

OIE Collaborating Centres Reports Activities

Activities in 2018

This report has been submitted : 2019-01-18 14:27:03

Title of collaborating centre:	Information Aquatic Animal Diseases
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Name of Director of Institute (Responsible Official):	Dr Rachel Hartnell, Divisional Director
Name (including Title and Position) of Head of the Collaborating Centre (formally OIE Contact Point):	Prof Stephen W. Feist, Principal Pathologist, Chief Scientific Advisor Aquatic Animal Health
Name of writer:	Stephen W. Feist

ToR: To provide services to the OIE, in particular within the region, in the designated specialty, in support of the implementation of OIE policies and, where required, seek for collaboration with OIE Reference Laboratories

ToR: To identify and maintain existing expertise, in particular within its region

1. Activities as a centre of research, expertise, standardisation and dissemination of techniques within the remit of the mandate given by the OIE

Disease control	
Title of activity	Scope
Provision of a dedicated Fish Health Inspectorate (FHI) to fulfil statutory responsibilities regarding aquatic animal health.	The FHI is responsible for the delivery and enforcement of aquatic animal health legislation in England and Wales.
Epidemiology, surveillance, risk assessment, modelling	
Title of activity	Scope
Provision of an aquatic animal health epidemiological surveillance service.	Provision of advice for aquatic animal health policy. Risk assessment and modelling; design and assessment of surveillance plans.
Training, capacity building	
Title of activity	Scope
Provision of EURL crustacean disease proficiency testing.	PT scheme for EU Member States for the diagnosis via PCR of the OIE and EC listed pathogens WSSV, TSV & YHV
Training in laboratory diagnostics.	Training participants from Oman (in country and at Cefas) in the use of diagnostic tools to detect and identify pathogens endemic and exotic to Oman for the current and potential future aquaculture species. Training in crustacean histopathology at the EURL Technical Workshop.
Training in fish health inspection and surveillance.	Training in health survey design and implementation.
Training in molecular diagnostics.	Hosted four UK BEIS-funded Rutherford Fellows (WorldFish employees from Bangladesh and Malawi), providing training in molecular biology, molecular techniques for disease detection, diagnostics, and management, 'next generation' sequencing technologies, and bioinformatics
Zoonoses	
Title of activity	Scope
National Reference Laboratory for Anisakis.	Advice and representation at the EURLP and working group meetings. Coordinating Official Control Laboratory activities for Anisakis. Production of Standard Operating Procedures (SOPs) and other guidance documentation. Overseeing and delivery of proficiency tests. Maintenance of website for the Anisakis NRL.

Wildlife	
Title of activity	Scope
Monitoring of offshore marine fish and shellfish.	As part of the UK marine environmental quality assessments. Using sentinel fish (dab). Commercial fish and shellfish (when available) are assessed for disease and samples collected for analysis and reference collections.
Aquatic animal diseases	
Title of activity	Scope
Emerging aquatic animal disease investigations.	Disease characterisation, epidemiology, pathogen characterisation, risk assessment for aquaculture and wild populations.
OIE experts available for Koi Herpesvirus (KHV) and Spring Viraemia of Carp (SVC).	Provision of expert advice on these disease conditions, their diagnosis, host range, pathogenicity and characterisation. Included pathogen testing in a carp only mass mortality in Iraq.
Activities as EURL for Crustacean diseases (to June 2018).	Provision of expertise in crustacean disease and diagnostic proficiency testing. Supporting research activities; nationally and with several international partners.
Pathogen characterisation.	Regular requests for assistance with the interpretation of histopathology and for reference material. Supporting research activities, including pathogen characterisation via electron microscopy (TEM), laser capture microscopy and subsequent DNA sequencing.
Development of rapid in-field diagnostics.	Working with technologists to develop rapid in-field diagnostics (PCR) and reporting (via smartphone app) for two OIE-listed pathogens (WSSV and AHPND).
Collaborative research on microbiome conditions for disease emergence.	Research project in India, Bangladesh and Malawi on microbiological (microbiome) conditions for emergence of disease (including OIE-listed diseases such as WSSV) in pond systems using environmental DNA (eDNA).
Pathology & systematics of novel and emerging pathogens.	Working with EU Member States and other countries on the pathology and systematics of novel and emerging pathogens in wild and farmed aquatic animals.
Improving understanding of molluscan protistan pathogen life-cycles.	As part of the EU H2020 consortium in shellfish disease ('Vivaldi'), research into the inter-relationships between invertebrate hosts and their pathogens, using integrated approaches for pathogen systematics, specific in situ imaging in host tissues (ISH) and assessment of pathogenicity.
Application of cutting-edge molecular diagnostic technologies.	Working with technologists to trial portable high throughput sequencing technologies for multiplex detection of aquatic animal pathogens and, development of bioinformatic tools to place listed pathogens in context with underlying microbiome/pathobiome in outbreak/non-outbreak scenarios.
Investigations into large scale mortalities in Ghana.	Integrated diagnostic approaches to identify involvement of pathogens and significant pathology.

