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Polyculture of milkfish (*Chanos chanos*) and mud crab (*Scylla serrata*) at two stocking densities

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Mud crabs were cultured singly and in combination with milkfish to compare growth, survival and production rates. The experiment was conducted in three 0.1 ha ponds. Each pond was subdivided equally into five compartments by erecting bamboo screen partition running across to make a total of 15 compartments. Each pond was assigned to one of the following treatments:

Treatment I	:	Milkfish, 2500/ha
Treatment II	:	Crab, 5000/ha
Treatment III	:	Crab, 10,000/ha
Treatment IV	:	Polyculture: milkfish 2500/ha and crab, 5000/ha
Treatment V	:	Polyculture: milkfish 2500/ha and crab, 10,000/ha

Initial mean weight was 36.1 g and mean carapace width was 59.1 mm for crab juveniles. Initial mean weight for milkfish averaged 12.2 g at stocking.

Sample mean weights of crab on day 30, 60 and 87 and those measured during inventory on day 140 are shown in Table 1. Averages of these means are plotted to show the growth curves (Fig. 1). Analyzed statistically as in a randomized complete block design the means showed no significant differences at the 5% level among treatments at each and respective sampling date.

As early as day 60 it was observed that the range in size and weight varied widely and that some crabs had already attained fairly good marketable sizes. Until day 75 survival was believed high as it would take no more than 30 seconds to lure and catch a crab. Test samplings were occasionally made to assess conditions of the stock. However, during sampling on day 87 there was extreme difficulty experienced in catching. It was taken as an indication that the stock had diminished due to cannibalism. To prevent further loss of stock all samples were harvested. Average weight was 169.4 g and carapace width 97.0 mm.

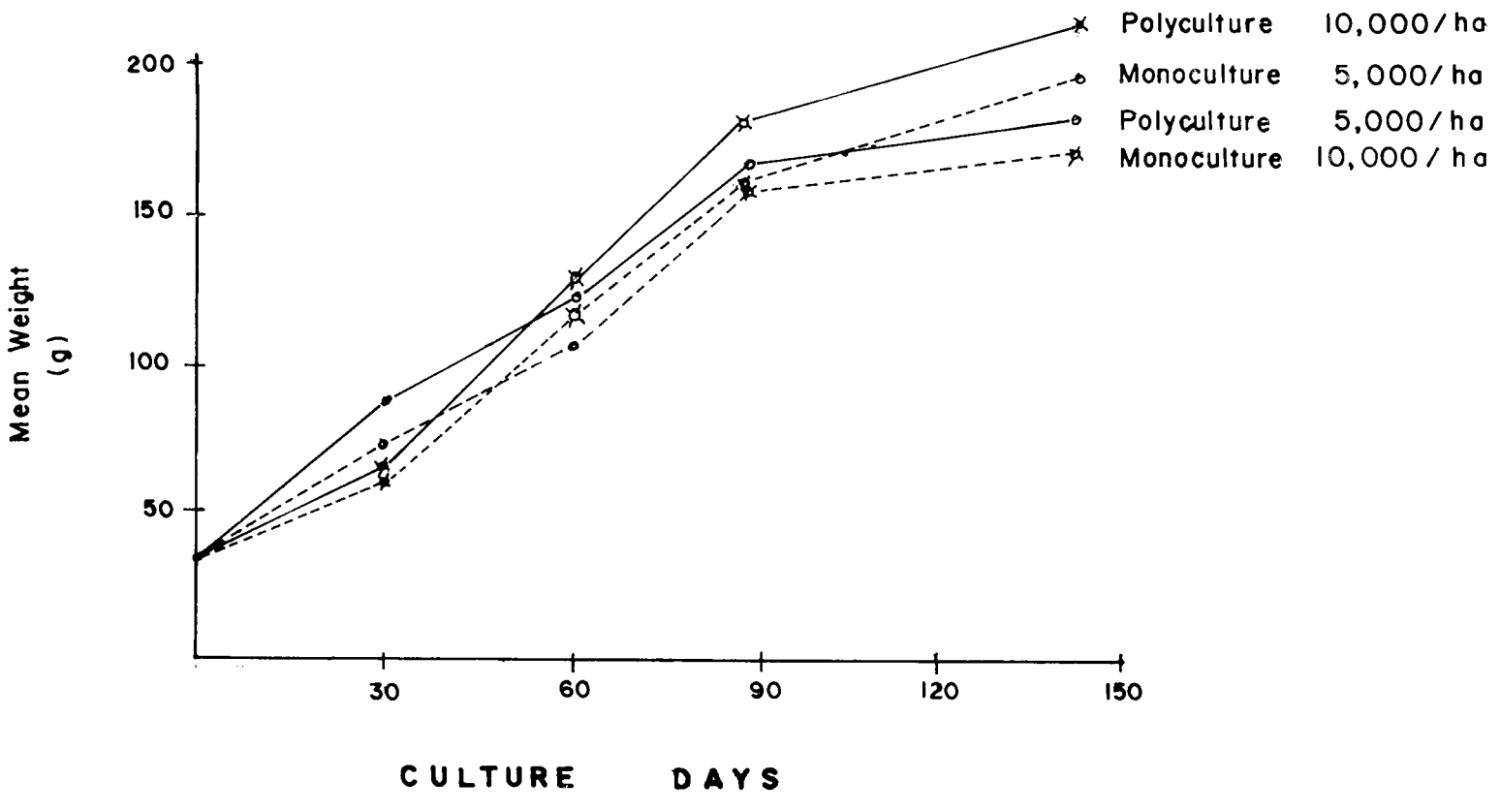

Figure 1. Growth curves of mud crab in monoculture and polyculture with milkfish at two stocking densities (Milkfish: 2500/ha).

