

Polyculture of Nile Tilapia (*Oreochromis niloticus*) and Black Tiger Prawn (*Penaeus monodon*) in Floating Netcages

Augustus P. Avillanosa and Liezel D. Pikit-Pikit

Western Philippines University-Puerto Princesa Campus
Puerto Princesa City, Palawan, Philippines

ABSTRACT

Polyculture of Nile Tilapia (*Oreochromis niloticus*) and Black Tiger Prawn (*Penaeus monodon*) was conducted using floating netcages made of B-net at Tiniguiban Cove, Puerto Princesa City. Three different treatments were used. T₁: monoculture of *O. niloticus*, T₂: monoculture of *P. monodon*, and T₃: polyculture of *O. niloticus* and *P. monodon*, at a stocking density of 10 pcs/m³. *O. niloticus* and *P. monodon* were fed with commercial pellets and trashfish, respectively.

Results of the study showed a mean percentage increase in weight and length of *O. niloticus* in mono- and polyculture by 105% and 33%, respectively. *P. monodon* in both culture methods, on the other hand attained a mean percentage weight increase of 200% during the 60 days culture period.

No significant difference between the two culture methods was found for mean body weight gain, total length gain, biomass, specific growth rate, and condition factor of the two species. The FCR of tilapia in polyculture (4.86) however is better than in monoculture (13.85). While the survival rate of *P. monodon* in monoculture (73.33%) was significantly higher than in polyculture (60.0%).

The total yield from polyculture of *O. niloticus* and *P. monodon* was better compared with monoculture of *O. niloticus* but not if compared to monoculture of *P. monodon*. The competition index is not conclusive about the feasibility *P. monodon* and *O. niloticus* polyculture.

INTRODUCTION

The culture of *Oreochromis niloticus* with a combination of *Penaeus monodon* increases fish production. The presence of secondary species generates additional income for fishfarmers, and at the same time, provides a cheaper source of protein for consumers (Gonzales-Corre 1988).

Tilapia production in freshwater ponds, pens and netcages has been gaining popularity in the Philippines. The culture of this fish has gained wide acceptance among fishpond operators in the Philippines (Guerrero and Abello 1976). The tolerance of the species to a wide range of environmental factors is another reason

for its ease in culture. *Oreochromis* spp. is cultured either in marine or in brackishwater (Gonzales-Corre 1988, Sombrero 1993, and Salvador 1992). *Oreochromis* sp. fed with *Gracilariopsis* sp. and commercial pellet and cultured in floating netcages at salinities between 25-35 ppt obtained 44 to 52% weight gain and 68 to 76% survival rate after 75 days culture (Paalan 2001).

Penaeus monodon, which is known in the international trade as Black Tiger Prawn, has been the leading culture species among crustacean (SEAFDEC 1999). In the Philippines, culture of prawns in netcages is not commonly practiced. Although, Sarmiento (2002) observed in Sta. Monica, Puerto Princesa City that hatchery bred *P. monodon* cultured in floating netcages and fed with either commercial pellet or trashfish obtained good growth and survival.

This study attempted to culture *O. niloticus* and *P. monodon* in floating netcages specifically to evaluate their growth and survival in mono- and polyculture, and to determine their competition index.

METHODOLOGY

Study Site

The study was conducted in Tiniguiban Cove, Puerto Princesa City at 09°33' to 10°5' N latitude and 118°39' to 119°08' E longitude (Fig. 1).

Experimental Animals

Two species were used in the study: the Nile Tilapia (*Oreochromis niloticus*) (Plate 1) and the Black Tiger Prawn (*Penaeus monodon*) (Plate 2). *O. niloticus* was taken from the Western Philippines University -Puerto Princesa Campus fishpond project while *P. monodon* was obtained from local fishermen in Tiniguiban Cove, Puerto Princesa City.

Experimental Set-up

Nine netcages measuring 1.0m x 1.0m x 1.5m made of B-net were tied within a bamboo raft and covered with polyethylene nets to avoid loss of stocks. The same polyethylene net was used as perimeter net.

O. niloticus and *P. monodon* were randomly distributed in Completely Randomized Design. Three treatments with three replicates were used; T₁ - monoculture *O. niloticus*, T₂ - monoculture *P. monodon* and T₃ - polyculture of *O. niloticus* and *P. monodon* at stocking density of 10pcs/m³.