ToR : To propose or develop methods and procedures that facilitate harmonisation

of international standards and guidelines applicable to the designated speciality**2. Proposal or development of any procedure that will facilitate harmonisation of international regulations applicable to the surveillance and control of animal diseases, food safety or animal welfare**

Proposal title	Scope/Content	Applicable area
Update of the	Updates of the Aquatic Manual by OIE experts for KHV,SVC and Crayfish Plague. Expert input from Dr Ed Peeler who is currently Vice President of the OIE Aquatic Animal Disease Commission.	<input checked="" type="checkbox"/> Surveillance and control of animal diseases <input type="checkbox"/> Food safety <input type="checkbox"/> Animal welfare

ToR: To establish and maintain a network with other OIE Collaborating Centres designated for the same speciality, and should the need arise, with Collaborating Centres in other disciplines

ToR: To carry out and/or coordinate scientific and technical studies in collaboration with other centres, laboratories or organisations

3. Did your Collaborating Centre maintain a network with other OIE Collaborating Centres (CC), Reference Laboratories (RL), or organisations designated for the same speciality, to coordinate scientific and technical studies?

Yes

Name of OIE CC/RL/other organisation(s)	Location	Region of networking Centre	Purpose
EURL Crustacean Disease	Cefas Weymouth, UK and DTU, Denmark	<input type="checkbox"/> Africa <input type="checkbox"/> Americas <input type="checkbox"/> Asia and Pacific <input checked="" type="checkbox"/> Europe <input type="checkbox"/> Middle East	Coordinate activities regarding crustacean disease systematics and training (to June 2018). 2018 meeting held DTU, Denmark.
Worldfish Centre	Malaysia	<input checked="" type="checkbox"/> Africa <input checked="" type="checkbox"/> Americas <input checked="" type="checkbox"/> Asia and Pacific <input checked="" type="checkbox"/> Europe <input checked="" type="checkbox"/> Middle East	<p>Coordination of Cefas activities with those of the Worldfish FISH CRP in the area of Tilapia Health. Co-support of new Cefas/Worldfish fellow in aquatic animal</p> <p>health which has been in place since early 2018; based in Malaysia (Worldfish Centre) and has embarked on a tilapia health programme in Asia (Bangladesh) and various African nations.</p>

EURL for Mollusc Disease	Ifremer, France	<input type="checkbox"/> Africa <input type="checkbox"/> Americas <input type="checkbox"/> Asia and Pacific <input checked="" type="checkbox"/> Europe <input type="checkbox"/> Middle East	Sharing of information on fish health status. Participation in inter-laboratory proficiency tests; provision of reference materials and advice; provision of training.
EURL for Fish and Crustacean (from June 2018) Disease	DTU, Denmark	<input type="checkbox"/> Africa <input type="checkbox"/> Americas <input type="checkbox"/> Asia and Pacific <input checked="" type="checkbox"/> Europe <input type="checkbox"/> Middle East	Sharing of information on fish health status. Participation in inter-laboratory proficiency tests; provision of reference materials and advice; provision of training.
International Council for the Exploration of the Seas (ICES). Expert Group Pathology and diseases of Marine Organisms.	Denmark	<input type="checkbox"/> Africa <input checked="" type="checkbox"/> Americas <input type="checkbox"/> Asia and Pacific <input checked="" type="checkbox"/> Europe <input type="checkbox"/> Middle East	Reporting of disease emergence and trends in marine fish and shellfish (wild stocks and aquaculture).

