

Elucidation of natural purification capabilities in mangrove ecosystems

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Objectives

In order to develop an environment-friendly aquaculture system utilizing the natural purification capabilities and high productivity of mangrove brackish waters, water was circulated between aquaculture ponds and mangrove enclosures. The continuous flow of water from aquaculture ponds maintained water and mud quality, while aquaculture ponds received plankton-rich water from the mangrove enclosures (Fig. 1).

Results

Survival rate was highest, and the feed conversion ratio (quantity of feed per unit weight increase) was lowest in Pond 5, in which larvae were stocked at low density, and the water was exchanged with mangrove water. Thus, Pond 5 achieved the most efficient level of aquacultural production.

In Pond 1, P content in the mud exceeded the amount provided in the feed (Table 1) and the P budget for Pond 1 was negative. This suggests that extra P was supplied from another source. We believe that anoxia was responsible for the release of P from the lower depths of the ponds. In Pond 2, the budget results suggest that 1.55 kg of P flowed into the mangrove-planted pond. Although the budget results were negative in Pond 5, it was higher than that of Pond 1. If the same quantity of P in Pond 1 had been supplied in Pond 5 from the lower depths of the pond, about 0.43 kg of P should have flowed into the mangrove ecosystem. As a result, deterioration in the lower pond environment was reduced in Ponds 2 and 5 via the circulation of water between the shrimp and mangrove ponds, in comparison to the control. Because the P budget was higher in Ponds 2 and 5 relative to the control, environmental burden in the ponds was reduced.

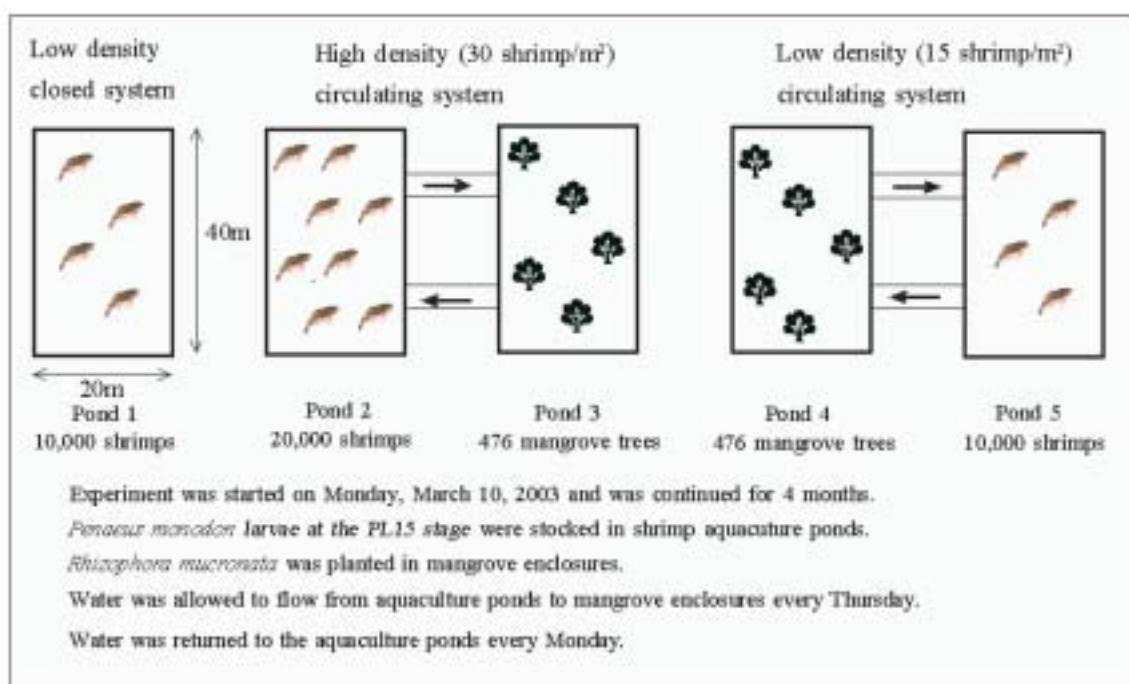


Fig. 1. Outline of the water exchange experiment.

Table 1. Phosphorus budget in each shrimp pond.

		Pond 1	Pond 2	Pond 5
Input	Phosphorus supplied from feed	2.09	4.36	2.19
	P content in stocked larvae	< 0.01	< 0.01	< 0.01
Stored	Phosphorus accumulated into shrimp at harvest	0.29	0.48	0.32
	Phosphorus content in snails	0.26	0.24	0.00
	Phosphorus content in barnacles	0.03	0.02	0.04
	Increase in phosphorus in water	0.08	0.20	0.07
	Increase in phosphorus in mud	2.97	1.86	2.86
Budget (input - stored)		-1.54	1.55	-1.11

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