

WOAH Collaborative Centre Reports Activities 2023

Activities in 2023

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Centre Information

Title of WOA Collaborating Centre	Emerging Aquatic Animal Diseases
Address of WOA Collaborating Centre	Centre for Environment, Fisheries and Aquaculture Science (Cefas), Barrack Road, The Nothe, Weymouth, DT4 8UB, UK
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Website:	https://www.cefas.co.uk/icoe/aquatic-animal-health/designations/woah-collaborating-centre-for-emerging-aquatic-animal-disease/
Name Director of Institute (Responsible Official):	Dr Rachel Hartnell
Name (including Title and Position) of Head of the Collaborating Centre (WOAH Contact Point):	Dr Kelly Bateman and Dr Richard Paley
Name of the writer:	Dr Kelly Bateman and Dr Richard Paley

TOR1 AND 2: SERVICES PROVIDED

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

Category	Title of activity	Scope
Disease control (true)	Provision of 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, (true)	Provision of 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 (true)	Provision of training in sampling and histological analysis of fish and crustacean diseases	Training in sampling and histological processing techniques for fish and crustacean tissues. Training in histopathology to examine tissues for infectious disease agents
Wildlife (true)	Monitoring of health and disease of wild fish, crustacean and bivalve molluscs	Samples of fish, crustacean and bivalve mollusc tissues were assessed for disease and samples collected for reference materials

Aquatic animal diseases (true)	International Database on Aquatic Animal Diseases (IDAAD)	Complete review of the disease data, accessions added and updated as required
Training, capacity building (true)	Provision of training in DNA/RNA extraction and PCR analysis	Training in DNA and RNA extraction for analysis via PCR for WOAHA listed diseases
Training, capacity building (true)	Provision of training in in situ hybridisation for detection and localisation of aquatic pathogens	Organised a workshop to deliver training course on in situ hybridisation techniques for diagnosing mollusc pathogens. The training consisted of a three-day lab work using histology sections of Chilean mussels infected with either <i>Endozoicomonas</i> sp., <i>Francisella haliotidica</i> , and <i>Anaplasma</i> sp., as well as negative controls.
Training, capacity building (true)	Provision of training for bioinformatic analyses of fish pathogens	Organised a workshop on Genomics of Fish Pathogens as part of the 21st International Conference on Diseases of Fish and Shellfish (September 2023, Aberdeen, UK). This workshop was aimed for early career researchers with no or minimal experience of performing bioinformatics analyses. The training involved learning basic command-line techniques, which were then used to analyse bacterial pathogen data.
Aquatic animal diseases (true)	WOAH experts available for Koi Herpesvirus (KHV) and Spring Viraemia of Carp (SVC)	Provision of expert advice on these disease conditions, their diagnostics, host range, pathogenicity and characterisation, including pathogen testing when required
Aquatic animal diseases (true)	Investigation into health of Lobster stocks (<i>Homarus gammarus</i>)	Provision of advice and assistance in histological analysis of tissues to European colleagues
Aquatic animal diseases (true)	Investigation into red skin disease	National collaboration to undertake transcriptomic analyses on samples from England and Scotland to investigate potential aetiological agents associated with extensive ventral haemorrhaging in returning wild Atlantic salmon (termed red skin disease)
Aquatic animal diseases (true)	WOAH Training of National Focal Points for Aquatic Animal Health (Cycle IV)	Expert facilitator support x1 at Africa English speaking training event in Kigali, Rwanda
Aquatic animal diseases (true)	QOAH Launch of the Regional Aquatic Animal Health Laboratory Network for Africa (RAAHLN-AF)	Expert facilitator support x2 at Africa English speaking training event in Pretoria, South Africa

TOR3: HARMONISATION OF STANDARDS

2. Proposal or development of any procedure that will facilitate harmonisation of international regulations applicable to the main focus area for which you were designated

Proposal title	Scope/Content	Applicable area
Tilapia Lake Virus Chapter for WOAHA Diagnostic Manual	Draft preparation following WOAHA template is ongoing	Laboratory expertise health management

WOAH ad hoc group on susceptibility of crustacean species to infection with WOAHL listed diseases	Reviewed evidence for susceptibility of crustacean species with Decapod Iridovirus 1 (DIV1) and White Spot Syndrome Virus (WSSV). Reports submitted to WOAHL	Laboratory expertise health management
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3. In exercising your activities, have you identified any regulatory research needs* relevant for WOAHL?

