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BIVALVES

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ABSTRACT

Mollusc research at the Aquaculture Department of the Southeast Asian Fisheries Development Center from 1989 to 1991 was primarily focused on the highly exploited window-pane oyster, *Placuna placenta* Linnaeus. Other species studied were the saddle-shaped oyster, *Placuna sella*, the slipper-shaped oyster, *Crassostrea iredalei*, and the green mussel, *Perna viridis*. Research on *P. placenta* aimed to develop techniques in seed production (broodstock maturation and induced spawning), transplantation, and stock assessment and restocking of depleted natural beds. The annual variations in the reproductive activity, condition index, and proximate composition of *P. sella* were determined. A socioeconomic study of oyster (*C. iredalei*) and mussel (*P. viridis*) farming practices in western Visayas, central Philippines is on-going and will provide information on current culture methods and their profitability. An inventory of mollusc researches conducted in the Philippines has been done and the culture techniques and research gaps are being reviewed and identified. This information will guide further research on molluscs in the Philippines.

INTRODUCTION

Previous works at SEAFDEC Aquaculture Department (SEAFDEC/AQD) on mollusc were on the slipper-shaped oyster, *Crassostrea iredalei*, and the green mussel, *Perna viridis*. Techniques were developed to 1) increase collection of seeds from the wild, 2) improve farming techniques, 3) produce mussel and oyster seeds in the hatchery, and 4) improve sanitation and quality of bivalves (SEAFDEC, 1983). Some studies were also conducted on other species with high economic value, including the Asian-moon scallop *Amusium pleuronectes*, and the window-pane oyster, *Placuna placenta*.

During the first Seminar-Workshop on Aquaculture Development in Southeast Asia in 1987, four bivalve species namely *Perna viridis*, *Crassostrea iredalei*, *Anadara sp.*, and *Placuna placenta* were recommended as the priority species for research in 1989-1991. Research was to concentrate on: 1) resource evaluation, 2) site identification, 3) transplantation, 4) development of hatchery techniques, 5) spatfall forecasting, 6) refinement of grow-out techniques, 7) evaluation of culture technology, 8) depuration, and 9) product development and other uses. However, due to depletion of some *P. placenta* natural beds, mollusc research at SEAFDEC / AQD focused on first, with the primary objective of developing techniques in hatchery seed production, transplantation, and farming. At present, other research activities include studies on the saddle-shaped oyster *Placuna sella*, a socioeconomic study of oyster and mussel farming practices in western Visayas, Central Philippines, and a review of the mollusc culture techniques and research gaps in the Philippines.

WINDOW-PANE OYSTER

In 1909, Hornell reported that the window-pane oyster, *P. placenta*, is widely distributed but at present, it is only in India (Narasimham 1973) and the Philippines (Rosell 1979) that its occurrence and utilization have been documented. In the Philippines, it is extensively collected from the wild and can be fashioned into various shellcraft items which are exported. However, the dwindling supply of the *P. placenta* from the wild hinders the expansion of the industry in the Philippines. Therefore, there is an urgent need to properly manage this species. Research has been focused on stock assessment and development of hatchery and grow-out technology.

Induced Spawning

P. placenta has been successfully induced to spawn through water flow manipulation (Young 1980). The same method failed when repeated in 1989-1990. Limited success was obtained using other techniques such as temperature shock, salinity shock, addition of gametes, and overfeeding. Spawning techniques will be developed upon availability of spawners.

Hormonal induction of spawning will be conducted using serotonin, which has been shown to be effective in induced spawning of nine species of bivalves (Matsutani and Nomura 1982, Gibbons and Castagna 1984, Belda and del Norte 1988, Velez et al. 1990).

Broodstock Maturation

To offset the problem of seasonal availability of wild *P. placenta* spawners, an attempt was made to develop broodstock in tanks. Sexually immature *P. placenta* were given supplemental feeding of either the diatom *Isochrysis galbana* Parke, and the green alga *Tetraselmis tetrahele* (G.S. West) Butch, or their 1:1 combination at 100,000 cells per milliliter divided into 2 rations per day. Monthly histological examination shows a rapid gonad development in *P. placenta* fed the combination of *I. galbana* and *T. tetrahele*, attaining sexual maturity on the third month, a month ahead of those fed single algal species (Gallardo et al. 1992).

