

FAO Reference Centre - Annual report for the FAO Reference Centre for Bivalve
Mollusc Sanitation Calendar Year 2020

(Thematic areas¹)

Title of FAO Reference Centre	FAO Reference Centre for Bivalve Mollusc Sanitation
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Name, title and function of reporting officer (if different from above)	
Reporting period	January 2020 – December 2020
Date of reporting	May 2021

1.0 Introduction

The Centre for Environment, Fisheries and Aquaculture Science (Cefas) is designated as the FAO Reference Centre for Bivalve Mollusc Sanitation. The Reference Centre's mandate is to contribute to the implementation of FAO's scientific, technical, and economic programme priorities and to provide specific, independent technical/scientific advice aimed at strengthening capacities in countries and regions. According to the 'Terms and Conditions of the Designation' agreed between FAO and the United Kingdom's Department of Environment, Food and Rural Affairs (Defra), the duration of the existing FAO Reference Centre for Bivalve Mollusc Sanitation is 4-years. This second annual report describes the technical and scientific activities delivered via the Reference Centre to support the FAO Department of Fisheries and Aquaculture, and the associated costs for calendar year 2020. Financial support for operation of the Reference Centre was afforded by Defra and the United Kingdom's Food Standards Agency (FSA). Details of finances are provided in Annex I.

2.0 Areas of Collaboration

The annual work programme of the FAO Reference Centre for Bivalve Mollusc Sanitation was agreed in December 2018 [<https://www.cefas.co.uk/faobivalves/>]. Five main areas of collaboration were agreed for 2020:

- Provision of support for the development and maintenance of FAO eLearning material and resources on bivalve mollusc sanitation
- Provide guidance on relevant laboratory protocols, accreditation and use of methods for bivalve mollusc testing to FAO Member Countries
- Prepare and deliver an International/regional workshop on bivalve mollusc sanitation
- Undertake pilot proficiency testing (PT) for Member Countries
- Additional activities supporting FAO and WHO mandate

2.1 Provision of support for the development and maintenance of FAO eLearning material and resources on bivalve mollusc sanitation.

In 2018, the FAO/WHO Food Safety and Quality Series, Technical Guidance for the Development of the Growing Area Aspects of Bivalve Mollusc Sanitation Programmes was published². In 2019 the first part of this technical guidance was successfully translated into an eLearning module via a collaboration between FAO Reference Centre for Bivalve Mollusc Sanitation, FAO Department of Fisheries and Aquaculture and the FAO eLearning Academy. In 2020 Module two, covering 'Growing Area Assessment and Review' (Figure 1) was developed and published (<https://elearning.fao.org/course/view.php?id=629>) according to an agreed framework. This course comprises 8 lessons of between 20- and 70-minutes duration (Table 1) and is intended for policy makers, development practitioners, sectoral specialists and researchers, bivalve farmers, trainers, and extension agents. Lessons in module 2 cover scope and review of the growing area assessment in terms of potential hazards identified in the growing area profile thus linking with

² FAO and WHO (2018) *Technical guidance for the development of the growing area aspects of Bivalve Mollusc Sanitation Programmes*. Food Safety and Quality Series No. 5 Rome, 292 pp Licence: CC BY-NC-SA 3.0 IGO.

module 1 (Growing Area Risk Profile). It also includes information on how to document relevant data on sources of contamination and environmental factors impacting the assessment area, to document and analyse shoreline survey data and undertake an indicator and/or hazard survey. Finally, it covers the use of quantitative assessment techniques to evaluate the presence of hazards or indicators in a growing area.

Plans for the development of the final module 3 (Classification and Growing Monitoring and Growing Area Management) were agreed (Figure 2). Once complete this three-module eLearning package will form an easily accessible, open access online resource detailing all of the stages required to select, maintain and manage growing areas to help ensure the production and harvest of microbiologically safe bivalves. FAO eLearning attracts over 600,000 active learners. This demonstrates the power and reach of this approach, which also reduces the necessity for in-country visits (reducing carbon emissions) and helps target capacity-building needs in Low- and Middle-Income Countries, (LMICs), the latter particularly relevant during 2020 due to significant national and international movement restrictions imposed during the COVID-19 pandemic.



Figure 1. eLearning Module 2—published in 2020
<https://elearning.fao.org/course/view.php?id=629>

Bivalve mollusc sanitation: growing area assessment and review			
1	Introduction to the Growing Area Assessment	5	Data analysis and assessment
2	Data gathering on contamination sources	6	Types of quantitative assessments
3	Gathering data on environmental factors	7	Outcomes of the growing area assessment
4	Shoreline, indicator, and hazard surveys	8	Growing area review

Table 1. Bivalve mollusc sanitation: growing area assessment and review lesson breakdown



Learning outcomes – module 3

1. Be able to use the output of the GAA, to **design a primary monitoring regime** to provide data to inform **classification status** and **ongoing monitoring**.
2. Make informed recommendations for ongoing monitoring using information generated from 1, and to generate and **document sampling plans** for ongoing monitoring.
3. Understand the requirements for **sampling and sample transport**
4. Understand the recommended **quality management frameworks** for laboratories and microbiological methods, including an overview of the **principles of the recognised international methods** for the determination of faecal indicators and pathogens in bivalves and water.
5. **Delineate production areas**, determine **classification status** of the area, including establishing conditional classifications and buffer zones.
6. Understand the **role of the Responsible Authorities** in event management, surveillance and enforcement.
7. Be able to **document all components** of classification, monitoring and management into a coherent bivalve sanitation programme.

