BIM EMFAF Work Programme Project Report 2023

BENEFICIARY: Bord Iascaigh Mhara
PROJECT REFERENCE NUMBER: 23/KGS/STS-BG011-BR107-108
NAME OF PROJECT: **Fish Welfare**
IMPLEMENTATION PERIOD: 1st January to 31st December 2023

Project Scope

The purpose of the technical elements of the Fish Welfare project is to provide a holistic solution to the threats to fish welfare posed by Harmful Algal Blooms. The project seeks to provide an early warning system for Harmful Algal Blooms (HAB) events on farms. The is further aligned to the use of biomarker technology to identify and mitigate the fish welfare impacts of same. However, data derived from technical projects is rendered useless if farm operators cannot identify welfare indicators in the fish under their care. Knowledge is required to ensure that standard criteria for best fish welfare practices for staff of both freshwater and marine finfish sites is met within the Irish finfish sector.

The development of an early warning system is reliant on the emergence of machine learning based systems which can continuously report on phytoplankton composition in water at marine sea pen locations. This data can be used to provide a traffic light system for farmers and will reduce days lost feeding, improve fish welfare, and provide an efficient mechanism for deployment of mitigation measures, some of which are energy intensive. The development of such systems is reliant on an accurate database of images collected from the marine environment. Machine learning can then be deployed to constantly analyse images sampled in real time and provide an accurate assessment of both the type of algae present and its quantity.

The effect of phytoplankton, zooplankton, disease, and mitigation procedures against the same can have an effect on fish health and growth. The development of blood-based diagnostics offers the potential to improve the understanding of fish health. Existing diagnostic methods including histology can be time limiting and are often taken after fish health is compromised. Fish health diagnostics using biomarkers has the potential to significantly improve assessment of overall fish health. In practice this allows for non-lethal sampling of fish health.

Aligned to the technical programme BIM facilitates Fish Health & Welfare practical and classroom-based workshops on an annual basis, delivered by a professional service provider, which are recognised by third-party certification standard bodies. BIM Fish Health and Welfare Workshops are designed to equip industry with the knowledge and competence in fish welfare practice and handling techniques to meet regulatory and third-party standards requirements for best fish welfare practices for the aquaculture industry.

Objectives

- Industry meeting third-party seafood certification standards requirements on fish welfare competencies.

- Increase knowledge and proficiency in diagnostic and sampling methods for optimal assessment of fish health and disease in aquaculture facilities, through attendance at workshops and post workshop evaluation.
- Facilitate greater connectivity between industry members on fish health and welfare practices on fish farm sites.
- Information dissemination, networking opportunities.
- Improved fish welfare in commercial settings focusing on infectious diseases, vaccination and bath treatments in freshwater systems and fish harvesting and product quality
- This type of learning experience enhances knowledge retention and can boost staff confidence and competencies. Development of practical tools for use on site to complement the subject matter of the workshops.
- Install AI driven phytoplankton monitoring systems at four marine sites.
- Provide targeted phytoplankton analysis support to marine finfish sites.
- Improve accuracy and confidence level of phytoplankton identification from AI.
- Sample fish health of designated cohorts at least six finfish sites.
- Derive key fish welfare and health metrics from biomarker samples.
- Provide bespoke fish health data to finfish sites following biomarker analysis.

Outcomes

BIM ran a series of seven fish health and welfare workshops and practicals for the aquaculture industry during 2023 attended by 124 participants of the finfish sector. Three full curriculum class-based workshops (recognised for third-party standards certification) were delivered during Q2 and Q4, which included two workshops for the Marine sector and one workshop for the Freshwater sector. These workshops were targeted to individuals who wished to enhance their knowledge of fish welfare in the finfish aquaculture sector and were of particular interest to new entrants or as a refresher for freshwater and marine site staff working directly with and involved in the handling, transferring, and harvesting of fish.

A further four modularised workshops were delivered, focused on impacts of harmful zooplankton on fish health and welfare, cleaner fish health and welfare, vaccination and bath treatments in freshwater and one final workshop on harvesting, delivered on-line. These workshops looked at both the ethical considerations of fish welfare and the practical implications of poor welfare on product quality. Workshops also looked at harmful plankton species (zoo- and phytoplankton) and their impact on finfish health and welfare, with practical guidance on sampling techniques, species identification and mitigation measures.

It is further important to note that the workshops also covered the freshwater sector specifically husbandry and management measures aligned to high standards of fish welfare. Further through ongoing collaboration with the ATU laboratories, practical elements form part of the workshops which provide a unique opportunity for hands-on learning from experienced professionals to enhance knowledge retention and to increase industry skills and competence in fish health and welfare.

In tandem to the workshops, BIM's Fish Health & Welfare Toolkit, which sits on the BIM website, continues to complement BIM's existing fish welfare advisory services, providing clear and practical information on monitoring cataracts in salmon; gill score sheets; a common cross gill pathology chart and, wrasse identification card, Zooplankton Monitoring ID card, and recently published booklets on Operation Welfare Indicators, Fish Welfare During Handling, and Plankton Sampling.

BIM oversaw the installation of LPAS algal monitoring systems on four sites in 2023. The systems trialled a beta version of AI software developed to identify and quantify numerous species of phytoplankton. The systems were utilised by trained personnel at each site and used in day-to-day monitoring activities. The systems were updated regularly as a result of machine learning outcomes. The accuracy and confidence level

of the AI increased during the trial period. Following the deployment of the systems further modifications were made to the systems following operator feedback.

Biomarker analysis of sampled fish continued at a number of marine and freshwater finfish sites. The biomarker results monitored overall fish health in the sampled populations and provided site operators with further insight into fish health and welfare during husbandry operations.

Summary of Project Spend

Summary of Spend	
Total Approved Costs	€177,000
Total Eligible Expenditure	€173,316
EMFAF Eligible Expenditure	€86,658
Exchequer	€86,658

Project Partners: Marine Institute, Atlantic Technical University (ATU)

Report by: Damien Toner and Vera Flynn

Date: February 2024