astaci* was detected in three of these catchments, indicating an active infection was in progress. In addition, an active outbreak of crayfish plague was identified following crayfish mortalities in the River Al in Athlone. *Aphanomyces astaci* was detected in both moribund crayfish and water samples taken from this river in 2018. In 2019, the second phase of water sampling using eDNA methodology was undertaken. Water samples were collected from an additional 84 sites in 14 catchments. Analysis of water samples for the presence of *Aphanomyces astaci* is on-going and will be completed by May 2020. Water samples collected in 2018 and 2019 will also be tested for the presence of DNA from non-native species. Non-native species selected for analysis will be based on species listed in the European Union (Invasive Alien Species) (Freshwater Crayfish) Regulations 2018 (SI 354/18). In addition, water samples will also be examined for the presence of DNA from *Cherax destructor* (Yabby), *Astacus Leptodactylus* (Turkish crayfish) and *Astacus astacus* (Noble crayfish). To this end, work to develop a multiplex real-time PCR for

analysis was recently completed. Analysis of all samples collected in 2018 and 2019 will be analysed by June 2020 as part of a national monitoring programme.

In addition to the national monitoring programme, the NRL detected *Aphanomyces astaci* in crayfish samples associated with four outbreaks of crayfish plague in 2018 and 2019. This included a further outbreak of plague in the river Barrow which was also affected in 2017 and outbreaks in new sites on the river Al in Athlone (2018), the River Maigue in Co. Limerick and the river Slate in Co. Kildare (2019). These further outbreaks of crayfish plague highlight an increasing spread of this disease in Ireland.

APPENDIX 1. ADDITIONAL SOURCES OF INFORMATION

Information sources

1. Marine Institute Fish Health **website** provides a range of information of aquatic animal health in Ireland. This includes
   - **Information Leaflets** on important diseases of aquatic animals
   - Requirements for **Fish Health Authorisations**
   - Registers of Authorised Aquaculture Businesses (APBs), Put and Take Fisheries, Approved Aquaculture Transporters and Authorised Processing Establishments in Ireland. (APBs Finfish) **(APBs Molluscs) (Put & Take Fisheries) (Authorised Processing Establishment Register) (Approved Aquaculture Transporters)**
   - Reporting **Aquatic Animal Mortalities**
   - Details for **Importers of ornamental aquatic animals**

2. The **Farmed Salmonid Handbook** provides a comprehensive manual on fish health for Ireland's salmon and trout farming industry. It contains detailed and practical information on all aspects of fish stock care ranging from veterinary issues, environmental protection, feed & nutrition, treatments and current legislation. The *Handbook* was compiled by experts from both private and governmental organisations. The handbook was launched in 2011. An updated version of the handbook was made available in July 2017
3. **European Union Reference Laboratory for fish and Crustacean Diseases** is situated within the unit for Fish and Shellfish Diseases at DTU Aqua – National Institute of Aquatic Resources at the Technical University of Denmark. The functions and duties of the EURL are concerned with harmonizing diagnostic procedures for notifiable fish and crustacean diseases in Europe. The Unit for Fish and Shellfish Diseases at DTU Aqua has since 1994 been designated as the EURL for fish diseases. From July 2018, the functions and duties were expanded to also include crustacean diseases.
4. **European Union Reference Laboratory for Mollusc Diseases** is situated in IFREMER in France and is responsible for coordinating methods employed by EU Member States for diagnosing diseases of bivalve molluscs.
5. World Organisation for Animal Health (OIE) **Aquatic Animal Health Code 21st Edition, 2019**. The OIE Aquatic Animal Health Code provides standards for the improvement of aquatic animal health worldwide. It also includes standards for the welfare of farmed fish and use of antimicrobial agents in aquatic animals. The sanitary measures of the Aquatic

Code should be used by the Competent Authorities of importing and exporting countries for early detection, reporting and control of pathogenic agents in aquatic animals.