Transplantation

As an initial work towards the development of farming techniques for *P. placenta*, an experiment was done in a cove at SEAFDEC/AQD's Igang Marine Substation at Guimaras Island to test for transplantation and farming of *P. placenta*, with a mean shell height of 66 millimeters were stocked at a density of 100 individuals per square in a 3 x 1 meter area. Growth increment and survival rate after 6 months were 19 millimeter (specific growth rate = 0.15 millimeters per day) and 32%, respectively. Physico-chemical parameter ranges were salinity, 26-28 parts per thousand, temperature of 27-32°C, pH 6.2-7.4, and, 0.2-1.6 parts per million net photosynthesis. These results are comparable with published data on the growth of natural populations (Rosell 1979, 1984) and in laboratory conditions (Young 1980).

Evaluation and Restocking of Depleted *P. placenta* Beds

The bays of Oton, Tigbauan, and Guimbal municipalities in Iloilo Province had been a natural bed of *P. placenta* until 1983. It is hypothesized that overharvesting, trawling, and possible change in the bio-physico-chemical characteristics of the area are the possible cause of the depletion. An evaluation of the area for restocking and repopulation has started, taking into consideration the type of substrate, quality of benthos and plankton, physico-chemical parameters, primary productivity of the water, and the growth and survival of restocked *P. placenta*. Data on the characteristics of the area were compared with the published data on the ecology of *P. placenta* (Rosell 1979).

SADDLE-SHAPED OYSTER

Studies on Reproductive Biology, Condition Index, and Proximate Composition

The saddle-shaped oyster *Placuna sella* (locally known as "bay-ad") is heavily exploited particularly from the bay of Banate, Iloilo Province, and nearby areas because of the high demand for its delicious meat. Concerned over its possible depletion just like *P. placenta* in some natural beds, researchers at SEAFDEC/AQD are conducting studies on its reproductive biology, variations in condition index, and proximate composition during reproductive cycle. The data gathered will provide information on its spawning season and the suitable time for commercial harvest.

GREEN MUSSEL AND SUPPER-SHAPED OYSTER

Socioeconomic Study of Oyster and Mussel Farming Practices in Western Visayas

This study, in collaboration with the International Center for Living Aquatic Resources Management (ICLARM) through the Asian Fisheries Social Science Research Network (AFSSRN), aims to: 1) determine the characteristics and social conditions of oyster and mussel farmers, 2) assess the farming methods and technology practiced in oyster and mussel culture 3) analyze the detailed input-output data of operations and the production performance indicators of efficiency in terms of resource utilization and rate of returns, and 4) determine the development potential, identify problems and constraints, and formulate appropriate management policies that would sustain the development and viability for the oyster and mussel industry.

It was initially found that 1,597 oyster and mussel farmers operate in the provinces of Aklan, Capiz, Iloilo, and Negros Occidental in central Philippines. Negros Occidental had the most number of oyster and mussel farmers and the most advanced culture technology. The culture methods used are broadcast, stake, raft, and hanging, with several modifications of these methods. In addition, the commonly used culture substrates are empty oyster shells, old rubber tires, bamboos, wood, and nipa petioles.

OTHER SPECIES

Review of the Culture Techniques and Research Gaps in the Philippines

An assessment of mollusc research in the Philippines was conducted to review the culture techniques and identify research gaps. The study indicated that there are 17 species under 10 genera of bivalves that are subject of research studies. These are the mussels (*Perna viridis* and *Modiolus metcalfei*), oysters

(*Crassostrea iredalei*, *Placuna placenta*, *Pinctada margaritifera*, and *P. maxima*), scallop (*Amusium pleuronectes*), angel-wing clam (*Pholas orientalis*), abalone (*Haliotis varia*, *H. asinina*), giant clams (*Tridacna maxima*, *T. squamosa*, *T. crocea*, *T. derasa*, *T. gigas*, *Hippopus hippopus*, and *H. porcellanus*). Those with extensive basic information are *C. iredalei*, *P. viridis*, and *P. placenta*. The first two species have developed culture technology. For *C. iredalei* and *P. viridis*, research gaps include mortality from spat to market size, percent fertility and survival of trocophore to spat stage, standard method of spatfall forecasting, effects of foulers and epibionts on growth rates, determination of productive level of water column, and hatchery technology for seed production.

CONCLUSION

Compared with other commodities such as prawns/shrimps, bivalves still have a lot of research areas to be worked on toward the development of culture techniques, especially for the window-pane oyster *P. placenta*. A number of research work have already been done on the slipper-shaped oyster and the green mussel. The on-going socio-economic study on oyster and mussel would evaluate the farming practices particularly in western Visayas and would provide insights in refinement and transfer of appropriate technology.

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