

IGNITION

IGNITION. Improving green innovation for the blue revolution: New tools and opportunities for more sustainable animal farming

In the wake of a recent surge in global commodity prices, it has become evident that European Union (EU) food systems need to undergo a transformation towards greater resilience and sustainability. Animal health and welfare are issues of high research priority for European aquaculture and are at the heart of the Farm to Fork strategy, aligning with the goals of the European Green Deal. The current research goals focus at lowering the industry's environmental impact and enhancing animal welfare while minimizing the use of veterinary pharmaceuticals. For producers, researchers, and other stakeholders in the aquaculture industry, the prevention and mitigation of illness are of paramount importance. Additionally, as a result of rising public concern about the health and welfare of aquatic animals, policymakers, the scientific community, and consumers alike are paying more attention on innovative disease prevention strategies. The IGNITION project intends to present fresh insights on animal wellbeing in the context of climate change and to propose novel methods for reducing stress. By doing so, the IGNITION project aims to enhance animal welfare, boost farming productivity, and promote sustainability within the industry.

IGNITION aims to address the effect of acute and chronic stress factors that affect fish welfare. This includes studying the impact of handling procedures, temperature changes, and salinity variations on the well-being of fish. By understanding these stressors and their effects, the project aims to develop strategies that mitigate their negative impact and improve

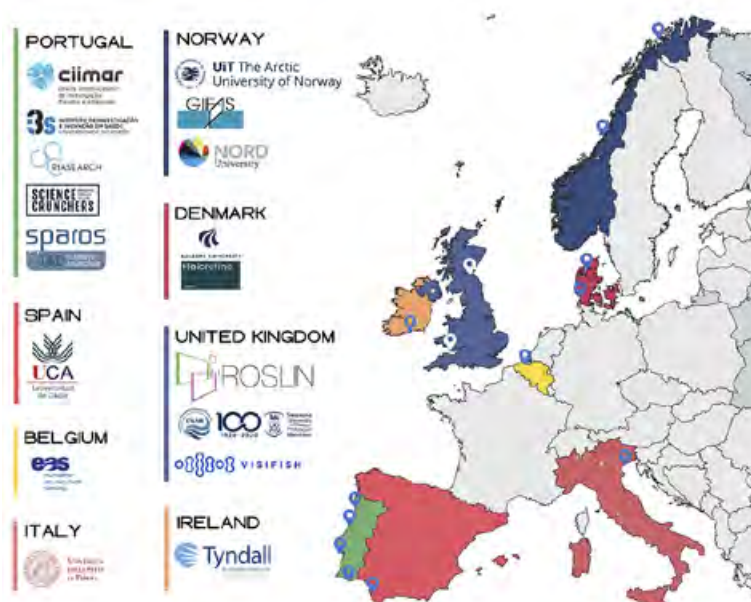
overall animal welfare.

Furthermore, IGNITION acknowledges the role of nutrition in promoting fish welfare and health during stressful events. The project will focus on developing nutritional strategies that support the well-being of fish in challenging conditions. By optimising the diet and nutritional intake of fish, IGNITION aims to enhance their resilience and minimise the negative consequences of stress. The research will be done on important fish species from various aquaculture regions, including the Northern, Mediterranean, and continental area, including European seabass, rainbow trout and Atlantic salmon. To gain valuable insights into these species, various sampling and analysis methods will be employed, including blood, brain and tissue samples, proteomic and transcriptome analysis, and genetic parameter estimation. IGNITION will also focus on developing welfare indicators for shrimp, and a bio economic model for Atlantic salmon, recognizing their significance in the aquaculture industry.





Photo taken in Edinburgh, Scotland during the 6M meeting at the University of Edinburgh in June 2023



In parallel, IGNITION is currently developing optimal extraction strategies for bioactive compounds from residual halophytes. This will include optimising and demonstrating the extraction process, identifying and quantifying the bioactive compounds, evaluating their bioactivity, conducting *in vitro* trials against bacterial and viral pathogens. Additionally, experimental diets for fish and shrimp will be formulated using these bioactive compounds. The diets will be tested in feeding trials, followed by challenge tests to assess their effectiveness in improving health, gut integrity, and disease resistance in fish and shrimp. Video analysis of fish and shrimp behaviour during infection will also be performed.

The IGNITION project also aims to develop effective vaccination strategies against tenacibaculosis and infectious salmonid anaemia virus (ISAV) in fish. The team is currently focused on obtaining an optimised Outer Membrane Vesicle (OMV) backbone for loading viral and bacterial antigens from different fish pathogens. Different OMV vaccination methods, including intraperitoneal (IP) injection and oral administration, will be assessed to enable immunisation of small-sized fish (0.5–2g). The goal is to develop improved vaccination strategies that can combat these widespread and challenging diseases in fish. Data from these tasks will also be used to feed a mathematical model for disease prediction and for molecular phenotyping in later stages of the project.

Results from all experiments performed under IGNITION will be used to develop a sensor device to detect diseases and monitor the health of farmed animals. To achieve this, the team will search for and select biomarkers per species to be integrated into the sensor device. Non-invasive electrochemical sensors for quantitative analysis of selected biomarkers in farm products using single and multiplex sensor platforms will be developed. Biomarker protocols and sensors for prototypes will have to be validated.

Furthermore, IGNITION will focus on characterising the genetic component of stress responses observed in previous work packages, with the goal of testing and incorporating

novel phenotypes into breeding programs. The project team has outlined specific objectives to achieve this: (i) identify non-invasive markers of exposure to commonly encountered stress events in aquaculture animals, (ii) determine if these stress responses are heritable and characterise the genetic architecture of these responses, meaning if they can be passed down to offspring and (iii) use the results to develop novel breeding goals to increase the capacity to deal with stress in farmed fishes and improve welfare within populations.

In conclusion, the IGNITION project represents a significant step towards improving the sustainability, welfare, and resilience of animal farming in the aquaculture industry. By addressing key challenges such as disease prevention, stress management, and genetic characterization, IGNITION aims to revolutionise current practices and pave the way for a more sustainable future.

By integrating the knowledge and findings from its research endeavours, IGNITION aspires to develop practical solutions that have real-world impact. This includes the development of sensor devices for disease detection and health monitoring, as well as the formulation of novel breeding goals to enhance stress coping mechanisms in farmed fishes.

Overall, IGNITION project represents a collaborative effort among researchers, policymakers, producers, and stakeholders to drive innovation and promote sustainable practices in animal farming. With a focus on disease prevention, stress management, genetic characterization, and technological advancements, IGNITION is poised to shape the future of aquaculture by prioritising the well-being of aquatic animals, ensuring environmental stewardship, and fostering a more resilient and sustainable industry.



Visit IGNITION's website for more information: <https://ignition-project.eu/>

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