6. World Organisation for Animal Health (OIE) OIE **Manual of Diagnostic Tests for Aquatic Animals 7th Edition, 2016** . The manual provides a standardised approach to the diagnosis of the diseases listed in the Aquatic Code, to facilitate health certification for trade in aquatic animal products.

APPENDIX 2. FHU PUBLICATIONS 2018

1. **Collins E, McCleary S, Morrissey T, Geary M,** O Connor C, **Cheslett, D.** 2018. Sporulating Haplosporidium nelson in Crassostrea gigas in a production bay in Ireland. *Bulletin of the EAFP* 38: 4-11.

2. **Downes JK,** Yatabe T, Marcos-Lopez M, Rodger HD, MacCarthy E, O Connor I, **Collins E, Ruane NM**. 2018. Investigation of co-infections with pathogens associated with gill disease in Atlantic salmon during an amoebic gill disease outbreak. *Journal of Fish Diseases* 41: 1217-1227.

3. **Downes JK, Collins EM**, **Morrissey T, Hickey C**, O Connor I, Rodger HD, MacCarthy E, Palmer R, Ruttledge M, **Ruane NM**. 2018. Confirmation of Neoparamoeba perurans on the gills of Atlantic salmon during the earliest outbreaks of amoebic gill disease in Ireland. *Bulletin of the EAFP* 38: 42-48.

4. Gallagher MD, Matejusova I, Nguyen L, **Ruane NM**, Falk K, Macqueen DJ. 2018. Nanopore sequencing for rapid diagnostics of salmonid RNA viruses. Nanopore sequencing for rapid diagnostics of salmonid RNA viruses. *Scientific Reports* 8:16307.

5. **Ruane NM, Swords D, Morrissey T, Geary M, Hickey C, Collins EM, Geoghegan F, Swords F.** 2018. Isolation of salmonid alphavirus subtype 6 from wild-caught ballan wrasse, Labrus bergylta (Ascanius). *Journal of Fish Diseases* 41: 1643-1651.

6. Scholz F, **Ruane NM**, Marcos-Lopez M, Mitchell S, Bolton-Warberg M, O Connor I, Mirimin L, MacCarthy E, Rodger HD. 2018. Systemic mycoses in lumpfish (Cyclopterus lumpus L.) in Ireland: aetiology and clinical presentation. *Bulletin of the EAFP* 38: 202-212.

7. Scholz F, **Ruane NM, Morrissey T**, Marcos-Lopez M, Mitchell S, O Connor I, Mirimin L, MacCarthy E, Rodger HD. 2018. Piscine myocarditis virus detected in corkwing wrasse (Symphodus melops) and ballen wrasse (Labrus bergylta). *Journal of Fish Diseases* 41: 147-152.

8. Yatabe T, More SJ, **Geoghegan F**, McManus C, Hill AE, Martinez-Lopez B. 2018. Can biosecurity and local network properties predict pathogen species richness in the salmonid industry? *PLOS ONE* 13: e0191680.

9. Chloe J. English, **Fiona Swords**, **Jamie K. Downes**, **Neil M. Ruane**, Natasha A. Botwright, Richard S. Taylor, Andrew C. Barnes, James W. Wynne, Paula C. Lima, Mathew T. Cook. 2019. Prevalence of six amoeba species colonising the gills of farmed Atlantic salmon with amoebic gill disease (AGD) using qPCR Aquacult. Environ. Interact. Vol. 11: 405–415, 2019

10. Niccoló Vendramin, Argelia Cuenca, Juliane Sørensen, Anna L. F. Alencar, Debes H. Christiansen, Jan A. Jacobsen, Charlotte Axen, François Lieffrig, **Neil M. Ruane**, Patrick Martin, Timothy Sheehan, Tine M. Iburg, Espen Rimstad, Niels J. Olesen. 2019. Presence and genetic variability of Piscine orthoreovirus genotype 1 (PRV-1) in wild salmonids in Northern Europe and North Atlantic Ocean *J Fish Dis.* 42:1107–1118.