4. Did your Collaborating Centre maintain a network with other OIE Collaborating Centres, Reference laboratories, or organisations in other disciplines, to coordinate scientific and technical studies?

No

ToR: To place expert consultants at the disposal of the OIE.

5. Did your Collaborating Centre place expert consultants at the disposal of the OIE?

Yes

Name of expert	Kind of consultancy	Subject
Prof Stephen W Feist	Advice	Expert services for investigation of emerging aquatic animal diseases. Also, including the Centre's facilities for screening of the published literature on a regular basis for sound and relevant information on the occurrence of OIE-listed diseases for adding to the International Database on Aquatic Animal Disease (IDAAD). Dr Feist answered by email, requests from OIE member countries for aquatic animal disease information, including emerging diseases.
Dr Edmund Peeler	Advice	Epidemiology and Risk. Dr Peeler is currently Vice President of the OIE Aquatic Animal Disease Commission.
Dr David Stone	Advice	OIE Expert on Spring Viraemia of Carp (SVC) and Koi Herpesvirus (KHV).

Prof Grant D Stentiford	Advice	Expert in crustacean disease. Dr Stentiford was the Director of the EURL for Crustacean diseases (to June 2018). Currently leading the International Centre of Excellence for Aquatic Animal Health at Cefas Weymouth.
Dr Kevin Denham	Advice	Dr Denham is the Head of the Fish Health Inspectorate, responsible for the regulatory functions for the national control of aquatic animal diseases in England and Wales.
Dr David Verner-Jeffreys	Advice	Expert aquatic animal bacteriologist with expertise in antimicrobial resistance (AMR).
Dr Richard Paley	Advice	Expert virologist and member of the ICES Expert Group on Pathology and Diseases of Marine Organisms (WGPDMO)
Dr Kelly Bateman	Advice	Crustacean disease expert. Coordinator for EURL for crustacean diseases (to June 2018).
Dr David Bass	Advice	Protistologist and molecular parasitologist with emphasis on pathogen diversity and life cycles.

ToR: To provide, within the designated specialty, scientific and technical training to personnel from OIE Member Countries

6. Did your Collaborating Centre provide scientific and technical training, within the remit of the mandate given by the OIE, to personnel from OIE Member Countries?

Yes

- a) Technical visits: 7
- b) Seminars: 1
- c) Hands-on training courses: 3
- d) Internships (>1 month): 8

Type of technical training provided (a, b, c or d)	Content	Country of origin of the expert(s) provided with training	No. participants from the corresponding country
a	Aquatic animal health diagnostics and control.	Oman	3
a	Crustacean disease diagnostics	Thailand	5
b	Crustacean disease diagnostics	Various	10
c	Diagnostic sampling procedures for fish disease.	Ghana, Bangladesh, Malawi and Oman	4
d	PhD students in various aspects of fish and shellfish health and pathogen systematics	Various	8

ToR: To organise and participate in scientific meetings and other activities on behalf of the OIE

7. Did your Collaborating Centre organise or participate in the organisation of scientific meetings on behalf of the OIE?

No

ToR: To collect, process, analyse, publish and disseminate data and information relevant to the designated specialty

8. Publication and dissemination of any information within the remit of the mandate given by the OIE that may be useful to Member Countries of the OIE

a) Articles published in peer-reviewed journals: 21

Minardi, D., Bateman, K.S., Kudzal, A., Stone, M.J., Avant, J., Condliffe, R., Brotherton, P., Laverick, M., Dangtip, K., Itsathitphaisarn, O., Baoprasertkul, P., Stentiford, G.D. (2018) Testing of a Pond-Side Molecular Diagnostic Tool for the Detection of White Spot Syndrome Virus (WSSV) in Shrimp Aquaculture. *Journal of the World Aquaculture Society*, DOI: 10.1111/jwas.12558.

Cano Cejas, I., Taylor, N., Bayley, A.E., Gunning, S.E., McCulloch, R., Bateman, K.S., Nowak, B., Paley, R.K. (2018) In vitro gill cell monolayer successfully reproduces in vivo Atlantic salmon host responses to *Neoparamoeba perurans* infection. *Fish and Shellfish Immunology*, 86, 287-300.

