

Coastal Ranching of Kuruma Prawn, Blue Crab, and Red Seabream in Japan

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Some aspects of coastal ranching of Kuruma prawn *Penaeus japonicus*, blue crab *Portunus trituberculatus*, and red seabream *Pagrus major* are briefly described in this report.

Figure 1 shows the location of the coastal ranching stations in Japan. Number 1 with two star marks in the figure indicates the stations which are supported by the federal government. There is a total of 11 stations and 2 substations. Two more stations are scheduled for the Okinawa Islands and the Japan Sea coast. Number 2 to 40 in this figure show the prefectural government stations. Most coastal prefectures have their own stations. (The exceptions are Tokyo and Osaka prefectures).

Table 1 shows total Japanese seed production of Kuruma prawn, blue crab, and red seabream in 1979. Ranching accounts for 72.8% of the total for the prawn, 100% for the crab and 52.9% for the seabream.

Prawn Ranching

Generally, the seeds are produced by biologists and special technicians in the coastal ranching stations. However, the nursery culture of the seeds is done by fishermen. Figure 2 shows a typical example of a nursery cage used in culture of prawn seeds prior to release at the coast. The seeds are fed daily the artificial diets. They grow from 15 mm to 30 mm during the nursery phase. It takes about 3 to 4 weeks in summer.

Migration of prawn seeds after release is illustrated in Figures 3 and 4. Individuals remained within about 5 km of the release site in Wakasa Bay, Kyoto prefecture (Fig. 3) and within 20 km in Izumi Bay, Kagoshima prefecture (Fig. 4). Most prawn tended to stay in water of 5 to 20 km in Izumi Bay (Fig. 4).

Growth of prawn seeds after release is shown in Figures 5 and 6. The seeds released in Wakasa Bay, for example, were released at the end of June with a body length of 6 to 7 cm. They grew to 13 to 15 cm by the end of August. At this size, the prawns are ready for harvesting by fishermen. Generally females grew faster than males. Almost the same results are obtained in Izumi Bay as shown Figure 6.

In order to show the effect on catches of releasing prawn seeds, the annual catch and number of prawn released in Wakasa Bay is illustrated in Figure 7. The number of prawn seeds released increased gradually from about 0.4 million in 1975 to 1.8 million in

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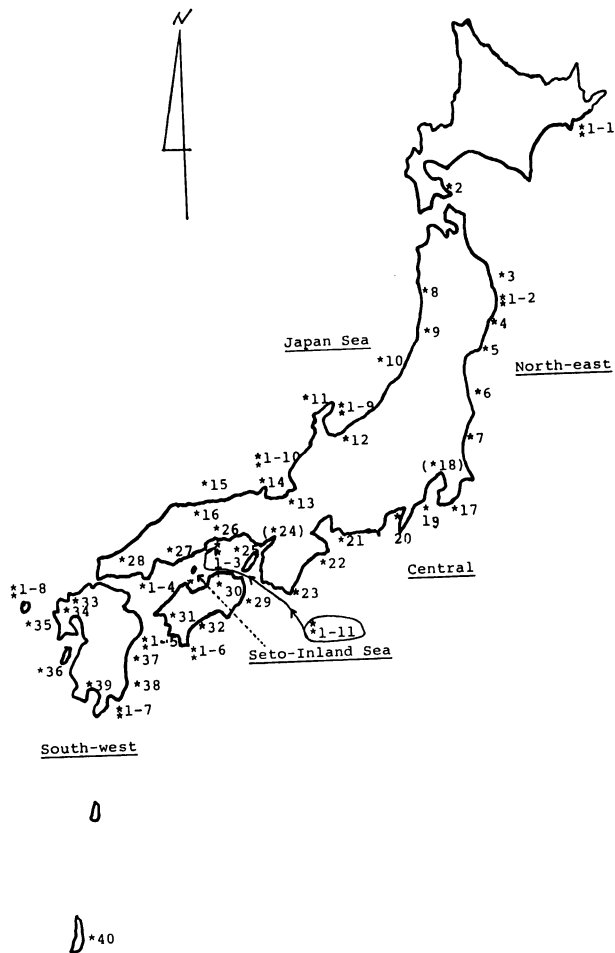


Fig. 1. Location of the coastal ranching stations in Japan. Numbers as shown in Table 4.

* Prefectural government stations, * Federal government stations.

Table 1. Total seed production of kuruma prawn, blue crab, and red seabream in Japan in 1979. (Rearranged after Fishery Agency and Japan Sea Farming Fisheries Association, 1982).