11. Aide Lasa, Andrea di Cesare, Giovanni Tassistro, Alessio Borello, Stefano Gualdi, Dolors Furones, Noelia Carrasco, **Deborah Cheslett**, Amanda Brechon, Christine Paillard, Adeline Bidault, Fabrice Pernet, Laura Canesi, Paolo Edomi, Alberto Pallavicini, Carla Pruzzo, Luigi Vezzulli. 2019 Dynamics of the Pacific oyster pathobiota during mortality episodes in Europe assessed by 16S rRNA gene profiling and a new target enrichment next-generation sequencing strategy Environmental Microbiology doi:10.1111/1462-2920.14750

12. Helmut Segner, Stefan Reiser, **Neil Ruane**, Roland Rösch Dieter Steinhagen, Teppo Vehanen, 2019. Welfare of fishes in aquaculture. FAO Fisheries and Aquaculture Circular No. 1189 REU/C1189 (En).

13. ICES. 2019. Working Group on Pathology and Diseases of Marine Organisms (WGPDMO) ICES Scientific Reports. 1:62. 35 pp. http://doi.org/10.17895/ices.pub.5603 Editors Ryan Carnegie Authors - Charlotte Axén, Juan Barja, **Deborah Cheslett,** Anna Maria Eriksson-Kallio, Olga Haenen, Simon Jones, Árni Kristmundsson, Bjorn Olav Kvamme, Atle Lillehaug, Lone Madsen, Ruta Medne, Eann Munro, Richard Paley, Magdalena Podolska, Mark Powell, Paula Ramos, Tristan Renault, Francisco Ruano Janet Whaley, Tom Wiklund and Werner Wosniok

14. Tighe AJ, Carlsson J, Morrissey T, Swords F. & Ruane NM. 2019. Genetic diversity of piscine myocarditis virus in Atlantic salmon Salmo salar L. in Ireland Journal of Fish Diseases 42, 1161-1168.

APPENDIX 3. EU Regulations and Statutory Instruments Relevant for Aquatic Animal Health in Ireland

EU Council Directive 2006/88/EC	Animal Health requirements for aquaculture animals and products thereof, andprevention and control of certain diseases in aquatic animals.
Commission Regulation (EC) No 1251/2008/EC	Conditions and certification requirements for the placing on the market and the import into the Community of aquaculture animals and products thereof and laying down a list of vector species.
Commission Decision 2010/221/EU	This Decision gives Ireland protection from additional significant diseases affecting finfish, which are not listed in 2006/88/EC and which not present in Ireland. SVC, BKD, *Gyrodactylus Salaris* (GS)).
Commission Decision 2010/171/EC	Established a targeted surveillance programme for koi herpes virus (KHV) to assess Ireland's status in relation to KHV (Ireland is currently Category III) and thereafter achieve Category I status (freedom).
Commission Decision 2011/187/EU	This decision gives the approval of national measures for preventing the introduction of OsHV-1 µvar into certain areas of Ireland and the United Kingdom.
Commission Regulation 2011/350/EU	Requirements for place consignments of Pacific oysters on the market in Member States. The main objective is to protect the areas which remain free of OsHV-1 µvar. This regulation repeals Commission Regulation 175/2010
Commission Implementing Directive 2012/31/EU	Commission Implementing Directive 2012/31/EU of 25 October 2012 amending Annex IV to Council Directive 2006/88/EC as regards the list of fish species susceptible to Viral haemorrhagic septicaemia and the deletion of the entry for Epizootic ulcerative syndrome
Commission Implementing Decision 2013/706/EC	Amending annex I to Decision 2009/177/EC declares disease-free status for Ireland for Koi herpes virus thereby giving the highest health status available in Europe with respect to this disease (Category I status as defined in Fish Health Directive 2006/88/EC).
Commission Implementing Decision 2016/1096/EC	Amending Regulation (EC) No 1251/2008 as regards the requirements for placing on the market of consignments of certain fish species intended for the Member States or parts thereof with national measures for salmonid alphavirus (SAV).
S.I. 261 of 2008	Council Directive 2006/88/EC was transposed into Irish Law by the European Communities (Health of Aquaculture Animals and Products) Regulations 2008. (SI No. 261 of 2008). This was subsequently amended in 2010 and 2011 (see amendment regulations below).
S.I. No. 398 of 2010	These Regulations amend the European Communities (Health of Aquaculture Animals and Products) Regulations 2008 (S.I. No. 261 of 2008), to take account of developments at European Union level.
S.I. No. 430 of 2011	These Regulations amend the European Communities (Health of Aquaculture Animals and Products) Regulations 2008 (S.I. No. 261 of 2008) to give effect to new measures introduced by Commission Decision 2011/187/EU as regards the approval of national measures for preventing the introduction of ostreid herpesvirus 1 µvar (OsHV-1µVar). The Regulations provide for the establishment of national measures in relation to OsHV-1 µvar, which will allow areas (bays) which are currently free of the virus to be protected in terms of trading with areas infected with OsHV- 1 µvar.
S.I. No. 23 of 2015	European Communities (Health of Aquaculture Animals and Products) (Amendment) Regulations 2015. This Regulation amends Annex IV to Council Directive 2006/88/EC as regards infectious salmon anaemia (ISA)

