forestry, fisheries & the environment

Department:
Forestry, Fisheries and the Environment
REPUBLIC OF SOUTH AFRICA

Standard Operating Procedure: Phytoplankton Inter-Laboratory Comparisons

Branch: Fisheries Management
Chief Directorate: Aquaculture Development and Freshwater Fisheries
Directorate: Sustainable Aquaculture Management

Issue 2: July 2024

TITLE

Standard Operating Procedure: Phytoplankton Inter-Laboratory Comparisons.

COMMENCEMENT

This Standard Operating Procedure comes into force on 1 July 2024.

STANDARD OPERATING PROCEDURES ISSUED

Issue	Date of issue
1	01 October 2023

ISSUING AUTHORITY

This Standard Operating Procedure is issued by the Environmental Officer Specialised Production of the Directorate Sustainable Aquaculture Management of the Department of Forestry, Fisheries and the Environment in terms of the Aquacultured Marine Fish Food Safety Programme (AMFFSP).

Environmental Officer Specialised Production

DATE: 01/07/2024

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1. DOCUMENT CONTROL

The Standard Operating Procedure (SOP): Phytoplankton Inter-Laboratory Comparisons was compiled by the Department of Forestry, Fisheries and the Environment (DFFE): Food Safety Office (FSO) of the Directorate Sustainable Aquaculture Management. The SOP is administered by the FSO and will be reviewed and updated as relevant new information becomes available.

A detailed record of all amendments shall be maintained, and the latest version will be made available at the FSO and will be loaded onto the DFFE website. Suggestions for alterations that would significantly improve the document are welcomed. These should be forwarded to the coordinator, Mr John Foord and enquiries can be directed to Ms Portia Dwane (Appendix 1).

2. SCOPE

This document covers the procedures for the phytoplankton Inter-Laboratory Comparison (ILC) as required in terms of the Aquacultured Marine Fish Food Safety Programme (AMFFSP). The procedures include organization performance and evaluation of measurements or tests on the same or similar phytoplankton samples by two or more laboratories in accordance with predetermined conditions prescribed by the Department of Forestry, Fisheries and the Environment (DFFE). The phytoplankton ILC is undertaken for the official phytoplankton laboratories in South Africa. The ILC is designed to determine whether analytical methods implemented by the laboratories are fit for purpose and the ability of the laboratories to deliver accurate testing results.

3. BACKGROUND

The Department of Forestry, Fisheries and the Environment (DFFE) is the managing and regulatory authority for the undertaking of aquaculture activities that include farming, harvesting and transporting of fish for wholesale trading stipulated in the permit conditions issued in terms of the Marine Living Resources Act, 1998 (Act No. 18 of 1998) and associated regulations. The Directorate: Sustainable Aquaculture Management (D: SAM) of the Fisheries Branch of DFFE is responsible for the development, management and regulation of a sustainable aquaculture industry that contributes towards job creation, food security, rural development and economic growth. D: SAM aims to achieve the above-mentioned strategic objectives through the development and implementation of relevant enabling legislation, policies and programmes as well as be responsive and compliant to international obligations and agreed standards. The Food Safety Office (FSO) within D: SAM is responsible for the development and management of food safety programmes stipulated in the permit conditions issued in terms of the Marine Living Resources Act, 1998 (Act No. 18 of 1998) including the AMFFSP and the National Residue Control Programme (NRCP). The objectives of the food safety programmes include providing guarantees to domestic and international markets and consumers that South African cultured fish products are safe for human consumption.

The risks to food safety of cultured fish include environmental residues (heavy metals, perfluoroalkyl substances, pesticides, polychlorinated biphenyl, dioxins, polycyclic aromatic hydrocarbons and radionuclides) and veterinary medicine residues (hormones, antibiotics and anthelmintics), the accumulation of biotoxins (Paralytic Shellfish Toxins (PST), Lipophilic Shellfish Toxins (LST) and Amnesic Shellfish Toxins (AST)) and microbiological contamination in shellfish indicated by the presence of *E. coli*.

The accumulation of biotoxins is caused by toxic phytoplankton blooms that are present in the vicinity of aquaculture farms. Phytoplankton sampling needs to be undertaken frequently and near or on aquaculture farms in order to address the inherent temporal and spatial variability in phytoplankton blooms along the South African coast. The phytoplankton monitoring programme requires that potentially toxic species are identified, and the concentrations calculated to determine the potential risk of the bloom on the farm in terms of food safety. If harmful species are found, contingency measures must be implemented to prevent the harvesting and marketing of toxic shellfish to consumers. Additional samples may be taken from distant areas where blooms are known to develop before being advected to within close proximity to farms as an early warning system. The phytoplankton monitoring programme requires that the phytoplankton laboratories participate in an ILC to demonstrate their competency in carrying out phytoplankton analyses.

