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OVERVIEW OF SEAFARMING AND SEARANCHING TECHNOLOGY IN JAPAN

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ABSTRACT

In 1989, artificial seed production was attained in 37 species of fishes, 16 species of Crustacea, 25 species of shellfishes, and 9 species of other fishery animals in Japan. Eighty species of fishery animal seed, including natural and artificial production, were released in natural fishery grounds during this year. The total mariculture production was 1.3 million tons. This composed of 18% fish, 35% shellfish, 46% seaweed, and 1% of other fishery animals.

In recent years, Japan achieved some success in Seafarming and searanching projects. Among these are searanching of Japanese scallop in northern Japan and acoustic habituation system of red sea bream. Searanching of striped jack using artificial seed is also explained.

FACTS ON SEAFARMING AND SEARANCHING

Artificial Seed Production

According to the Fishery Agency and Japan Sea Farming Association (Bureau of Statistics 1990), seeds of commodities that are artificially produced for stocking in Seafarming and searanching activities in Japan are given below. The changes in number of species produced and their production are shown in Fig. 1 and 2, respectively.

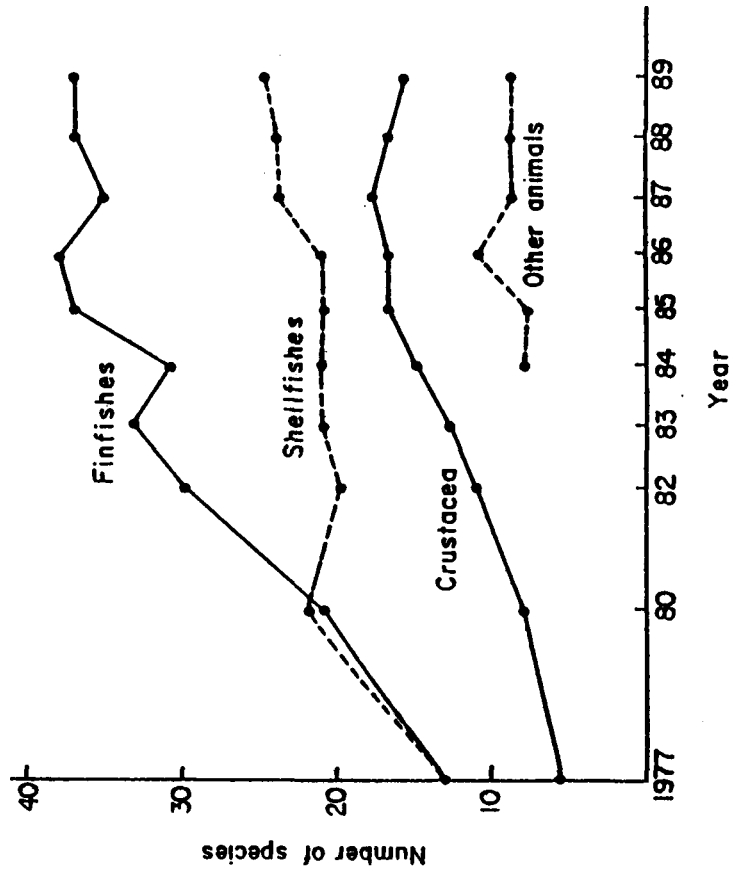


Fig. 1. Number of species per commodity for seed production from 1977 to 1989

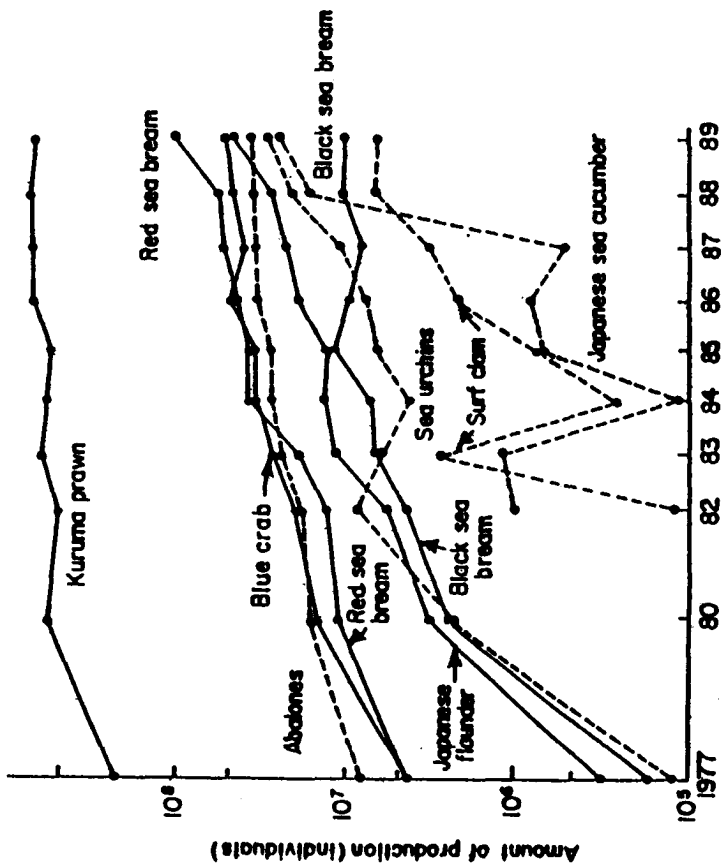


Fig. 2. Production of seeds of different species from 1977 to 1989

Fish: Thirty three species for releasing and 17 species for culture were produced in 1989. The major species of fish seed production were red sea bream (102 million individuals), Japanese flounder (46 million individuals), and flat fish (2 million individuals).

Crustacea: Sixteen species for releasing and 2 species for culture were produced in 1989. The major species of crustacean seed production were Kuruma shrimp ((723 million individuals), greasy back shrimp (41 million individuals), and blue crab (53 million individuals).

