Food and Agriculture Organization of the United Nations

# FAO Reference Centre - Annual report for the FAO Reference Centre for Bivalve Mollusc Sanitation 2024-25

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| **Reporting period** | April 2024 – March 2025 |
| **Date of reporting** | August 2025 |

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# List of acronyms

| Acronym | Meaning |
|---|---|
| Cefas | Centre for Environment, Fisheries and Aquaculture Science |
| FAO | Food and Agriculture Organization of the United Nations |
| RC | Reference Centre |
| Defra | Department of Environment, Food and Rural Affairs |
| APHW | APHW - Animal and Plant Health and Welfare |
| MOU | MOU - Memorandum of Understanding |
| OCPP | OCPP - Ocean Country Partnership Programme |
| PT | Proficiency Testing |
| ISO | International Standards Organisation |
| CEN | European Committee for Standardisation |
| APHA | American Public Health Association |
| US FDA | United States Food and Drug Administration |
| BAM | Bacteriological Analytical Manual |
| *E. coli* | *Escherichia coli* |
| MPN | Most Probable Number |
| NoV | Norovirus |
| HAV | Hepatitis A virus |
| ICMSS | International Conference on Molluscan Shellfish Safety |
| IAC | International Advisory Committee |
| CAC-GL | Codex Alimentarius Commission - Guideline |

# 1. Introduction

The Centre for Environment, Fisheries and Aquaculture Science (Cefas) is designated as the Food and Agriculture Organization of the United Nations (FAO) Reference Centre (RC) 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. This designation is made under an agreement between FAO and the United Kingdom's (UK) Department of Environment, Food and Rural Affairs (Defra). This sixth annual report describes the technical and scientific activities delivered via the RC to support the FAO Department of Fisheries and Aquaculture, and the associated costs for the period April 2024 – March 2025. Financial support for baseline operation of the FAO RC was provided by Defra under the Animal and Plant Health and Welfare (APHW) Memorandum of Understanding (MOU) with additional targeted activities in eligible countries supported via the Ocean Country Partnership Programme (OCPP), part of the UK's Blue Planet Fund.

# 2. Areas of Collaboration

The work programme of the FAO RC for Bivalve Mollusc Sanitation for the period covered in this report was submitted in March 2024 [https://www.cefas.co.uk/faobivalves/]. Main areas of collaboration for 2024-25 were:

- To provide support for the development and maintenance of FAO resources and elearning material on bivalve mollusc sanitation.
- To provide guidance on relevant laboratory protocols, accreditation, and use of methods for bivalve mollusc testing to FAO Member Countries.
- To prepare and deliver training workshops at the FAO RC at Cefas, Weymouth, UK for FAO Member Country representatives on methods for the determination of faecal indicator organisms in bivalve molluscs.
- To plan, organise, and distribute a Proficiency Testing (PT) scheme for faecal indicator bacteria for FAO Member Country Official Laboratories.
- To undertake additional activities, within scope, supporting FAO mandate in Member Countries.
- On request, support for FAO Member Countries on topics related to contamination of bivalve molluscs with harmful algal biotoxins.

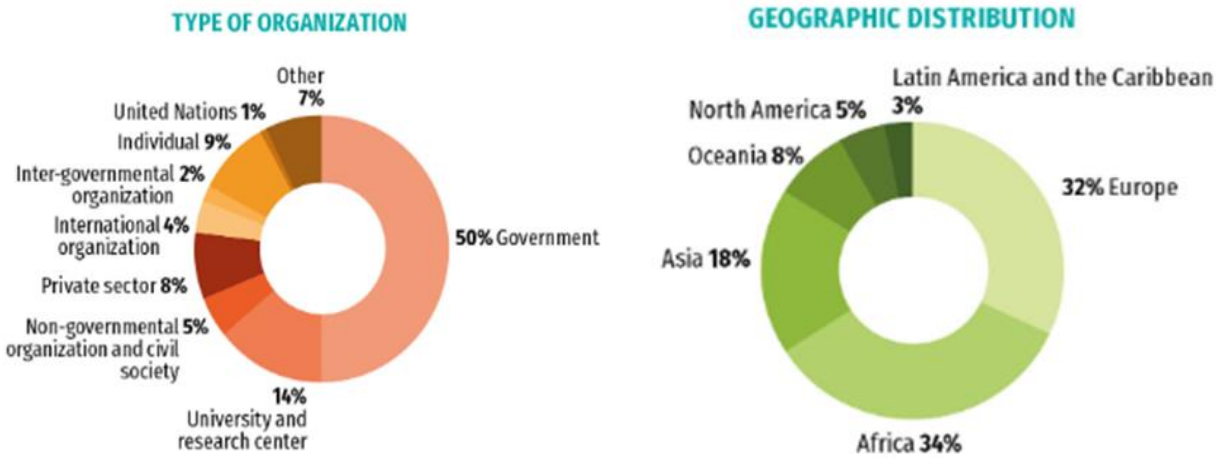
# 3. Provision of support for the development and maintenance of FAO elearning material and resources on bivalve mollusc sanitation