No

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

Yes

Name of WOAHL CC/RL/other organisation(s)	Location	Region of networking Centre	Purpose
European Union Reference Laboratory for Fish and Crustacean Diseases	DTU, Denmark	Europe	Sharing of information on fish and crustacean health, participation in interlaboratory proficiency tests
European Union Reference Laboratory for Bivalve Mollusc Diseases	IFREMER, France	Europe	Sharing of information on bivalve mollusc health, participation in interlaboratory proficiency tests
FAO Antimicrobial Resistance (AMR) Reference Centre	Cefas, UK	Europe	Collaboration to provide services in identifying AMR risks to aquatic animals and to help develop and assess the effectiveness of alternative solutions to control disease in farmed aquatic animals (particularly finfish and shrimp)
International Council for the Exploration of the Seas (ICES). Expert working group on Pathology and diseases of marine organisms (WGPDMO)	ICES, Denmark	Europe	Chair of the WGPDMO, reporting of disease emergence and trends in marine fish and shellfish stocks (wild stocks and aquaculture)
International Council for the Exploration of the Seas (ICES). Expert working group on crab	ICES, Denmark	Europe	Reporting of disease emergence and trends in wild crab stocks
European Virus Archive – Global (EvaG)	Various	Europe	International group of 47 laboratories that represent an extensive range of virological disciplines, generating and distributing diagnostic materials and protocols globally
WOAHL Reference Laboratory for AHPND, IHHNV, NHP, TSV, WSSV	University of Arizona, USA	Americas	Participation in histological proficiency test for crustacean diseases

Department of Fisheries, Thailand	Bangkok, Thailand	Asia and Pasific	Collaboration on shrimp health
Centre of Excellence for Shrimp Molecular Biology and Biotechnology (CENTEX Shrimp)	Mahidol University, Thailand		Collaboration on shrimp health
Department for Animal Production and Health (DAP&H)	Kandy, Sri Lanka	Asia and Pasific	Collaboration on project investigating slow growth syndrome in shrimp
Cawthron	New Zealand	Asia and Pasific	Metabarcoding analyses for characterization of bacterial communities in mussels
National Agricultural Research Organisation (NARO)	Uganda	Africa	Visit to assess laboratory capabilities and opportunities to support development including potential PhD studies.
Ministry of Fisheries and Aquaculture Development, Fisheries Commission, Fish Health Unit	Ghana	Africa	Ongoing support of capacity development and supervision of PhD students. Whole genome sequencing of bacterial isolates
Indian Council of Agricultural Research (ICAR)	India	Asia and Pasific	Collaboration on investigation, technical development and knowledge sharing on white gut syndrome in farmed shrimp; developing understanding of syndromic/multi-factorial diseases and their elucidation.

TOR4 AND 5: NETWORKING AND COLLABORATION

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

Yes

Name of WOAHP CC/RL/other organisation(s)	Location	Region of networking Centre	Purpose
WOAHP Collaborating Centre Network in Wildlife Health	WOAHP HQ, Paris	Africa Americas Asia and Pasific Europe	Network of Collaborating Centres on Wildlife Health to support the wildlife health framework towards improving wildlife health around the globe by effectively targeting the needs of its member countries
			Network of Collaborating Centres on Aquatic Animal

WOAH Aquatic Collaborating Centre Network	Online meetings	Americas Europe	Health to enhance communication, identify and share opportunities for collaboration on projects (research and technology transfer) and identify and facilitate opportunities for aquatic animal health collaborative training within the WOAHA community
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TOR6: EXPERT CONSULTANTS