Shellfish (bivalve and snail): Twenty species for releasing and 13 species for culture were produced in 1989. The major species of shellfish seed production were Japanese black abalone (12 million individuals), yezo abalone (23 million individuals), blood ark shell (9 million individuals), and surf clam (17 million individuals).

Other fishery animals (squid, octopus, sea urchin, and sea cucumber): Nine species for releasing were produced in 1989. The major species were sea urchin (30 million individuals) and sea cucumber (27 million individuals).

Mariculture

The total amount of mariculture production in 1989 was 1.3 million tons (Bureau of Statistics 1990). This quantity of culture production was composed of 18% fishes (main species were silver salmon, yellow tail, red sea bream, and flounder), 35% shellfishes (main species were Japanese scallop and Japanese oyster), 46% seaweeds (main species were *Porphyra* and *Laminaria),* and 1% of others (Fig. 3).

Releasing

Eighty species of aquatic animal seed, including natural and artificially produced, were released in 1989 (Fishery Agency and Japan Sea Farming Assoc. 1990). The main species were red sea bream (16 million individuals), flounder (19 million individuals), Kuruma shrimp (524 million individuals), blue crab (30 million individuals), abalone (24 million individuals), Japanese scallop (3231 million individuals, almost all were natural seeds) (Fig. 4).

SOME EXAMPLES OF SEAFARMING AND SEARANCHING

Recently, restocking operations on many fishery animals were undertaken in various areas of Japan, however, except for some species, e.g. Kuruma shrimp, blue crab, Japanese scallop, and flounder, the effect of stocking was not statistically clear. Good examples of Seafarming and searanching in Japan were the introduction of Japanese scallop, red sea bream, and striped jack.

