PerformFISH

Consumer Driven Production: Integrating Innovative approaches for Competitive and Sustainable Performance across the Mediterranean Aquaculture Value Chain

www.performfishproject.eu

Image © Culmarex

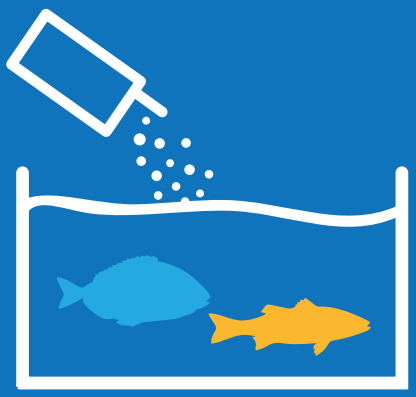
WORK PACKAGE 4 – EFFICIENT FEEDS TO IMPROVE THE CURRENT KPIS IN PRODUCTION SYSTEMS

The Challenge

The nutritional quality of fish feeds and feeding management are major factors with an impact on core Key Performance Indicators (KPIs) of fish farming, namely growth rate, feed conversion rate and mortality rate. Unbalanced diets that do not fully meet the nutritional needs of fish are recognised by farmers as one of the main constraints affecting the technical performance and viability of the Mediterranean Marine Fish Farming (MMFF) industry (EAS/EATIP, 2015). Despite the fact that feed and feeding expenses represent almost 50% of the production cost of European sea bass and gilthead sea bream, no complete guidelines on recommended dietary nutrient levels for MMFF feeds exist to date, while the need to identify raw materials for fish feeds that can sustainably support the growth of the MMFF industry is more evident than ever.

PerformFISH Proposed Solution

PerformFISH has developed a multi-faceted approach to increase feed efficiency. The determination of the micro- and macro-nutritional requirements of sea bass and sea bream throughout their biological cycles will provide insight into how specific nutrients contribute to optimisation of feed efficiency. This will build on and complement results generated by previous projects (e.g. ARRAINA) in order to develop the first complete benchmark of nutritional quality for MMFF feeds. PerformFISH will explore novel alternative ingredients of low ecological footprint to develop sustainable, cost-effective fish feeds to meet the updated nutritional requirements of MMFF. This will be coupled with improved feed management through advanced modelling and technology development to allow monitoring of feeding behaviour and cage biomass in production systems. Finally, the introduction of early metabolic programming protocols coupled with breeding will be investigated as another promising means to enhance fish growth performance, robustness and welfare.



Main Results to Date

Minerals and Vitamins Requirements for Sea Bass and Sea Bream

A table of defined requirements of macro and micronutrients for seabream and sea bass has been compiled using published and unpublished knowledge. Subsequently, eight different studies aiming to define the recommended levels for minerals and vitamins in sea bass and sea bream diets have been conducted in Ecoaqua Institute and the Hellenic Centre for Marine Research (HCMR). For each micronutrient five dietary levels were compared using formulations similar to the current industrial feeds. The results will fill in identified gaps in the Table of nutritional requirements and will allow the formulation of nutrient-balanced diets tailored for each Mediterranean species to improve their KPIs in relation to growth, feed utilisation and survival.

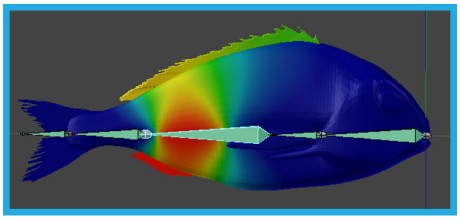
Optical methods and image analysis for biomass estimation

Reliably defining the fish biomass within a cage is at the core of any feeding system. This includes estimation of fish size and growth using optical methods and image analysis, and also total cage biomass using echo sounders.

HCMR is developing a non-invasive body weight measurement system for fish by estimating their total length, using stereoscopic video imaging and available measuring techniques (e.g. www.vidsync.org).

A customised software for automated fish recognition and measurement from the video footage is developed. Initially, the candidate fish to be measured was selected using only the image "depth" data. The system presents accuracy with reasonable deviation from the actual size.

Length estimation based on image's "depth"



3D model of G. seabream

Selecting an appropriate image to measure based on specific features

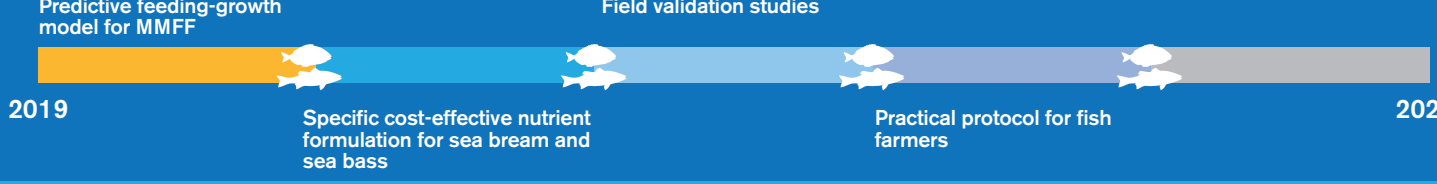
To improve accuracy a model was created allowing the application of "3D model pose" while specialised algorithms facilitate the selection of the appropriate candidate image for measurement among a group of fish.

Decision Support System

PerformFISH is developing a web-based tool called FEEDEST. This tool is designed to provide feeding programmes, growth estimates and environmental impact parameters based on initial biomass (average body weight and total number of fish), and a historical temperature profile as input. Several trials have been planned to fully validate this tool for exploitation by the MMFF.

Going Forward 2019-2022

To address the nutritional challenge, PerformFISH will further develop and validate at commercial installations the predictive feeding-growth model for optimal feeding as well as the new techniques to measure the biomass in the cage. In addition, novel sustainable ingredients will be screened for their capacity to cover the nutritional requirements for each species. The aim is to produce species-specific nutrient-balanced feeds of low ecological footprint and to optimize feeding rates by monitoring real-time growth. A new practical protocol will be developed for conditioning Mediterranean fish to novel feeds at early stages in order to increase adaptability, reduce stress and increase biological efficiency at the grow out stages. By developing applied tools and solutions of technological and commercial interest to the European aquaculture industry, PerformFISH aims at ensuring efficient feed utilisation for optimum growth.



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