October 11. 2021

Regional Fish Institute, Ltd.

Okumura Corporation

NTT DOCOMO, Inc.

Iwatani Corporation

Verification Experiment to Develop Optimal Smart Aquaculture Package of Whiteleg Shrimp Started

～Aiming to Develop an Efficient Cultivation Method Using Completely Domestically Produced Fry in an Environment of Dependence on Imports～

Regional Fish Institute, Ltd. (hereinafter referred to as "Regional Fish"), Okumura Corporation ("Okumura"), NTT DOCOMO, Inc. ("NTT DOCOMO"), and Iwatani Corporation ("Iwatani") started a verification experiment to identify the optimal method and conditions for cultivating whiteleg shrimps (*Litopenaeus vannamei*)[*1] by combining the technical strengths of the four companies. Through the open innovation realized by the collaboration between Regional Fish, which succeeded in the domestic production of whiteleg shrimp fry, and other three companies having Japan's leading technological capabilities, we aim for the completion of a whiteleg shrimp cultivation package that will achieve the highest productivity.

Whiteleg shrimp fry

Whiteleg shrimps are the most consumed shrimps in the world. Most are small with each weighing

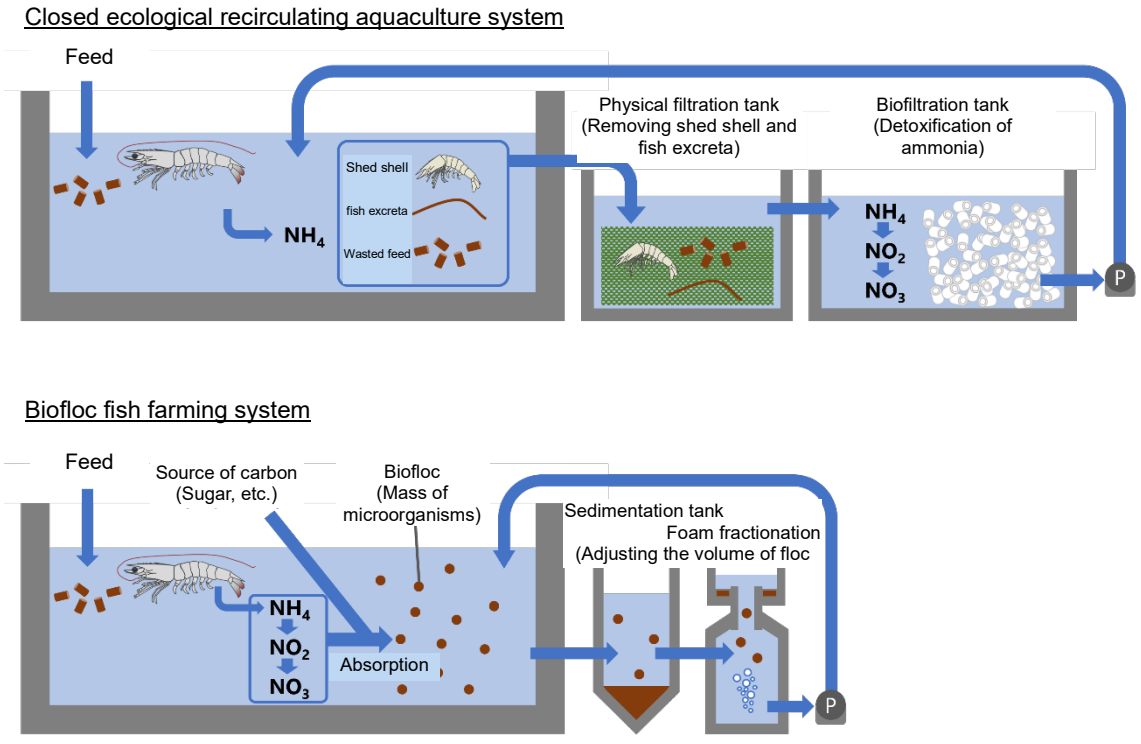
about 15 to 18 grams. In Japan, they are used in a wide range of menus, such as sushi toppings and deep-fried shrimps or sold as shelled shrimps. The whiteleg shrimp fry for cultivation are imported in many cases and specified diseases[*2] of foreign origin have often caused damage. Fish farmers are always exposed to the risk of diseases that can totally damage their shrimps.

To solve this problem, the four companies will work together to identify the optimal cultivation method using domestically produced whiteleg shrimp fry. Using three 200-ton water tanks, we will implement a closed ecological recirculating aquaculture system[*3] and a Biofloc fish farming system[*4] at the same time. We will extract the advantages and disadvantages of each system to select the optimal cultivation method and find ways to make improvements.

These two systems are the prevailing methods for cultivating whiteleg shrimps. Both systems do not require any water changes and therefore have the advantage of reducing the risk of disease.