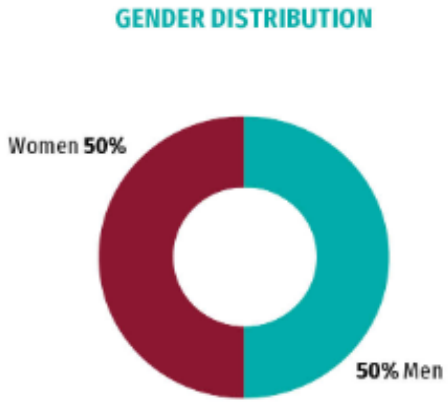
## *3.1 elearning on bivalve mollusc sanitation - Launch Event July 2024*

The four-module bivalve mollusc sanitation elearning series was completed in 2024-25 with finalisation of the course certification eBadging. The objective of this elearning series is to assist in the implementation of Codex Alimentarius guidance and standards in their various application and to provide detailed information on how to establish and monitor bivalve mollusc growing areas. In July 2024, a live-stream International Webinar event was hosted by FAO with the aim of presenting the elearning course series, increasing the awareness of resources that FAO offers to support implementation of bivalve mollusc sanitation systems and to promote good practice across the sector. The webinar was opened by the Deputy Director of Fisheries and Aquaculture Division at FAO, with presentations from FAO and Cefas. Course: Bivalve Mollusc Sanitation for growing areas | FAO elearning Academy

The webinar was well attended, with over 200 attendees. Details of organisational type, geographic distribution of participants and gender distribution are shown in Figure 1. Participants' organisation type was predominantly government which is consistent with the aims of the FAO RC remit to support responsible authorities in the development of bivalve sanitation programmes. Geographical coverage was variable in terms of overall participation split across FAO regions, the higher proportion of attendees from African nations, perhaps reflecting the growing interest in the development of bivalve production as a source of economic growth and food security in the region. An equal gender balance was recorded amongst participants.

**Figure 1. Breakdown of organisation type, geographic distribution and gender balance of participants at the International Webinar launching the bivalve sanitation elearning series**






ALT text: Donut graphs showing distribution of participants at international elearning launch by type of institution, region and by gender

Links to the launch material including presentations given by FAO and Cefas personnel can be accessed here Course: Bivalve Mollusc Sanitation for growing areas | FAO elearning Academy

The elearning and information on certification can be accessed here:

Course: Bivalve mollusc sanitation: Growing area risk profile | FAO elearning Academy

Course: Bivalve mollusc sanitation: Growing area assessment and review | FAO elearning Academy

Course: Bivalve mollusc sanitation: Growing area monitoring | FAO elearning Academy

Course: Bivalve mollusc sanitation: Growing area classification and management | FAO elearning Academy

During 2024-25 French language versions of the courses on Growing area monitoring and Growing area classification and management were launched.

# 4. Provision of advice and guidance on protocols, accreditation, and use of methods and approaches for bivalve mollusc production

## *4.1 Laboratory protocols and guidance available from the Reference Centre*

The FAO RC website provides a repository of advice, guidance and protocols to support the development and implementation of bivalve mollusc sanitation programmes FAO Reference Centre for Bivalve Mollusc Sanitation - Cefas (Centre for Environment, Fisheries and Aquaculture Science). Protocols for test methods and associated guidance (Table 1) are reviewed on an annual basis and updated as required, all protocols can be downloaded via the protocols and technical guidance portal of the website Protocols and Technical Guidance - Cefas (Centre for Environment, Fisheries and Aquaculture Science). These protocols are based upon internationally recognised standard methods such as those published by the International Standards Organisation (ISO), the European Committee for Standardization (CEN) or the American Public Health Association (APHA).

In addition, technical guidance notes and calculation spreadsheets to assist laboratories using the methods are included.