Figure 2. *Classification and Growing Monitoring and Growing Area Management – agreed framework for lesson structure in Module 3, with learning outcomes.*

2.2 Provide guidance on relevant laboratory protocols, accreditation and use of methods for bivalve mollusc testing

A website hosted by Cefas [<https://www.cefas.co.uk/faobivalves>] was maintained and enhanced enabling interested parties to access relevant information, download laboratory method protocols, troubleshooting guidance, technical reports, eLearning and register for proficiency/comparative testing. The website is the primary method of dissemination for the FAO Reference Centre community and will be continuously improved based upon stakeholder feedback and user statistics. In 2020 improvements included the addition of the real time online Vibrio Map Viewer (Figure 3), developed in collaboration with the European Centre for Disease Prevention and Control (ECDC) and others, providing a near real-time model that uses daily updated remote sensing data to examine worldwide environmental conditions, such as sea surface temperature and salinity for *Vibrio* spp. In addition, the *Vibrio parahaemolyticus* global phylogeny tool (Figure 3), using the Microreact application, shows the phylogenetic relationships, geographic distribution and timeline of a collection of more than 1300 *V. parahaemolyticus* genomes. The collection comprises genomes available from public databases (NCBI) along with genomes from strains deposited in the Reference Centre's *V. parahaemolyticus* global culture collection,

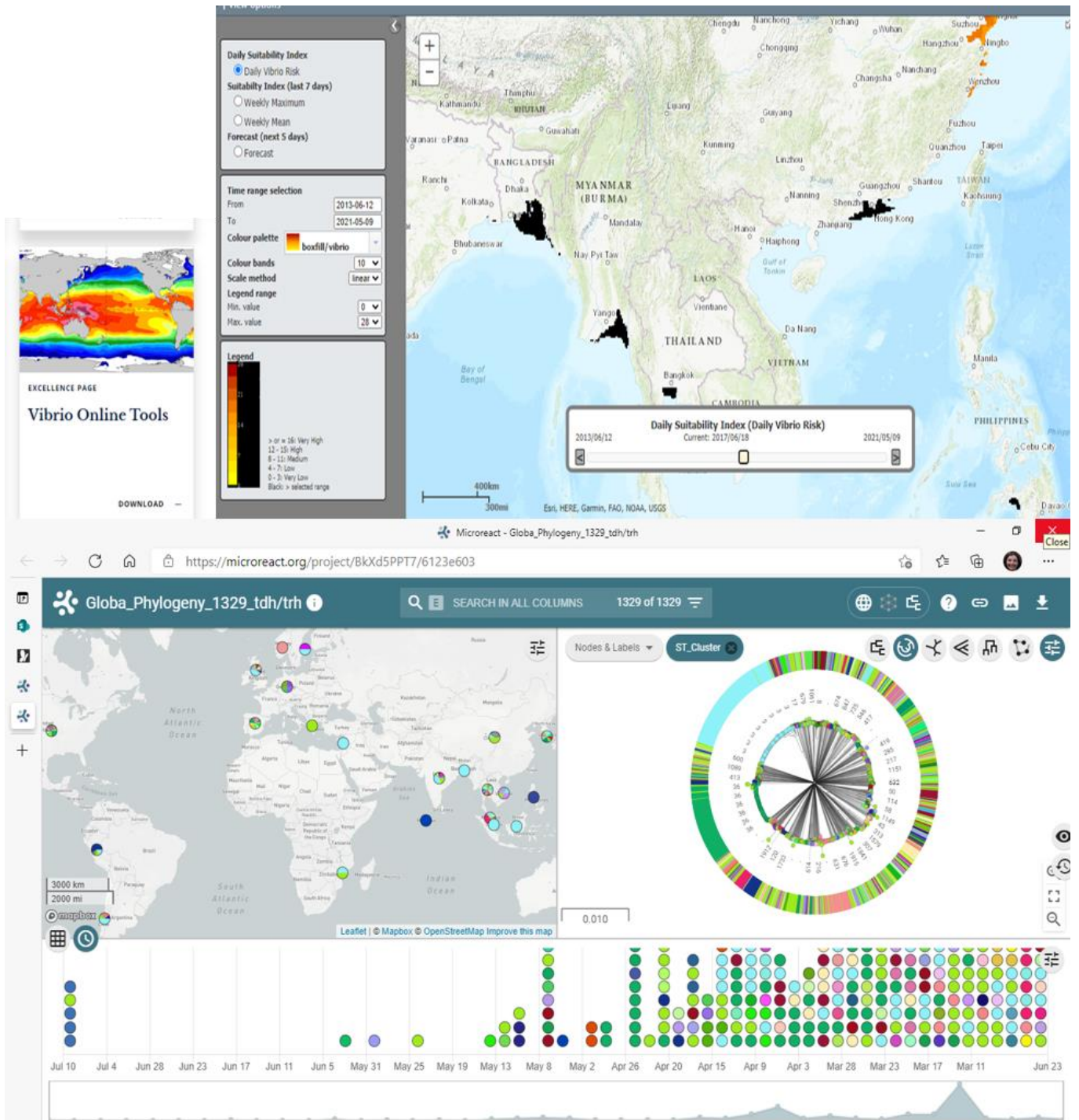


Figure 3. *Vibrio* online tools on the Cefas FAO Reference Centre website in 2020