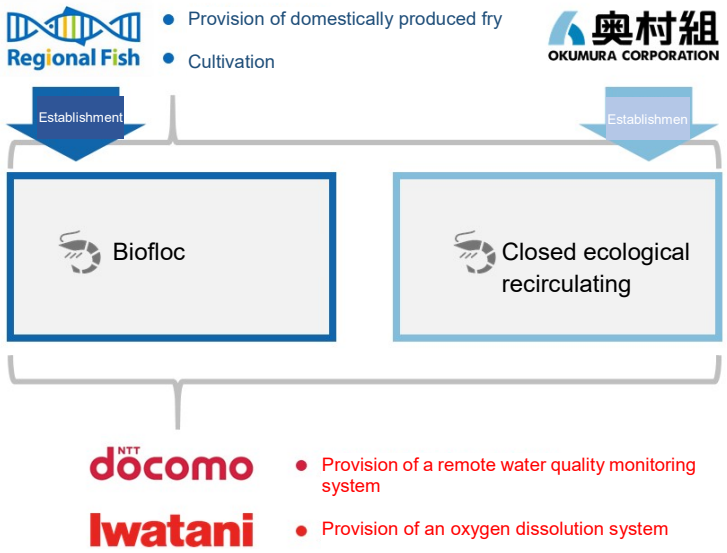
However, there have been no examples of comparative verification of the two systems on the scale of an actual farm, and we have no clear proof of which is superior. This is the reason we are going to conduct the verification using ICT and other means.

Schematic Diagrams of Closed Ecological Recirculating Aquaculture System and Biofloc Fish Farming System



Regional Fish, Okumura, NTT DOCOMO, and Iwatani promote open innovation and contribute to the realization of sustainable fisheries by combining the technical strengths of each company as shown below.

Roles of Four Companies



Construction of aquaculture tanks and implementation of aquaculture

1. Establishment of a closed ecological recirculating aquaculture system by Okumura

Okumura establishes a closed ecological recirculating aquaculture system and carries out closed ecological recirculating aquaculture. The company also verifies the optimization of various functions in this verification experiment, aiming at stable operation of the system.

2. Provision of domestically produced fry and establishment of a Biofloc fish farming system by Regional Fish

Regional Fish provides domestically produced whiteleg shrimp fry and carries out Biofloc fish farming. The company is the first enterprise in the world to succeed in editing the shrimp genome to promote further improvement of the breed.

Establishment of a remote water quality monitoring system and a cultivation environment suitable for growth

3. A remote water quality monitoring system based on the ICT buoy by NTT DOCOMO

NTT DOCOMO provides a remote water quality monitoring system using ICT, where the water temperature, dissolved oxygen, salt content, pH, and other measured water quality data can be checked on a smartphone via the Umimiru app. Data from another company's sensors (e.g. ammonia) are also provided via the Umimiru through API integration.

4. Highly efficient supply of oxygen using an oxygen dissolution system by Iwatani

For land-based aquaculture, an efficient oxygen supply is essential. Iwatani aims to increase yields by controlling the dissolved oxygen concentration at the optimum level using its high concentration oxygen dissolution system.

Notes:

*1 Whiteleg shrimps are the most consumed shrimps in the world and have a market of 5 million tons and 10 trillion yen (source: FAO, 2019). Most shrimps are small with each weighing about 15 to 18 grams. In Japan, they are used in a wide range of menus, such as sushi toppings and deep-fried shrimps or sold as shelled shrimps.

*2 A specified disease refers to an infectious disease of farm-raised aquatic animals and plants and not confirmed to have occurred in Japan or has occurred in only one part of Japan and which is specified by ordinance of the Ministry of Agriculture, Forestry and Fisheries as a disease likely to seriously injure farm-raised aquatic animals and plants if the disease spreads. (Article 2, Paragraph 2, of the Sustainable Aquaculture Production Assurance Act: https://elaws.e-gov.go.jp/document?lawid=411AC0000000051)

*3 Closed ecological recirculating aquaculture is a method that uses a filtration system to purify, circulate, and reuse water for fish farming.

*4 Biofloc fish farming is a method that purifies water by adding a source of carbon to the fish-farming water to create a mass of microorganisms called Biofloc and then use the ability of the microorganisms.

■ Overview of Regional Fish Institute, Ltd.

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Separate Sheet

■ Comments from the Project Leader

○ **Tetsuya Ogino, Invertebrate Organism Breeding Group Leader, Research and Development Department, Regional Fish**

Whiteleg shrimps are the world's most produced crustacean. Cultivation is flourishing in Southeast Asia in the main, and Japan is almost totally dependent on imports. While the number of new entrants into aquaculture is increasing in Japan, fish farmers are always exposed to the risk of diseases that can completely damage their shrimps. To be free of risk, closed aquaculture systems that do not allow outside water to enter are being developed in many countries of the world. However, there have been almost no examples of simultaneously comparing the two predominate systems—a closed ecological recirculating aquaculture system and a Biofloc fish farming system—on the scale of an actual farm. In this project, we compare the two systems, where the latest equipment to manage and maintain water quality is introduced, and aim to create an aquaculture package that will achieve the highest productivity in the cultivation of whiteleg shrimps. At present, Southeast Asian countries have an overwhelming advantage. I hope that Japan's businesses will consider developing aquaculture technologies not as a competitive field but as a collaborative one, invite more partners, and promote open innovation. I would like to tackle the development of the Japanese-style aquaculture package that eliminates the risk of disease and achieves high productivity, envisioning a time when it can be seen everywhere in the world.