6. Did your Collaborating Centre place expert consultants at the disposal of WOAHA?

Yes

NAME OF EXPERT	KIND OF CONSULTANCY	SUBJECT
Dr Kelly Bateman	Advice	Co-Head of the WOAHA Collaborating Centre for Emerging Aquatic Animal Diseases From April 2023). Expert in crustacean diseases and pathologist for investigation of aquatic animal diseases
Dr Richard Paley	Advice	Co-Head of the WOAHA Collaborating Centre for Emerging Aquatic Animal Diseases (from April 2023); Expert virologist, especially Spring Viraemia of Carp (SVC)
Prof Grant Stentiford	Advice	Expert pathologist for investigation of aquatic animal diseases. Head of the WOAHA Collaborating Centre for Emerging Aquatic Animal Diseases (until end March 2023)
Dr Frederico Batista	Advice	Expert in bivalve mollusc diseases and emerging molecular diagnostic tools
Dr Edmund Peeler	Advice	Expert in epidemiology and risk
Dr Jessica Witt	Advice	WOAHA Focal point for Aquatic Animal Health for the UK, expert in epidemiology and risk
Prof David Bass	Advice	Molecular parasitologist, focussing on pathogen diversity and life cycles; and molecular systematics of novel/emergent pathogens
Dr Verner Jeffreys	Advice	Director of FAO AMR Reference Centre, expert aquatic animal bacteriologist
Dr David Stone	Advice	WOAHA expert on Koi Herpesvirus (KHV) and Spring Viraemia of Carp (SVC)
Dr Irene Cano Cejas	Advice	Expert virologist, especially Koi Herpesvirus (KHV) Expert in immunology and host-responses

Dr Ronny van Aerle	Advice	Expert in genomics and bioinformatics, focussing on Aquatic Animal Health. Co-Director of the Collaborative Centre for Sustainable Aquaculture Futures (SAF).
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TOR7: SCIENTIFIC AND TECHNICAL TRAINING

7. Did your Collaborating Centre provide advice/services to requests from Members in your main focus area?

Yes

- Assistance provided to a European country investigating an unexplained mortality event in European lobster (*Homarus Gammarus*) stocks. Samples were submitted to the Collaborating Centre for analysis via histology, electron microscopy, PCR and sequencing.
- Assistance provided to European NRL investigating unusual histopathology in kidneys of imported rainbow trout undergoing a disease event. Samples submitted to the collaborating centre, histological slides prepared and scanned, results discussed jointly in real time from scanned images.

8. Did your Collaborating Centre provide scientific and technical training, within the remit of the mandate given by WOAAH, to personnel from WOAAH Members?

Yes

a) Technical visit : 0

b) Seminars : 5

c) Hands-on training courses: 6

d) Internships (>1 month) : 10

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
B	Organised and hosted seminar – One Health Aquaculture and co-design of future research, technical, and policy priorities	India	80
B	Invited as keynote speaker at the CrayfIT conference to present on Viral diseases of Crayfish	Various European countries	50
B	Training of National Focal Points for Aquatic Animal Health	Rwanda	10
B	Training of National Focal Points for Aquatic Animal Health	South Africa	10
C	Hands on training in shrimp pathology	Philippines	1
C	Hands on training in crab dissections	St Helena	2
C	Hands on training in fish and shrimp pathology	Qatar	1
C	Hands on training in DNA and RNA extraction and PCR for known aquatic diseases	Bangladesh	2
C	Hands on training in in situ hybridisation methods	Chile	15

D	PhD and MPhil students, various subjects in the field of aquatic animal disease	Various	10
B	Invited speaker and panel member at the Giant Prawn 2023 conference in Bangkok, Thailand to present on diseases of <i>Macrobrachium rosenbergii</i>	Various	160
C	Hands on training in shrimp pathology and PCR in situ hybridisation analysis	Bangladesh	8

TOR8: SCIENTIFIC MEETINGS

9. Did your Collaborating Centre organise or participate in the organisation of scientific meetings related to your main focus area on behalf of WOA?H

Yes

NATIONAL/INTERNATIONAL	TITLE OF EVENT	CO-ORGANISER	DATE (MM/YY)	LOCATION	NO. PARTICIPANTS
International	WOAH Training of National Focal Points for Aquatic Animal Health (Cycle IV)	WOAH	2023-10-02	Kigali Rwanda	24
International	WOAH Launch of the Regional Aquatic Animal Health Laboratory Network for Africa (RAAHLN-AF)	WOAH	2023-12-05	Pretoria, South Africa	30

