



GVA-THINKINAZUL WP6 - MARINE TECHNOLOGIES FOR PRECISION AND SUSTAINABLE AQUACULTURE (TECMAPS)

Advanced methodologies for monitoring interactions between aquaculture and fisheries. Analysis of fishing effort around aquaculture facilities using drones. Monitoring and traceability tools for escapes at first-sale points to reduce socio-environmental interactions of aquaculture.

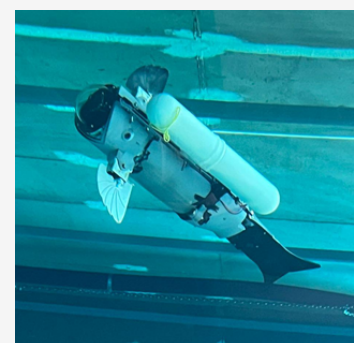
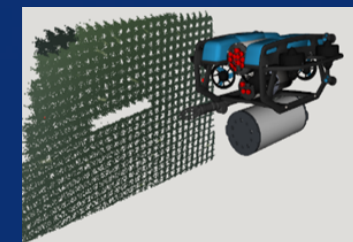


UNDERSTANDING WP6

WP6 (TECMAPS) is fully focused on developing tools, applications, and management strategies that support precision and environmentally sustainable marine aquaculture. The work in this group revolves around two main axes: developing technologies for improved real-time monitoring and supervision of aquaculture operations, using sensor networks, the Internet of Things (IoT), artificial intelligence, and robotics; and second, the creation of tools to evaluate, model, and mitigate environmental risks and interactions, from site selection to product traceability. This working group brings together both cutting-edge engineering applied to offshore aquaculture operations and advanced data analysis and modeling techniques for environmental and socio-economic applications. Its mission is to promote a more sustainable and resilient aquaculture sector in the face of global change.

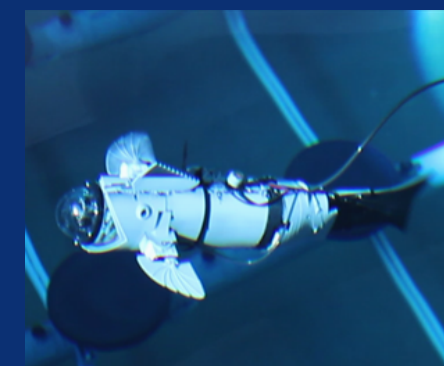
TOWARDS ROBOTIC SOLUTIONS IN AQUACULTURE

Development of technologies for the use of robots in identifying and locating defects in sea cages. Implementation of realistic virtual environments that recreate operational conditions in facilities, used for training and evaluating autonomous robot behaviours, as well as for designing computer vision algorithms and trajectory planning adapted to the complex geometries of the installations.



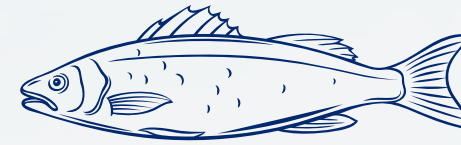
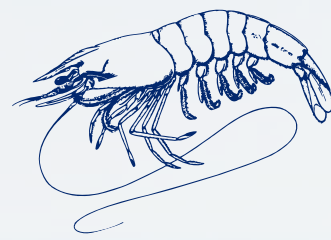
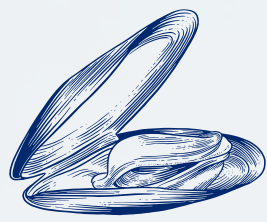
Detachable sensor carrier designed for measuring greenhouse gases in aquaculture facilities. It can be mounted on the fish-robot but also used independently via a LARS (Launch and Recovery System), providing added versatility.

Prototype of a bioinspired robot modeled after a fish, with locomotion via caudal and pectoral fins. Designed to suit the characteristics and needs of commonly farmed species, capable of diving up to 20 meters deep, equipped with a computer vision system and the ability to carry sensors of interest for monitoring farming conditions.