The Utermöhl method (Hasle, 1978) is utilized to identify and enumerate phytoplankton samples collected in accordance with Standard Operation Procedure: Phytoplankton sampling and enumeration. A list of all organisms indicated in the programme shall be identified and their respective concentrations are to be reported to the Food Safety Office of the Directorate Sustainable Aquaculture Management. The laboratory is required to be SANAS accredited based on ISO 17025 (General requirements for the competence of testing and calibration laboratories) and ISO 15204 (Water quality. Guidance standard on the enumeration of phytoplankton using inverted microscopy - Utermöhl technique) or working towards accreditation.

4. LABORATORY PARTICIPANTS

Seawater samples shall be submitted to SeeWise, Amanzi Biosecurity and Nelson Mandela University laboratories for toxic phytoplankton identification and enumeration. The laboratory addresses are included below:

SeeWise Food Safety (Pty) Ltd
13 Kaizer Crescent
Lorenza Complex
Bluewater Bay
Saldanha Bay
7395

Amanzi Biosecurity laboratory
45 Jan van Riebeek Crescent
Sandbaai
Hermanus
7200

Nelson Mandela University laboratory:
Botany Department, Building 12, Ground Floor, Room 002
University Way, Summerstrand
Gqeberha
6031

5. METHODOLOGY

The ILC requires the analysis of homogenised samples by the official laboratories to compare the accuracy of the laboratories. The aim of the ILC is to assess the reliability of the test results of the participating laboratories. The ILC furthermore is furthermore an accreditation requirement of ISO/IEC 17025.

The ILC includes the following steps:

1. The FSO shall coordinate the distribution of seawater samples, with known toxic phytoplankton species at known concentration to the participating laboratories. The samples distributed shall be subsamples of well homogenised phytoplankton samples.
2. The FSO shall ensure that the participating laboratories are using the same standardised sampling preparation and analysis methods including using the same settling volume depending on the density of the toxic phytoplankton species present.
3. The laboratories must accurately identify and enumerate the toxic phytoplankton species listed in the AMFFSP and submit the results to the FSO.
4. The FSO must evaluate the results provided in terms of the toxic phytoplankton species identified and the count of the species and provide feedback to the participating laboratories.

6. REPORTING RESULTS

The ILC identification and enumeration results from the phytoplankton laboratories shall be emailed to the Food Safety Office (Email: SAMSanitation@dffe.gov.za) within 7 days from the day the samples are received.

7. REFERENCES

Department of Forestry, Fisheries and the Environment. 2024. Aquacultured Marine Fish Food Safety Programme. Cape Town. Issue 8, 1-67.

Hallegraeff G.M. et al. 2003. Manual on Harmful Marine Microalgae

Hansen G. et al. 2001. Potentially harmful microalgae of the Western Indian Ocean: a guide based on a preliminary survey. IOC Manuals and Guides No.41. IOC of UNESCO (http://archive.iwlearn.net/bclme.org/factfig/HAB%20workshop/Books/Hansenetal2001.pdf)

Hasle, G. R. 1978. The inverted-microscope method, in Sournia, A. (ed.) Phytoplankton manual. 1st ed. Paris: UNESCO, pp. 88–96.

Intergovernmental Oceanographic Commission. Accessed 2020. Taxonomic Reference List of Harmful Micro Algae. (http://www.marinespecies.org/hab/index.php)

Kudela Lab University of California. Accessed 2020. Phytoplankton Identification: a look at the tiny drifters along the California coast (http://oceandatacenter.ucsc.edu/home/outreach/PhytoID_fullset.pdf)

Lassus P. et al. 2016. Toxic and Harmful Microalgae of the World Ocean. Denmark. ISSHA

Marine Phytoplankton Atlas of Kuwait's Waters. Published in Kuwait. 2009. Kuwait Institute for Scientific Research (https://www.researchgate.net/publication/246990259_Oceanographic_Atlas_of_Kuwait's_Waters).

Tomas C. R. 1997. Identifying Marine Phytoplankton. Academic Press.

Appendix 1: Contact Information

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Food Safety Office

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