Stentiford, G.D., Ross, S., Minardi, D., Feist, S.W., Bateman, K.S., Gainey, P., Troman, C., Bass, D. (2018) Evidence for trophic transfer of *Indosporous octospora* and *Oveipleistophora arlo n. sp.* (microsporidia) between crustacean and fish hosts. *Parasitology*, 145, (8), 1-13.

Cano, I., van Aerle, R., Ross S, Verney-Jeffreys, D., Paley, R.K., Rimmer, G., Hooper, P., Stone, D., Feist, S.W. (2018) Molecular characterization of an *Endozoicomonas*-like organisms causing infection in the king scallop *Pecten maximus* L. *Applied and Environmental Microbiology* 84: 3 (300952-17) (open access).

Kerr, R., Ward, G.M., Stentiford, G.D., Alfjorden, A., Mortensen, S., Bignell, J.P., Feist, S.W., Villalba, A., Carballal, M.J., Cao, A., Arzul, I., Ryder, D., Bass, D. (2018) *Marteilia refringens* and *Marteilia pararefringens* sp. Nov. are distinct parasites of bivalves and have different European distributions. *Parasitology*, 145, (11), 1483-1492.

Van Eynde, B., Christiaens, O., Delbare, D., Cooreman, K., Bateman, K.S., Stentiford, G.D., Dullemans, A., Van Oers, M., Smaghe, G. (2018). Development and application of a duplex PCR assay for detection of Crangon crangon bacilliform virus in populations of European brown shrimp (*Crangon crangon*). *Journal of Invertebrate Pathology*, 153,195-202.

Snorre Gulla, Andrew C. Barnes, Timothy J. Welch, Jesús L. Romalde, David Ryder, Michael J. Ormsby, Jeremy Carson, Karin Lagesen, David W. Verner-Jeffreys*, Robert L. Davies, Duncan J. Colquhoun (2018) Multilocus Variable-Number Tandem-Repeat Analysis of *Yersinia ruckeri* Confirms the Existence of Host Specificity, Geographic Endemism, and Anthropogenic Dissemination of Virulent Clones. *Applied and Environmental Microbiology*, 84 (16), e00730-18.

Matthijs Metselaar, Kim D Thompson, Richard Paley, Scott E LaPatra, David W. Verner-Jeffreys, Stephen W. Feist, Sonia J Lloyd, Douglas R Call & Alexandra Adams. Investigating the involvement of a Rickettsia-like organism in red mark syndrome in rainbow trout *Oncorhynchus mykiss*. *Journal of Fish Diseases* (Submitted).

Joakim Larsen et al. incl. D. W. Verner- Jeffreys* (2018) Critical knowledge gaps and research needs related to the environmental dimensions of antibiotic resistance. *Environment International* 117, 132-138.

Christie, L., van Aerle, R., Paley, R.K., Verner-Jeffreys, D.W., Tidbury, H., Feist, S.W. and Cano, I. (2018) The skin immune response of Rainbow Trout, *Oncorhynchus mykiss* (Walbaum), to Puffy Skin Disease. *Fish and Shellfish*

Immunology. 78, 355-363.

Ward GM, Feist SW, Noguera P, Marcos-Lopez M, Ross, S, Green M, Urrutia A, Bass D (2018) Detection and characterisation of *Minchinia mytilii* n. sp., a haplosporidian parasite of the blue mussel *Mytilus edulis*. *Diseases of Aquatic Organisms* (in press).

Holt C, Foster R, Daniels CL, van der Giezen M, Feist SW, Stentiford GD, Bass D (2018) *Halioticida noduliformans* infection in eggs of lobster (*Homarus gammarus*) reveals its generalist parasitic strategy in marine invertebrates. *J Invert Pathol*, 154, 109-116.

Bojko, J., Dunn, A.M., Stebbing, P.D., van Aerle, R., Bacela-Spychalska, K., Bean, T.P., Stentiford, G.D. (2018) *Aquarickettsiella crustaci* n. gen. n. sp. (Gammaproteobacteria: Legionellales: Coxiellaceae); a bacterial pathogen of the freshwater crustacean *Gammarus fossarum* (Malacostraca: Amphipoda). *Journal of Invertebrate Pathology*, 156, 41-53.

