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Effects of Light and Different Diet Types during the Nursery of Snubnose Pompano *Trachinotus blochii*

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Abstract

There is an increasing interest on snubnose pompano being a relatively new and high value aquaculture species. This study evaluated the effects of light and different diet types on the growth, survival and production of the fish during nursery culture (30 days) in brackishwater pond. The experiment utilized a complete randomized design in a factorial set up with light (with and without) and diet types (low protein and high protein) as the main factors. The treatments were as follows: with light + low protein diet, with light + high protein diet, without light + low protein diet and without light + high protein diet. The results showed that both factors (light and diet) significantly affect the indices measured. Specific growth rate in terms of weight was significantly higher in fish fed with low protein diet with light and fed with high protein diet without light at 6.72% day^{-1} and 4.32% day^{-1} respectively. Similar results were obtained for specific growth rate in terms of length. Fish fed with low protein diet without light got the highest survival at 84.76% and was significant from other treatments. Although snubnose pompano has a higher protein requirement, the findings indicate that there is compensatory factor contributing to higher growth and survival. The presence of light might attract zooplanktons, increasing availability of natural food in the system. Moreover, with light the visibility of live food was increased that could result to higher foraging efficiency and live feed consumption.

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Introduction

Pompanos like jacks and trevallies are marine finfish belonging to family Carangidae. Snubnose pompano *Trachinotus blochii* (Lacepede, 1801) is one of the 20 species in the genus *Trachinotus*. Locally the fish is known as "ampahan", "bitilya" or simply "pompano" and is sometimes called talakitok because it resembles the jacks. There are at least two species of pompano that are reared commercially in the world; the Florida pompano *Trachinotus carolinus* in the west, considered as one of the finest, most desirable and highly prized finfish in the United States (Craig, 2000) and the snubnose pompano *Trachinotus blochii* in the east, one of the popular finfish cultured in Taiwan and Singapore (Liao *et al*., 1995; Chou *et al*., 1995; Chou and Lee, 1997). The Florida pompano has been considered a prime candidate for aquaculture in the United States because of its desirable characteristics (Craig, 2000). The snubnose pompano has likewise high potential for aquaculture in Asia Pacific because it is easier and faster to grow in floating cages, more resilient to diseases and erratic changes in the environment and most importantly it commands good price (Liao *et al*., 1995; Chou *et al*., 1995; Chou and Lee, 1997; Juniyanto *et al*., 2008).

The successful artificial propagation of snubnose pompano started in Taiwan during the late 1980s (Liao *et al*., 1995). Juniyanto *et al* (2008) reported successful larval rearing of snubnose pompano at the Mariculture Development Centre of Batam in Indonesia. In the Philippines the Southeast Asian Fisheries Development Center-Aquaculture Department (SEAFDEC-AQD) pioneered hatchery production of the species. Larval rearing takes about 30 days after hatching (dah). Harvesting of larvae is done 30-35 day after hatching (dah) and survival is estimated at about 20-25%. Thereafter, larvae are transferred in nursery tanks or ponds and are kept for a month or two before stocking in grow-out.

Nutrition during the nursery phase of pompano is crucial because it serves as a preparatory phase for grow-out. Juvenile snubnose pompano has a minimum requirement of 45% crude protein in the diet (SEAFDEC, 2012). During the early stages of the nursery phase, feeding relies mainly on natural food such as copepods and mysid shrimps. Artificial diet is supplemented at 40% body weight but given gradually until complete weaning which indicates the end of the nursery phase and start of grow out. The advantage of rearing juvenile pompano in ponds during the nursery period is the inherent availability of natural food.

However, visually feeding fish depend on water visibility and good light conditions for effective foraging of zooplanktons. With good water visibility, foraging of natural food could be maximized and hence there is a possibility of substituting expensive high protein artificial diet with a cheaper low protein artificial diet. Hence, this study is conducted to determine the interactive effects of light and different diet types (low protein and high protein) in snubnose pompano juvenile during nursery production in brackish pond on its survival and growth in terms of absolute growth rate, specific growth rate and total length.

Materials and methods

Experimental Design

The experiment utilized a complete randomized design in a factorial set up with light (with and without) and diet types (low protein and high protein) as the main factors with a total of four treatments that include with light + low protein diet, with light + high protein diet, without light + low protein diet and without light + high protein diet. Rearing of snubnose pompano juvenile lasted for 30 days.

Pond and Set-Up Preparation

The study was conducted at BISU Calape-Calunasan Brackishwater Station. The pond has a total area of 0.01 ha (10m x 10m) with an average depth of 1m. The pond was prepared using standard methods. Tea seed powder was added at 100 ppm to eliminate pest present in the mud (CIBA, 2014) and lime at 100 ppm to decrease the free Carbon dioxide which will buffer the pH (Lazur, Cichra and Watson, 2013). The pond was fertilized with urea and chicken manure at a rate of 100 ppm and 1500 ppm respectively.

The incoming water was screened to prevent the entry of predators. Four hapa nets were installed inside the ponds corresponding to the four treatments. Each hapa net was divided into three compartments with a dimension of 1m x 1m that served as replicates. A 20 watt bulb covered with dark plastic was individually installed one foot above the compartments that were assigned to treatments with light.

