Prawn Farming

Nanobubble Technology

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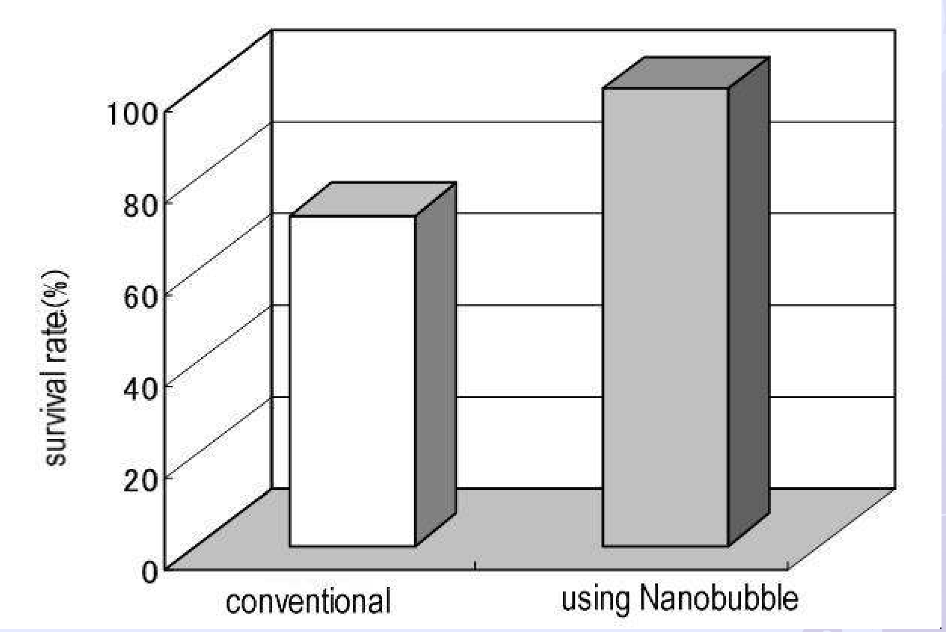
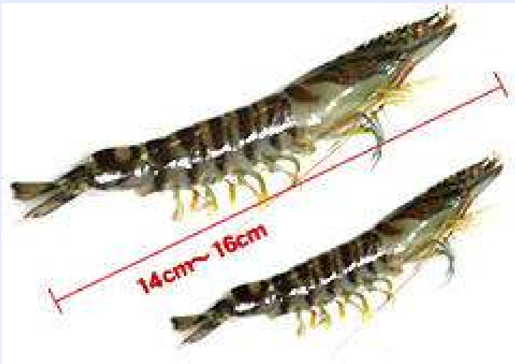
Prawn Farming in Ariake Sea in Southern Japan

The Ariake sea is the biggest tide-land in Japan. It covers an area of 20,000 hectares.
The prawn catch in this area has drastically reduced over recent years. The local governments, Fukuoka, Kumamoto, Saga, & Nagasaki, decided to jointly release a batch of farm raised prawns into the sea. From 2004, Arao Fishermen's Cooperative Association (AFCA) was entrusted by Kumamoto prefecture, with intermediate breeding of prawns and to discharge the prawns into Arao area of the Ariake Sea.
An overview of the intermediate breeding of the prawns is as follows:-

The AFCA received 250,000 juvenile prawns 12mm in size, which were bred at Kumamoto Fisheries Research Center. Thereafter, AFCA proceeded with the intermediate breeding of these prawns in a water tank for about 3 weeks, until the prawns reached a length of 30mm. It takes 20 days before the prawns have grown into a size where they can be safely released.



The AFCA released a batch of juvenile prawns into the Ariake Sea, after inspection of the city's marine biologists. Based on past results, the survival rate of juvenile prawns, after the intermediate breeding, was about 70% and nearly 30% died.
As such, an attempt was made to increase the growth and survival rate of the prawns, using a micro-bubblegenerator. The water tank size used for intermediate breeding of prawns was 11.7 x 7.5 m, with circulating, filtered salt water being used.
The flow rate derived, was from an underground water tank with a volume of 100t, and the prawn breeding tank volume was about 88t. In practice, approximately 40t of sea water was added to the breeding tank.