### Table 1. Protocols and guidance for bivalve molluscs

| Title | Type | Accreditation [1] |
|---|---|---|
| Enumeration of *Escherichia coli* in bivalve shellfish using the most probable number technique (based on ISO 16649-3) [2] | Protocol [3] | Yes |
| Determination of faecal coliform bacteria in seawater using most probable number technique (based on the US FDA BAM chapter 4) | | No |
| Detection of *Salmonella* spp. in bivalve molluscs (based on ISO 6579-1) | | Yes |
| Detection of potentially pathogenic *Vibrio* spp. in bivalve shellfish | | No |
| Quantitative detection of norovirus and hepatitis A virus in bivalve molluscan shellfish (using ISO 15216-1) | | Yes |
| Enumeration of FRNA phage in bivalve shellfish | | No |
| Shellfish MPN calculator - clean version | Guidance [4] | n/a |
| Shellfish MPN calculator - 3 dilutions | | n/a |
| Shellfish MPN calculator - 4 dilutions | | n/a |
| Guidance for the Determination of Limits of Detection and Quantification for Determination of Viruses in Bivalve Shellfish | | n/a |
| Example Data Set for Determination of Limits of Detection and Quantification for Determination of Viruses in Bivalve Shellfish | | n/a |
| Calculation Spreadsheet for Quantification of Viruses in Bivalve Shellfish using ISO 15216-1 | | n/a |
| Guidance for Best Practice for Norovirus Testing in Shellfish | | n/a |

## *4.2 Method standardisation, and provision of ad hoc scientific and technical advice*

Personnel at the FAO RC led or contributed to activities supporting method development, validation, and standardisation with relevance to bivalve molluscs, and provided technical and scientific advice to national bodies in 2024-25. In brief this included:

- Provision of leadership within ISO/TC34/SC9/WG8 (international standardisation group on preparation of test samples for food microbiology), responsible for revision of ISO 6887-3 (preparation of fish and fishery products including bivalve molluscs).
- Provision of representation on ISO/TC34/SC9/WG3 (international standardisation of methods for validation of food microbiology methods).
- Provision of representation on ISO/TC34/SC9/WG27 (Vibrios), developing methods

[1] Accreditation status of the method at the FAO RC
[2] Also available in Portuguese language version
[3] Protocol derived from international standard or set of standards
[4] Additional informative guidance or calculation spreadsheets for protocol application

(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 ISO/TC34/SC9/WG31 (international standardisation of methods for hepatitis E virus).
- Provision of representation on ISO/TC34/SC9/WG37 (international standardisation group covering general requirements for PCR methods in food microbiology).
- Provision of representation on ISO/TC147/SC4/WG28 (international standardisation group covering general requirements for PCR methods in water microbiology).
- Provision of representation on ISO/TC147/SC4/WG32 (international standardisation group covering detection of norovirus in environmental waters).
- Provision of representation on AW/009 (UK mirror group for standardisation within food microbiology).

# 5. Preparation and delivery of training workshops on methods for the determination of faecal indicator organisms in bivalve molluscs

## *5.1 Practical training in bivalve mollusc sample collection and transport and determination of Escherichia coli*

In February 2025, the FAO RC hosted the fourth training workshop on bivalve mollusc sample collection and transport and determination of *Escherichia coli* (*E. coli*) (faecal indicator organism) in bivalves using the most probable number (MPN) method (based on ISO 16649-3), at its laboratory in Weymouth, UK (Figure 2).

Over the course of the workshop, 5 delegates from appropriate government departments and testing laboratories in two FAO Member Countries (Ghana and Sri Lanka) were provided with information in classroom sessions on public health risks related to bivalves, approaches to sampling and the principles of *E. coli* analysis. Delegates also spent time in the microbiology laboratories at Cefas receiving hands-on training in sample preparation and *E. coli* testing, participated in a practical bivalve mollusc sampling exercise on the shoreline, and were able to visit local oyster production areas and a depuration facility to learn more about mollusc production and post-harvest treatments in the UK. This activity was partially funded through the Ocean Country Partnership Programme (OCPP) Ocean Country Partnership Programme (OCPP) - GOV.UK.

The training workshop was very well received by the delegates with 72% of participant providing a feedback scores as ‘very good’ or ‘good’ for different workshop elements (administration, accommodation and workshop location, content, presentations and practical sessions). Additional comments were also provided:

*‘The makeshift sampling at the beach front or shoreline was very considerate giving the limited amount of time we had for the workshop. Also, the practical sessions were very eye-opening and I wished there was more time to practise in the lab’*

*'It was highly beneficial in enhancing my knowledge of bivalve sanitation. I plan to apply the insights gained in both sample analysis and the depuration process'*

*'Overall, the workshop content, presentations, and practical sessions were good and met my expectations. However, I would like to raise a concern regarding our arrival date — there were no arrangements made for feeding, which caused some inconvenience. Additionally, it would have been nice if a tour had been organized for participants to explore the city of London or even the local area in Weymouth, to better appreciate the location and culture'*

## Figure 2. Training workshop on methods for sample collection and determination of faecal indicator organisms

Alt text: Delegates collecting and processing bivalve samples at the Cefas training course.