TOR9: DATA AND INFORMATION DISSEMINATION

10. Publication and dissemination of any information within the remit of the mandate given by WOA?H that may be useful to Members of WOA?H

a) Articles published in peer-reviewed journals:

21

- Adamek, M., Matras, M., Surachetpong, W., Rakus, K., Stachnik, M., Bauer, J., Falco, A., Jung-Schroers, V., Piewbang, C., Techangamsuwan, S. and Abd El Rahman, S., Paley, R., Reichert M., Steinhagen D. (2023). How susceptible are rainbow trout and brown trout to infection with tilapia lake virus at increased water temperature—Is there any potential for climate change driven host jump?. *Aquaculture*, 571, p.739469. <https://doi.org/10.1016/j.aquaculture.2023.739469>.
- Alathari, S., Chaput, D.L., Bolaños, L.M., Joseph, A., Jackson, V.L., Verner-Jeffreys, D., Paley, R., Tyler, C.R. and Temperton, B. (2023) A multiplexed, tiled PCR method for rapid whole-genome sequencing of Infectious spleen and kidney necrosis virus (ISKNV) in tilapia. *Viruses*, 15(4), 965. <https://doi.org/10.3390/v15040965>
- Bass, D., Christison, K.W., Stentiford, G.D., Cook, L.S.J., Hartikainen, H. (2023) Environmental DNA/RNA for pathogen and parasite detection, surveillance, and ecology. *Trends Parasitol.* 39, 285-304. <https://doi.org/10.1016/j.pt.2022.12.010>
- Batista, F.M., Hatfield, R., Powell, A., Baker-Austin, C., Lowther, J., Turner, A.D. (2023). Methodological advances in the detection of biotoxins and pathogens affecting production and consumption of bivalve molluscs in a changing environment. *Current Opinion in Biotechnology* 80:102896. <https://doi.org/10.1016/j.copbio.2023.102896>
- Bojko, J. Behringer, D.C., Bateman, K.S., Stentiford, G.D., Clark, F.P. (2023) *Pseudohepatospora borealis* n. gen. n. sp. (Microsporidia: Enterocytozoonida): a microsporidian pathogen of the Jonah crab (*Cancer borealis*). *Journal of Invertebrate Pathology*, <https://doi.org/10.1016/j.jip.2023.107886>
- Campbell, A.M., Hauton, C., Baker-Austin, C., van Aerle, R., and Martinez-Urtaza, J. 2023. An integrated eco-evolutionary framework to predict population-level responses of climate-sensitive pathogens. *Current Opinion in Biotechnology*. 80:102898 <https://doi.org/10.1016/j.copbio.2023.102898>
- Coyle, N.M., O'Toole, C., Thomas, J.C., Ryder, D., Feil, E.J., Geary, M., Bean, T.P., Joseph, A.W., Waine, A., Cheslett, D. and Verner-Jeffreys, D.W., (2023). *Vibrio aestuarianus* clade A and clade B isolates are associated with Pacific oyster (*Magallana gigas*) disease outbreaks across Ireland. *Microbial Genomics*, 9(8), p.001078. <https://doi.org/10.1099/mgen.0.001078>
- EFSA (European Food Safety Authority), Gnocchi M, Aires M, Alvarez J, Arzul I, Asensio Aznar I, Bicot D, Carmosino I, Drewe Ashley J, Dharmaveer S, Garin Bastuji B, Karagianni AE, Miranda Chueca MA, Olesen NJ, Palaiokostas C, Roberts H, Saxmose Nielsen S, Schiøtt M, Sindre H, Stone D, Rusina A, Vendramin N and Dhollander S, (2023). Extensive literature review on vectors and reservoirs of AHL-listed pathogens of fish. EFSA supporting publication 2023:EN-8123. 22 pp. <https://doi.org/10.2903/sp.efsa.2023.EN-8123>
- EFSA (European Food Safety Authority), Lindgren KL, Alemu S, Alvarez J, Arzul I, Asensio Aznar I, Bailly Caumette E, Bicot D, Ashley Drewe J, Dharmaveer S, Garin Bastuji B, Kohnle L, Meroc E, Miranda Chueca MA, Olesen NJ, Roberts H, Saxmose Nielsen S, Schiøtt M, Sindre H, Stone D, Rusina A, Vendramin N and Dhollander S, 2023. Extensive literature review on vectors and reservoirs of AHL-listed pathogens of crustaceans. EFSA supporting publication 2023:EN-8122. 12 pp. <https://doi.org/10.2903/sp.efsa.2023.EN-8122>
- EFSA AHAW Panel (EFSA Panel on Animal Health and Welfare), Nielsen, S. S., Alvarez, J., Bicot, D., Calistri, P., Canali, E., Drewe, J. A., Garin-Bastuji, B., Gonzales Rojas, J.