APPENDIX 4. Notifiable Diseases Listed in Annex IV of EU Directive 2006/88

Notifiable diseases are those listed in Part II, Annex IV of Council Directive 2006/88/EC, as amended. Directive 2006/88/EC classifies notifiable diseases into two categories. Each category has its own set of criteria for listing.

Exotic Diseases - These are exotic to the European Community and have the potential for significant economic consequences in aquaculture or have potential to cause detrimental environmental effects to wild species if they occur in the European community.

Exotic diseases listed as notifiable in Directive 2006/88/EC

Fish	Molluscs	Crustacean
Epizootic haematopoietic necrosis (EHN)	Infection with Bonamia exitiosa	Taura syndrome
	Infection with Perkinsus marinus	Yellowhead disease
	Infection with Microcytosis mackini	

Non-exotic Diseases - These are present in some parts of the European Community and have either, the potential for significant economic consequences in aquaculture or the potential to cause detrimental environmental effects to wild species if they occur in regions where they are not currently found.

Non-exotic diseases listed as notifiable in Directive 2006/88/EC

Fish	Molluscs	Crustacean
Infectious salmon anaemia (ISA)	Infection with *Bonamia ostreae*	White spot disease
Viral haemorrhagic Septicaemia (VHS)	Infection with *Marteilia refringens*	
Infectious haematopoeitic necrosis (IHN)		
Koi herpes virus (KHV)		

Notifiable Diseases Listed Under National Measures for Ireland - In addition to the diseases listed above, Ireland is free of the following diseases for which we have applied national measures under Article 43 of Directive 2006/88/EC and enacted through Community legislation (Decision 2010/221/EU as amended).

Diseases for which Ireland has implemented national measures

Fish	Molluscs
Gyrodactylosis	Oysters herpesvirus 1-µVar
Spring viraemia of carp (SVC)	
Bacterial kidney disease	

APPENDIX 5. List of all Marine Environment Health Series

No. 1. Assessment of Water Quality Data from Kilkieran Bay, Co. Galway Evin McGovern, A. Rowe, B. McHugh, J. Costello, M. Bloxham, Conor Duffy, Eugene Nixon (2001*).* http://hdl.handle.net/10793/219

No. 2. Trace metal and chlorinated hydrocarbon concentrations in shellfish from Irish waters, 1997-1999. Evin McGovern, A. Rowe, B. McHugh, J. Costello, M. Bloxham, Conor Duffy, Eugene Nixon (2001). http://hdl.handle.net/10793/220

