

Purpose of the Project

This project aims to enhance the sustainability and productivity of aquaculture by implementing biomass estimation and behavioral analysis using AI technology. In Japan's aquaculture industry, challenges such as an aging workforce, a shortage of skilled labor, and limited responsiveness to environmental changes have become apparent. In particular, optimizing feeding and understanding the health status of fish stocks have relied heavily on experience, creating a demand for quantitative management methods. This project developed a technology that combines underwater video data and AI analysis to estimate biomass in real time by analyzing swimming speed, density, and feeding behavior of fish. As a result, decisions on feeding and harvesting can be made based on objective data. While existing Japanese services mainly rely on camera recordings and manual data aggregation, this service distinguishes itself by offering "non-contact, continuous AI-based automated monitoring."



Details of Demonstration

- This project aimed to develop and validate AI-based biomass estimation and behavioral analysis technologies for farmed fish, specifically targeting mackerel aquaculture in Nakaminato, Ibaraki Prefecture. In collaboration with the Fisheries Division of Ibaraki Prefecture, the project team identified site-specific conditions and challenges, and received feedback on the feasibility of applying the technology and designed the technical requirements based on it.
- From June, 2024 onward, multiple field visits and device installations were carried out, and full-scale proof-of-concept testing commenced in October. From November, regular site visits were conducted to test the AI-based analysis system in real time and improve it.
- During the demonstration, video data of fish schools was analyzed to extract their swimming speed, density, and feeding behavior, thereby confirming the accuracy of individual count and size estimation. Behavioral responses to environmental changes and pre/post-feeding activities were also observed, and the consistency between AI estimations and field observations was verified. These results serve as a foundation for mass deployment and commercialization in the following fiscal year.

Project Outcome

- In this project, we conducted a demonstration of an AI-based fish behavior analysis and biomass estimation system at a mackerel aquaculture site in Nakaminato, Ibaraki Prefecture, and were able to achieve certain results. Specifically, using AI cameras and our proprietary algorithms, we successfully captured swimming patterns, density, and feeding responses of the fish in real time. The biomass estimates calculated from this data showed an approximate 15% improvement in accuracy compared to conventional methods. Additionally, detecting behavioral changes before and after feeding made it possible to optimize feed quantity and estimate fish health, leading to expectations for future integration with automated feeding systems.
- Furthermore, through the demonstration process, we gained significant insights into how on-site communication environment, shooting angles, and changes in water quality affect analytical accuracy. These findings have clarified the direction for future product improvements and new feature implementation, and we assess that this project has taken a solid step toward commercialization.

Challenges and Solutions

- This demonstration revealed that changes in filming conditions (e.g., water turbidity, lighting) and unstable communication infrastructure adversely affected AI analysis accuracy. Camera shake from waves and cloudy weather at the aquaculture site lowered image recognition performance. To mitigate this, we implemented a noise-resistant AI model and optimized the installation angle and fixing method of the equipment for stable data capture. Limited connectivity at the port also hindered real-time remote monitoring and its improvement is a key issue to be addressed in the next fiscal year.

Future Plans

- In fiscal year 2025, we aim to establish a SaaS-based sales model to drive monetization in Japan, while also exploring potential expansion into the Southeast Asian and European markets. Additionally, we plan to improve the accuracy and robustness of our AI system so that our service will become competitive in the aquaculture industry and eventually contribute to improving the quality of the service for the end users. Hence, we will realize better sustainable fish farming.