

# **The existing condition of coastal aquaculture in Japan and lately progress of closed recirculation system for aquaculture**

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In Japan, there have been the extremely serious problems in food situation. Self-sufficiency rate of fisheries products was reduced in Japan and it was shown 57% in 2003. As the background of this problem, fisheries demand is stability, and fisheries import is increasing, and Japanese fisheries production is decreasing. As the results, self-sufficiency rate of fisheries products was declined during the past 30 years.

Ratio of mariculture production among Japanese fisheries has occupied about 20 % in quantity. The gross of mariculture production was amounting to 3.8 billion US\$. Therefore, significance of mariculture is increasing. Major mariculture species are Laver, Yellowtail, Red sea bream, Japanese oyster, Amberjack, and Common scallop etc. And lately remarkable target species are Bluefin tuna, Barfin flounder and Grouper. In seaweed, "Mozuku" is remarkably species that have high content of "fucoidan". Thus, tendency of newly target species have reflected both of the expensive taste and the healthy boom. Therefore production of materials of functional foods for human health will be specially increased in the future.

Present and future priorities for development and research in Japan are as the following; i) development for fine breeding, ii) development of efficient feeding method and artificial food, iii) preventive measure against disease, iv) polyculture system (including integrated culture), v) utilization of deep sea water, vi) promotion of aquaculture without food supply, vii) aquaculture by a closed recirculation system.

Lately, there are some problems on mariculture, and the most serious problem is self-pollution by mariculture in net cage in Japan. In some reports of nitrogen balance, total discharged nitrogen into the coastal waters was showed about 70 % of input on mariculture in net cage. There is a report that makes a trial calculation of the level of coastal pollution by exchange the human population. According to this report, the level of pollution by mariculture in Japan is estimated to be equal to between 5 million to 10 million people. These results clearly show that environmental pollution by mariculture has reached serious condition in Japan and it is suggested that management should be carried out quickly.

As the viewpoint of coastal environment preservation, closed recirculation system is spotlighted on the rearing technology. Completely system control is led to a lot of benefit that are environmental preservation, cost saving, increase of survival rate and prevention of disease. Accordingly, closed recirculation system is environmental-friendly and safe and efficient rearing method. And, that is a hope of the future aquaculture system in Japan.

Closed recirculation system in Fisheries Research Agency is consisted of foam separation system, bio-filtration system and sterilization system. Main characteristics of this system are environmental preservation by few discharge, high nitrification ability and Space saving, high productivity by high density rearing, and maintenance of water quality. But, trial of aquaculture by closed recirculation system has been just started in Japan. In some trials in private company, aquaculture fish by closed recirculation system were evaluated to high additional value in fish market by traceability of safety.

The composition of Japanese fisheries has three categories that are fishing, aquaculture and stock enhancement. The aim of stock enhancement is recovery and increase of fisheries stocking by release of artificial seedlings. The system of stock enhancement is consisted of selection of target species, brood stock management, securing egg and larva and seed production in public hatcheries, and artificial seedlings are released in natural waters. After released, artificial seedlings and wild juveniles are mixed and grown up to fisheries stocking in natural waters. And comprehensive stock management is operated both stocking. As the characteristic of this trial, knowledge of ecological information in target species is necessary and it emerged that the release operation on ecological fitness in target species is necessary condition for the guarantee of highly stocking effectiveness. In some species (e.g. dog salmon and common scallop), effectiveness of stock enhancement was clearly reflected on the increase of fishery production and the case studies reported high return rate (8~50%) in red sea bream and Japanese flounder and abalone etc.

Marine fundamental productivity is supported to the fishery. But condition of fundamental productivity of natural coastal water is exhausted by disappearance of tide land and seaweed bed. Therefore as the national policy, which aims to rise up the self-sufficiency rate of fisheries products and to conserve the coastal environment, time has come to consider seriously to promote the aquaculture and to switch into the aquaculture by a closed recirculation system that is type of environment preservation.