Growth and production of *Meretrix casta* (Gmelin) under experimental culture conditions in Moorad Estuary, north Kerala

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The Moorad Estuary (11° 32' N to 11° 35' and 75° 35' to 75° 40' E) located along north Kerala, southern India is a small estuary with a water-spread area of about 1.4 km^2, supporting fishery of finfish and bivalves. *Meretrix casta* forms a major fishery of this estuary. The clam beds are composed of sand and mud. Suitable site for clam culture was selected in the Moorad estuary based on the salinity, tidal flushing and substratum for the experimental culture of the white clam *M. casta*.

Two methods of rearing were followed at three stocking densities. Seed clams of average total length 15 mm and average total weight 1.25 g collected from the natural clam beds in the Moorad Estuary were used for the experiment and reared for a period of five months. Seed clams were stocked in pre-fabricated netlon cages of 1mm mesh size (100 x 50 x 5 cm). The bottom set cages were stocked at 800 (B-SD^1), 1200 (B-SD^2) and 1600 (B-SD^3) numbers per m^2 and the suspended cages were stocked at 1600 (S-SD^1), 3200 (S-SD^2) and 4800 (S-SD^3) numbers m^{-2}. The experiments were set up in duplicate. The hydrological parameters *viz.*, salinity, pH, clarity, dissolved oxygen, productivity and nutrients were monitored at monthly intervals. The growth and survival were also monitored at monthly intervals. The clams from natural bed were also sampled for comparison of growth. The production was estimated for each system at the end of the experiment.

The hydrological conditions in the culture site were as follows: salinity ranged from 7‰ in July to 35‰ in February/December 2003. The pH ranged from 0.57 in October to 8.2 in May and average value was 6.9. The average clarity at the farm site was 48 cm. The dissolved oxygen content ranged from 3.9 ml l^{-1} in March to 8 ml l^{-1} in February. Average gross productivity was 0.71 mg C $m^{-3}day^{-1}$ and the average net productivity was 0.33 mg C $m^{-3}day^{-1}$

Bottom culture

In bottom culture, the clams attained an average length of 28.26 mm, 28.1 mm and 27.2 mm at the three stocking densities 800 numbers m^{-2}, 1200 numbers m^{-2} and 1600 numbers m^{-2} respectively in four months. The instantaneous growth in terms of total length was 12.5, 11.8 and 11.1 mm and the growth increment per month was 2.1 mm, 2.9 mm and 2.8 mm for the three densities respectively. The increase in the total weight was 7.3 g, 6.7 g and 6.3 g respectively for the three stocking densities. The instantaneous growth in terms of total weight was 6.2 g, 5.5 g and 5.1 g and weight increment per month was 1.6 g, 1.4 g and 1.3 g respectively. The average weight per clam attained was 7.5 g, 7.3 g and 6.3 g for the three stocking densities. The weight increment was 6.2 g, 5.5 g and 5.1 g respectively, recording highest growth in the lowest stocking density (Fig. 1).

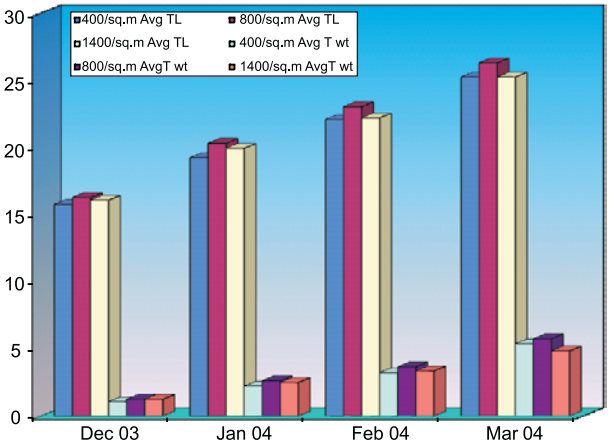

Fig. 1. Growth pattern of *Meretrix casta* in bottom culture at different stocking desities

The highest survival was recorded in B-SD^2 at 68% followed by B-SD^1 37% and very poor survival in B-SD^3 at 6%. The survival rates fluctuated during

the culture period with high mortalities during March-April. The mortality was high in the higher stocking B-SD^3 and continued to rise. The mortality in the lower stocking B-SD^1 was high during the third month due to smothering by seaweeds. The mortality in the medium stocked cage B-SD^2 was low during the first three months and then increased in the last month.

Suspended culture

In the suspended culture, the clams attained an average length of 26.2 mm and 26.5 mm and 25.5 mm in the three stocking densities 1600 numbers m^{-2}, 3200 numbers m^{-2} and 4800 numbers m^{-2} in five months. The instantaneous growth in terms of total length was 10.7 mm, 10.6 mm and 9.5 mm and the growth increment per month was 2.1 mm, 2.1 mm and 1.9 mm for the three densities respectively. The corresponding increase in the total weight was 5.9 g, 6.9 g and 14.6 g respectively for the three stocking densities. The instantaneous growth in terms of total weight was 4.7 g, 5.7 g and 13.6 g and the weight increment per month was 0.9 g, 1.1 g and 2.7 g respectively. The average weight per clam attained was 4.7 g, 5.7 g and 12.8 g for the three stocking densities. The weight increment was 0.9 g, 1.1 g and 2.6 g respectively, recording highest growth in the highest stocking density (Fig. 2).