- L., Smith, C. G., Herskin, M., Michel, V., Miranda Chueca, M. A., Padalino, B., Spooler, H., Stahl, K., Velarde, A., Viltrop, A., Winckler, C., Arzul, I., Shetty D., Olesen, N.J., Schiatt, M., Sindre, H., Stone, D., Vendramin, N., Aires, M., Aznar Asensio, I., Antoniou, S-E, Barizzone, F., Dhollander, S., Gnocchi, M., Karagianni, AE., Lindgren Kero, L., Pilar Munoz Guajardo, I., Rusina A., and Roberts, H. (2023). Species which may act as vectors or reservoirs of diseases covered by the Animal Health Law: Listed pathogens of fish. *EFSA Journal*, 21 (8), 1–45. <http://doi.org/10.2903/j.efsa.2023.8174>
- EFSA AHAW Panel (EFSA Panel on Animal Health and Welfare), Nielsen, S. et al., (2023). "Assessment of listing and categorisation of animal diseases within the framework of the Animal Health Law (Regulation (EU) 2016/429): Spring Viraemia of Carp (SVC)." *EFSA Journal* 21(10): e08324. <https://doi.org/10.2903/j.efsa.2023.8324>
 - EFSA AHAW Panel (EFSA Panel on Animal Health and Welfare), Nielsen, S. et al., (2023). "Assessment of listing and categorisation of animal diseases within the framework of the Animal Health Law (Regulation (EU) 2016/429): infection with *Gyrodactylus salaris* (GS)." *EFSA Journal* 21(10): e08325. <https://doi.org/10.2903/j.efsa.2023.8325>
 - EFSA AHAW Panel (EFSA Panel on Animal Health and Welfare), Nielsen, S. et al., (2023). "Assessment of listing and categorisation of animal diseases within the framework of the Animal Health Law (Regulation (EU) 2016/429): Bacterial kidney disease (BKD)." *EFSA Journal* 21(10): e08326. <https://doi.org/10.2903/j.efsa.2023.8326>
 - EFSA AHAW Panel (EFSA Panel on Animal Health and Welfare), Nielsen, S. et al., (2023) "Assessment of listing and categorisation of animal diseases within the framework of the Animal Health Law (Regulation (EU)2016/429): Infection with salmonid alphavirus (SAV)." *EFSA Journal* 21(10): e08327. <https://doi.org/10.2903/j.efsa.2023.8327>
 - EFSA AHAW Panel (EFSA Panel on Animal Health and Welfare), Nielsen, S. et al., (2023). "Assessment of listing and categorisation of animal diseases within the framework of the Animal Health Law (Regulation (EU) No 2016/429): infectious pancreatic necrosis (IPN)." *EFSA Journal* 21(6): e08028. <https://doi.org/10.2903/j.efsa.2023.8028>
 - Hooper, C., Ward, G.M., Foster R, Skujina, I., Ironside, J.E., Berney, C., Bass, D. (2023) Long amplicons as a tool to identify variable regions of ribosomal RNA (rRNA) for improved taxonomic resolution and diagnostic assay design in microeukaryotes: using *Ascetosporea* as a case study. *Frontiers in Ecology and Evolution* 11, 1266151, <https://doi.org/10.3389/fevo.2023.1266151>
 - Riborg, A., Gulla, S., Fiskebeck, E.Z., Ryder, D., Verner-Jeffreys, D.W., Colquhoun, D.J. and Welch, T.J., (2023). Pan-genome survey of the fish pathogen *Yersinia ruckeri* links accessory-and amplified genes to virulence. *PLOS ONE*, 18(5). <https://doi.org/10.1371/journal.pone.0285257>
 - Smith, P., Le Devendec, L., Jouy, E., Larvor, E., Le Breton, A., Picon-Camacho, S., ana Zrnčić, S., Zupičič, I.G., Karataş, S., Verner-Jeffreys, D. and Joseph, A.W., (2023). Epidemiological cut-off values for *Vibrio anguillarum* MIC and disc diffusion data generated by standardised methods. *Diseases of aquatic organisms*, 155, pp. 109-123. <https://doi.org/10.3354/dao03740>
 - Stentiford, G.D., Tyler, C.R., Ellis, R.P., Bean, T.P., MacKenzie, S., Brugere, C., Holt, C.C., Peeler, E.J., Christison, K.W., Rushton, J., Bass, D. (2023) Defining and averting syndemic pathways in aquaculture: a major global food sector. *Frontiers in Sustainable Food Systems*, 7, <https://doi.org/10.3389/fsufs.2023.1281447>
 - Walters, E.A., Bojko, J., Crowley, C.E., Gandy, R.L., Martin, C.W., Shea, C.P., Bateman, K.S., Stentiford, G.D., Behringer, D.C. (2023) Salinity and temperature affect the symbiont profile and host condition of Florida USA blue crabs *Callinectes sapidus*. *Journal of Invertebrate Pathology*, <https://doi.org/10.1016/j.jip.2023.107930>
 - Zhang, J., Huiling, Q., Wen, Z., Wu, L., Yang, X., Zhu, Y., Zheng, X., Stone, D., Yu, Y., Huang, P., Zhou, W., St-Hilaire, S., Liu, H., Jia, P. (2023). Carp edema virus, a great threat for carp and koi farming in Henan, China. *Aquaculture*, 576, p.739869. <https://doi.org/10.1016/j.aquaculture.2023.739869>