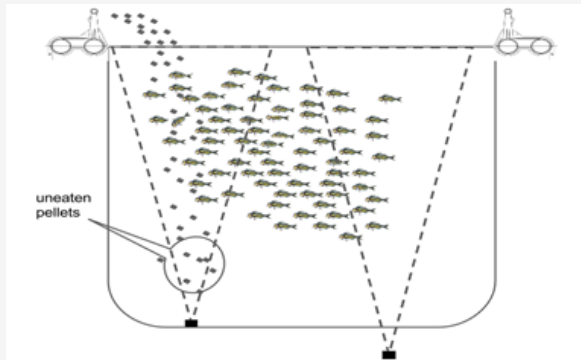


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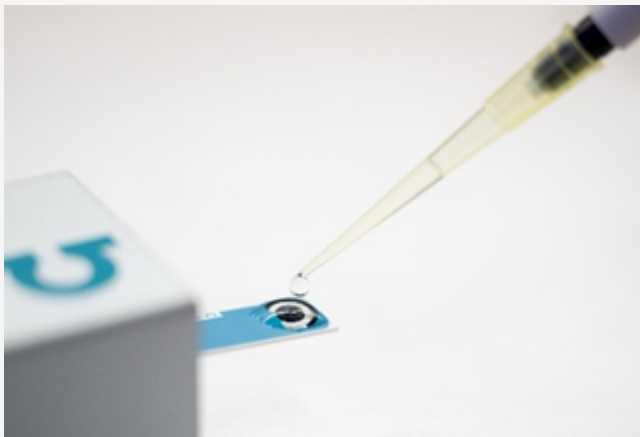
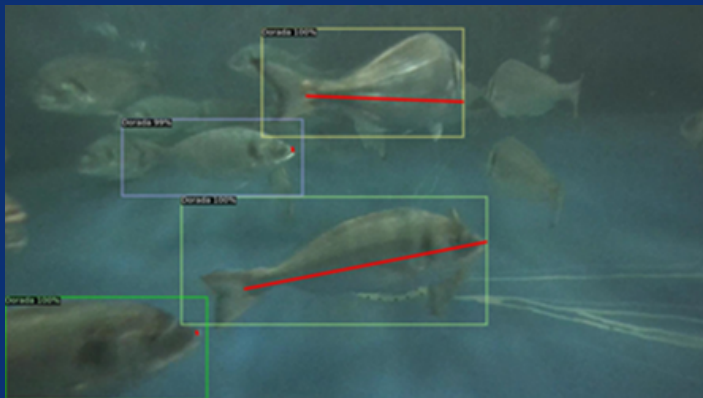


ADVANCED SENSING FOR PRECISION AQUACULTURE



Acoustic technologies and devices for biomass and feeding control in floating cages for intensive aquaculture. Through an echo sounder system, continuous non-invasive monitoring of growth, quantification of uneaten feed, estimation of biomass density, and escape alerts can be performed.

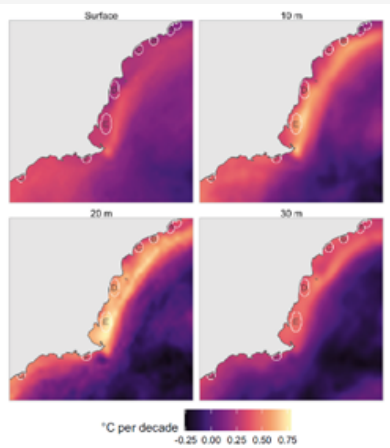
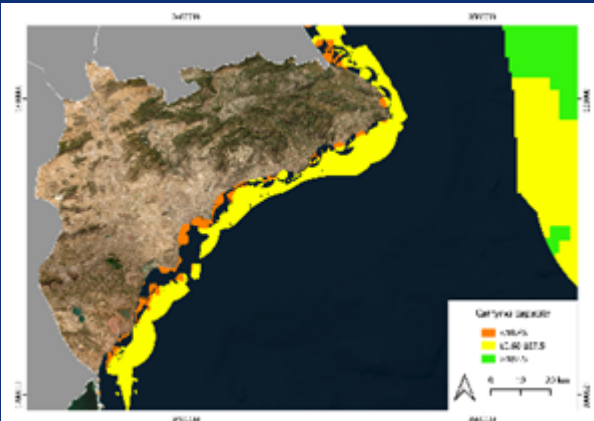
Software tool for automatic size estimation of sea bass and gilthead sea bream. A fully automatic and non-invasive system for obtaining sizes based on Deep Learning techniques and prepared to work in real and complex environments.



Electrochemical environmental alert device for rapid detection of chemical-biological risks in farming areas. The low-cost, portable, and easily integrable device allows for sensitive and rapid measurements, facilitating early warning generation without the need for specialized technical personnel.

TOOLS FOR SPATIAL PLANNING AND MITIGATION OF SOCIO-ENVIRONMENTAL INTERACTIONS IN AQUACULTURE

GIS tool to map areas of interest for aquaculture on the Spanish Mediterranean coast and calculate the theoretical carrying capacity in these areas. This tool can be transferred to public administrations for decision-making regarding spatial planning of aquaculture. Its modular nature facilitates adaptation to different regions and operational conditions.



Specialized software and algorithms for studying extreme weather events such as heatwaves to improve both site selection and cage distribution within facilities. This tool uses advanced techniques such as Bayesian modeling, Data Envelopment Analysis, and Machine Learning to reduce the incidence of diseases and mortalities in farming.

ThinkInLagSim-Interface for Real-Time Lagrangian Simulations. This tool offers a graphical interface that allows for Lagrangian simulations of virtual particles based on a probabilistic approach. It enables users without expertise in ocean physics or programming knowledge to perform simulations, aiming to track the trajectories of individual particles moving in the marine environment.

