Food and Agriculture Organization of the United Nations

Cefas INTERNATIONAL CENTRES OF EXCELLENCE

Centre for Environment Fisheries & Aquaculture Science

World Class Science for the Marine and Freshwater Environment

FAO Reference Centre for Bivalve Mollusc Sanitation

Report on Cefas Training Workshops on Sample Collection and E. coli *Testing of Bivalve Molluscs for African Countries (Ghana, Kenya, Mozambique, Senegal) and Bangladesh*

Authors: Joel Dorning and James Lowther

Issue Date: 26/07/2024

Food and Agriculture Organization of the United Nations

Cefas INTERNATIONAL CENTRES OF EXCELLENCE

Centre for Environment Fisheries & Aquaculture Science

World Class Science for the Marine and Freshwater Environment

Cefas Document Control

Submitted to:	Esther Garrido Gamarro
Date submitted:	06/06/24
Project Manager:	Sam Course
Report compiled by:	Joel Dorning, James Lowther
Quality control by:	Rachel Hartnell, Michelle Price-Hayward
Approved by and date:	26/07/24
Version:	Final

Version Control History			
Version	**Author**	**Date**	**Comment**
Draft V1	Joel Dorning, James Lowther	29/05/24	Initial Draft
Draft V2	Joel Dorning, James Lowther	30/05/24	After review by Rachel Hartnell
Draft V3	Joel Dorning, James Lowther	06/06/24	Final review and application of science QA checklist
Draft V4	Joel Dorning, James Lowther	11/06/24	After proof check
Final	Joel Dorning, James Lowther	26/07/24	After approval by Esther Garrido Gamarro (FAO)

Food and Agriculture Organization of the United Nations

Cefas INTERNATIONAL CENTRES OF EXCELLENCE

Centre for Environment Fisheries & Aquaculture Science

World Class Science for the Marine and Freshwater Environment

Contents

Foreword

This document summarises relevant information from a series of three technical training workshops hosted by the Food and Agriculture Organisation of the United Nations Reference Centre for Bivalve Mollusc Sanitation (FAORC) at its laboratory in Weymouth, the United Kingdom, for shellfish safety professionals from five FAO member countries (Bangladesh, Ghana, Kenya, Mozambique, Senegal). Financial support for these training events was provided by the United Kingdom (UK) government via UK International Development (Ocean Country Partnership Programme [Ocean Country Partnership Programme (OCPP) - GOV.UK (www.gov.uk)]), the Department of Environment, Food and Rural Affairs (Defra) and the Food Standards Agency (FSA).