2.2.1 Laboratory protocols (accredited ISO/IEC 17025 and non-accredited) available from the Reference Centre

The methods listed in Table 1 with application for testing bivalve molluscs or growing areas were reviewed and made available to interested parties via the website www.cefias.co.uk/faobivalves. Reference materials can be provided on request to laboratories wishing to develop and implement methods for determination of bivalve mollusc or growing area quality.

Methods and guidance with applicability for bivalve mollusc sanitation
[NEW] Determination of faecal coliform bacteria in seawater using most probable number technique (based on the US FDA BAM chapter 4)
Enumeration of <i>Escherichia coli</i> in bivalve shellfish using the most probable number technique (based on ISO 16649-3) *
Detection of potentially pathogenic <i>Vibrio</i> spp. in bivalve shellfish
Detection of <i>Salmonella</i> spp. in bivalve molluscs (based on ISO 6579-1) *
Quantitative detection of norovirus and hepatitis A virus in bivalve molluscan shellfish (using ISO 15216-1) *
Enumeration of FRNA phage in bivalve shellfish
Guidance on the derivation of MPN results for official control testing of bivalve molluscs
Guidance for determining uncertainty of measurement for the enumeration of <i>E. coli</i> in bivalve molluscs by ISO 16649-3
Guidance on the use of proprietary <i>Salmonella</i> detection kits for detection and identification of <i>Salmonella</i> spp. in bivalve molluscs
Guidance providing supplementary data on the performance of vvHA real-time PCR assays for the detection of <i>Vibrio vulnificus</i>
Guidance for the determination of limits of detection and quantification for determination of viruses in bivalve shellfish
Example datasets for determination of limits of detection and quantification for determination of viruses in bivalve shellfish
Calculation spreadsheet for quantification of viruses in bivalve shellfish using ISO 15216-1
Guidance for best practice for norovirus testing in shellfish

*ISO/IEC 17025 accreditation held at the Reference Centre

Table 2. Methods and guidance with applicability for bivalve mollusc sanitation

2.2.2 Method Standardisation Activities and Representation

Personnel at the Reference Centre led or contributed to activities supporting method development, validation and standardisation with relevance to bivalve molluscs, in 2020 these included;

Provision of leadership for the ISO Ad Hoc Group “ISO 15216-1:2017/AMD-1” – Preparing the technical amendment to ISO 15216-1:2017 Microbiology of the food chain — Horizontal method for determination of hepatitis A virus and norovirus using real-time RT-PCR —Part 1: Method for quantification.

Provision of leadership and representation for the ISO/TC34/SC9/W27 “Vibrios” – Developing methods (quantitative and qualitative) for determination of human pathogenic *Vibrio* spp. (*V. parahaemolyticus*, *V. vulnificus* and *V. cholerae*) in seafoods (including bivalve molluscs).

Provision of representation on the project group on viruses and parasites within ISO/TC43/SC9/WG3 (method validation).

Provision of representation on CEN/TC463/WG1 (molecular methods for food microbiology)

2.3 Prepare and deliver an International/regional workshop on bivalve mollusc sanitation

The Reference Centre supported FAO’s scientific, technical and economic programme priorities in the Asia and Pacific region via the co-delivery of a virtual regional workshop on Bivalve Mollusc Sanitation on the 9th -11th December 2020 with FAO, Fisheries Division (Rome) (Figure 4). The aim of the workshop was to explore targeted programmes of capability building and networks in Responsible Authorities and Official Laboratories. Invitation of national Responsible Authorities and others was preceded by a selection process considering previous interest in bivalve production (received via FAO or Cefas), previous involvement with FAO in projects developing bivalve mollusc production, FAO production statistics for bivalves between 2011 and 2015, and existing international trade in fish, fisheries products and bivalve molluscs. Over 60 National Competent Authority delegates from **Bangladesh, India, Indonesia, Malaysia, Pakistan, The Philippines, Thailand, and Turkey** attended the three-day workshop, together with representatives from FAO and the Reference Centre. The workshop comprised presentation of existing capability and capacity data presented by each Responsible Authority, dissemination of aspects of the technical guidance for growing areas aspects of bivalve mollusc production areas, an interactive question and answer session, and a bivalve mollusc ‘quiz’. Due to increased interest in controls for marine biotoxins the Reference Centre invited Cefas’ principal biotoxin scientist Dr Andrew Turner to present on methods for detection of biotoxins in bivalve molluscs. The expected benefit and impact of the workshop was to build networks to provide support to countries wishing to sustainably develop or expand their production of bivalve molluscs (oysters, mussels, clams etc.) for domestic consumption or Interregional and International trade (Figure 5). The full workshop report can be downloaded at <https://www.cefas.co.uk/icoe/seafood-safety/designations/fao-reference-centre-for-bivalve-mollusc-sanitation/fao-regional-workshops/asia-and-pacific-virtual-regional-workshop-on-bivalve-mollusc-sanitation-december-2020/>. Summary feedback from delegates is included as Figure 6.

