Polyculture of Tropical Bivalve Molluscs with Tilapia: A Potentially Profitable Solution to Predator Control and Fowling Problems

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Subtidal culture of tropical bivalve molluscs is often plagued with the rapid growth and development of fouling organisms, particularly in highly productive areas such as mangrove swamps (Fig. 1). In Jamaica, mangrove oysters (*Crassostrea rhizophorae*) are hung from subtidal floating rafts. Culture starts with 6 week-old oysters. These and their collector substrates often become smothered with fouling organisms within 2 to 3 weeks. Periodic aerial exposure can control such fouling but substantial losses still occur from predation by gastropods (*Cymatium pileare*) (Littlewood 1989), flatworms and fish (e.g. *Diodon hystrix*) and from reduced growth and survival (competition for food with fouling organisms).

Fig. 1. The growth of fouling organisms on mangrove oysters (*Crassostrea rhizophorae*) and collectors in Jamaica after 4 to 6 weeks in hanging culture from raft.

Protection from predators by means of mesh screens or cages has been impractical as fouling quickly reduces the water exchange. Attempts to capture predatory fish around the rafts have also had limited success. Nonpredatory species dominated the catches and any benefit (extra protein and income) from such fishing activities for Caribbean small-scale farmers have been minor and greatly outweighed by the deleterious effects they have had on already overfished reef fish stocks that utilize oyster growing areas as nursery grounds (Koslow et al. 1988).

Seawater acclimated tilapias (*Oreochromis aureus*) have shown good growth rates and survival in seawater cages (e.g. McGeachin et al. 1987). In similar studies in oyster growing areas of Jamaica, the tilapias grazed the soft fouling organisms on their cages, thereby alleviating the need for costly cleaning (Robin Hall, pers. comm.). This suggests that tropical omnivorous/herbivorous fish and bivalve molluscs could be profitably cultured together. Beveridge (1987) says of cage culture that "with increasing pressure to improve profitability and to reduce waste loading, there is some incentive to stock herbivores to control fouling and benthos/detritus feeders to utilize uneaten food".

The possible benefits of cage culture of tilapia with bivalve molluscs include: improved tilapia growth as the molluscs and their substrate provide a larger grazing area; improved growth, survival and condition of the molluscs, as predatory fish are excluded, fewer other predators of the bivalve molluscs, such as flatworms and gastropods, as they may be eaten by the tilapia; reduction in biofouling, increasing water exchange and food for the bivalve molluscs; and possible use by the bivalve molluscs of surplus supplemental fish food, if supplied.

Therefore, aquaculture researchers in the tropics could test further the viability of fish-bivalve mollusc cage polyculture. Experimental trials could comprise the following treatments: i. molluscs hung from raft, no cage; ii. molluscs hung from raft, in cage; iii. molluscs hung from raft, in cage with fish, no supplemental feed; iv. molluscs hung from raft, in cage with fish fed supplemental feed; and v. fish held in cages, fed supplemental feed, but with no molluscs. A variety of species combinations, stocking densities, cage designs, food types, and stock management (as the fish and molluscs are unlikely to attain marketable size and quality simultaneously) merit investigation.

References

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Editor's Note: At ICLARM's Coastal Aquaculture Centre near Honiara, Solomon Island, Dr. John Munro and his colleagues found that a combination of various species of rabbitfish (Siganidae), surgeon fish (Acanthuridae) and saltwater acclimated tilapia (*Oreochromis mossambicus*) were effective in controlling algal overgrowths in giant clam nursery tanks.