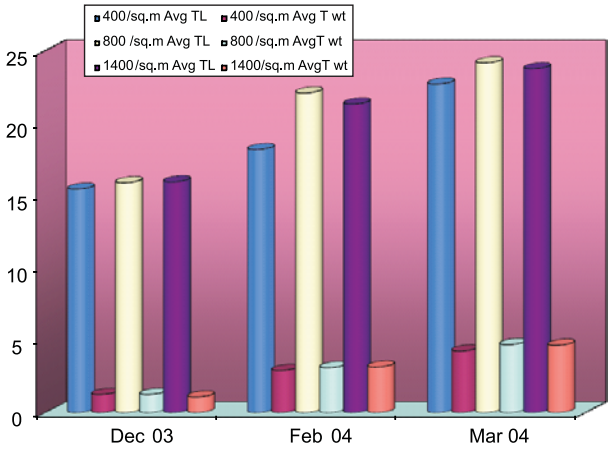

Fig. 2. Growth details of *Meretrix casta* in suspended culture at different stocking densities

The highest survival was recorded in S-SD^2 at 44% followed by S-SD^3 at 13% and very poor survival in S-SD^1 at 4%. The survival rates fluctuated during the culture period with high mortalities during April-May. The mortality was high in the higher stocking S-SD^3 and continued to rise. The mortality in the lower stocking S-SD^1 was high during the third month due to smothering by seaweeds. The mortality in the medium stocked cage S-SD^2 was low during the first three months and then increased in the last month

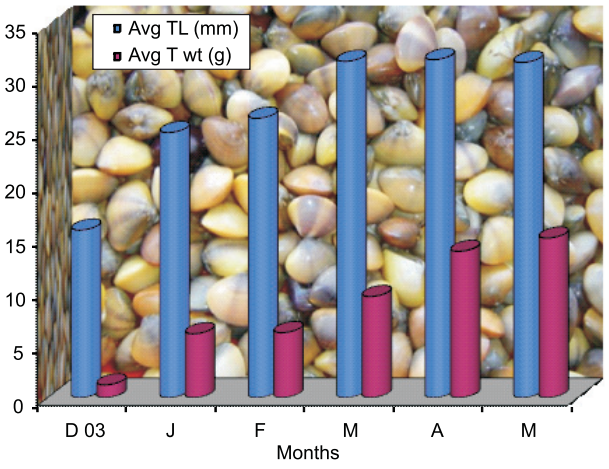

Fig. 3. Growth of *Meretrix casta* in natural bed

Natural bed

M. casta sampled from the natural bed recorded an average growth of 31.52 mm and average weight of 15 g in six months (Fig. 3).

Production per unit area

In the bottom culture experiment, the maximum production per unit area and meat production was in B-SD^2 at 5.3 kg m^{-2} and 0.7 kg m^{-2} followed by B-SD^1 with 2.2 kg m^{-2} and 0.3 kg m^{-2}. Production in B-SD^3 was 0.7 kg m^{-2} and 0.1 kg m^{-2} and 0.1 kg m^{-2} (Table 1).

In the suspended culture, the maximum production per unit area and meat production was in S-SD^3 at 14.1 kg m^{-2} and 1.7 kg m^{-2} followed by S-SD^2 at 14.1 kg m^{-2} and 1.5 kg m^{-2}. The production in S-SD^1 was 2.2 kg m^{-2} and 0.3 kg m^{-2}. Thus it can be seen that suspended culture gives a higher production per unit area compared to bottom culture even though the stocking densities were twice that of bottom culture (Table 1).

In the natural bed, the production was 7.9 kg m^{-2} and 1 kg m^{-2} meat in the month of April (Table 1).

In the bottom culture of *M. casta*, the overall growth was highest in the lowest stocking density *i.e.,* 800 numbers m^{-2}. However survival was highest in the B-SD^2 1200 numbers m^{-2} at 68%. Also the shell

on production was higher by nearly 59 % and the meat production was also highest in B-SD[2]. Thus, a moderate stocking density of 1200 numbers m^{-2} would be ideal in case of bottom culture.

In suspended culture, the growth in terms of length increment was highest in the lower stocking density of 1600 numbers m^{-2}. However, weight gain was higher in the S-SD[3] of 4800 numbers m^{-2}. The survival was highest in S-SD[2]. The shell on production and meat productions were highest in S-SD[3] (Table 1). Thus, in suspended culture, higher stocking densities gave higher production although survival rates were low. The suspended culture method gave higher production compared to bottom culture as well as natural bed.

Table 1. Average production of clams per unit area in the different culture systems in Moorad Estuary

Product	Bottom culture			Suspended culture			Natural bed
	B-SD[1]	B-SD[2]	B-SD[3]	S-SD[1]	S-SD[2]	S-SD[3]	
	800 no. m^{-2}	1200 no. m^{-2}	1600 no. m^{-2}	1600 no. m^{-2}	3200 no. m^{-2}	4800 no. m^{-2}	572 no. m^{-2}
Shell on production kg m^{-2}	2.2	5.33	0.68	2.24	10.4	14.08	7.87
Meat production kg m^{-2}	0.27	0.66	0.08	0.28	1.54	1.75	0.98