Dr Rachel Hartnell

Director of the FAO Reference Centre for Bivalve Mollusc Sanitation

International Centre of Excellence for Seafood Safety

Cefas Weymouth Laboratory,

Barrack Road,

The Nothe,

Weymouth, Dorset

DT4 8UB, United Kingdom

Food and Agriculture Organization of the United Nations

Cefas INTERNATIONAL CENTRES OF EXCELLENCE

Centre for Environment Fisheries & Aquaculture Science

World Class Science for the Marine and Freshwater Environment

Delegate List

Delegate	Country	Affiliation	Workshop attended
Katrine Enimil Armah	Ghana	Fisheries Commission of Ghana	14-16 November 2023
Eric Boyce Sawyerr	Ghana	Fisheries Commission of Ghana	
Josephine Marigu Njeru	Kenya	Kenya Marine and Fisheries Research Institute	
Mohammad Habibur Rahman	Bangladesh	Ministry of Fisheries and Livestock	30 January - 1 February 2024
Mohammad Maqueshudul Haque Bhuiyan	Bangladesh	Department of Fisheries, Matshya Bhaban, Dhaka	
Mohammad Jahangir Alam	Bangladesh	Quality Control Laboratory, Dept of Fisheries, Dhaka	
Md. Shafiul Alam	Bangladesh	Quality Control Laboratory, Dept of Fisheries, Dhaka	
Salma Begum	Bangladesh	Quality Control Laboratory, Dept of Fisheries, Chattogram	
A B M Jakaria	Bangladesh	Office of the Deputy Director, Fish Inspection and Quality Control, Khulna	
Md Zillur Rahman	Bangladesh	Quality Control Laboratory, Dept of Fisheries, Khulna	
Md. Shahi Emran Rasel	Bangladesh	Quality Control Laboratory, Dept of Fisheries, Khulna	
James Wanjama Kabugu	Kenya	Kenyan Fisheries Service	20-22 February 2024
Carlos Alberto Morais	Mozambique	National Institute of Fish Inspection	
Edson Carlos Alberto Tembe	Mozambique	National Institute of Fish Inspection	
Alioune Badara Kane Diouf	Senegal	Inspection and Control Division	
Mame Ibrahima Mbacke	Senegal	Fisheries Processing Industries Department	
Rachel Hartnell	UK	FAO Reference Centre	All
Craig Baker-Austin	UK	FAO Reference Centre	
Karsan Dhanji	UK	FAO Reference Centre	
Joel Dorning	UK	FAO Reference Centre	
Chris Kent	UK	FAO Reference Centre	
James Lowther	UK	FAO Reference Centre	
Ben Maskrey	UK	FAO Reference Centre	
Abigail Parker	UK	FAO Reference Centre	
Michelle Price-Hayward	UK	FAO Reference Centre	
Louise Stockley	UK	FAO Reference Centre	
Michelle Stone	UK	FAO Reference Centre	
Andy Younger	UK	FAO Reference Centre	

Summary of Workshop Content

Between November 2023 and February 2024, the Reference Centre hosted three separate training workshops on bivalve mollusc sanitation, with particular focus on practical methods for determination of *Escherichia coli* (*E. coli*) in bivalves, at its laboratory in Weymouth, UK.

Between 14th and 16th November, 30th January and 1st February, and 20th and 22nd February, the Reference Centre hosted 3 delegates from Ghana and Kenya, 8 delegates from Bangladesh, and 5 delegates from Kenya, Mozambique, and Senegal respectively (Figure 1). The programmes of the three workshops (Appendix 1) were broadly similar, with variations depending on practicalities around fieldwork elements (tide times, availability of external experts etc), availability of laboratory staff, and the specialisms, experience, and priorities of the delegates.

The principal focus of the workshop was practical training in the method for determination of *E. coli* in bivalves using the most probable number (MPN) method described in the ISO (International Organization for Standardization) international standard ISO16649-3, which is the reference method in both European Union (EU) legislation and the Codex Alimentarius Standard for Live and Raw Bivalve Molluscs. Delegates took part in training sessions in the laboratory covering sample preparation, homogenisation, preparation of dilutions, inoculation and incubation of primary and secondary media and interpretation and counting of media after incubation (Figure 2). In addition, classroom presentations on the principles of the MPN method, and the calculation of results from the raw tube counts using the FAORC MPN calculator were provided.

Figure 1; Reference Centre staff and delegates at one of the training workshops

Other topics covered in the classroom included the main public health risks associated with bivalve shellfish, sampling strategies and sampling protocols, and practical sampling officer considerations for taking samples from the environment; the latter presentation acted as preparation for a practical shellfish sampling exercise conducted at the beach adjacent to the laboratory (Figure 3).

The programme also included a visit to a local commercial oyster harvesting area, and either a commercial or experimental depuration facility, which provided the delegates with insights into shellfish production and post-harvest treatments in the UK. Finally, a small number of delegates from Bangladesh received practical training at the laboratory in methods for detection of algal biotoxins in bivalves.

Figure 2; Workshop delegates training in the laboratory.

Figure 3; Reference Centre staff and delegates carrying out the shellfish sampling exercise.

These training workshops were very well received by the delegates with 100% of participant feedback scores for different workshop elements (content, presentations, practical sessions, administration, accommodation, and workshop location) in good or very good brackets (87% very good including 100% of scores for workshop content; see Appendix 2).

APPENDIX 1 – Workshop Agendas

Workshop Dates: 14th, 15th, 16th November 2023

Day one – meeting start time 10:00.

- Welcome and domestic arrangements (15 min)
- Introduction to Cefas and FAO reference centre Programme (15 min)
- Public health risks associated with bivalve shellfish (30 min)

  Break 11:00-11:30

- Risk assessment acknowledgment (10 min)
- Introduction to the principles of the MPN method (35 min)

  Lunch 12:30-14:00.