Species	Ranching		Culturing		Total ($\times 10^3$ ind)
	($\times 10^3$ ind)	(%)	($\times 10^3$ ind)	(%)	
Kuruma prawn	534,634	72.8	200,185	27.2	734,819
Blue crab	18,070	100.0	0	0	18,070
Red seabream	11,592	52.9	10,309	47.1	21,901

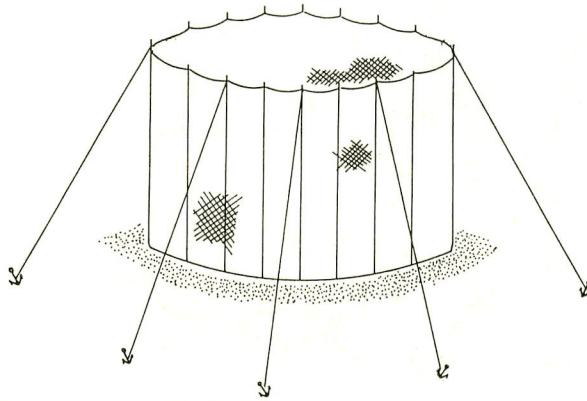


Fig. 2. Typical example of the type of enclosure used in nursery culture of prawn seeds prior to release at the coast.

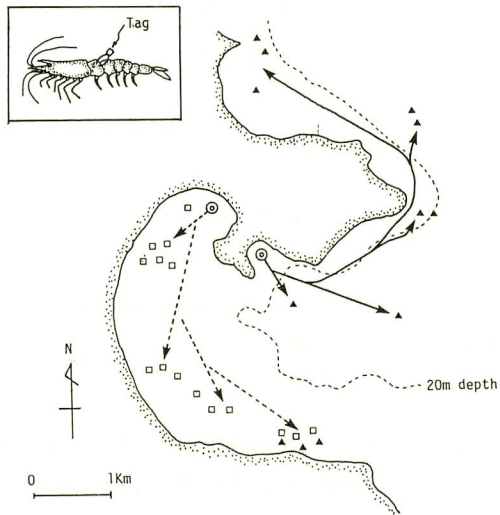


Fig. 3. Migration of prawns after release in Kurita Cove, Wakasa Bay, Kyoto Prefecture (Data after NAKAJI, 1983).

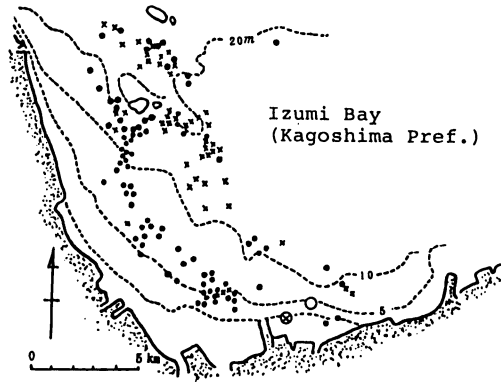


Fig. 4. Migration of prawn seeds after release. Marks ●, ⊗, ○, and ■ indicate the releasing points A, and B, and prawn seeds collected A' and B', respectively. (After NOMURA and SHIIHARA, 1974).

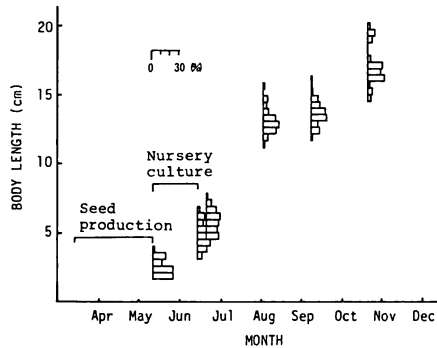


Fig. 5. Growth in body length of prawns released in Kurita Cove, Wakasa Bay, Kyoto Prefecture (Data after NAKAJI 1983).

1981. The annual catch of prawn increased rapidly after 1979. This increased catch might be attributed to the success of coastal ranching. Recapture rate of the prawn released are estimated at about 2 to 3% on average.

Crab Ranching

Some examples of migration of blue crab after release in the vicinity of Saijo in the Seto Inland Sea are presented in Figure 8. Most crab migrated within 10 km. Some of them, however, migrated up to 30 or 40 km.

Recapture rates of blue crab adults which were released for testing the migration mentioned above are summarized in Table 2. Recapture rate averaged 42.7% in these examination. In practical trials as shown in Table 3, higher rates were obtained; for example one rate of about 70% recapture was recorded. This high rate may be an indication of the great fishing pressure on these crabs in Saijo area, and it may reflect good releasing technique by nursery culturists.