VIRTUAL REGIONAL WORKSHOP ON BIVALVE MOLLUSCS SANITATION

9, 10, 11 December 2020

Figure 4. Virtual Regional workshop on bivalve sanitation co-hosted by FAO Fisheries Division and the FAO Reference Centre for Bivalve Mollusc Sanitation

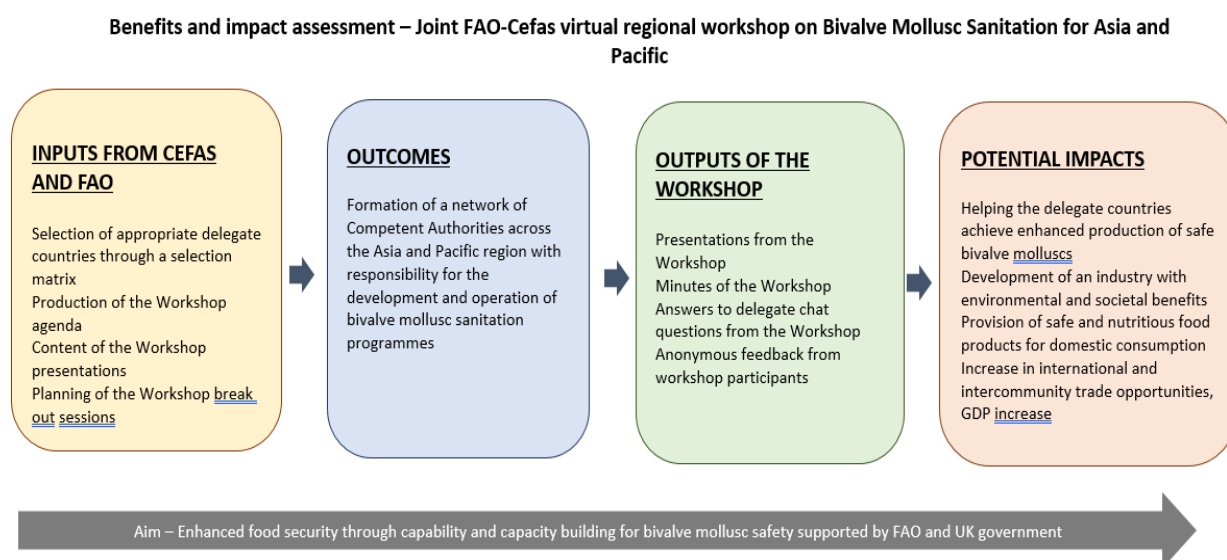


Figure 5. Benefits and impact assessment of the Asia and Pacific virtual regional workshop of the FAO Reference Centre for Bivalve Mollusc Sanitation

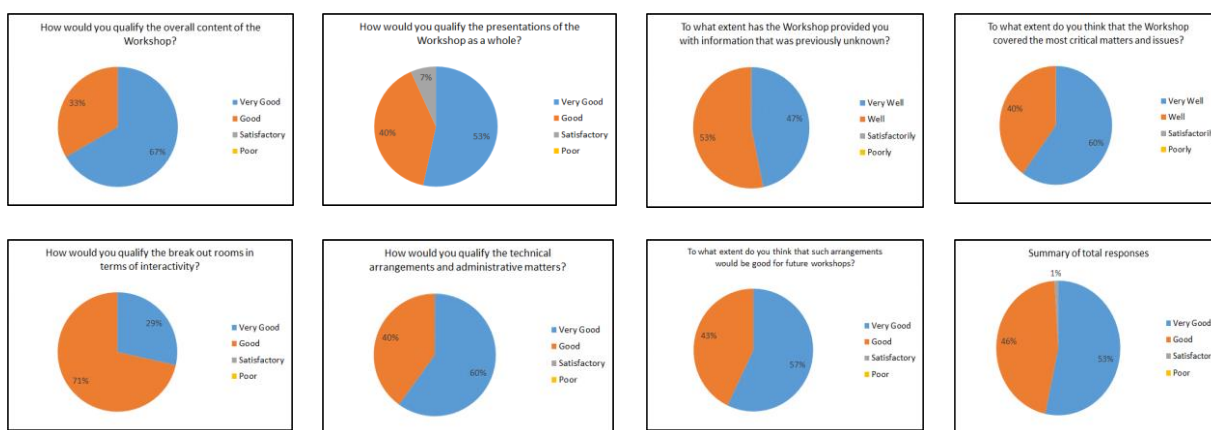


Figure 6. Anonymous feedback from the Asia and Pacific virtual regional workshop of the FAO Reference Centre for Bivalve Mollusc Sanitation

