

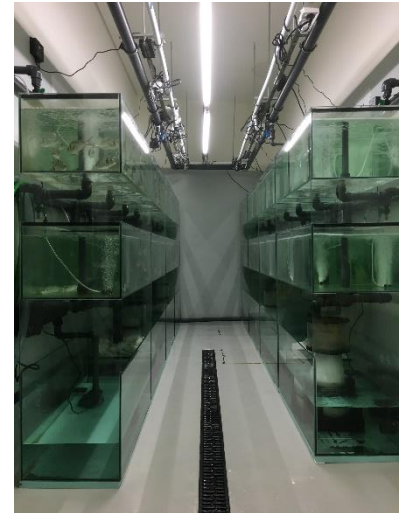
Functional fish feed formulation and testing

Benjamin within this for years project what is the main project task of CIIMAR?

We are mainly dedicated to WP7, and particularly responsible for task 7.4 where we aim to assess immune condition and inflammatory responses of fish and shrimp fed with halophyte supplemented diets.

What added value do you expect from the project?

We expect to develop functional feeds based on bioactives from halophytes that can contribute to improve the health of aquatic farmed animals. Beyond this enhanced health condition, we are also seeking for immunomodulatory functionality, meaning that these functional diets can also boost innate immunity after recognising an antigen, for instance following contact with a pathogen.



Fish-trials

When you think about the results, which ones have surprised you the most so far?

Most surprising results so far were observed during this trial with European seabass fed a diet with 10% of *Salicornia ramosissima* inclusion for two months. It was observed an increased recruitment of leucocytes (immune cells) to the place where pathogenic bacteria were injected. This meant that this particular halophyte has the potential to boost immune responses in seabass, and therefore showed the immunomodulatory capacity we are looking for.



Result documentation

Why is this topic important?

This is extremely important because there is an urgent need to develop tools to improve animal's robustness and resilience to environmental challenges. Tailored strategies such as functional diets can be designed to support animal farming in a context of disease outbreaks and therefore lowering the dependence of antimicrobials. In this context, AQUACOMBINE can deliver innovative solutions for the aquaculture sector through the production of probiotics, prebiotics and phytochemicals from cheap residual plant biomasses in a systemic circular system. Therefore, the cost of the feeds will be competitive to administering non-therapeutic antibiotics. These bio-based strategies will contribute to improve the





farming of aquatic animals to become fairer, more resilient and environment friendly food systems.

If you could wish for something for the project, what would it be?

A biorefinery approach to co-producing food products and feed additives giving a synergistic impact effect towards providing sufficient, safe, nutritious, healthy, and affordable food for all.

Benjamin, can you please explain why you wish for just that?

Halophyte farms have several environmental benefits including: Utilization of marginal and saline soils, bioremediation of effluents, increased biodiversity, and efficient CO₂ sequestration. In the future, the combined aquaculture and halophyte farming using the principles of circular economy would be a huge step towards the sustainability of the industry, where animal's waste is recovered and utilised with-in the system to create both internal value and new food and feed products, besides avoiding nitrogen waste.

CIIMAR is a multidisciplinary research and advanced training institute whose mission is to develop exceptional quality research, promote technological development and innovation, and dissemination in Marine and Environmental Sciences. CIIMAR hosts around 200 PhD researchers with diverse scientific backgrounds and a remarkable publication record, publishing about 600 ISI publications annually, providing excellent scientific environment for working at the frontier of knowledge and innovation. The CIIMAR mission is to promote transdisciplinary research, technological development, and training, contributing to advances in scientific knowledge and sustainability of the marine and coastal environments. CIIMAR fields of expertise cover three research domains: GLOBAL CHANGES AND ECOSYSTEM SERVICES, AQUACULTURE AND SEAFOOD QUALITY, and MARINE BIOTECHNOLOGY, addressing important economic and societal challenges and contributing to achieving UN Sustainable Development Goals. To deliver our mission and build a shared understanding and valorisation of the ocean, CIIMAR is strongly involved in partnerships, networks of research centres, industry, public engagement, and literacy. CIIMAR features well equipped facilities (e.g. molecular and omics tools, spectroscopy, chromatography, histology as well as general laboratory equipment). The centre has animal experimental facilities approved by Portuguese Veterinary Authority for aquatic organisms.



Benjamin Costas is Principal Investigator and head of the Animal Health and Aquaculture team at CIIMAR. A strong background in the fields of nutritional immunology and aquaculture allows to unravel how nutrition can modulate immune responses and disease resistance in farmed aquatic animals.



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