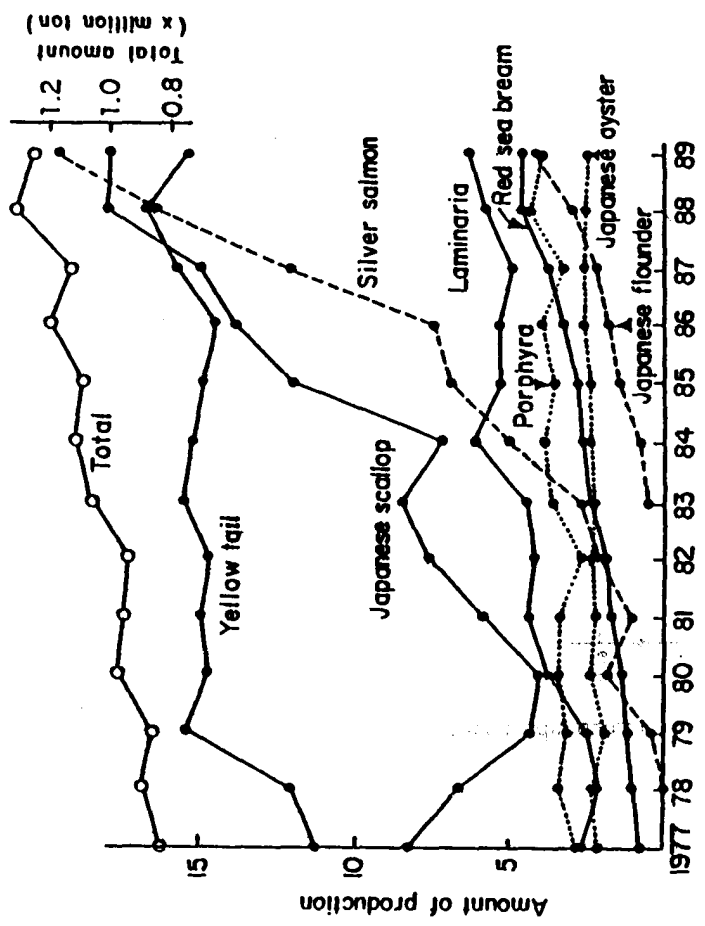


Fig. 3. Mariculture production from 1977 to 1989

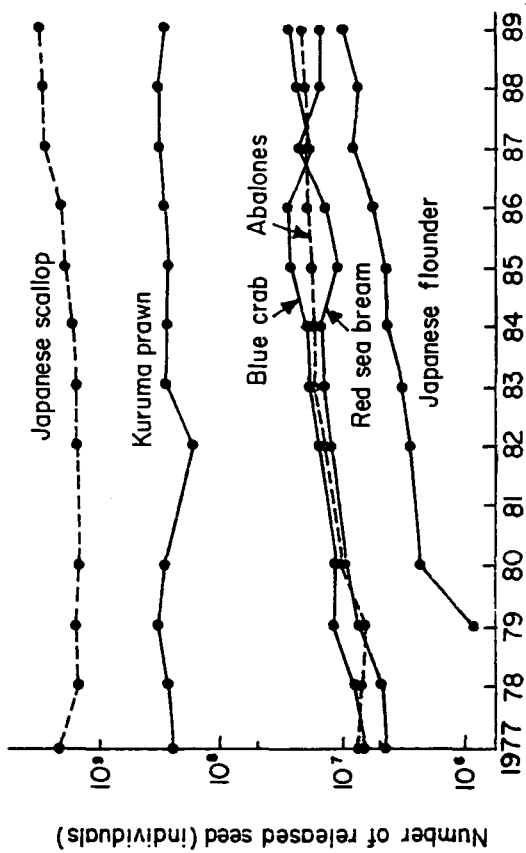


Fig. 4. Yearly change of number of released seeds, 1977-1989

Searanching of Japanese Scallop in the Northern Part of Japan

Japanese scallop is one of the most important commercial shellfishes for the northern coastal waters of Japan. In the late 1960s, the methods of natural seed collection, intermediate rearing, mariculture, and release of the Japanese scallop were established (Fig. 5). As a result of these operations, the yield of Japanese scallop increased from 20,000 tons in 1970 to 370,000 tons in 1989 (Fig. 6). This rapid production growth was due to increase in quantity of seeds collected as a result of mariculture and searanching of the Japanese scallop, which also played a role in the recruitment of stock.