- Safety talk – Opening shellfish and homogenisation (5 min)
- First practical session – Step 1 of ISO 16649-3 – Sample preparation and initial homogenisation (1hr 45min)

  Break 15:45-16:15

- Safety talk – Dilutions (5 min)
- Second practical session – Step 1 of ISO 16649-3 – Further dilutions and inoculation of MMGB tubes (1hr 30min)

Day two – meeting start time 09:30.

- Welcome (5 min)
- Sampling strategies and sampling protocols (1hr)
- Sampling officer considerations for taking samples with description of exercise (including Health &Safety briefing) (10min)

  Break 10:45-11:15

- Safety talk – Sample collection (5 min)
- Visit to Newtons Cove to collect shellfish (1hr 30min)

  Lunch 13:00 – 14:30

- Safety talk – Lab
- Third practical session – Step 2 of ISO 16649-3 – Reading MMGB tubes and subculturing onto TBX plates (1hr 30min)

Break 16:00-16:30

- Exercise
- Trip to Crab House harvesting area and shellfish tour (Fleet) (1hr)

Day three – meeting start time 09:30.

- Welcome (5 min)
- Safety talk - Lab (5 min)
- Fourth practical session – Step 3 of ISO 16649-3 – Reading TBX plates and determining MPN values (1hr 15min)

Break 11:00-11:30

- Quality assurance accreditation and quality systems (30min)
- Calculation of MPN results (20 min)
- Performance analysis (10 min)
- Question and answers from Day 3 practical sessions

Lunch 12:30 – 13:30.

- Reporting and storage of data (15 min)
- Introduction to depuration (30 min)

Break

- Visit to depuration tanks – Cefas tank room (1hr)
- Round up to workshop (15 min)

World Class Science for the Marine and Freshwater Environment

Workshop Dates: 30th. 31st January 1st February 2024

Day one – meeting start time 10:00.

- Welcome and domestic arrangements (15 min)
- Introduction to Cefas and FAO centre programme (15 min)
- Public health risks associated with bivalve shellfish (30 mins)
- Bivalve Mollusc Quiz 1 (10 min)

Break 11:00-11:30

- Risk assessment acknowledgment (10 min)
- Bacteriology training: Introduction to the principles of the MPN method OR Biotoxin training: Introduction to algal toxin testing methods and laboratory (35 min)

Lunch 12:30-14:00.

- Safety talk – Opening shellfish and homogenisation (5 min)
- First practical session – Bacteriology training: Step 1 of ISO 16649-3 – Sample preparation and initial homogenisation OR Biotoxin training: Sample preparation and initial homogenisation (1hr 45min)

Break 15:45-16:15

- Safety talk – Dilutions (5 mins)
- Second practical session – Bacteriology training: Step 1 of ISO 16649-3 – Further dilutions and inoculation of MMGB tubes OR Biotoxin training: Extraction of lipophilic toxins (1hr 30mins)

Day two – Meeting start time 10:00

- Welcome (5 min)
- Sampling strategies and sampling protocols (1 hr)

Break 11:00-11:30

- Safety talk -Lab (5 min)
- Third Practical session – Bacteriology training: Step 2 of ISO 16649-3- Reading MMGB tubes and subculturing onto TBX plates OR Biotoxin training: Hydrolysis of sample extracts and LC-MS/MS analysis (1hr 30 min)

Lunch 13:15-14:15

- Safety talk – Sample collection (5 min)

- Sampling officer considerations for taking samples with description of exercise – en route to beach. Visit to Newtons Cove to collect shellfish (1hr 30 min)
- Questions and answers from Day 2 (40 min)

Day three – meeting start time 09:30

- Welcome (5 min)
- Safety talk – Lab (5 min)
- Fourth practical session – Bacteriology training: Step 3 of ISO 16649-3 – Reading TBX plates and determining MPN values OR Biotoxin training: Analysis of LC-MS/MS data (1hr 15min)

  Break 11:00-11:30

- Quality assurance accreditation and quality systems (30 min)
- Bacteriology training: Calculation of MPN results OR Biotoxin training: Overview of other biotoxin testing methods (20 min)
- Bacteriology training: Performance analysis OR Biotoxin training: Wrap up (10 min)

  Lunch 12:30 -13:30

- Reporting and storage of data (15 min)
- Introduction to depuration (30 min)

  Break 14:15pm – 14:45pm

- Trip to Crab House harvesting area and shellfish tour (Fleet) (1hr)
- Bivalve quiz 2 plenary session (30 min)
- Round up to workshop (15 min)

World Class Science for the Marine and Freshwater Environment

Workshop Dates: 20th, 21st, 22nd February 2024

Day one – meeting start time 10:00.