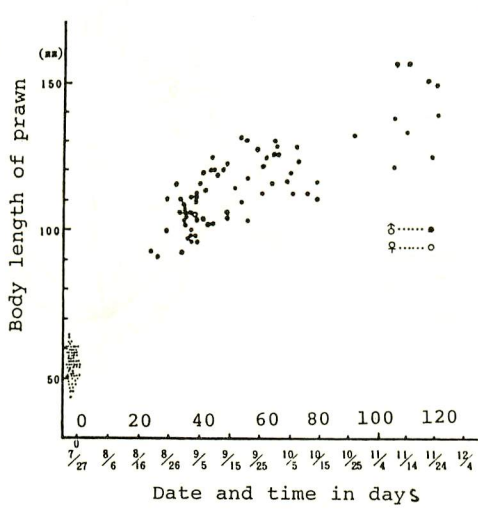


Fig. 6. Growth of prawn seeds after release. (After NOMURA and SHIIHARA, 1974).

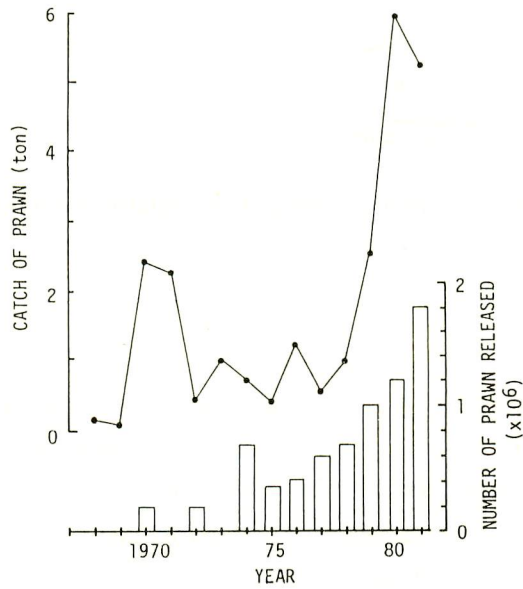


Fig. 7. Annual catch and number of prawns released in Kurita Cove, Wakasa Bay, Kyoto Prefecture (Data after NAKAJI 1983).

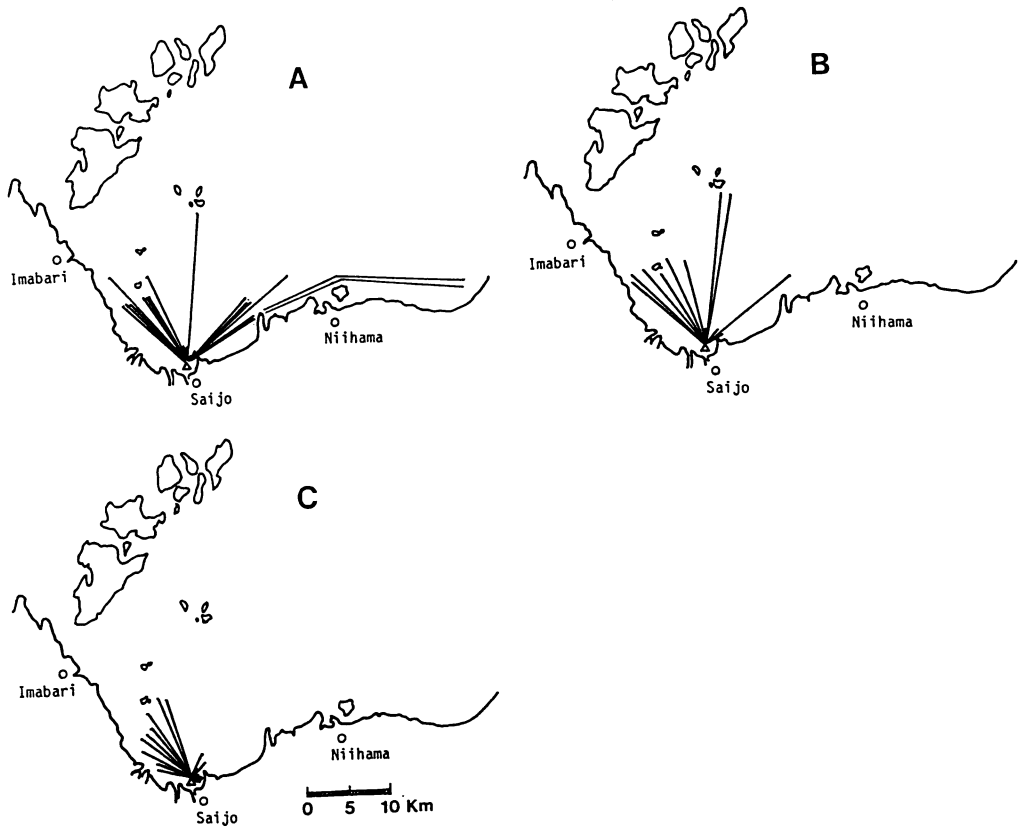


Fig. 8. Migration of blue crabs after releasing in the vicinity of Saijo in Seto Inland Sea (after TAKEDA, 1983).