2.4 Pilot proficiency testing (PT) for Member Countries

The Reference Centre invited official laboratories of all countries attending the Africa (2019) and Asia and Pacific (2020) regional workshops to participate in a pilot PT distribution. The distribution comprises easily transportable, fully characterised laboratory constructed materials (Lenticules™) which once reconstituted mimic the bacteriological flora of either bivalve mollusc growing area waters or bivalve mollusc flesh and intravalvular fluid. All costs of the PT distribution were covered by the FAO Reference Centre. The aim of the PT is to assist in the establishment of approved laboratory methods for the determination of faecal indicators in national laboratories where the capability does not yet exist, or where participation in PT would assist laboratories with demonstration of the quality of test results and provide valuable material for staff training. Twenty-nine laboratories from 15 countries expressed an interest in participating in the distribution (Table 2). Generic protocols providing FAO reference methods for the determination of faecal coliform bacteria in seawater by most probable number (MPN) based upon the FDA BAM chapter 4 (seawater) (used for growing area assessments under the US National Shellfish Sanitation Programme (NSSP)) and enumeration of *Escherichia coli* in bivalve molluscan shellfish by the most probable number (MPN) technique based on ISO 16649-3 (bivalve flesh) used within the European Union (EU) regulatory framework for assessments of microbiological safety of bivalve molluscs, were also distributed to all participants. Results of the PT will be returned to the Reference Centre by June 2021 and a performance report along with troubleshooting guidance will be provided to participating laboratories and Competent Authorities in 2021.

Participating country Official Control Laboratory	No. of laboratories	Sample type requested	
		Faecal coliform (seawater)	<i>Escherichia coli</i> (bivalve flesh)
Quality Control Laboratory for Fisheries Products at INIPM, Angola	1		x
Quality Control Laboratory, Department of Fisheries, Chattogram, Bangladesh	3		x
Quality Control Laboratory, Department of Fisheries, Dhaka, Bangladesh			x
Quality Control Laboratory, Fish Inspection and Quality Control, Department Of Fisheries, Khulna, Bangladesh			x
Department of Water Resources, The Gambia	1	x	x
National Food Safety Labs, Fish Health Unit, Ghana	1		x
Loka Pemeriksaan Penyakit Ikan dan Lingkungan (Station for Investigation of Fish Health and Environmental), Indonesia	1	x	x

Kenya Marine and Fisheries Research Institute, Kenya	2		x
Kenya Fisheries Service, Kenya			x
Institut Pasteur de Madagascar, Madagascar	1	x	x
Marine Microbiology Laboratory, Mauritius	1	x	
Pusat Biosekuriti Perikanan Kuantan, Malaysia	2	x	x
Bacteriology Lab, Fisheries Research Institute, Malaysia		x	x
Laboratório de Inspeção do Pescado de Maputo, Mozambique	3		x
Laboratório de Inspeção do Pescado da Beira, Mozambique			x
Laboratório de Inspeção do Pescado de Quelimane, Mozambique			x
Livestock Experiment Station, Pakistan	1	x	x
Bureau of Fisheries and Aquatic Resources, The Philippines	1	x	x
Bureau of Fisheries and Aquatic Resources, Senegal	2	x	x
Laboratoire National de Commerce (LANAC), Senegal		x	x
South African Bureau of Standards (SABS), South Africa	2	x	x
Mérieux NutriSciences, South Africa		x	x
Gıda Kontrol Laboratuvar Mudurlugu, Turkey	6	x	x
Bursa Gıda ve Yem Kontrol Merkez Araştırma Enstitüsü Müdürlüğü, Turkey		x	x
Ulusal Gıda Referans Laboratuvar Müdürlüğü, Turkey		x	x
İstanbul Gıda Kontrol Laboratuvar Müdürlüğü, Turkey		x	x
Kazım Dirik Mahallesi Sanayi Caddesi, Turkey		x	x
Balıkesir Gıda Kontrol Laboratuvarı, Turkey		x	x
Total	29		

Table 3. National Official Laboratories participating in pilot proficiency testing for determinands of bivalve mollusc sanitary quality.

2.5 On request, deliver training and support to include provision of protocols, reference materials and access to proficiency testing programmes on microbiological testing and assessment of bivalve growing areas.

Further to section 2.4, protocols, reference materials, and access to additional standard matrix and non-matrix proficiency testing distributions (Annex II) were made available via the website (see 2.2), although the latter were impacted by international lockdown restrictions due to COVID-19. A signposting demonstration of how to access materials was provided to delegates at the Asia and Pacific workshop.

