## Activities Related to Sustainable Aquaculture Operations

Case Study: Production of Egg-to-harvest Bluefin Tuna

Maruha Nichiro is a pioneer of egg-to-harvest bluefin tuna production. One of Maruha Nichiro's Group Companies, Aquafarm Co., Ltd., officially began shipping from its aquaculture farm specializing in artificial cultivation of bluefin tuna in FY2019, and shipped 390 tons in FY2022. In order to strive for further production efficiency, we will temporarily reduce our annual shipping amount and further focus on the development of production technology.

Amount of Egg-to-harvest Bluefin Tuna Shipped

FY2018	FY2019	FY2020	FY2021	FY2022
409	623	908	570	390
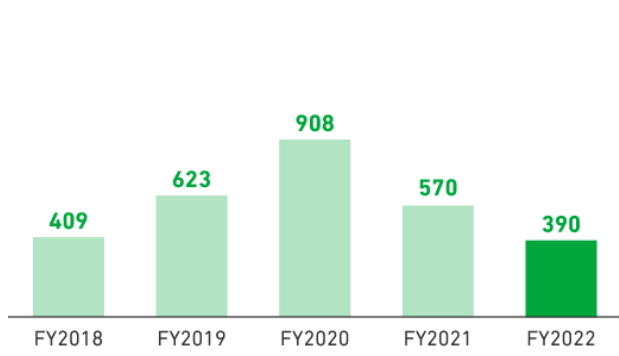
Egg-to-harvest Bluefin Tuna

Case Study: Focus on the Development of Egg-to-harvest Technology

We work with the National Research and Development Agency's Fisheries Research and Education Agency (located in the city of Yokohama, Kanagawa Prefecture, hereinafter, "FRA") to develop basic and applied technologies for breeding improvement of egg-to-harvest bluefin tuna.

National Research and Development Agency's Fisheries Research and Education Agency (Headquarters)

We are also promoting the complete aquaculture of yellowtail and greater amberjack and have begun selling completely cultured yellowtail since fiscal year 2022. And sales of fully cultured greater amberjack are expected to begin in fiscal 2024. We will continue to focus on the development of complete aquaculture technology and contribute to the sustainable use of marine resources.

Case Study: Feed Development to Reduce the Use of Fish Meal in Fish Feed

Maruha Nichiro's Central Research Institute is undertaking efforts, including the development of feed to reduce the use of fish meal in fish feed, as part of its activities to preserve marine resources. We are conducting research and development on feed that effectively utilizes plant proteins and feed focused on insect meal, and are conducting fish feeding tests by manufacturing test feed using an extruder granulator owned by the Central Research Institute.

Test feed

Test tank

Case Study: Demonstration Test for Inland Cherry Salmon Aquaculture

Demonstration tests of inland cherry salmon aquaculture are a joint research project by Company's Central Research Laboratory and the Fisheries Research and Education Organization, aiming to "develop a next-generation closed-loop land-based aquaculture system that integrates innovative technologies and creation of the highest quality brand of Japanese national species of cherry salmon." Following the completion of the demonstration test at the end of March 2021, we are proceeding to the next step of research for commercialization necessary for closed-loop land-based rearing of cherry salmon, utilizing the knowledge gained from the test results for technological development in terms of both tangible aspects, such as water tanks, temperature control, and filtration methods, and intangible aspects, such as feeding management and improvement of fish quality.

In June 2021, inland cherry salmon aquaculture were landed at a test site under the jurisdiction of the Maruha Nichiro's Central Research Institute in Yuzamachi, Yamagata Prefecture. These were shipped to restaurants in Tokyo and Sakata City, Yamagata Prefecture. The 20 larger fish were transferred to a training tank as parent fish responsible for the next cycle of fish farming.

In order to cultivate seedlings suited for land-based aquaculture, selective breeding is conducted using genetic information, and the growth rate has been improving year by year. In the current fiscal year as well, we are expanding our breeding facilities and conducting high-density feed testing and other technological developments that can be utilized for large-scale commercialization.

Although the joint project has come to an end, Maruha Nichiro will continue working with Yusa Town, Yamagata Prefecture, and other related organizations to conduct tests and research on land-based cultivation of cherry salmon.

Inland cherry salmon aquaculture   Inland cherry salmon being landed   Inland cherry salmon aquaculture

Case Study: Sakurajima Yougyo Introduces An Automatic Live Fish Counting System
Using AI-based Image Processing Technology

We have worked with an outside contractor to develop an automatic live fish counting system using AI-based image processing technology. The system began operation in April 2020 at Maruha Nichiro AQUA Co., Ltd. (formerly Sakurajima Yougyo Co., Ltd.), a Group Company that conducts aquaculture of yellowtail and greater amberjack. Currently, it is being used in actual business activities at all Maruha Nichiro AQUA fishing areas of Sakurajima business sites, AQUA office Kamiura fishery, AQUA office Shimaura fishery, and at Maruha Nichiro's Aquaculture Technology Development Center. (As of April 2022)

By automating the counting of farmed fish on board offshore vessels, which used to be done manually, the system reduces the labor of employees who used to count fish visually all day long at sea, and improves efficiency by reducing human error. Not only is this employee-

friendly and efficient, but it is also expected to reduce the risk of marine pollution by optimizing the amount of bait. In addition, when it first began operations, it was used only with parent yellowtail/greater amberjack, but it is currently also used with juvenile yellowtail/greater amberjack. We will continue to strive to expand the number of units introduced.
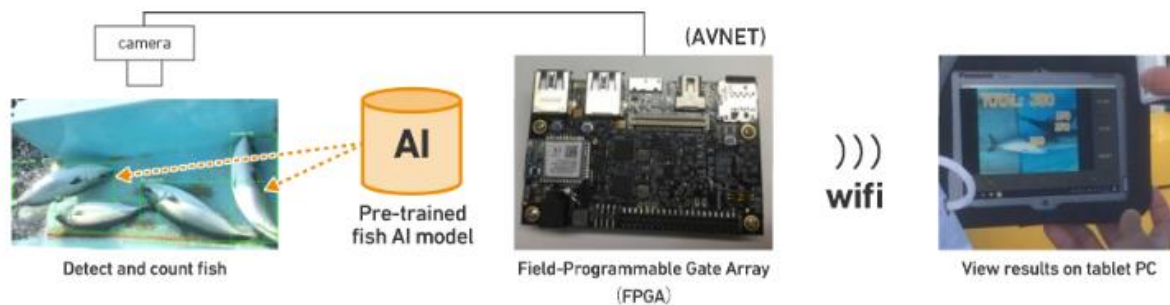
How the automatic live fish counting system works

Scene of the automatic live fish counting system in use