- Welcome and domestic arrangements (15 min)
- Introduction to Cefas and FAO centre programme (15 min)
- Public health risks associated with bivalve shellfish (30 min)
- Bivalve mollusc quiz 1 (10 min)

Break 11:10 - 11:30

- Risk assessment acknowledgement (10 min)
- Introduction the principles of the MPN method (35 min)

Lunch 12:15 - 13:45

- Safety talk - Opening shellfish and homogenisation (5 min)
- First practical session - Step 1 of ISO 16649-3 -Sample preparation and initial homogenisation (1hr 45min)

Break 15:35 - 16:00

- Safety talk – Dilutions (5 min)
- Second practical session - Step 1 of ISO 16649-3 – Further dilutions and inoculation of MMGB tubes (1hr 30min)

Day two – meeting start time 09:30am

- Welcome (10 min)
- Sampling strategies and sampling protocols (45 min)
- Safety talk - Sample collection(5 min)
- Sampling officer considerations for taking samples with description of exercise – en route to beach. Visit to Newtons Cove to collect bivalve shellfish. (1hr 30 min)

Lunch 12:00 - 13:00

- Safety talk - Lab (5 min)
- Third practical session – Step 2 of ISO 16649-3 – Reading MMGB tubes and subculturing onto TBX plates (1hr 30 min)

Break 14:35 - 15:00

- Virtual growing area risk profile- Hazard identification and risk assessment. (1hr)
- Question and answers from day 2 (15 min)

Day three – meeting start time 10:00

- Trip to Crab House harvesting area and shellfish tour (Fleet) (1hr)

Break 11:00 - 11:30

- Safety talk (5 min)
- Fourth practical session - Step 3 of ISO 16649-3 – Reading TBX plates and determining MPN value (1hr 15 min)
- Quality assurance, accreditation and quality systems (20 min)

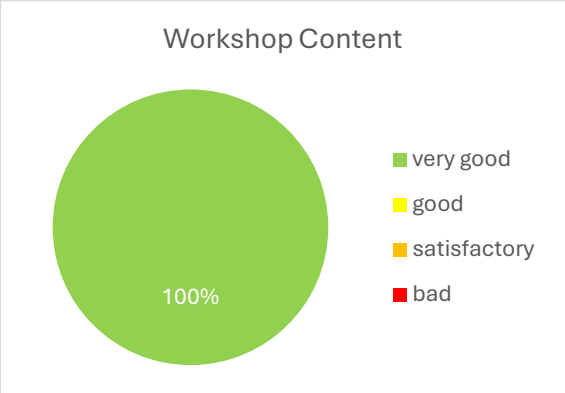
Lunch 13:10 - 14:15

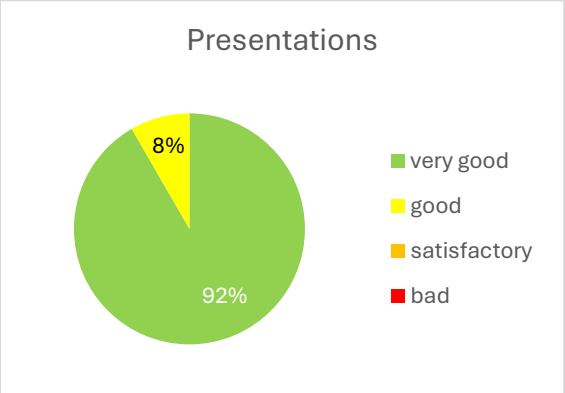
- Reporting and storage of data (15 min)
- Introduction to depuration (30 min)
- Calculation of MPN results (MPN calculator) (20 min)
- Performance analysis exercise (30 min)