A member of FAO Reference Centre staff (Mr Andrew Younger) assisted with a mission to Indonesia to support the Indonesian Competent Authority in satisfying the requirements of the EU bivalve mollusc safety programmes. As background, in 2002, an EU audit team carried out a mission in Indonesia with the objective of assessing equivalence of the Indonesian control systems for live bivalve molluscs intended for export to the EU. This team identified important shortcomings in relation to several EU requirements, specifically in: the detail of the relevant Indonesian legislation, the performance of the competent authority, laboratory testing, and the classification of production areas. The main objective of the assignment undertaken by the FAO Reference Centre at the request of the Spanish Association for Standardisation (UNE), working on behalf of the EU, was essentially a follow-up on the 2002 EU audit to assess progress in addressing these shortcomings. The mission lasted 3 weeks (15 working days) and involved various meetings, site visits and training workshops with Government officials and industry members in Jakarta (Java), Bandar Lampung and Desa Sungai Burung (both in Sumatra). A final report was produced, the main findings of which were presented at the concluding meeting in Jakarta on 26th February 2020.



Figure 7. Mr Andrew Younger (second from left) representing the FAO Reference Centre with Indonesian Competent Authority officials at the opening meeting in Jakarta, Indonesia, February 2020.



Figure 8. Mr Andrew Younger presenting information to regional Indonesian Competent Authority officials at Desa Sungai Burung during a 3-week training mission (February 2020)

2.5 Additional activities supporting FAO and WHO mandate

The Reference Centre contributed to several initiatives in the FAO and WHO mandate with respect to supporting the development of safe bivalve production in 2020.

2.5.1 *Development of risk assessment tools for Vibrio parahaemolyticus and V. vulnificus associated with seafood*

Globally, the bacterial species *V. parahaemolyticus*, *V. cholerae* and *V. vulnificus* represent important human pathogens associated with the consumption of seafood. In response to the requests for scientific advice from the Codex Committee on Food Hygiene (CCFH), risk assessments for the pathogens *V. vulnificus*, *V. cholerae*, *V. parahaemolyticus* and guidance on methods for the detection of *Vibrio* spp. in seafood have been conducted and published previously by Joint FAO/WHO Microbiological Risk Assessment (JEMRA) expert meetings (e.g. the 2005 Risk assessment of *V. vulnificus* in raw oysters (VVRA) and the 2011 Risk assessment of *V. parahaemolyticus* in seafood (FAO/WHO 2005 & 2011). In order to provide an update on the state-of-the-art advice regarding risk assessment for *V. parahaemolyticus* and *V. vulnificus* in seafood, a JEMRA expert meeting was convened at Centre for Environment Fisheries and

Aquaculture Science (Cefas), Weymouth, United Kingdom, on 13-15 May 2019. In 2020 FAO Reference Centre staff in collaboration with WHO completed the meeting report. The report covered a number of topics where significant new information had emerged in the last decade (and since the publication of the 2010 meeting workshop draft report). These included (1) recent epidemiological data, (2) approaches on remote sensing-based risk assessment models, (3) improvements to detection and molecular methods, (4) aspects related to best practice for reducing risk, (5) new information on climate change, and (6) demographics; all of which represented key aspects in terms of modulating human health risks associated with these pathogens. Publication of the meeting report by WHO is pending.

2.5.2 *Vibrio strain collection*

Reference Centre funding was used to partially support the continued development of the global repository of vibrios of human pathogenic significance. In 2020 material transfer agreements with the Centre for South East Asian Studies, University of Kyoto, Japan and University of North Carolina were signed enabling the transfer of characterised strains of *V. parahaemolyticus* and *V. vulnificus*. These important bacterial strains will be made available to interested parties for research and development studies, method implementation and validation. This work supports the development of an online tool for molecular characterisation and deposition of vibrio genomes. Selected strains will be added to the Vibrio Phylogeny Tool (See Figure 3).

2.5.3 *Ad hoc advice to FAO*

The FAO Reference Centre provided *ad hoc* advice³ and participated in additional collaborative activities with FAO in the following areas:

- Assistance with the revision of the *Technical guidance for the development of the growing area aspects of Bivalve Mollusc Sanitation Programmes*. Food Safety and Quality Series No. 5.
- Assistance with information with respect to potential risks associated with bivalve molluscs and Sars Cov-2 virus.
- Assistance with the development of eLearning related to Antimicrobial Resistance.
- Technical information regarding *Streptococcus agalactiae*.
- FAO officers provided assistance, and support to Cefas with a UK government funded project aligned to the work of the FAO Reference Centre for bivalve molluscs sanitation aimed at capability and capacity building programme in Bangladesh across the aquatic supply chain, the partial focus of which was development of bivalve mollusc production in the Bay of Bengal (see Annex III).

³ *Ad hoc* advice is defined as that requiring >0.5-person days

3.0 Outreach and Collaboration Activities—FAO Reference Centre for Bivalve Mollusc Sanitation 2020

In 2020 the Reference Centre provided technical assistance, training, and access to proficiency testing to Responsible Authorities and Official Laboratories across 23 countries, Figure 10 summarises activities undertaken in 2020.