Table 2. Recapture rates of adults of blue crab which were released for migration test as shown in Figure 8. The observation was conducted in Saijo area, Ehime prefecture during 1979 and 1981. (Rearranged after TAKEDA, 1983).

Trial year	Blue crab released (ind)	Carapace length (mm)	Recaptured crab (ind)	Recapture rate (%)
1978a	57	157	32	55.2
1978b	36	161	15	41.7
1979a	72	103	22	30.6
Mean	55	140.3	23	42.5

Table 3. Results of nursery culture and recapture rates of blue crab adults released in Saijo area, Ehime prefecture. (Rearranged after TAKEDA, 1983).

Trial year	Nursery		Survival rate (%)	After	
	Initial juvenile (x10 ³ ind)	Final juvenile (x10 ³ ind)		Adults recaptured (x10 ³ ind)	Recapture rate (%)
1979b	743	76	10.2	53	69.7
1981	542	150	27.7	62	41.3
Meam			19.0		55.5

Seabream Ranching

Figure 9 shows the migration pattern of red seabream released in the eastern Seto Inland Sea region. The fish remain in the region throughout the year, but migrate seasonally, within the region, about 200 km.

Figure 10-A shows the strong positive correlation between cumulative number of red seabream released in the area shown in Figure 9 and the total catch of red seabream in the same area. Figure 10-B shows the strong correlation between the increasing catches of seabream in the fishery and the duration of the release program.

For red seabream, it is difficult to get accurate recapture information, due to large migration, difficulty of tagging the fish permanently, and the long time span involved (up to 9 years). The Kanagawa Fisheries Experimental Station did a study of this problem and produced some figure for expected recapture rates, as shown in Table 4. According to this study, the total recapture rate of released fish after 9 years is about 4%.

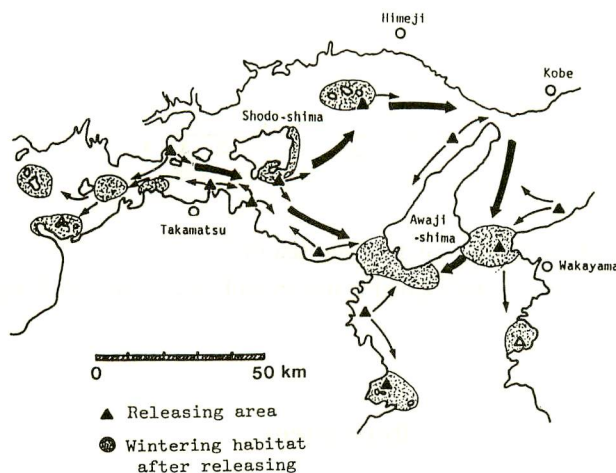


Fig. 9. Releasing areas and migration of red sea bream after setting free in eastern Seto Inland Sea (after FURUSAWA, 1983).

Table 4. Recapture rates expected in each age of seabream released. (After Kanagawa Fish. Exp. St., 1971).

Age	Age distribution ratio (%)	Recapture expected		Recapture rate expected (%)
		Quantity (t)	Number (n)	
1	2.3	0.8	5,063	0.5
2	10.8	3.8	9,450	1.0
3	31.6	11.1	18,225	1.4
4	13.0	4.6	3,500	0.4
5	16.6	5.8	3,058	0.3
6	6.3	2.2	850	0.1
7	7.1	2.5	732	0.1
8	7.7	2.7	643	0.1
9	4.5	1.6	263	0.03
T	99.9	30.5	37,384	3.93

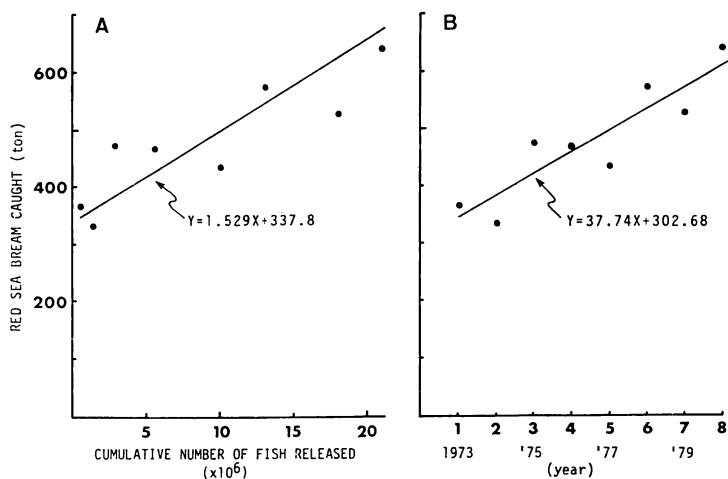


Fig. 10. Effect of ranching on the catch of red sea bream.

A: Relation between fish caught and cumulative number of fish released. B: Age.

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