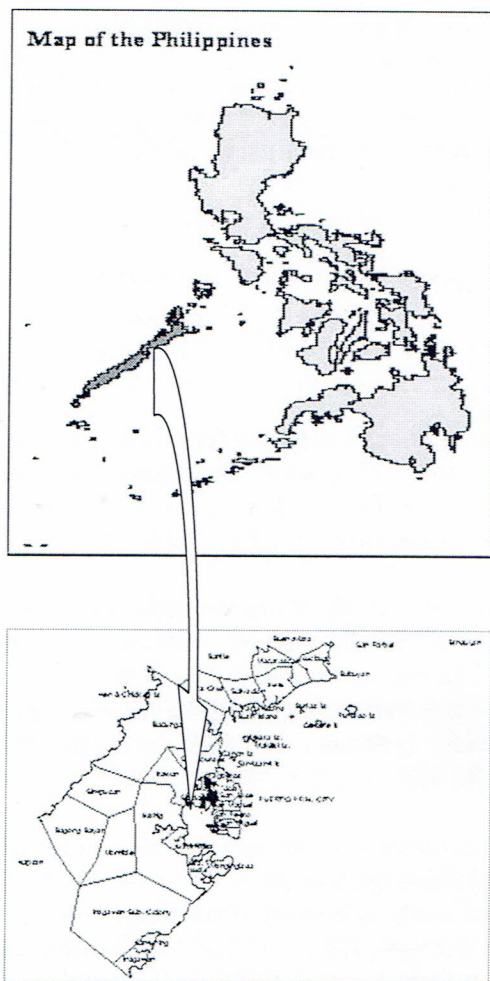


Figure 1. Map of the Philippines indicating the study site.

Feeds and Feeding

O. niloticus and *P. monodon* were fed with commercial pellet and trashfish, respectively. A feeding tray made of B-net was used for the shrimps to prevent feed wastage. The feeds were given between 4:00 to 5:00 p.m. at feeding rate of 10%, 8%, 6% and 4% of their body weight from 1st to 15th, 30th, 45th, and 60th days of culture, respectively.

Sampling

The growth and survival of *O. niloticus* and *P. monodon* were monitored every 15 days. The growth (increase in weight and length) was determined using

Yamato weighing scale and digital weighing scale, and measuring board and Vernier caliper, respectively.

Data Analysis

The data gathered were analyzed using ANOVA (Gomez and Gomez 1984).

RESULTS AND DISCUSSION

Growth and Survival

O. niloticus cultured in floating netcages for 60 days with an initial average body weight of 9.93 g grew to 19.22 g while *O. niloticus* in polyculture with *P. monodon* grew from 8.9 to 19.32 g (Figure 2). Tilapia obtained better weight gain in polyculture (10.41 g) than in monoculture (9.29 g) (Table 1).

O. niloticus in polyculture obtained highest mean final length of 10.14 cm, and length gain of 2.65 cm compared with *O. niloticus* in monoculture which obtained only 9.87 cm and 2.28 cm, respectively. The SGR and K of *O. niloticus* in monoculture and polyculture cultured in floating netcages was 1.21 to 1.43% g/day and 1.77 to 1.97, respectively. However, the FCR in monoculture (13.85) was higher than the polyculture (4.86).

P. monodon in monoculture with an initial body weight of 7.61g grew to 21.79g while those in polyculture grew from 7.07 to 22.29g/pc (Figure 2). The polyculture (15.23g) obtained a higher average body weight gain compared with *P. monodon* in monoculture (13.86g) (Table 1). The same result was recorded by Gonzales-Corre (1988) in brackishwater pond. She attributed the better growth of *P. monodon* in polyculture to the undigested food particles excreted by *O. niloticus* that served directly as food for *P. monodon*.

Further, *P. monodon* in polyculture obtained higher final total length, and length gain, 13.92cm and 4.83cm, compared with those in monoculture which obtained 13.68cm and 4.22cm, respectively. The carapace length of *P. monodon* in monoculture increased from 2.0cm to 3.25cm. In polyculture, carapace length increased from 2.04cm to 3.32cm. The SGR and FCR of *P. monodon* in monoculture and polyculture was 1.70 to 1.92%/g/day and 4.05 to 4.92, respectively (Table 1).

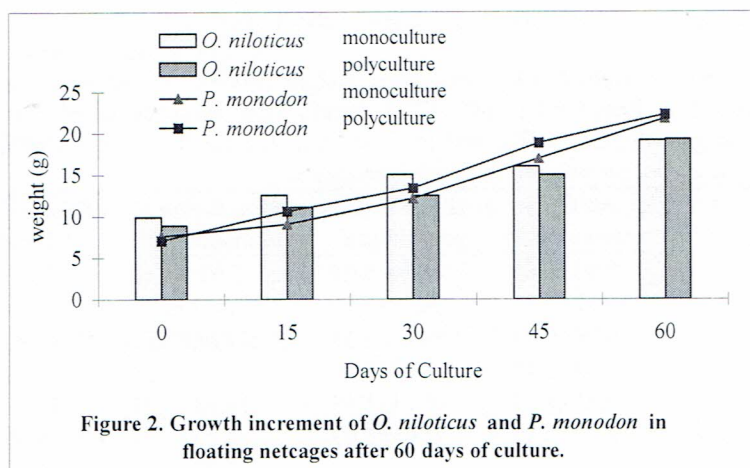
Table 1. Initial body weight (IBW), final body weight (FBW), weight gain, initial body length (ITL), final total length (FTL), length gain, carapace length gain (CLG), specific growth rate (SGR), and feed conversion ratio (FCR) of *O. niloticus* and *Penaeus monodon* cultured in floating netcages.