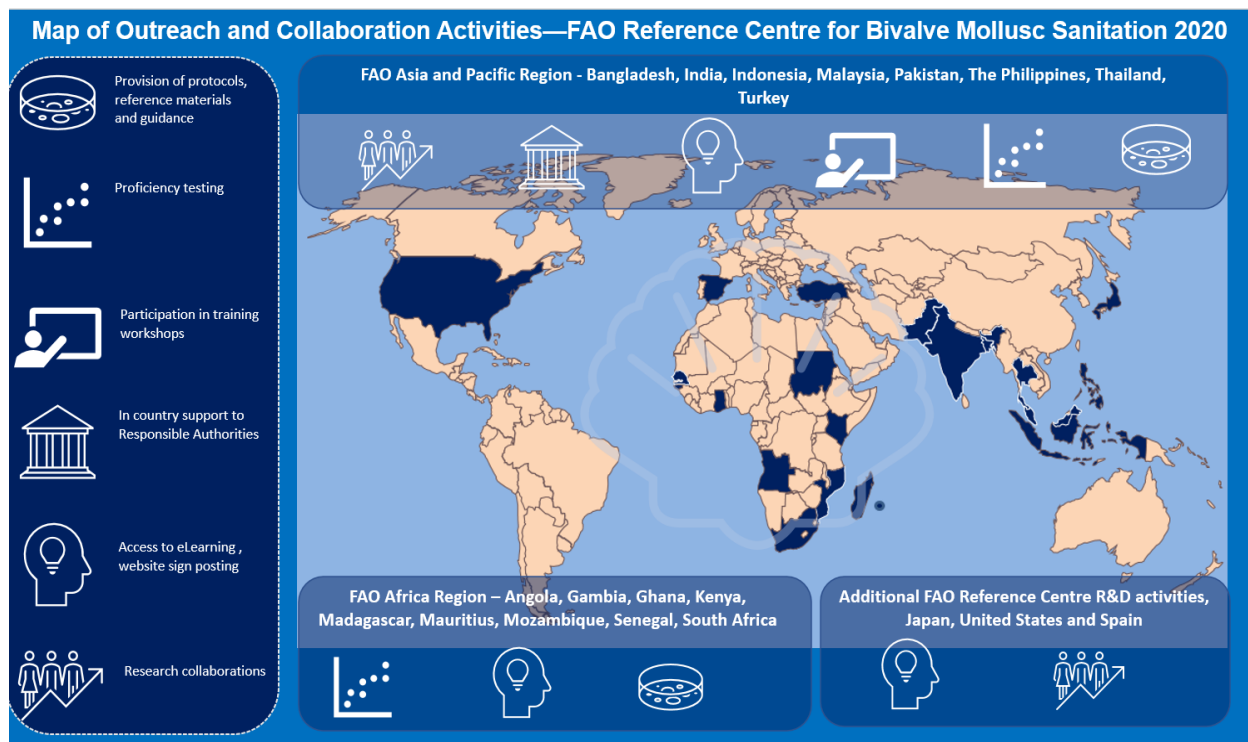


Figure 10. Outreach and Collaboration Activities—FAO Reference Centre for Bivalve Mollusc Sanitation 2020

4.0 Peer review and grey literature publications written by staff associated with the FAO Reference Centre for Bivalve Mollusc Sanitation in 2020

1. [The simple food that fights climate change \(bbc.com\)](https://www.bbc.com/news/health-56888888) contributions from FAO Esther Garrido Gamarro and Rachel Hartnell.
2. [Oceanic hitchhikers—assessing pathogen risks from marine microplastic](https://doi.org/10.1093/fms/fzab001) J Bowley, **C Baker-Austin**, A Porter, **R Hartnell**, C Lewis - Trends in Microbiology, 2020.
3. [Sustainable aquaculture through the One Health lens](https://doi.org/10.1038/s41538-020-0088-8) GD Stentiford, IJ Bateman, SJ Hinchliffe, D Bass, **R Hartnell**, EM Santos, MJ Devlin, SW Feist, NGH Taylor, DW Verner-Jeffreys, R van Aerle, EJ Peeler, WA Higman, L Smith, R Baines, DC Behringer, I Katsiadaki, HE Froehlich, CR Tyler, Nature Food, 2020.