Alt text: Delegates outside of the Cefas laboratories at the practical training course for sample collection and methods for determination of faecal indicators

# 6. Provision of proficiency testing (PT) for FAO Member Countries

## *6.1 Third Distribution for Faecal Indicators*

The third distribution of the laboratory constructed (Lenticule™) PT scheme for quantitation of faecal indicators (*E. coli*) and faecal coliforms, aimed at countries developing sanitary testing capacity, took place in March 2024 with results and evaluations completed by August 2024. Fourteen laboratories in Antigua & Barbuda, Bangladesh, Chile, Ghana, Indonesia, Malaysia, South Africa, Turkey and Uruguay received test material. Eleven and ten laboratories returned results for *E. coli* and faecal coliforms, respectively. The majority of laboratories (70%) examining samples for *E. coli* used ISO 16649-3 MPN method (as defined in FAO RC Generic Protocol). Five laboratories utilised the FAO RC Generic Protocol for Determination of Faecal Coliform Bacteria in Seawater using the MPN Technique, with others using membrane filtration or proprietary tests. Development of laboratory capability to apply ISO 16649-3 supports application of CODEX Standard 292-2008 live bivalve molluscs hygiene.

Overall performance of laboratories was mixed for *E. coli* in shellfish samples with 55% of laboratories reporting duplicate *E. coli* MPN/100 g results within the satisfactory range (±2.68 $SD_T$ of the participants' median). For faecal coliforms in water samples only 40% of laboratories reported a single *E. coli* MPN/100 ml result within the satisfactory range (±2.68 $SD_T$ of the participants' median). Full performance reports can be accessed via Proficiency Testing and Quality Assurance - Cefas (Centre for Environment, Fisheries and Aquaculture Science)

A review of laboratory performance over three distributions (Lenticule™) was performed (Table 2 and 3). From the twenty-four laboratories participating in 1 or more distributions, 46% of laboratories reported all *E. coli* MPN/100 g within the satisfactory range (±2.68 $SD_T$ of the participants' median). For faecal coliforms in water, only 29% of laboratories reported all *E. coli* MPN/100 ml within the satisfactory range (±2.68 $SD_T$ of the participants' median).

Overall, the results reported indicate some difficulties amongst laboratories when implementing the methods required for microbiological analyses supporting the monitoring and classification of bivalve growing areas (faecal indicators). Of particular note is the improved performance of official laboratories in Bangladesh following their attendance at the methods training workshop in February 2024.

The FAO Reference Centre is developing additional video material, to support the implementation of ISO 16649-3 and to introduce more detailed elearning modules on methods to supplement online technical training.

## Table 2 – Participants performance in the *E. coli* in shellfish PT scheme over 3 lenticule distributions

| Country | Method used | 2021 | | 2022 | | 2024 | |
|---|---|---|---|---|---|---|---|
| | | 1 | | 2 | | 3 | |
| | | S1 | S2 | S1 | S2 | S1 | S2 |
| Angola | ISO 16649-3 | x | x | | | | |
| Argentina | ISO 16649-3 | | | x | x | | |
| Bangladesh | ISO 16649-3 | x | x | | | x | x |
| | ISO 16649-3 | x | x | x | x | x | x |
| | ISO 16649-3 | | | x | x | x | x |
| Brazil | ISO 7218:2007 | | | x | x | | |
| Chile | NCh3056:2007 | | | x | x | x | x |
| | ISO 16649-3 | | | x | x | | |
| Indonesia | SNI 2332.1: 2015 then BAM | x | x | x | x | x | x |
| Kenya | NMKL 96. RAPID *E. coli* agar based chrom media then MPN - MacB pour plate method TBX. | x | x | x | x | | |
| Madagascar | ISO 16649-3 | x | x | | | | |
| Malaysia | ISO 16649-3 | x | x | | | | |
| | Compendium of Methods for the Microbiological Foods. 2nd Edition, (MPN method- 4 diln, 3 tubes) APHA (1992). | x | x | | | | |
| | MPN and SimPlate | x | x | x | x | x | x |
| Philippines | ISO 16649-3 | | | x | x | | |
| | ISO 16649-3 then BAM | x | x | x | x | | |
| | BAM, Chapter 4: Enumeration of *E. coli* and the Coliform Bacteria | | | x | x | | |
| South Africa | ISO 16649-3 | x | x | | | | |
| | ISO 16649-3 | | | x | x | x | x |
| Turkey | ISO 16649-3 | x | x | | | | |
| | ISO 16649-3 | x | x | | | x | x |
| | ISO 16649-3 | x | x | | | | |
| | ISO 16649-3 | x | x | | | x | x |
| | ISO 16649-3 | x | x | | | | |
| | ISO 16649-3 | x | x | | | | |
| Uruguay | ISO 16649-3 | | | | | x | x |

**Key**: Green = All results reported within ±2.68 range; Orange = One result between ±2.68 and ± 4SD; Red = All results outside ± 4SD.