b) International conferences:

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- Dr Kelly Bateman and Dr Ronny van Aerle attended the 55th Annual Meeting of the Society for Invertebrate Pathology, Maryland USA, 30th July – 3rd August 2023. Dr Bateman organised and chaired a symposium on "Blue crabs of Maryland and their various parasites: 50 years on, what do we know?" and provided oral presentation opening symposium. Dr van Aerle organised and chaired a symposium on "Omics tools furthering invertebrate pathology research".
- Dr Kelly Bateman was invited keynote speaker at the CrayfishIT European meeting of the International Association of Astacology IAA, Pavia Italy, 5th – 8th September 2023. Dr Bateman provided oral presentation on "Viral diseases of Crayfish".
- Dr Richard Paley attended the 21st International Conference on Diseases of Fish and Shellfish, European Association of Fish Pathologists (EAFP), Aberdeen, UK, 11th-14th September 2023. Dr Paley provided oral presentation on "Investigation into Red Skin Disease" and staffed a stand promoting the collaborating centre and its work.
- Ms Chantelle Hooper was an invited speaker and panel member at the Global Meet on Giant Prawns, held in Bangkok, Thailand, 27 – 29th November 2023. Ms Hooper provided oral presentation on "Diseases of *Macrobrachium rosenbergii*".

c) National conferences:

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- Dr Frederico Batista was invited to give a talk at the Shellfish Association of Great Britain's annual conference, London UK, 6th and 7th June 2023.

d) Other (Provide website address or link to appropriate information):

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11. What have you done in the past year to advance your area of focus, e.g. updated technology?

12. Additional comments regarding your report:

Dr Kelly Bateman and Dr Richard Paley were appointed as Co-Heads of the Collaborating Centre for Emerging Aquatic Animal Diseases, taking over from Prof. Grant Stentiford in April 2023.