4. [Computational methods for 16S metabarcoding studies using Nanopore sequencing data](#)
A Santos, R van Aerle, L Barrientos, **J Martinez-Urtaza** - Computational and structural biotechnology journal, 2020.
5. [Whole genome sequencing of Hepatitis A virus using a PCR-free single-molecule nanopore sequencing approach](#) FM Batista, T Stapleton, **JA Lowther**, VG Fonseca... - Frontiers in Microbiology, 2020.
6. [The 2020 report of The Lancet Countdown on health and climate change: responding to converging crises](#) T Oreszczyn, B Vu, E Robinson, J Triñanes, **J Martinez-Urtaza** ... - 2020.
7. [Global expansion of Pacific Northwest *Vibrio parahaemolyticus* sequence type 36](#)
M Abanto, RG Gavilan, **C Baker-Austin**... - Emerging infectious diseases, 2020.
8. [Vibrio parahaemolyticus](#). **J Martinez-Urtaza**, **C Baker-Austin** - Trends in Microbiology, 2020.
9. [The application of nanopore sequencing technology to the study of dinoflagellates: a proof-of-concept study for rapid sequence-based discrimination of potentially harmful algae](#) RG Hatfield, FM Batista, TP Bean, VG Fonseca, **AD Turner**, **J Martinez-Urtaza** ... - Frontiers in Microbiology, 2020.
10. [Isolation and characterization of potentially pathogenic *Vibrio* species in a temperate, higher latitude hotspot](#) CL Ford, A Powell, DYL Lau, **AD Turner**... - Environmental Microbiology Reports, 2020.
11. [Genomic epidemiology of domestic and travel-associated *Vibrio parahaemolyticus* infections in the UK, 2008–2018](#) **C Baker-Austin**, C Jenkins, J Dadzie, O Mestanza... - Food Control, 2020.
12. [Vibrios from the Norwegian marine environment: Characterization of associated antibiotic resistance and virulence genes](#) F Håkonsholm, BT Lunestad, JR Aguirre Sánchez, **J Martinez-Urtaza** ... - Microbiology Open, 2020.
13. [Strategies to reduce norovirus \(NoV\) contamination from oysters under depuration conditions](#) **AD Younger**, A Neish, DI Walker, KL Jenkins... - Food and Chemical Toxicology, 2020.
14. [Stakeholder perspectives on the importance of water quality and other constraints for sustainable mariculture](#) AR Brown, J Webber, S Zonneveld, D Carless, **C Baker-Austin** ... - Environmental Science & Policy, 2020.

5.0 Acknowledgements

The FAO Reference Centre would like to thank the following individuals for their active support in the delivery of the work programme in 2020:

- Dr Esther Garrido Gamarro, FAO Food Safety and Quality, Fisheries Division.
- Dr Iddya Karunsager, University of Nitte, Mangalore, India for advice and collaboration during the year, and especially his participation in the Virtual Regional Workshop on Bivalve Mollusc Sanitation in December 2020.
- Dr Jaime Martinez-Urtaza, currently based at Department of Genetics and Microbiology, Universitat Autònoma de Barcelona (UAB) and an associate member of the FAO Reference Centre, for his ongoing scientific and technical collaborations and in particular contributions to the Vibrio Online Tools, and vibrio strain collections.
- Ms Dalene Goosen and Ms Reshma Senyal at the FAO eLearning academy for their exceptional dedication and work to deliver the eLearning Module 2– Bivalve Mollusc Sanitation Growing Area Assessment and Review.
- Ms Guilia Loi and Ms Gloria Lorient, FAO, Products, Trade and Marketing Branch for administration and secretariat roles at the the Virtual Regional Workshop on Bivalve Mollusc Sanitation in December 2020.
- Prof. Wataru Yamazaki, Center for Southeast Asian Studies, Kyoto University for his exceptional work to facilitate the transfer of *Vibrio parahaemolyticus* strains from Japan to the FAO Reference Centre.
- Dr Greg Goblick, Division of Seafood Science and Technology, Microbiological Hazards Science Branch, US FDA for his assistance with the revision and updating of the FAO/WHO Technical Guidance for the development of the growing area aspects of Bivalve Mollusc Sanitation Programmes.
- Dr Andrew Turner, Principal Chemist and marine biotoxin scientist at Cefas for his participation in the Virtual Regional Workshop on Bivalve Mollusc Sanitation in December 2020, and for provision of ongoing technical advice related to marine biotoxins and bivalve molluscs during 2020.

Annex I. Financial support for the FAO Reference Centre for Bivalve Mollusc Sanitation received at Cefas (Financial year 2020/21)

Funding Body	Amounts
Department for Environment, Food and Rural Affairs (Defra)	£80,000
Food Standards Agency (FSA)	£125,000
Total	£205,000
Allocated as:	
Staff Pay	£ 132,597
Student support	£ 6,044
Non-Pay (T&S / Consumables/ Proficiency Testing etc.)	£ 19,455
E-Learning contribution to FAO academy	£ 46,904

Linked programmes

In addition, in 2020 Cefas received additional funding via UK Overseas Development Assistance programme (Cefas REF.FD001, pillar 3 – hazard identification, risk profiling, capacity and capability building), used in part to deliver demand driven capability review and assistance for the development of bivalve molluscs production in Bangladesh in partnership with the Bangladeshi Department of Fisheries, the relevant Competent Authority for aquatic food production sectors. An overview of this work is provided as Annex III.

Annex II



Food and Agriculture
Organization of the
United Nations



Cefas
INTERNATIONAL
CENTRES OF
EXCELLENCE



Centre for Environment
Fisheries & Aquaculture
Science

Cefas bivalve shellfish proficiency testing programme 2020 - updated

Reference No.	Description	Distribution date
PT 82	Matrix samples for examination for norovirus and hepatitis A (quantitative and/or qualitative)	Postponed until 2021
PT 83	Whole animal distribution of live bivalve molluscs for examination for <i>E. coli</i> and <i>Salmonella</i> spp.	Postponed until 2021

For registration please contact Louise Stockley via email at louise.stockley@cefas.co.uk

Figure 1. ODA Bangladesh pillar three – risk profiling – highlight report