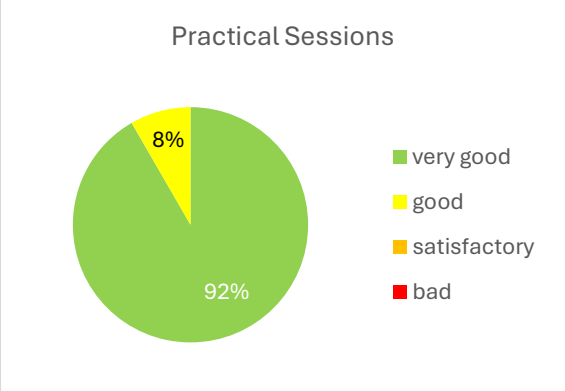
Break 15:30 - 15:45

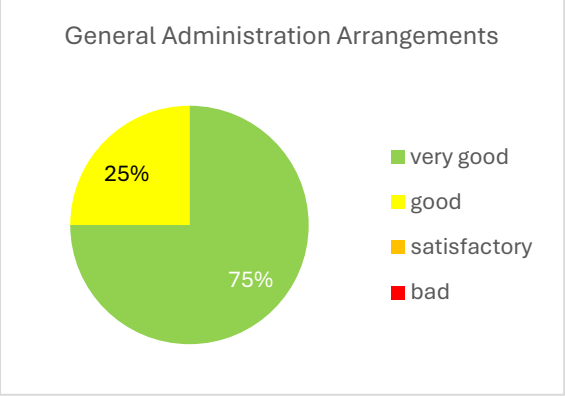
- Cefas FAO website as a source of information (15 min)
- Bivalve quiz plenary session (15 min)
- Round up to meeting (15 min)

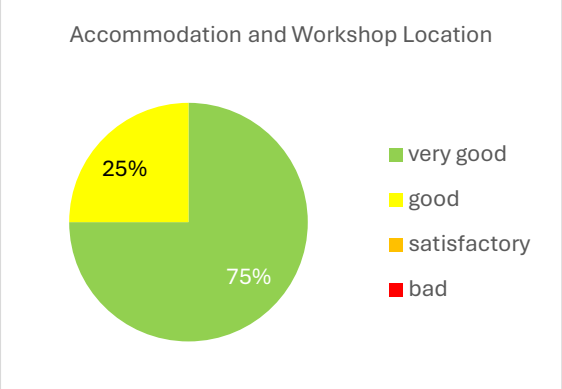
APPENDIX 2 – Confidential Participant Feedback Results

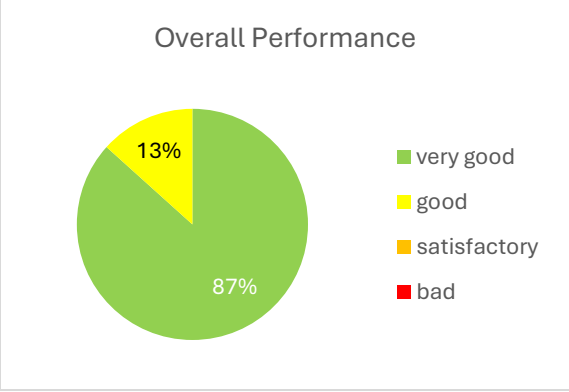












World Class Science for the Marine and Freshwater Environment

Comments received alongside feedback scores;

Nov 2023 Workshop

1. a. The training was very informative and well delivered. In terms of the content, it would be great to also learn about what other third countries are doing in their bivalve molluscs programmes and the challenges they are facing to help us prepare our programmes from a relatable point of view.
   b. In terms of the arrangements, it might be helpful to send out invitations for the training (with all other required documents) well in advance (at least 3 months in advance) to give ample time for Visa processing. It would also be great if Cefas (through the UK Government) would be able to directly contact the embassies of third countries to discuss modalities of waiving the Visa fees for applicants from these countries.
   c. I would also recommend a longer training period or more training sessions, to expose the trainees to more practical work and field activities in bivalve mollusc growing areas.
2. The programme was insightful and I believe it will have impact on my personal and career growth.