25 air stones were placed at equal intervals around the breeding tank. Air generated by a ring-blow device (air volume 1,950dm3min-1,power consumption 850w) was pumped into the water via the air stones, to ensure the correct level and concentration of dissolved oxygen was available for breeding the prawns. Due to the fact that juvenile prawns are not goodswimmers, it also played a role in creating a friendly water flow, with this air-lift effect. Seawater in the intermediate breeding tank was circulating in a clockwise direction and eventually discharged from a hole in the center of the tank. Oyster shells were spread around the inside ditch that led to the underground tank, whereby the seawater flowed through. Oyster shells meant for the purification of sea water were cleaned periodically.

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Micro-bubble generator model H30, and magnetic pump model MD-30RZ-N (Iwaki Co., Ltd.) were used. An air supply pipe had been set-upon the primary side of the magnet pump. The volume of air supplied through the pipe was adjusted to an optimum level of 340cm3min-1(about 2% of the gas-liquid ratio). In the breeding tank, the air stones, along the longest side of the tank, had 3 units each of micro bubble generators and were installed on both sides. We used micro bubble in bubbling the seawater, and then supplied the bubbled seawater at approximately 100dm3min-1.
The flow rate was calculated, based on the total, of about 140t seawater and (40t of seawater in the intermediate breeding tank. Plus about 100t of seawater in the underground water tank) using micro bubble generator to do bubbling once per day. E xperiments were conducted in respect to the survival rate of juvenile prawns. However, since there is no reference tank to compare with, comparisons were made, based on the survival rate data of the same period, before & after the installation of micro bubble generators.

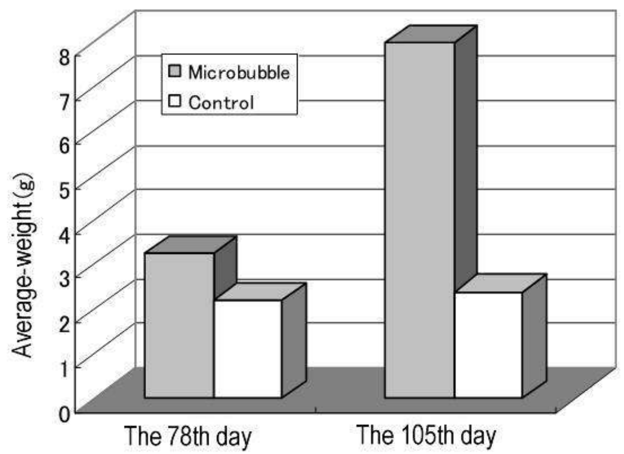

Figure 4

The results shown in Figure 3. Against the conventional survival rate of about 70%, it was increased upto 99.7% by the presence of microbubbles. In fact, compared to the normal aeration of 2,000dm3min-1amount of air, microbubbles air supply was only 2dm3min-1,about 1% of the overall air supply. This clearly shows the significant effect of microbubbles. From the above results, it was found, that there is an improvement in survival rate, due to the physiological activities of microbubbles in the intermediate breeding of prawns. In addition, in order to study the effect of micro-bubbles on the growth rate of juvenile prawns, we bred the prawns in a water tank at the laboratory. The results shown in Figure 4. With the presence of micro-bubblewater, it was found that there is a difference in the growth rate in daily observations. On day 105, the prawns had grown more than three times as compared to those that bred with normal water aeration.

PRACTICE OF REGIONAL REGENERATION FOR ARAO CITY

Shozo HIMURO

In 2007, a regional regeneration program was introduced into our college. The program arranges effectively new subjects of topics in community collaboration, exercise in community collaboration I and exercise in community collaboration II into a curriculum and trains students to be excellent practical engineers. In this paper, a new education model included collaborative works involving industry, local government and our college is proposed and the recent movements of agricultural and fishing actions are described. Application of microbubble technology has made it possible to give the high harvests of shrimps, seaweeds, strawberries, eggplants, tomatoes and pears. The students have equipped with logical thinking to explore potential problems and solve them, and extensive knowledge of their own discipline coupled with interdisciplinarity.

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