	<i>O. niloticus</i> monoculture	<i>O. niloticus</i> polyculture	<i>P. monodon</i> monoculture	<i>P. monodon</i> Polyculture
IBW (g)	9.93±5.86	8.9± 6.04	7.61± 1.11	7.07± 1.99
FBW (g)	19.22±5.71	19.32±8.02	21.79±1.3	22.29±5.75
Wt. gain (g)	9.29±0.34	10.41±27.51	13.86±1.57	15.23±3.78
ITL (cm)	7.58±1.45	7.49±1.85	9.46±0.89	9.08±0.59
FTL (cm)	9.87±1.15	10.14±1.45	13.68±0.05	13.92±1.15
Length gain (cm)	2.28±0.33	2.65±0.93	4.22±0.90	4.83±0.64
CLG (cm)	-	-	1.25±0.22	1.28±0.41
SGR (%g/day)	1.21±0.34	1.43±0.56	1.70±0.27	1.92±0.05
FCR	13.85±2.60	4.86±16.79	4.05±2.00	4.92±7.72

The initial body weight, final body weight, weight gained, final total length, length gain, SGR and K of *O. niloticus* and *P. monodon* showed no significant differences between monoculture and polyculture.

The biomass of *O. niloticus* in polyculture was 125.03 g/m³ greater than in monoculture which obtained only 156.12 g/m³. While *P. monodon* biomass in monoculture was 152.56g/m³ which is significantly higher than in polyculture (133.75 g/m³).

The survival of *O. niloticus* ranged from 66 to 83% in monoculture and polyculture. The maximum % survival in this study is better than Paalan (2001) which is only between 68.88 to 76.66%. The survival rate of *P. monodon* ranged from 60 to 73.33% (Figure 2). The low survival of *P. monodon* is attributed to loss (jumping) during sampling. According to Gonzales-Corre (1988) tilapia with the combination of shrimp has a survival rate of up to 75%. While Sarmiento (2002) found out that the survival of shrimp cultured in floating netcages within the period of 60 days is 85 to 90%.



Competition Index

The competitive correlation between *O. niloticus* with *P. monodon* at same stocking density of 10pcs/m³ is positive (+0.12). It was observed that *O. niloticus* competed in terms of food and space with *P. monodon*. In contrast, the competition index of *P. monodon* and *O. niloticus* is negative (-0.24) indicating that *P. monodon* did not affect the growth of *O. niloticus*.

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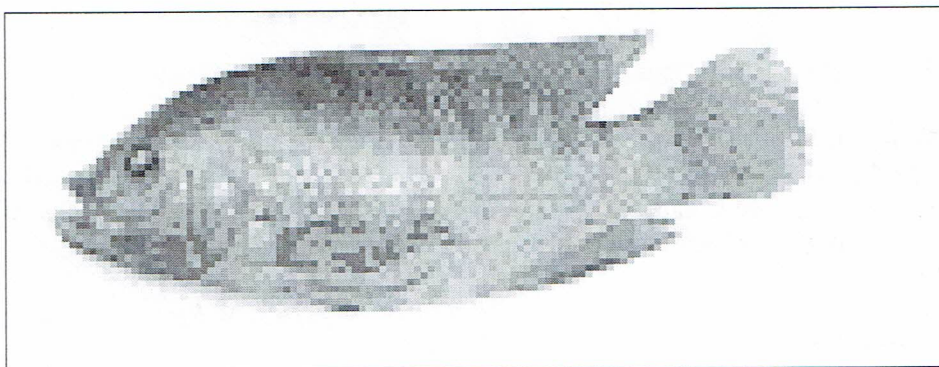


Plate 1. *Oreochromis niloticus*

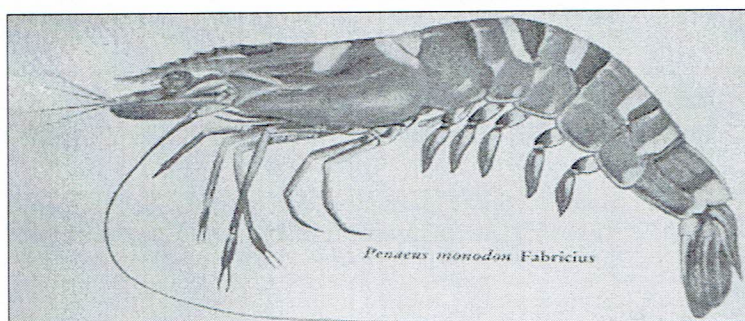


Plate 2. *Penaeus monodon* (adopted from SEAFDEC)