Table 1. Sample mean weights (g) of mud crab at given culture days and stocking densities cultured singly and in polyculture with milkfish.*

Treatments	Mean Weight (g)			
Day 30	Block 1	Block 2	Block 3	Average Weight
Monoculture, 5,000/ha	66.1	80.4	57.2	67.9
Monoculture, 10,000/ha	48.6	67.6	70.0	60.0
Polyculture, 5,000/ha	67.0	73.5	74.1	71.5
Polyculture, 10,000/ha	50.0	77.5	64.0	63.8
Day 60				
Monoculture, 5,000/ha	119.1	116.3	96.1	110.5
Monoculture, 10,000/ha	90.4	145.9	110.8	115.7
Polyculture, 5,000/ha	112.1	151.3	103.2	122.2
Polyculture, 10,000/ha	121.8	136.2	130.2	129.4
Day 87				
Monoculture, 5,000/ha	156.6	178.7	166.2	167.2
Monoculture, 10,000/ha	162.1	160.4	164.5	162.3
Polyculture, 5,000/ha	147.5	169.1	166.4	160.9
Polyculture, 10,000/ha	193.4	203.6	164.9	187.3
Day 140				
Monoculture, 5,000/ha	176.6	190.8	249.9	205.8
Monoculture, 10,000/ha	186.9	154.5	192.3	177.9
Polyculture, 5,000/ha	198.9	189.8	185.3	191.3
Polyculture, 10,000/ha	189.6	219.8	231.9	213.8

*Milkfish stocked at 2500/ha in all polyculture treatments.

Crabs were observed to molt at an interval of about two weeks coinciding with the occurrence of the neap tides. After molting discarded shells could be seen strewn about at the pond bottom. During this time the crabs could hardly be seen for about 2 to 3 days. Normally, the crabs could be observed swimming against the current flowing in from the inlets, or occasionally basking atop the trellises in the early morning hours and shortly before feeding time in the afternoon.

On day 87 a few berried females were included among those sampled. The berry had yellowish color indicating that the eggs were in the early stage of incubation period (Ong, 1964). Mating, or what appeared to be so, was however observed as early as day 28. It was not uncommon

to catch a pair with the male holding firmly on top of a female in a double formation. It could not be ascertained though whether hatching of the eggs actually occurred in the pond.

Production and survival obtained per treatment are shown in Table 2. Survival rate of crab was highest at Treatment IV with 56.0% which was 19.0% and 29.5% more than that recorded in the monoculture at 5000/ha and in the mono- and polyculture at 10,000/ha, respectively.

Table 2. Summary of production and survival obtained in a study on the mono- and polyculture of the mud crab *Scylla serrata* and milkfish.

Treatments	Gross Production (kg/ha)		Net Production (kg/ha)		Survival (%)		Feed Conversion
	Milkfish	Crab	Milkfish	Crab	Milkfish	Crab	
I. Milkfish only: 2500/ha	533.4		502.3	–	97.3	–	–
II. Crab only: 5000/ha	–	336.2	–	155.7	–	37.0	18.4•
III. Crab only: 10,000/ha	–	445.3	–	84.3	–	26.5	68.1
IV. Polyculture: Milkfish: 2500/ha	372.9	–	342.5	–	91.3	–	–
Crab: 5000/ha	–	499.7	–	319.2	–	56.0	9.0
V. Polyculture: Milkfish: 2500/ha	395.0	–	364.5	–	100.0	–	–
Crab: 10,000/ha	–	529.0	–	168.0	–	26.5	37.3

Net production of crab was higher in the polyculture than in the monoculture in both stocking densities. The reverse was observed in the case of milkfish. The preliminary study conducted earlier also indicated the same trend. It is possible that the presence of milkfish became a plus factor, in that 1) fish species may contribute directly or indirectly towards increasing the

amount of natural food available for crabs (Robles, 1978); and 2) the active swimming of the milkfish restricts the free-ranging movement of the crabs, thus reducing the incidence of encounter and cannibalism among fellow crabs. Milkfish as a prey was not entirely discounted in the beginning even as Hill (1976) concluded from a tank experiment using live prawns, that fish, like penaeids unless dead or incapacitated are apparently too mobile for *Scylla serrata.* In the pond, the crabs and milkfish literally came in contact with each other when swimming against the incoming current. At inventory the prey-predator relationship was not evident from the high recovery rate obtained for milkfish ranging from 91.3 to 100%. Either the milkfish is indeed to fast a prey for crabs, or that the latter while responding to water current as in this particular case is invariably and instinctively dissociated from any other behavioral activity such as feeding or foraging for food.

Highest net production was recorded at Treatment IV with 319.2 kg and 342.5 kg/ha for the crab and milkfish, respectively. On the basis of two crops a year, this is equivalent to about 640 kg of crabs and 685 kg of milkfish per hectare net production in a year. On the other hand, the gross production in the same treatment amounted to 500 kg of crabs and 373 kg of milkfish per hectare. Similarly, on a two-crop operation this is equivalent to 1000 kg of crabs and 746 g of milkfish, per hectare in a year. Assuming further that a kilo of crab fetches a selling price that is 3 times as much as a kilo of milkfish, the combined gross production will invariably amount to 3.746 tons of milkfish/ha/year.

Analyzed in the preceding manner, Treatment V would appear to have even higher gross production; but the amount of feed required becomes limiting. Treatment IV had the lowest feed conversion ratio at 1:9 compared to 1:37 in Treatment V. Treatment II and III were equally high with 1:18 and 1:68, respectively.

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