No. 3. The fate of oxytetracycline in the marine environment of a salmon cage farm. R. Coyne*, P. Smith, Christopher Moriarity (2001).* http://hdl.handle.net/10793/221

No.4. Winter nutrient monitoring of the Western Irish Sea - 1990 to 2000 Evin McGovern, Eileen Monaghan, M. Bloxham, A. Rowe, Conor Duffy, A. Quinn, Brendan McHugh, T. McMahon, M. Smyth, M. Naughton, M. McManus, Eugene Nixon (2002). http://hdl.handle.net/10793/222

No.5. Monitoring of zebra mussels in the Shannon-Boyle navigation, other navigable regions and principal Irish lakes, 2000 & 2001 Dan Minchin, F. Lucy, M. Sullivan (2002). http://hdl.handle.net/10793/223

No. 6. *Monitoring of tributyl tin contamination in six marine inlets using biological indicators. Dan Minchin (2003).* http://hdl.handle.net/10793/224

No.7. *Trace metal and chlorinated hydrocarbon concentrations in shellfish from Irish waters, 2000 Denise Glynn, Linda Tyrrell, Brendan McHugh, A. Rowe, Jim Costello, Evin McGovern (2003).* http://hdl.handle.net/10793/225

No. 8. *Trace metal and chlorinated hydrocarbon concentrations in various fish species, landed at selected Irish ports 1997-2000. Linda Tyrrell, Denise Glynn, A. Rowe, Brendan McHugh, Jim Costello, Conor Duffy, A. Quinn, M. Naughton, M. Bloxham, Eugene Nixon, Evin McGovern (2003).* http://hdl.handle.net/10793/226

No. 9. *Environmental quality and carrying capacity for aquaculture in Mulroy Bay Co. Donegal. T. Telfor, K. Robinson (2003).* http://hdl.handle.net/10793/228

No.10. Trace metal and chlorinated hydrocarbon concentrations in shellfish from Irish waters, 2001. Denise Glynn, Linda Tyrrell, Brendan McHugh, A. Rowe, Eileen Monaghan, Jim Costello, Evin McGovern (2003*).* http://hdl.handle.net/10793/231

No.11. The Irish coral task force and Atlantic coarl ecosystem study report on two deep-water coral conservation stakeholder workshops held in Galway in 2000 and 2002 A. Grehan, R. Long, B. Deegan, M. O'Cinneide (2003). http://hdl.handle.net/10793/234

No.12. The occurrence and risk assessment of the pesticide toxaphene in fish from Irish waters. (2003). Brendan McHugh, Denise Glynn, Eugene Nixon, Evin McGovern (2003*).* http://hdl.handle.net/10793/235

No.13. Trace Metal and Chlorinated Hydrocarbon Concentrations in Various Fish Species Landed at Selected Irish Ports, (2001). Linda Tyrrell, Denise Glynn, Brendan McHugh, A. Rowe, Eileen Monaghan, Jim Costello, Evin McGovern (2003). http://hdl.handle.net/10793/237

No.14. An epidemiological investigation of the re-emergence of pancreas. Disease in Irish farmed Atlantic Salmon (Salmo Salar L.) in 2002 M. F. McLoughlin, E. Peeler, K. L. Foyle, H. D. Rodger, D. O'Ceallachain, F. Geoghegan (2003). http://hdl.handle.net/10793/239

No.15. Salmon Mortalities at Inver Bay and Mc Swynes Bay Finfish Farms, County Donegal, Ireland during 2003. Margot Cronin, Caroline Cusack, Fiona Geoghegan, Dave Jackson, Evin McGovern, T. McMahon, Francis O'Beirn, M. O'Cinneide & Joe Silke (2004). http://hdl.handle.net/10793/241

No.16. Trace Metal and Chlorinated Hydrocarbon Concentrations in Shellfish from Irish waters, (2002). Denise Glynn, Linda Tyrrell, Brendan McHugh, Eileen Monaghan, Jim Costello, Evin McGovern (2004*).* http://hdl.handle.net/10793/255