Acoustic Habituation System of Red Sea Bream

Acoustic habituation system of red sea bream was tested at Kamiura-machi, Oita Prefecture, Kyushu District of Japan by Oita Prefectural Fisheries Experimental Station (Kamijo et al. 1990). Acoustic habituation system uses 300 Hz sound to condition the response of red sea bream while feeding juveniles within 2-4 weeks in a net cage. They were then released from the net cage and the sound was still used while feeding. The objective was to make the fish stay around the releasing point to observe mortality and escape from the nursery ground.

This trial was conducted from 1984 to 1987. Six groups of red sea bream that have been conditioned to acoustic habituation were released for pilot farm examination (Table 1). The result of recapture of autumn 1984 released group are shown in Fig. 7. The recapture rate after 16 months from release was 11.2% and capture points were within 2 kilometers from the release point. Total recapture rate of all groups was 11.6%. Compared with the release of red sea bream without acoustic habituation, the recapture rate with acoustic habituation was higher by 3-5%.

Table 1. Number of red sea bream conditioned to acoustic habituation and released from 1984 to 1987 (Kamijo et al. 1990)

Year	Season	Number released
1984	Autumn	66,472
1985	Autumn	66,332
1986	Spring	2,000
	Autumn	89,150
1987	Spring	3,000
	Autumn	50,000