Bojko, J., Stentiford, G.D., Stebbing, P.D., Hassall, C., Deacon, A., Cargill, B., Pile, B., Dunn, A.M. (2017). Pathogens of *Dikerogammarus haemobaphes* regulate host activity and survival, controlling the invasive population, but also threaten native amphipod populations in the UK. *Diseases of Aquatic Organisms*, doi.org/10.3354/dao03195.

Bass, D., Czech, L., Williams, B., Berney, C., Dunthorn, M., Mahe, F., Torruella, G., Stentiford, G.D., Williams, T.A. (2018). Clarifying the relationships between Microsporidia and Cryptomycota. *Journal of Eukaryotic Microbiology*, 65, (6), 773-782.

Bojko, J., Stebbing, P.D., Dunn, A.M., Bateman, K.S., Clark, F., Kerr, R.C., Stewart-Clark, S., Johannesen, A., Stentiford, G.D. (2018) Symbiont profiles of green crabs (*Carcinus maenas*) along a North Atlantic invasion route. *Diseases of Aquatic Organisms*, 128, (2), 147-168.

Hooper, P., Verner-Jeffreys, D.W., Ross, S., Feist, S.W., Cano, I. Molecular detection of *Endozoicomonas*-like organisms in water samples shed by persistently infected kind scallop *Pecten maximus* L. shows evidence of horizontal transmission. *Diseases of Aquatic Organisms*, 84, (3), e00730-18.

Sana, S., Hardouin, E., Paley, R., Zhang, T., Andreou, D. Mitochondrial genome compaction precedes the evolution of multicellularity in animals. *Molecular Phylogenetics and Evolution* (Submitted).

Bass D, Czech L, Williams BAP, Berney C, Dunthorn M, Mahé F, Torruella G, Stentiford GD, Williams TA (2018) Clarifying the Relationships between Microsporidia and Cryptomycota. *J. Euk. Microbiol* 18(6):1282-1298. doi: 10.1111/1755-0998.12912.

Williams BAP, Hamilton KM, Jones MD, Bass, D (2018) Group-specific environmental sequencing reveals high levels of ecological heterogeneity across the microsporidian radiation. *Environmental Microbiology Reports* 10:328-336. doi: 10.1111/1758-2229.12642.

Ward GM, Neuhauser S, Groben R, Ciaghi S, Berney C, Romac S, Bass D (2018) Environmental sequencing fills the gap between parasitic haplosporidians and free-living giant amoebae. *J Euk Microbiol*, Jan 16. doi: 10.1111/jeu.12501.

b) International conferences: 8

Paley & Stinton: International workshop on new viral diseases in aquaculture of cyprinid fish. 23-25th October 2018. Vodnany, Czech Republic. 'Update on CEV research and diagnostics in England and Wales.

European Association of Fish Pathologists (EAFP) UK branch meeting held at Marine Institute, Galway, Ireland. 18-19th September 2018.

Bass, D. Invited plenary speaker at Czech Society for Parasitology meeting. 30th April to 4 May 2018. Czech Republic.

Bass, D. Invited plenary speaker at the Society for Experimental Biology meeting, Azores (Aquatic animal disease in high CO2 environments). 9-11 April, 2018.

Bass D. Protistology UK/International Society for Evolutionary Biology spring meeting. 'A novel filasterian parasite of littoral amphipods'. Droushia, Cyprus. 28 May to 1 June 2018.

Cano, I. European Vet workshop (EVIW) - Utrecht, Netherlands. 5th September 2018

Bateman, K.S. Society for Invertebrate Pathology (SIP). Organised and chaired symposium on White Spot Disease, Gold Coast, Australia, 12-16 August 2018.

c) National conferences: 0

d) Other

(Provide website address or link to appropriate information): 2

1. International Database on Aquatic Animal Diseases

(IDAAD)<http://www.cefas.co.uk/international-database-on-aquatic-animal-diseases/>

2. International Centre of Excellence for Aquatic Animal Health

<https://www.cefas.co.uk/centres-of-excellence/aquatic-animal-health/>