RESTOCKING OF WINDOWPANE SHELL, *PLACUNA PLACENTA* IN A DEPLETED BED OFF TIGBAUAN, ILOILO, THE PHILIPPINES

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ABSTRACT

The Tigbauan coast, Iloilo, the Philippines, has been depleted of the natural population of the windowpane shell, *Placuna placenta* Linnaeus, 1758, since the early 1980's. To support the declining *P. placenta* industry of the Philippines, restocking of depleted natural beds has to be done. This work aimed at assessing the suitability of the area for restocking of this valuable bivalve species. Immature P. *placenta* broodstock (71.6 ± 6.2 mm) and juveniles (40 ± 10 mm) were stocked in a 40 m^2 muddy bottom area off Tigbauan. Growth, survival, and reproduction of the animals were monitored monthly for 3 months. All juveniles were found dead after a month covered with sand and silt. However, broodstock remained alive. Broodstock samples, taken after a month, spawned after exposure to UV-light irradiated sea water. Survival rate, shell length and body weight increment of the broodstock after 91 days were 51%, 15.0 mm and 12.6 g, respectively. *P. placenta* veligers were found in the plankton one month after spawning and until the end of the three-month rearing period. Net productivity of the area ranged from 0.03-0.32 ml O_2/l. Phytoplankton species and macrobenthic organisms, such as *Ophelina acuminata* Oersted, 1843, *Halophila johnstoniae* Busk, 1852 and sipunculans, associated with *P. placenta* in the natural habitat were also collected in the area. Restocking of the depleted bed is still feasible by using adult animals to naturally repopulate the area.

INTRODUCTION

In the Philippines, the kapis (local name for *P. placenta*) fishery is dependent on a single species, *Placuna placenta*. The empty shells of this commercially important bivalve species are used in shell craft industry. Shell products such as lampshades, trays, decors and other products of aesthetic value are exported to USA, Japan, West Germany and other European countries. Due to the rapid proliferation of kapis shellcraft industry, demand for the mollusc shells increases. As a consequence, *P. placenta* has been extensively collected thus, imposing pressure on wildstock populations, which were depleted in several areas. *P. placenta* production in the Philippines declined from 963 MT in 1993 to 271 MT in 1997 (Fig. 1). To support

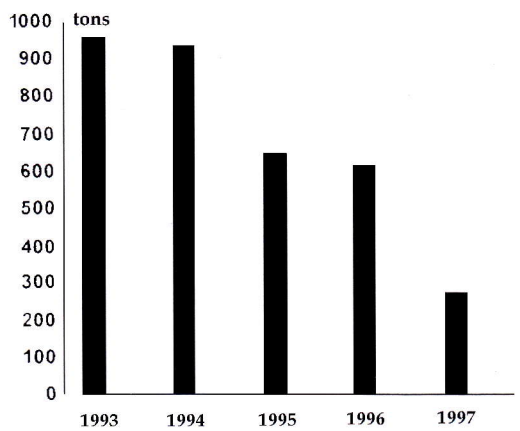

Fig. 1. *P. placenta* production in the Philippines (Source: Philippine Fisheries Statistics, 1993-1997, Bureau of Statistics, Philippines).

the declining kapis industry of the Philippines, transplantation and restocking has to be done in areas suitable for this bivalve species.

P. placenta has been reported to occur from the Gulf of Aden and around China and along the north coast of Borneo to the Philippines (Yonge 1977). It is euryhaline, living unattached on the surface of mudflats and sandy mud beaches. The bivalve is a filter feeder, feeding on phytoplankton, zooplankton, and organic detritus (Rosell 1979). Tigbauan coast was among the areas previously reported to have large populations of kapis shells (Rosell *et al.* 1983). However, natural populations began to disappear from the area after 1982 when indiscriminate harvesting was done using dredges and trawls. Divers and kapis buyers from the area reported that the last commercial harvest of kapis was in 1986. Thereafter, the area has been depleted of natural population. It is thought that if the area can be restocked with kapis, repopulating of the natural stock can be enhanced and the increasing demand of the industry will be sufficiently supported.

This study was carried out to assess the suitability of Tigbauan coast for restocking with *P. placenta* by assessing the physico-chemical parameters of the area, and determining the growth, survival and the feasibility of repopulating the depleted bed with kapis shell.

MATERIALS AND METHODS

The study was conducted at the Tigbauan coast, Iloilo, the Philippines. A station with soft, muddy bottom was located by diving and grab sampling and selected as the culture area. A 40 m^2 area was marked off by enclosing with bamboo pens. The experimental site was about 200 m from the shoreline at a water depth of approximately 2 m during the lowest tide and 8 m during the highest high tide.

Immature *P. placenta* broodstock with shell length of 71.6 mm (± 6.5 mm) and body weight of 14.45 g (± 6 g) were stocked at 75 ind./m^2. Juveniles with shell length of 40 ± 10 mm (n = 1,500) were also dispersed on the muddy bottom. Monthly sampling of 20 animals was done to determine growth and survival.