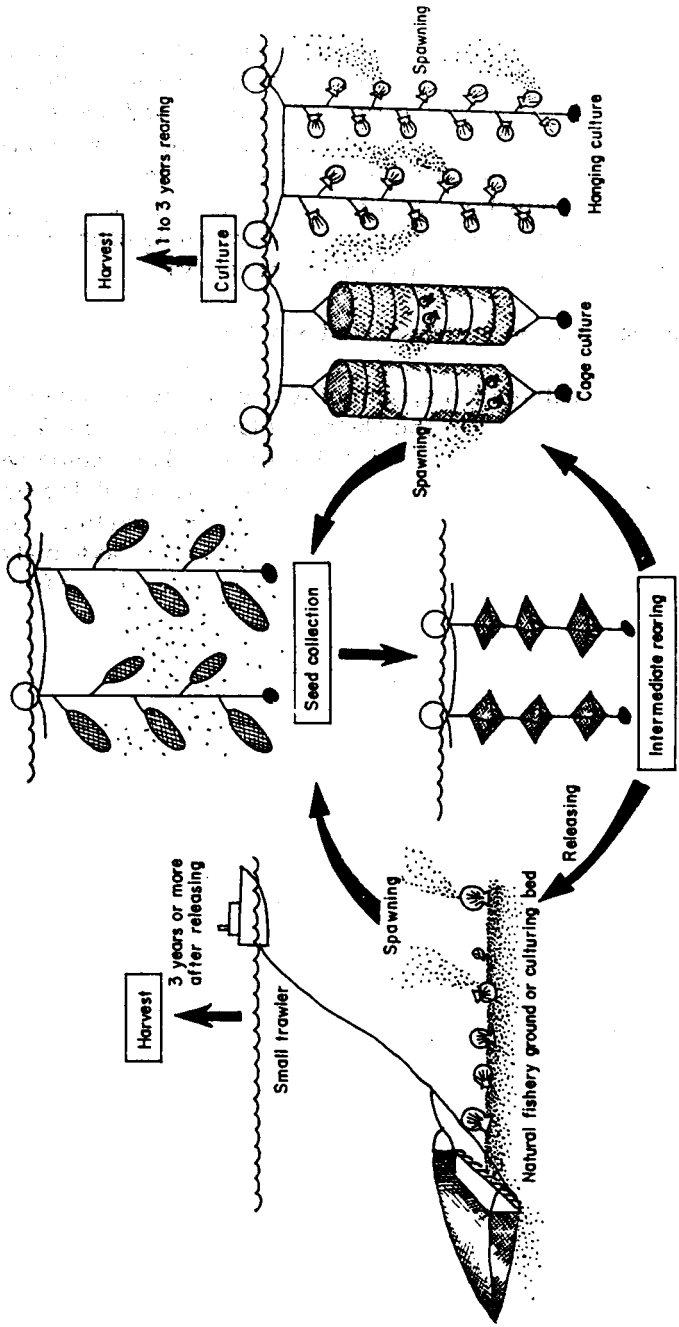


Fig. 5. Schematic diagram of mariculture and searanching of Japanese scallop

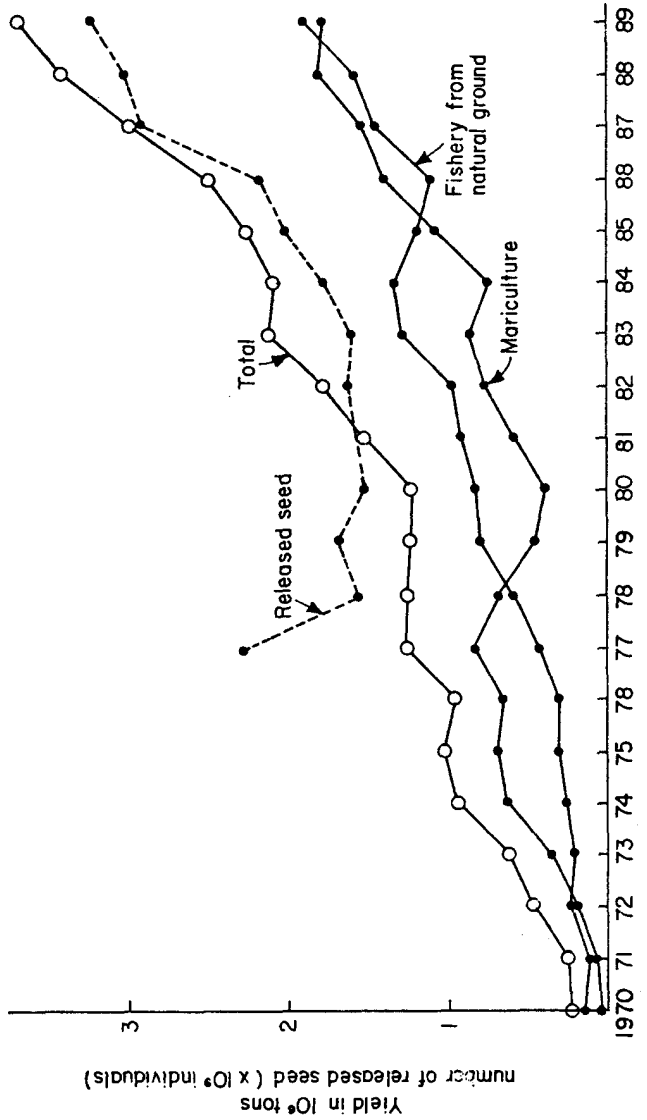


Fig. 6. Yield (mariculture, fishery from natural ground, and total) from 1970 to 1989 and number of seed released from 1977 to 1989 of Japanese scallop