**Table 3 – Participants performance in the Faecal coliforms in water PT scheme over 3 lenticule distributions**

| Country | Method used | 2021 | | 2022 | | 2024 | |
|---|---|---|---|---|---|---|---|
| | | 1 | | 2 | | 3 | |
| | | W1 | W2 | W1 | W2 | W1 | W2 |
| Bangladesh | FAO reference - FDA/BAM Chapter 4 | | | | | x | x |
| | ISO 9308-1 | | | x | x | x | x |
| | ISO 9308-1 | | | x | x | x | x |
| Brazil | FAO reference - FDA/BAM Chapter 4 | | | x | x | | |
| Chile | Standard Methods for the Examination of Water and Wastewater 23th Edition 2017, Capitulo 9221 E.1 | | | x | x | x | x |
| | FAO reference - FDA/BAM Chapter 4 | | | x | x | | |
| Indonesia | FAO reference - FDA/BAM Chapter 4 | x | x | x | x | x | x |
| Kenya | MPN-Media used MacConkey Broth. | | | x | x | | |
| Madagascar | Sample 1 filtration, Sample 2 IDEXX (Q 2000) | x | x | | | | |
| Malaysia | Standard Methods for the Examination of Water and Wastewater. 20th Edition, (MPN Method - 4 dilutions, 5 tubes) APHA (2001). | x | x | | | | |
| | COLILERT-18 Test Kit (MPN Method) | x | x | x | x | x | x |
| Mauritius | Membrane filtration APHA 9222 B | x | x | x | x | | |
| Philippines | Standard Methods for the Examination of Water and Wastewater (SMEWW) 23rd Ed. - MPN Method | | | x | x | | |
| | FAO reference - FDA/BAM Chapter 4 | x | x | x | x | | |
| | Standard Methods for the Examination of Water and Wastewater 23th Edition 2017, Capitulo 9221 E.1 | | | x | x | | |
| Senegal | ISO 9308-1 | x | x | | | | |
| South Africa | Membrane filtration; SANS 5221, 4.5:2018 | x | x | | | | |
| | Membrane filtration; SANS 5221, 4.5:2018 | | | x | x | x | x |
| Turkey | FAO reference - FDA/BAM Chapter 4 | x | x | | | x | x |
| | FAO reference - FDA/BAM Chapter 4 | x | x | | | | |
| Uruguay | FAO reference - FDA/BAM Chapter 4 | | | | | x | x |

**Key**: Green = All results reported within ±2.68 range; Orange = One result between ±2.68 and ± 4SD; Red = All results outside ± 4SD.

## *6.2 Proficiency Testing for norovirus GI, norovirus GII, hepatitis A virus in oyster matrix*

A PT distribution was completed in October 2024. This scheme is designed to test a laboratory's ability to detect and quantify the two main enteric viruses (norovirus (NoV) and

hepatitis A virus (HAV)) that can be vectored by bivalve molluscs. Test material comprised whole Pacific oysters (*Magallana gigas*) and blended oyster digestive glands, and control materials were also provided for quantification. Fourteen laboratories in 11 countries (Belgium, France, Germany, Ireland, The Netherlands, Spain, Sweden, Switzerland, UK, Tunisia and New Zealand) received samples. Almost all participating laboratories used method elements described in the informative annexes of ISO 15216-1 and provided in the FAO RC Generic Protocol for Quantitative Detection of Norovirus and Hepatitis A Virus in Bivalve Molluscan Shellfish.

Overall performance of laboratories was mixed with 64% of laboratories reporting all NoV (genogroup I & genogroup II) results as intended in terms of detection (presence/absence) and 79% of laboratories reporting intended detection results for HAV. Eleven laboratories reported quantification data, of this 55% gave satisfactory quantities for all viral targets.

Determination of NoV and HAV in bivalve shellfish is technically challenging; this PT scheme can help to support countries in the application of CODEX CAC-GL79-2012 guidelines on viruses in food.

Full performance reports can be accessed via Proficiency Testing and Quality Assurance - Cefas (Centre for Environment, Fisheries and Aquaculture Science)

### *6.3 Proficiency Testing for E. coli and Salmonella in bivalve mollusc matrix*

A PT distribution was completed in January 2025. This scheme is intended for laboratories undertaking the examination of live bivalve molluscs for bacteriological determinands. Test material comprised of two samples of whole Pacific oysters (*Magallana gigas*). Twenty-four laboratories in 7 countries (Denmark, France, Ireland, Italy, Sweden, Turkey and UK) received samples.

Overall performance of laboratories was excellent with 90% of laboratories reporting duplicate *E. coli* MPN/100g results within the satisfactory range (±2.68 $SD_T$ of the participants' median) and 95% of laboratories reporting *Salmonella* spp. results as intended in terms of detection (presence/absence).