The animals were also exposed to UV light-irradiated seawater to induce spawning (Madrones-Ladja 1997). Bimonthly, the physico-chemical parameters temperature, salinity, and pH were measured. The primary productivity of the area was evaluated by the Oxygen Method (APHA 1989). Plankton samples from inside and outside the bamboo pens were collected in 0.0695 mm mesh size plankton net using a 10 litre fabricated water sampler. Plankton net towing was also done from inside the pens to the 200 m distance. Macrobenthic organisms were collected using an Ekmann-Birge grab sampler (20 x 20 cm). Grabbed contents were washed through a sieve of 1 mm mesh size. All animals retained in the sieve were transferred to a glass sampling bottles. Plankton and benthos samples were separately preserved in 10% neutral formalin solution for identification. Benthic organisms were also collected from Libas coast, Roxas City, a naturally populated bed of *P. placenta*, for comparison.

RESULTS AND DISCUSSION

Growth, survival and spawning

Table 1 shows the growth and survival of *P. placenta* broodstock reared at Tigbauan. After 91 days, broodstock reared in the area increased by 15.0 mm shell length and 12.6 g wet weight. Survival rate was 51%. During the first sampling month, *P. placenta* spawned in the laboratory after exposure to UV light-irradiated seawater. These results show that sexual maturation of *P. placenta* was attained in the depleted area. Plankton samples showed the presence of kapis larvae.

The net productivity of the Tigbauan coast

Table 1. Shell growth (mm), body weight (g) and survival rate (%) of *P. placenta* reared in the depleted bed of Tigbauan coast, Iloilo, Philippines. (Temperature 26-30 °C; Salinity 34-36 ppt)

Months	Shell height (mm)	Shell length (mm)	Body weight (g)	Survival rate (%)
0	73.7	71.6	14.4	100.0
1	74.3	73.8	19.0	66.6
2	90.0	81.1	22.2	50.7
3	92.1	86.6	26.9	50.7

(NP = 0.03-0.32 ml O_2 l^{-1}) during the culture period was lower than the productivity observed in the populated area (NP = 0.76-3.63 O_2 l^{-1}) by Rosell (1979). However, growth and survival were comparable to that in the natural habitat (Rosell 1984). Plankton organisms necessary for growth and development of kapis larvae were abundant (Table 2). Water temperature, pH and salinity in the area ranged from 26-30 °C, 8.5-8.7 units, and 34-36 ppt respectively. These conditions were within the range observed in the natural habitat (Rosell 1979; Pota & Patel 1988).

Associated Organisms

Table 2 shows the list of plankton collected from the waters of Tigbauan coast. Multispecies of phytoplankton such as *Chaetoceros* sp., *Thalassionema* sp., *Thallassiothrix* sp., were abundant in April. Macrobenthic organisms associated with *P. placenta* in the populated area were also collected in the muddy bottom of the depleted bed (Table 3). Polychaetes and bryozoans dominated the benthos. *Ophelina acuminata* Oersted (1843) was the most commonly collected polychaete in both areas. Bryozoans *Halophila johnstoniae* Busk, 1852 along with *Balanus* sp. and sipunculans were abundant in all areas. Grab sampling of substrata in the general area of distribution showed that soft muddy bottom is abundant

Table 2. Plankton found at the Tigbauan coast, Iloilo, Philippines (34-36 ppt S; 26-30 °C). Legend: +++ = numerous; ++ = common; + = few to rare; - = absent.

Species	Month (Relative Abundance)				
	Feb	Mar	Apr	May	June
Chaetoceros sp.	+	+	+++	+	+
Thalassionema sp.	++	++	+++	++	+
Thalassionema nitzchidae	+	+	++	+	+
Thalassiothrix sp.	++	++	+++	++	++
Oscillatoria sp.	+	++	++	+	-
Melosira sp.	+	+	++	+	-
Rhizosolenia sp.	+	+	++	+	-
Biddulphia sp.	+	+	+	+	-
Bacillara paradoxa	+	+	+	+	+
Coscinodiscus sp.	+	+	+	+	+
Nitzchia paradoxa	+	+	+	+	+
Nitzchia closterium	+	+	+	+	+
Navicula sp.	+	+	+	+	-
P. placenta larvae	-	-	++	+++	+++

Table 3. Benthic organisms collected from the muddy substrate of the depleted bed (Tigbauan coast, Iloilo) of *P. placenta* during the culture period February to May (26-30 ºC and 34-36 ppt S). Legend: +++ = numerous; ++ = common; + = few to rare; - = absent.

Species	Month (Relative Abundance)			
	Feb	Mar	Apr	May
Ophelina acuminata Oersted, 1843	++	++	++	+++
Lysidice sp.	+	+++	+	+
Travisia spp.	+	+	+	-
Halophila johnstoniae Busk, 1852	+++	+++	+++	+++
Balanus sp.	+	+++	+++	+
Hydroids	+	+	+++	+
Custaceans	++	++	++	-
Foramineferans	+++	-	-	-
Sipunculids	-	-	-	+++
Nereis (Neanthes) caudata	-	-	+	-
Glycera benquellana	-	-	+	-

enough to provide the needed substrate of the species.

CONCLUSION

Tigbauan coast, a depleted bed of *P. placenta* maintains the condition necessary for its growth and development. Benthic organisms associated with and plankton species needed by the animals for food are still abundant in the area. The depletion of the area from kapis population was due to overfishing using trawls and dredges. To be successful with the repopulation, proper timing should be observed during stocking with broodstock size animals. Preferably restocking should occur during the first and last quarters of the year to avoid bad weather condition.

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