Marine Challenge

Project Outline:

Amoebic Gill Disease (AGD) is a recurring health issue for marine salmon farms. It is caused by a naturally occurring single celled planktonic organism and has no implications for human health or for interactions between farmed and wild fish. However, if left untreated in farmed conditions, high mortalities occur resulting in millions of Euros of losses. The preferred treatment method is bathing the affected salmon in fresh water for a period of hours. This project will help to improve this process and make it more efficient at a commercial scale.

The increasing occurrence and threat from phytoplankton and zooplankton have been felt by the Irish aquaculture sector. Harmful plankton can result in symptoms ranging from suboptimal growth through to increased mortalities and present a credible threat in the marine environment. In 2020 and 2021 elevated levels of mortality were recorded from the southwest to the northwest coast of Ireland. Last year BIM developed a network of real time data loggers in order to collect baseline data on the abundance and frequency of these challenges.

Fish welfare needs to be optimised further and this can be achieved via routine blood monitoring, seizing on the opportunity to reduce fish stress and optimise treatment times before symptoms become apparent.

A freshwater trial will establish if a freshwater lens contained within an existing salmon pen can retain the low salinity levels previously achieved in 50m pens. Pending initial findings regarding the salinity attained, BIM can then test if this layer can effectively remediate against the signs and symptoms of AGD under commercial conditions. BIM will deploy a flexible, strengthened, impermeable, bottomless structure within a salmon cage to test this approach. To that structure it will add desalinated water that will remain on the surface due to differences in density. The team now proposes to establish any changes in the gill health and whether or not this continuing access to freshwater has an impact on AGD gill scores in a commercial setting. Complete records of feeding rates, food conversion ratios and the impact on sea lice occurrence will also be documented. We aim to duplicate this on two sites with different year classes of fish in order to evaluate if fish size has any impact on effectiveness. Blood sampling will be carried out routinely in the trial and control groups. Improving gill and AGD scores will improve fish welfare, thereby improving specific growth rate. This will reduce the time to harvest and limit environmental exposure thus improving profitability.

The phytoplankton project will involve the deployment of multiple real time data logging sensors along with automated sampling systems. When thresholds in water quality are exceeded, BIM will initiate the collection of an automatic sample. This will enable BIM to analyse the composition and abundance of possible causative organisms. In parallel, BIM will investigate the possibility of using specific visible light wavelengths to identify harmful plankton species that can be used easily onsite upon full development.

BIM will also develop and refine site specific remediation systems based on new technology and the adaption of existing technology. The remediation systems developed and deployed will utilise knowledge from the real time sensors for activation in order to reduce costs and energy consumption. The deployment of a physical barrier will be undertaken, and sea-based trials will take place. This physical barrier will reduce the likelihood of harmful algae or zooplankton coming into contact with farmed fish. This will result in less occurrences of complex gill disease in the trial pens. Improved respiration rates enable better metabolism of food improving FCR and specific growth rates, thereby improving profitability. Blood sampling will be carried out routinely in the trial and control groups.

Phytoplankton counts will be used to determine the effectiveness of the barrier and BIM will also collect water quality data to ascertain any changes that result.

BIM, through our veterinary experts, will provide plankton identification workshops in order to empower and enable site specific expertise to be developed.

The use of non-physical barriers such as bubbles will be further validated. These will be refined throughout 2022 to deal with the wave and current conditions found in Ireland. These air barriers will reduce the abundance and likelihood of harmful algae and zooplankton coming into contact with salmon, damaging gills and skin. Reducing these impacts will improve gill health and reduce exterior infection. This will improve fish welfare and enable better growth rates, reducing time at sea thereby improving profitability.

BIM has the expertise to marry together the water quality data, the operational welfare indicators, the results of blood sampling in order to aid site management decision making processes in order to maximise fish welfare in addition to maximising growth rates and food conversion ratios. BIM will aid in the development of an IT based system that utilises all available data to provide advance warning of environmental events.

Project Objectives:

- To maximise the efficacy of biological treatment methods.
- To support fish welfare through early disease identification.
- To reduce the costs associated with current freshwater treatments, in relation to boats, generators and staff.
- To reduce the impacts on fish health by reducing the number of times fish are moved by pump.
- To reduce the impacts of AGD by enabling fish to 'self-treat' by the use freshwater that is always available
- To investigate the effects of this lens of sea lice abundance on Atlantic salmon.
- To develop a network of water quality sensors in order to assist with the early detection of harmful organisms.
- Increase knowledge of water quality around the coast particularly in relation to aquaculture sites.
- To deploy a physical barrier system.
- To test bubble curtains particularly in relation to commercial effectiveness and running cost.

Expected Benefits:

- A better monitored environment for the ongrowing of salmon.
- Site specific trigger levels defined for a variety of salmon aquaculture sites.
- Site productivity maximised via the implementation of mitigation measures.
- Decreased costs of production in salmon aquaculture, improved fish welfare and improved health and safety.

Projected Cost: €534,500