Cage Reporter

Development of technology for autonomous, bio-interactive and high-quality data acquisition from aquaculture net cages.

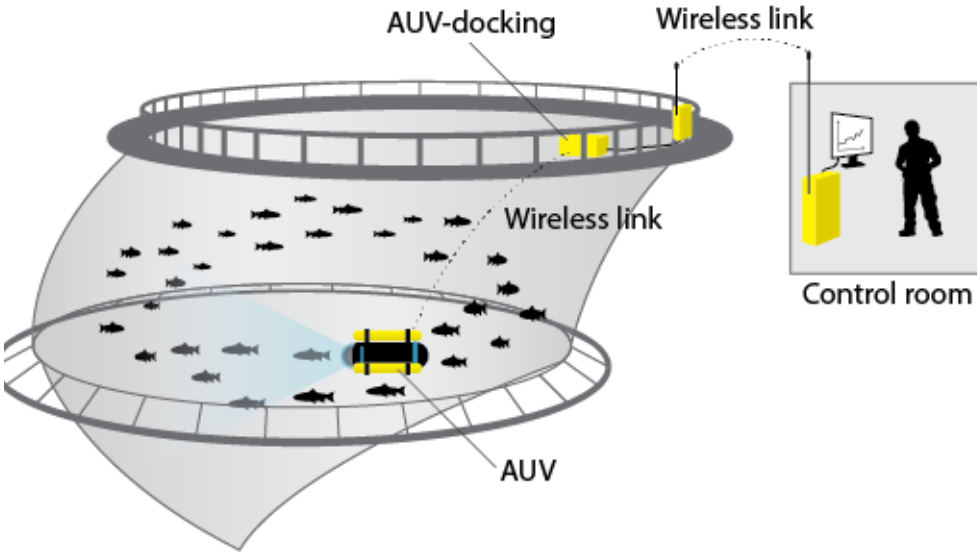

Figure 1: Resident (24/7), autonomous, non-tethered vehicle (AUV) for high quality data acquisition.

The main idea of CageReporter project is to use autonomous and tetherless underwater vehicle as a carrier of sensor systems for data acquisition, where the data are transferred from sea-based fish cages to a centralized land base control station. The vehicle will use active motion control and acquire data from the cage environment while exploring the water volume. Such vehicles are commonly referred to as AUVs (Autonomous Underwater Vehicle), which typically have a large capability of self-management and self-control. The main project objective is to develop technology for autonomous functionality for adaptive mission planning to achieve high quality data acquisition from the cage volume. One of the most important capabilities within this context is to operate in interaction with the biomass (bio-interactive) and the aquaculture structures.

The project will address many challenges within the aquaculture industry related to poor accuracy and representative sampling of important variables to describe both details and the whole picture. A successful project outcome will lead to new technology for collection of high-resolution data in time and space that could be utilized for assessment of the fish farm state, grouped within three main areas: A) fish condition, B) cage inspection and C) production environment. Examples of areas of applications are detection of abnormal fish behaviour, net inspection and mapping of water quality. CageReporter will provide continuous and close follow up of the current situation and be the ''eye'' of the fish farmer inside the cage. The project idea is based on using low-cost technology for underwater communication, vehicle positioning and camera systems for 3D vision.

MAIN GOAL

The project will develop autonomous resident technology for high quality data capture describing the conditions in the cage volume associated with the fish, infrastructure and production environment.

- **Sub-Goal 1:** Develop application-adapted underwater communications technology, position reference and 3D vision systems.
- **Sub-Goal 2:** The underwater vehicle will have autonomous functions that enable adaptive operation planning and bio-interactive data capture,.
- **Sub-Goal 3:** High quality data and metadata must be obtainable from the entire cage volume.
- **Sub-Goal 4:** The integrated system consisting of underwater vehicle with autonomous functionality, the underwater positioning system and the 3D vision system will be validated in full-scale trials for the following case studies: A) FISH CONDITION, B) CAGE INSPECTION, and C) PRODUCTION ENVIRONMENT.

INNOVATION AND VALUE CREATION

Within the aquaculture industry, there is currently only a minimum of technological solutions that can assist in bringing the fish through the production cycle into the sea, and within several areas the production process is suboptimal. Key variables such as feed mode and feed play, the number of fish, average weight and growth, sleep state, state of health and the condition of the cage are either inadequate control or the accuracy and detail level is inadequate. Innovation will help address three of the industry's main challenges: escapes, salmon lice and mortality, which today are factors that hinder further growth in the industry. Innovation will also provide the authorities with a new tool for monitoring the facilities in accordance with current rules and regulations. Documentation and standardization of operating conditions are becoming increasingly important in order to run in line with certification programs such as Aquaculture Stewardship Council (ASC). The Norwegian Food Safety Authority has called for better documentation from breeders, including better technology and methods for counting lice. Innovation addresses these challenges, thus enabling sustainable growth for future aquaculture.

There are currently no similar commercial products that the project page outlines, and the partners in the project therefore have the opportunity to be first in the market with new and ground-breaking technology and associated services.

PROJECT PARTICIPANTS

- Water Linked AS (Project owner).
- SINTEF Ocean AS (Project Leader).
- Sealab AS.
- Norsk Havservice AS.
- NTNU.
- University of Applied Sciences and Art Western Switzerland (HES-SO).

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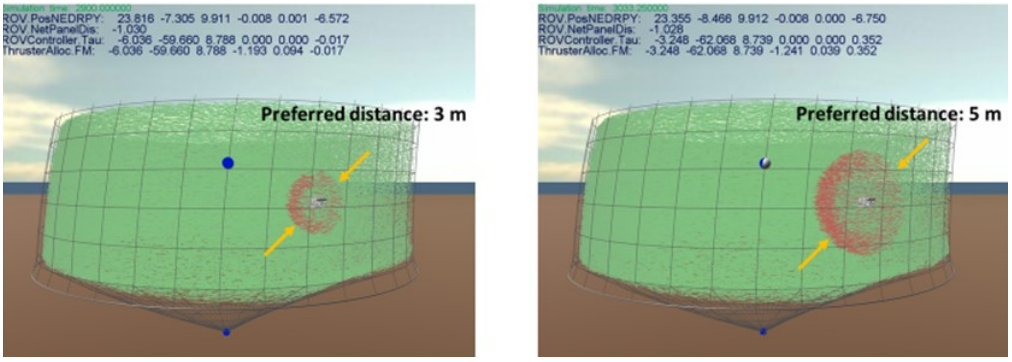

Figure 2: Fish behavioral responses toward ROV.

SINTEF

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