## 7. Additional activities, within scope, supporting FAO mandate in Member Countries

### *7.1 FAO RC collaboration with Department of Fisheries - Bangladesh*

The FAO RC continues to collaborate with the Department of Fisheries (DoF), Ministry of Fisheries and Livestock, to explore bivalve mollusc production in Bangladesh, supported through the Ocean Country Partnership Programme (OCPP) Ocean Country Partnership Programme (OCPP) - GOV.UK. The primary objective is to undertake a growing area risk profile for at least one area identified for the production of bivalve molluscs, along with targeted capacity and capability building in the Official Laboratories (Quality Control (QC) Laboratories) to help set up methods of analysis necessary for the implementation of Sanitary

and Phytosanitary (SPS) controls.

During the 2024/25 reporting period, the FAO RC continued to provide advice and training to Competent Authority officials (DoF) and staff from the QC Laboratories (Dhaka, Khulna, Chattogram), and, following a training workshop and the use of online protocols and SOPs, all 3 labs have now successfully developed the methodology in-house, as demonstrated by successful completion of the third Lenticule™ PT scheme. A site has been chosen to risk assess and a series of online meetings has commenced to guide DoF and QC Laboratory staff through the completion of a growing area risk profile, which, along with the completion of elearning modules and microbiological analysis, will enable informed decision making on the suitability of this, and other, selected sites for bivalve mollusc production (with regard to microbiological contamination, in the first instance).

### *7.2 FAO RC collaboration with the Ministry of Fisheries – Ghana*

During 2024/25 the FAO RC has continued to provide technical assistance supporting the development of capabilities in bivalve food safety and health in Ghana. Assistance has included a collaboration with the Atomic Energy Commission to advise on analytical capabilities required for testing of marine biotoxins and support with a baseline growing area assessment of a community managed production area for West African mangrove oysters in the Central region of Ghana. The latter is a partnership with the University of Cape Coast, through the Associations for Commonwealth Universities, and the Ghanian Ministry of Fisheries, and will provide a template for implementation of elements of the FAO/WHO Technical Guidance for the development of the growing area aspects of bivalve mollusc sanitation programmes (FAO and WHO, 2021) in other growing areas located in the Greater Accra region of Ghana that are harvesting mangrove oysters and the Volta clam. Bivalve programmes in Ghana are supported through OCPP Ocean Country Partnership Programme (OCPP) - GOV.UK.

**Figure 3. Practical training on growing area assessments in Ghana**

Alt text: Delegates at practical training sessions assisted by FAO RC staff providing guidance on growing area assessments for community managed oyster production

### *7.3 FISH4ACP - The Gambia*

The FAO RC has provided advice and technical guidance to the FAO led FISH4ACP programme which aims to maximise the potential of fisheries and aquaculture across FAO regions. In The Gambia the focus of this programme is the development of safe bivalve molluscs for raw sale. FAO RC have attended a number of conference calls with the project team, providing overviews of microbiological sanitation principles and biotoxin monitoring programmes. The FAO RC have made recommendations for monitoring plans and reviewed subsequent faecal indicator data and made a series of recommendations for risk-based testing for *Vibrio* spp., and marine biotoxins, the latter of which will be tested at the Cefas laboratory later this year.

## 8. Outreach, dissemination and collaboration activities

### *8.1 Outreach, dissemination and collaboration activities at a glance*

The FAO RC website continues as the main repository of information and portal for the dissemination of information and guidance FAO Reference Centre for Bivalve Mollusc Sanitation - Cefas (Centre for Environment, Fisheries and Aquaculture Science). User statistics for the period April 2024 to March 2025 showed over 800 views, 175 active users and 2295 events (downloads proxy).

The FAO RC was active in more than 30 countries worldwide in 2024-25 (Figure 4). Activities ranged from provision of elearning, delivery of training workshops, proficiency testing, distribution of protocols and technical guidance, support to FAO Member Country Competent/Responsible Authorities, and research collaborations.

### *8.2 International Conference on Molluscan Shellfish Safety (ICMSS)*

In April 2024 the International Advisory Committee (IAC) of the International Conference on Molluscan Shellfish Safety (ICMSS) published an open call for hosts of the conference in 2026 and 2028. The conference has been running since 1989 is the primary global conference on bivalve shellfish safety bringing together academics, national & international science institutes, regulators and industry. FAO RC submitted a proposal to host the conference at its strategic alliance partner, the University of Exeter, in Southwest England in September 2026. This bid was reviewed by the IAC in September 2024 and Cefas (FAO RC) were confirmed as the preferred hosts. To date, contracts with the University of Exeter events team have been signed and the venue and dates are confirmed. A draft thematic programme has been agreed with the IAC. The first announcement for the conference has been circulated (Figure 5) and the ICMSS website is now live International Conference on Molluscan Shellfish Safety (ICMSS) - Home