No. 17. Review of the potential mechanization of kelp harvesting in Ireland Astrid Werner Stefan Kraan (2004). http://hdl.handle.net/10793/261

No.18. Trace metal and chlorinated hydrocarbon concentrations in Various Fish species landed at selected Irish Port, 2002 Linda Tyrrell, Mary Twomey, Denise Glynn, Brendan McHugh, Eileen Joyce, Jim Costello, Evin McGovern (2004).http://hdl.handle.net/10793/260

No.19. Proceedings of the 5th Irish Shellfish Safety Scientific Workshop (2005) http://hdl.handle.net/10793/259

No. 20. Trace metal and chlorinated hydrocarbon concentrations in Various Fish Species landed at selected port 2003. Linda Tyrrell, Brendan McHugh, Denise Glynn, Mary Twomey, Eileen Joyce, Jim Costello, Evin McGovern (2005). http://hdl.handle.net/10793/229

No.21. *Karenia mikimotoi:* An exceptional Dinoflagellate bloom in western Irish waters, Summer 2005. J. Silke, F. O' Beirn and M. Cronin (2005). http://hdl.handle.net/10793/240

No. 22. Research on Pancreas Disease in Irish Farmed Salmon 2004/2005 - Current & Future Initiatives. Neil Ruane, H. Rodger, D. Graham, L. Foyle, A. Norris, J. Ratcliff, K. Murphy, S. Mitchell, C. Staples, H. Jewhurst, D. Todd, Fiona Geoghegan, M. O'Cinneide (2005). http://hdl.handle.net/10793/247

No. 23. Proceedings of the 6th Irish Shellfish Safety Workshop, Galway, 1st December 2005 (2006). http://hdl.handle.net/10793/249

No. 24. Guidelines for the assessment of dredge material for disposal in Irish waters. Margot Cronin, Evin McGovern, Terry McMahon, Rick Boelens, Marine Environment Consultant - Portroe, Nenagh, Co. Tipperary & Corresponding author (2006). http://hdl.handle.net/10793/251

No. 25. Trace Metal Concentrations in Shellfish from Irish Waters, 2003. B. Boyle, Linda Tyrrell, Brendan McHugh, Eileen Joyce, Jim Costello, Denise Glynn, Evin McGovern (2006). http://hdl.handle.net/10793/252

No. 26. *Investigation into levels of dioxins, furans, polycholorinated biphenyls and brominated flame retardants in fishery produce in Ireland. ChristinaTlustos, Brendan McHugh, Iona Pratt, Linda Tyrrell, Evin McGovern (2006).* http://hdl.handle.net/10793/254

No. 27. Proceedings of the 7th Irish Shellfish Safety Workshop (2007. http://hdl.handle.net/10793/262

No. 28. Isolation and purification of AZAs from naturally contaminated materials, and evaluation of their toxicological effects. Phillip Hess, Pearse McCarron, Nils Rehmann, Jane Kilcoyne, Terry McMahon, Gavin Ryan, Michael P. Ryan, Michael J. Twiner, Gregory J. Doucette, Masayuki Satake, Emiko Ito, Takeshi Yasumoto (2007). http://hdl.handle.net/10793/268

No. 29. Bonamia Ostrea in the native oyster Ostrea edulis: A Review. Sarah Culloty and Marie Mulcahy (2007). http://hdl.handle.net/10793/269

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HEADQUARTERS & LABORATORIES

MARINE INSTITUTE
Rinville
Oranmore
Co. Galway
Tel: +353 91 387 200
Fax: +353 91 387 201
Email: institute.mail@marine.ie

MARINE INSTITUTE REGIONAL OFFICES

MARINE INSTITUTE
Three Park Place
Upper Hatch Street
Dublin 2
Tel: +353 17 753 900
Fax: +353 91 387 201

MARINE INSTITUTE
Furnace
Newport
Co. Mayo
Tel: +353 98 42300
Fax: +353 98 42340