



SICA deployed in one of the cages near the SINTEF ACE Control Centre. © Hamid Er-Rachdi and Rosa Martínez (CTN)

SUMMARY

This output describes the use of the SICA (“Sistema Inteligente de Control de la Alimentación”, or “Smart System for Feeding Control”) - a cost-efficient, non-invasive, real-time passive acoustic system, to investigate the behaviour of Atlantic salmon (*Salmo salar*) in offshore sea cages during feeding. SICA utilises artificial intelligence to improve the efficiency of the feeding process in offshore sea environments, resulting in reduced environmental impacts and increased competitiveness for European salmon farmers.

KNOWLEDGE NEED

The salmon farming sector is keen to reduce production costs and increase production efficiency, while also reducing environmental impact. Fish feed is the main production cost for any fish farm company and is also a major source of waste in aquaculture systems, leading to pollution in the marine environment. Improved feeding efficiency is a potential solution to these issues. Most Atlantic salmon production takes place in marine net cages where feed is distributed to fish at the water surface. Computer vision technology has been widely used in recent years for behaviour monitoring, allowing fish appetite estimates to facilitate precision feeding by assessing the velocity, acceleration, degree of aggregation between fish, and also the amount of excess feed in the water. Underwater video methodologies have disadvantages though, such as high cost, accuracy, and the time required for monitoring. There is a need for more autonomous, accurate, real-time and cost-efficient monitoring systems in offshore environments.



POTENTIAL IMPACT

- Increased knowledge about salmon behaviour in offshore sea cages during the feeding process.
- Increased sustainability of offshore fish farms through a reduction of the environmental impact of the feeding process.
- Increased competitiveness of the salmon farming sector through a reduction in feeding costs and waste.

EATiP - Strategic Research and Innovation Agenda (SRIA) Thematic Area 4 - Sustainable Feed Production; Goal 2. To see the full list and descriptions of the thematic areas and goals, please visit: eatip.eu/?page_id=46

UNDERLYING SCIENCE

The Smart System for Feeding Control (SICA) was developed by the Marine Technology Centre (CTN), Spain, to optimize food supply in aquaculture systems. SICA is a non-invasive, passive acoustic system comprised of two modules: Data Logger and Control Unit. The Data Logger, which is deployed within sea cage infrastructures, acquires the data through a passive acoustic sensor, and carries out a pre-processing stage of this data, which is then transmitted via the Wireless Communication Device. The Control Unit controls feed delivery. It is located where the feeding process control is undertaken by farm operators, which can be either a vessel or an offshore platform. In this project, the unit was installed at the SINTEF ACE Control Centre (Norway). It applies the algorithms on data received from the Wireless Communication Device and makes decisions about the feeding process. The SICA system operates autonomously, acquiring and processing the acoustic data. The technology is non-invasive and provides real-time monitoring. The hardware core is relatively simple, passive, and nearly maintenance-free, making it highly cost-effective to operate. It can also be easily integrated into existing farm management systems.

RESULTS

The SICA system was found to be more effective for monitoring feeding behaviour of Atlantic salmon during the feeding process compared to traditional methods undertaken with underwater video cameras. SICA identified low feed intake earlier than the video method.

END-USERS & POTENTIAL APPLICATIONS

END-USER 1: Atlantic salmon farmers

APPLICATION: Improved efficiency in salmon feeding through the use of non-invasive, cost-efficient and accurate technology.

END-USER 2: Technology producers

APPLICATION: Production of novel passive acoustic systems for offshore fish farms.

END-USER 3: Aquaculture researchers

APPLICATION: Improve knowledge on the amount of fish feed that is actually eaten in sea cage environments, and optimise fish feed diets based on measured and validated data.

END-USER 4: Aquaculture marketing and and lobbying groups

APPLICATION: Supports aquaculture's promotion as a sustainable, dynamic sector, working towards global food security while decreasing environmental impact.

STATUS

Technology Readiness Level (TRL) 6 – technology demonstrated in relevant environment

- SICA has been developed and tested until TRL6. It is currently being tested in different relevant environments under the DEMO-BLUESMARTFEED project financed by the European Maritime and Fisheries Fund of the European Commission and it is expected to be ready for commercialisation (TRL9) in 2022.
- Within the framework of the AQUAEXCEL²⁰²⁰ TNA programme, the technology has been validated in real environmental conditions (in a Norwegian offshore environment).
- A scientific publication based on the results is expected to be published by the end of 2020.

AT A GLANCE

TITLE: Improving salmon feeding process with the Smart System for Feeding Control (SICA)

KNOWLEDGE TYPE: Exploitable scientific result

WHERE TO FIND IT: ctninnova.com/proyectos/sica

STATUS: Publication planned

TNA FACILITY USED: SINTEF ACE, Norway

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