**Figure 4. Outreach, Collaboration and R&D activities of the FAO Reference Centre for Bivalve Mollusc Sanitation**

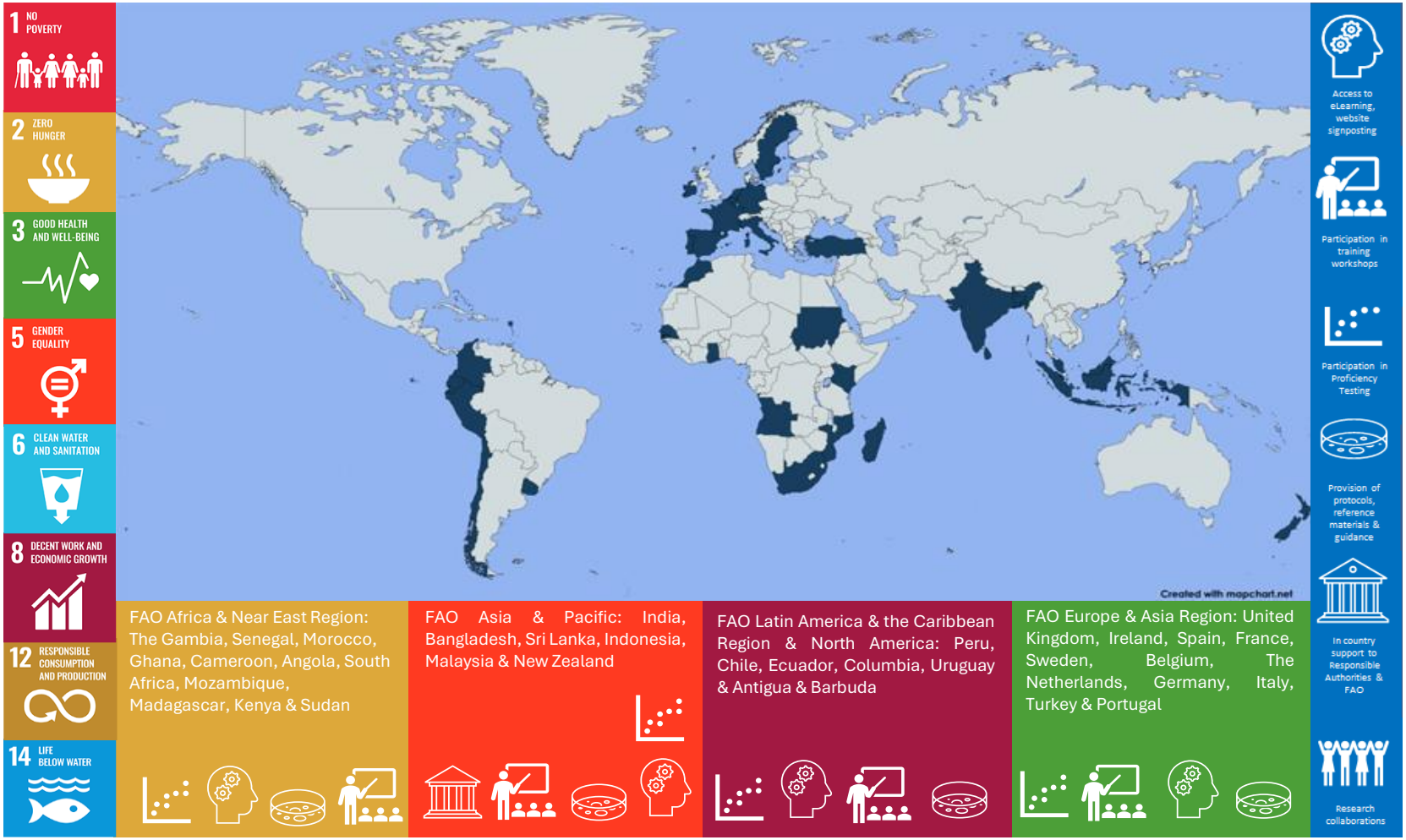


**Figure 5. 1st Announcement ICMSS 2026** [International Conference on Molluscan Shellfish Safety (ICMSS) - Home]

# 9 Peer Review Publications from FAO RC in 2024-25

- Alexander, R.P., O'Neill, A., Dean, K.J., **Turner, A.D**. and **Maskrey, B.H**., 2024. Detection of the Cyclic Imines Pinnatoxin G, 13-Desmethyl Spirolide C and 20-Methyl Spirolide G in Bivalve Molluscs from Great Britain. *Marine Drugs*, *22*(12), p.556.
- **Baker-Austin, C.**, Lake, I., Archer, E., **Hartnell, R.**, Trinanes, J. and Martinez-Urtaza, J., 2024. Stemming the rising tide of Vibrio disease. *The Lancet Planetary Health*, *8*(7), pp.e515-e520.
- Campbell, A.M., Cabrera-Gumbau, J.M., Trinanes, J., **Baker-Austin, C.** and **Martinez-Urtaza, J.**, 2025. Machine Learning Potential for Identifying and Forecasting Complex Environmental Drivers of *Vibrio vulnificus* Infections in the United States. *Environmental Health Perspectives*, *133*(1), p.017006.
- **Dhanji-Rapkova, M., Hatfield, R.G., Walker, D.I.**, Hooper, C., Alewijnse, S., **Baker-Austin, C., Turner, A.D.** and Ritchie, J.M., 2024. Investigating Non-Native Ribbon Worm *Cephalothrix simula* as a Potential Source of Tetrodotoxin in British Bivalve Shellfish. *Marine Drugs*, *22*(10), p.458.
- EFSA Panel on Biological Hazards (BIOHAZ), Koutsoumanis, K., Allende, A., Alvarez-Ordóñez, A., Bolton, D., Bover-Cid, S., Chemaly, M., De Cesare, A., Herman, L., Hilbert, F. and Lindqvist, R., 2024. Public health aspects of *Vibrio* spp. related to the consumption of seafood in the EU. *EFSA Journal*, *22*(7), p.e8896.
- Hall, A.J., Kershaw, J.L., Fraser, S., Davidson, K., Rowland-Pilgrim, S., **Turner, A.D**. and McConnell, B., 2024. Estimating the risks of exposure to harmful algal toxins among Scottish harbour seals. *Harmful Algae*, *136*, p.102653.
- Hill, R., Stentiford, G.D., Walker, D.I., **Baker-Austin, C**., Ward, G., **Maskrey, B.H**., van Aerle, R., Verner-Jeffreys, D., Peeler, E. and Bass, D., 2024. Realising a global One Health disease surveillance approach: insights from wastewater and beyond. *nature communications*, *15*(1), p.5324.
