GVA-THINKINAZUL
WP3- NUTRITION AND WELFARE (NUBE)

UNDERSTANDING WP3

WP3 (NUBE), focused on nutrition and welfare, is structured around three main objectives. The first aims to improve knowledge about the welfare of aquaculture stocks by using new tools and welfare indicators within the context of global change. The second objective focuses on enhancing the nutrition and feeding of cultured animals through new feed formulations based on mixtures of alternative raw materials and dietary supplements validated throughout the production cycle, supported by zootechnical, behavioral data, and new molecular biology and microbiota monitoring tools. Finally, the NUBE WP aims to develop new aquaculture feed ingredients by valorizing fishery by-products as well as other products and by-products of plant or animal origin, with the goal of obtaining compounds beneficial for the health and nutrition of the cultured species.

www:// **https://cvalenciana.thinkinazul.es/**

NEW SOLUTIONS FOR MONITORING AND MODELLING FARMED FISH BEHAVIOR, WELFARE, AND MICROBIOTA

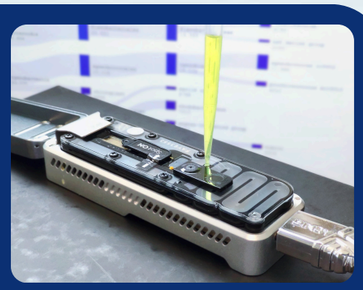
The AEFishBIT device (triaxial accelerometer, operculum attachment) allows for high-precision, individual monitoring of the effects of the environmental factors and new feed formulations on social cohesion and behavioral changes under stress tests.

The latest prototype offers extended battery life and wireless communication for remote programming and data retrieval. Machine Learning integration is also underway to automate result interpretation.

Optimized 16S metabarcoding techniques (based on Nanopore technology) provide reliable, low-cost, real-time measurements of the microbiota composition in both the culture environment and farmed animals.

Changes in skin and gut microbiota serve as good indicators of thermal stress, microplastic exposure, and phenotypic plasticity in response to seasonal and dietary changes throughout the production cycle.

Modeling microbiota–host interactions using Bayesian networks and membrane computing techniques enables predictions of climate change impacts on aquaculture production and the effectiveness of mitigation strategies.



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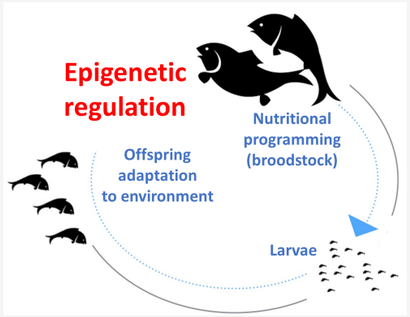
SUCCESS STORIES OF NEW FORMULATIONS AND ADDITIVES IN A GLOBAL WARMING CONTEXT

New fishmeal-free feed formulations, tested at pilot scale, enable accelerated growth of gilthead sea bream without compromising production efficiency, even during the record-high Mediterranean temperatures of 2022 and 2023.

The success of parental programming in gilthead sea bream to improve offspring depends on genetic background and their associated effects on lipid metabolism.

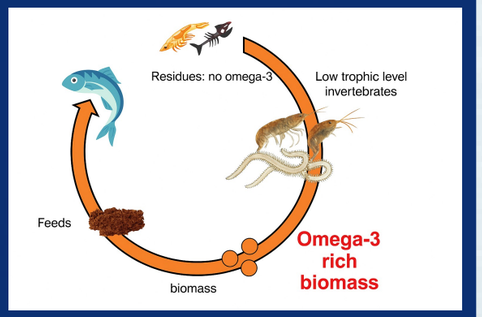


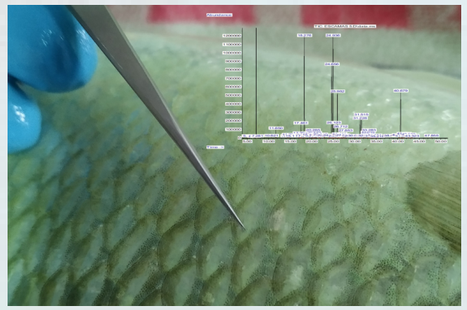
Supplementing alternative gilthead sea bream diets with bioactive products derived from meat industry by-products reduces aggressiveness and circulating cortisol levels, while enhancing swimming performance.

LIPID METABOLISM IN INVERTEBRATES – A CIRCULAR ECONOMY APPROACH TO USING INVERTEBRATES AS INGREDIENTS IN AQUACULTURE FEEDS

The repertoire of genes involved in LC-PUFA metabolism has been identified in invertebrates (crustaceans and annelids) and the functions of the encoded enzymes have been characterized in selected representative species. Annelids possess the enzymes required for all reactions necessary to convert C18 precursors into physiologically relevant long-chain polyunsaturated fatty acids (LC-PUFAs), such as eicosapentaenoic acid (20:5n-3) and arachidonic acid (20:4n-6).

Nereid polychaetes (*Hediste diversicolor*) and harpacticoid copepods (*Tigriopus californicus*) have de novo synthesis capacity for n-3 LC-PUFA, making them ideal candidates for circular economy strategies aimed at transforming agro-food and forestry industry waste into high-value functional biomasses. Polychaete biomass produced from by-products emerges as an ideal ingredient for the production of functional aquafeeds.





A non-invasive procedure has been developed to analyze fish muscle fatty acid profiles from their scales, facilitating the monitoring of changes in these profiles caused by biotic and abiotic factors.