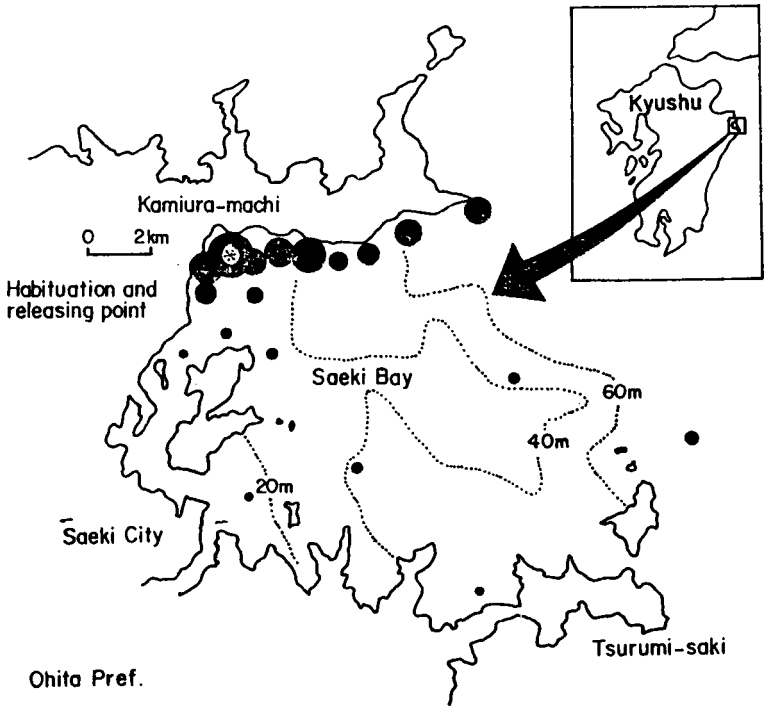
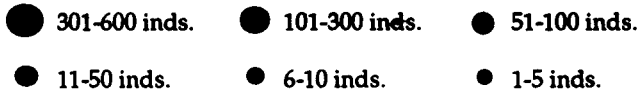


Fig. 7. Recapture area and number of red sea bream released with acoustic habituation (total number is 1,502 inds. during 16 months after release). Size of closed circles indicate the range of individuals released in an area.



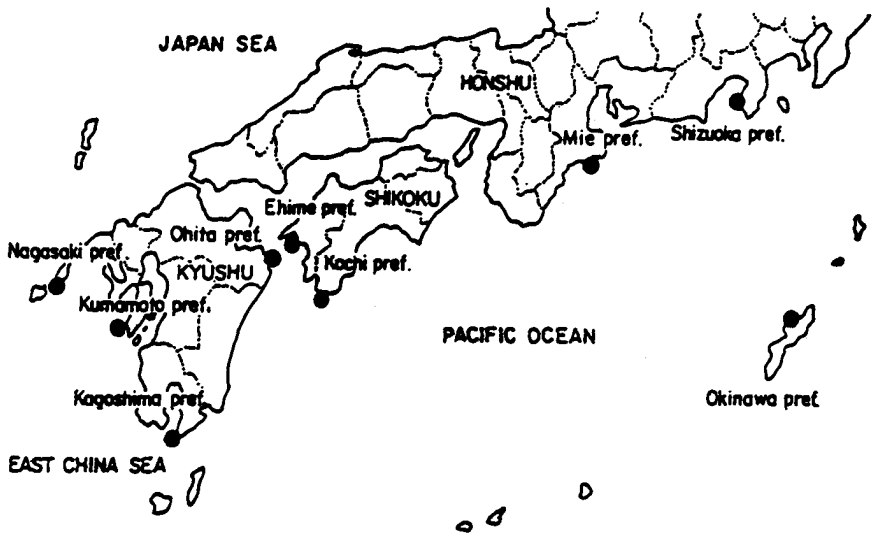


Fig. 8. Pilot farms (•) for searanching of striped jack

Searanching of Striped Jack Using Artificial Seed

Searanching of striped jack using the method of attraction to floating object and projection on the sea bottom was examined to prevent initial mortality of released fish before they grow to commercial size. Searanching of striped jack was done by setting-up into the shallow bay the culture net cage among fish artificial habitats. After release, feeding was done continuously to attract the fish to stay around and get used to the artificial habitats (Shizuoka Pref. Fish. Exp. Stn. et al. 1991).

At present, 9 prefectural fisheries experimental stations are conducting tests (Fig. 8) since 1989 with some using acoustic habituation. The studies in 1989 showed various results of inhabiting fish aggregation and recapture.

In the future, problems such as term of feeding, accretion for natural resource, and fishery management, must be addressed to implement this plan.

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