- Jaykus, L.A., Bidawid, S., Bosch, A., Butot, S., Cook, N., **Lowther, J**., Nasheri, N., Pintó, R.M., Schaffner, D.W., Simonsson, M. and Velebit, B., 2025. Detection of Foodborne Viruses in Berries–State of Science and Future Considerations. *Food Control*, p.111436.
- Mena Casero, M.V., **Turner, A.D**., Ben-Gigirey, B., Alexander, R.P., Dean, K.J., Hatfield, R.G., **Maskrey, B.H**., Mazuet, C., Karamendin, K. and Mateo, R., 2025. Identifying Causative Agents of a Paretic Syndrome in Waterbirds in Southern Portugal. *Toxins*, *17*(2), p.62.
- Rowley, A.F., **Baker-Austin, C**., Boerlage, A.S., Caillon, C., Davies, C.E., Duperret, L., Martin, S.A., Mitta, G., Pernet, F., Pratoomyot, J. and Shields, J.D., 2024. Diseases of marine fish and shellfish in an age of rapid climate change. *iScience*, *27*(9).
- **Scott, G**., Evens, N.P., Porter, J. and **Walker, D.I.,** 2025. The Impact of Viral Concentration Method on Quantification and Long Amplicon Nanopore Sequencing of SARS-CoV-2 and Noroviruses in Wastewater. *Microorganisms*, *13*(2), p.229.

- Smith, P., Joseph, A., **Baker-Austin, C**., Kang, N., Baron, S., Le Devendec, L., Jouy, E., Chisnall, T., Davies, A.R., Schwarz, S. and Feßler, A.T., 2024. Epidemiological cut-off values for *Vibrio parahaemolyticus* calculated from minimal inhibitory concentration data generated at 35 and 28° C. *Diseases of Aquatic Organisms*, *160*, pp.127-134.
- **Turner, A.D**., **Maskrey, B.H**., Stone, D., Mudge, E.M. and Robertson, A., 2025. First Confirmed Occurrence of Ciguatera Poisoning in the UK from Imported Pinjalo Snapper (*Pinjalo pinjalo*). *Marine Drugs*, *23*(2), p.67.
- Walker, D.I., **Lowther, J**., Evens, N., Warren, J., Porter, J. and Jones, D., 2024. Quantification of SARS-CoV-2 in wastewater.
- Walker, D.I., Witt, J., Rostant, W., Burton, R., Davison, V., Ditchburn, J., Evens, N., Godwin, R., Heywood, J., **Lowther, J.A**. and Peters, N., 2024. Piloting wastewater-based surveillance of norovirus in England. *Water Research*, *263*, p.122152.

## 10. References

FAO and WHO. 2021. Technical guidance for the development of the growing area aspects of Bivalve Mollusc Sanitation Programmes. Second edition. Food Safety and Quality Series No.5A. Rome. https://doi.org/10.4060/cb5072en

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