Jan-Feb 2024 Workshop

3. Training duration should be 7 – 10 days.
4. Thanks a lot, Cefas team for arranging such a wonderful learning and practical session. Though the duration was limited, we were hungry for more learning like virus tests, the technique of culture system, the disease of oysters, monitoring techniques, and many more things. We are eagerly waiting for your further call.
5. a. Workshop content was perfectly suited to achieve the objective of the training course, however workshop tenure could be increased from 3 days to 5 days including one dedicated day for visiting oyster farming and processing establishments, and one day within the sponsorship of the programme as refreshment visit for site seeing to get the visitors acquittanced with country's historical places, local cultures & heritages.
   b. Workshop location was perfect for the course, foods & hospitality was excellent; however accommodation was satisfactory.
6. a. Thanks Cefas for arranging wonderful and dynamic training session for us. It was insightful and interactive session both theoretical and practical session as well as exam part. We enjoyed a lot your warm hospitality as well. I am delighted to be a part of this programme.
   b. My request to Cefas is to arrange comprehensive training programme which cover hepatitis A virus , Norovirus test procedure and culture technique of bivalve mollusc.
7. It was a wonderful time we have passed in Weymouth, the program schedule was too compact for recreation. If the schedule was at least five-seven days it would be better for us to enjoy much. Any way thanks to Cefas and all associated organization for hosting us in such a wonderful program.

8. a.In general, I can say that the training was well structured and organized, the trainers were people with a level of knowledge suitable for delivering the content.

   b. It is known that English is an international language, in principle we should all speak it, however, practice indicates otherwise, so we proposed that conditions be created for a translation in future events for better assimilation of content. We hope that our governments create the conditions to implement learning.

9. a. The training was very informative and well delivered.
   b. I am grateful for the training and looking forward to more collaboration in different areas as we develop a joint proposal as discussed
   c. The FAO/Cefas organise visits of delegates to other developing countries' bivalve molluscs programmes to learn more as we plan to prepare our programmes.
   d. Send invitations for training and other required documents well in advance to give sufficient time for Visa processing.
   e. Cefas (through the UK Government) discuss modalities of Visa fee waivers for delegates attending training.

Food and Agriculture Organization of the United Nations

Cefas INTERNATIONAL CENTRES OF EXCELLENCE

Centre for Environment Fisheries & Aquaculture Science

World Class Science for the Marine and Freshwater Environment

About us

The Centre for Environment, Fisheries and Aquaculture Science is the UK's leading and most diverse centre for applied marine and freshwater science.

We advise UK government and private sector customers on the environmental impact of their policies, programmes and activities through our scientific evidence and impartial expert advice.

Our environmental monitoring and assessment programmes are fundamental to the sustainable development of marine and freshwater industries.

Through the application of our science and technology, we play a major role in growing the marine and freshwater economy, creating jobs, and safeguarding public health and the health of our seas and aquatic resources

Head office

Centre for Environment, Fisheries & Aquaculture

Science

Pakefield Road

Lowestoft

Suffolk

NR33 0HT

Tel: +44 (0) 1502 56 2244

Fax: +44 (0) 1502 51 3865

Weymouth office

Barrack Road

The Nothe

Weymouth

DT4 8UB

Tel: +44 (0) 1305 206600

Fax: +44 (0) 1305 206601

Customer focus

We offer a range of multidisciplinary bespoke scientific programmes covering a range of sectors, both public and private. Our broad capability covers shelf sea dynamics, climate effects on the aquatic environment, ecosystems and food security. We are growing our business in overseas markets, with a particular emphasis on Kuwait and the Middle East.

Our customer base and partnerships are broad, spanning Government, public and private sectors, academia, non-governmental organisations (NGOs), at home and internationally.

We work with:

- a wide range of UK Government departments and agencies, including Department for the Environment Food and Rural Affairs (Defra) and Department for Energy and Climate and Change (DECC), Natural Resources Wales, Scotland, Northern Ireland and governments overseas.
- industries across a range of sectors including offshore renewable energy, oil and gas emergency response, marine surveying, fishing and aquaculture.
- other scientists from research councils, universities and EU research programmes.
- NGOs interested in marine and freshwater.
- local communities and voluntary groups, active in protecting the coastal, marine and freshwater environments.