Procurement of Stocks and Stocking

Forty day old snubnose pompano were purchased from Southeast Asian Fisheries Development Center – Aquaculture Department (SEAFDEC-AQD) in Tigbauan, Iloilo. The fish were acclimatized for two days before stocking in the individual compartments. The fish with initial weight of 0.47g and total body length of 28.95mm were stocked in the compartments at a rate of 50 individuals per m^3. Stocking was done late in the afternoon. Lights were turned on from 3 until 6 am for treatments with light.

Diet Preparation and Feeding

The diets used in the experiment were two brands of commercial feed for finfish; one has low protein (less than 30% crude protein) while the other has high protein. The proximate composition is shown in Table 1. A feeding rate of 40% body weight was employed (SEAFDEC, 2011). Feeding ration was increased based on the body weight of the fish measured every ten days. The feed was offered six times a day.

Table 1. Proximate composition of the diet used in the experiment.

High Protein Commercial Pellet	%	Low Protein Commercial Pellet	%
Crude protein	45	Crude protein	28
Crude fat	8	Crude fat	6
Crude fiber	4	Crude fiber	6
Crude ash	16	Crude ash	12
Moisture	12	Moisture	12

Growth and Survival Monitoring

The weight of the stocks was monitored every five days to assess the growth and adjustment of amount of feed ration. The stocks were harvested after 30 days, counted individually and weighed using 1.0g precision electronic balance and length measured using Vernier caliper to the nearest 0.01cm. To estimate the specific growth rate (SGR), food consumption rate (FCR) and survival rate (SR), the following formulas were used: SGR = [(ln final weight – ln initial weight)/days] x 100. Where: ln = natural logarithm of final and initial weight. FCR = weight of feeds consumed/weight gained and SR = (recovered stocks/total stocks) × 100.

Statistical Analysis

All data were subjected to two-way ANOVA. Differences were considered significant at the $p < 0.05$ level. Post hoc was performed using Duncan's Multiple Range Test.

Results and discussion

The water quality parameters recorded during the experiment were within the tolerable range for finfish culture in ponds; the pH was at 7-7.5, salinity was at 20-30 ppt and temperature at 28-32°C. Maintaining good water quality is very important for pompano culture in ponds because the fish normally thrives in the open sea and naturally inhabits sandy areas. Growth, survival and production are presented in Table 2. Both factors (light and diet) significantly affect the indices measured. Specific growth rate in terms of length was significantly higher in fish fed with low protein diet with light and fed with high protein diet without light at 1.92% day^{-1} and 1.63% day^{-1} respectively. Similar results were obtained for specific growth rate in terms of weight. Fish fed with low protein diet with light got the highest survival at 84.76% and was significant from other treatments.

Table 2. Mean specific growth rate in weight and length and survival of snubnose pompano *T. blochii* in nursery culture.

Treatment	SGR in terms of length % day^{-1}	SGR in terms of weight % BW day^{-1}	FCR	Survival %
without light + low protein diet	1.09^{b}	3.72^{c}	-	61.90^{c}
with light + low protein diet	1.92^{a}	6.27^{a}	-	84.76^{a}
without light + high protein diet	1.63^{a}	5.61^{a}	-	83.1^{a}
with light + high protein diet	1.30^{b}	4.32^{b}	-	79.05^{b}

Means with different letters indicate significant differences between treatments ($P<0.05$).

The results showed that provision of light in fish fed with low protein diet significantly improved growth and survival during the nursery culture. Zooplanktons such as copepods and mysids are attracted to light. It has been proven that behavior of animals is regulated by light and many zooplanktons depend on light to forage for food (Atkinson *et al.*, 1996). Martynova and Gordeeva (2010) found out that there was a positive response of herbivorous crustaceans to light. The presence of live organisms is beneficial as pompano naturally subsist on live food during the early larval and juvenile stages. Moreover, with light the visibility of live food was increased that could result to higher foraging efficiency and live feed consumption. This result however did not conform to experiments on the effect of light on feed consumption and foraging. Skov *et al.* (2002) found out that there was no detectable impact of increased water transparency and light intensity on the foraging success of pike *Esox lucius*. Granqvist. Mattila (2004) reported that there were no significant reductions in the consumption of mysids by juvenile perch *Perca fluviatilis* with increased turbidity and decreased light intensity.

In contrary, the fish fed with high protein diet without light had significantly better growth and survival compared to that of the same dietary treatment with the provision of light. The presence of light could have triggered the fish to actively forage for food spending energy deliberately in the process. Thus, instead of allocating the energy obtained from high protein diet for growth it was used for pursuing available prey. Unlike in fish fed with low protein provided with light, it could be assumed that fish needed more energy to compensate the inadequacy supplied by the low protein diet and must conserve energy in the course of foraging food.

Conclusion

Both light and diet significantly affects growth, survival and production of snubnose pompano during nursery culture. High protein d*iet al*one resulted to better growth, survival and production. Although snubnose pompano has a higher protein requirement, the findings suggest that low protein diet with the presence of light has improved growth and survival of the stocks.

Recommendations

The same experiment could be conducted using higher stocking density. Gut analysis is every essential to evaluate especially the intake of zooplanktons as an effect to light treatment. Zooplankton density in the water should also be assessed during day time and the time when the light is turned on. Cost analysis using light is also very important to determine if using light is more economical than using expensive high protein feeds.

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