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Optimization of stocking density of *Mystus gulio* (Brackishwater catfish)

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ABSTRACT

An experiment was conducted for 150 days in earthen ponds to optimize the stocking density of *Mystus gulio.* The three different stocking density (treatment T_1, T_2, T_3) fishes were fed with commercial pellet feed (30% crude protein) @ 4-6% of estimated fish biomass. All treatments were randomly assigned and in duplicate. After five months of rearing, growth of fishes was almost uniform in all treatments and was 12.42 g, 12.13 g and 11.83 g in ponds at 8, 12 and 16/m^2 density respectively. Average survival of fishes was 64.41%, 53.26% and 50.17% with the above three stocking densities. But production of fishes in treatment T_3 (950kg/ha) was significantly highest than those of T_1 (650 kg/ha and T_2 (775 kg/ha). The findings indicate that *Mystus gulio* can be reared at higher density.

Key words: Commercial pellet feed (30% crude protein), Brackishwater catfish (*Mystus gulio*).

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INTRODUCTION

Mystus gulio, locally known as '*Nona tengra*', is a euryhaline estuarine small catfish commonly occurring in the coastal waters of Bangladesh and eastern coast of India. This species is supporting the coastal fisheries of Bangladesh to a great extent, both in point of commercial and local point of view. Though, the fish has naturally being caught every year in fairly a large quantity, its catch is gradually declining due to combined effect of different factors, such as over-exploitation, destructive fishing pressure, loss of habitat, and different ecological modifications (Alam, et al., 2006). This fish is having high market demand and delicious in taste and it has an emerging trend as an aquaculture species in the coastal Bangladesh. For conservation and increasing supply of this fish, Bangladesh Fisheries Research Institute has developed breeding technology of this fish in 2007 (Alam et al., 2007). This has paved the way of establishing and expansion of aquaculture of the species. But culture practice of this species has not yet been developed. Expansion of aquaculture of any fish is greatly dependent on its ensured supply of seed for grow-out pond. Nursing of yolk-absorbed spawn in the nursery pond seems to be very sensitive, as they pass through a critical period of switching over from planktonic feed to other feed and also need to adjust with new environment from indoor hatchery to outdoor earthen pond. Short term nursing of delicate spawn in nursery ponds is a prerequisite to ensure the reliable and regular supply of quality fry for stocking in grow out ponds at farmers' level. Considering the euryhaline nature, this fish has potential for culture in both brackishwater as well freshwater ponds. This fish may be very much

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suitable for culture with shrimp (*Penaeus monodon*) in brackishwater *ghers*. This may help to safe the shrimp farmers from losing their investment in case of invasion of viral disease in shrimp which is very common in the coastal *ghers*. In spite of having great possibility of production of this fish through aquaculture, seed production and culture technology of this fish has not yet developed. In this context, the present research program is being proposed to develop a nursery management and production technology of this important catfish in the south west Bangladesh.

MATERIALS AND METHODS

A 150-day experiment was carried out from 15th June 2013 to 15th November 2013 in 6 earthen ponds at Bangladesh fisheries Research Institute, Brackishwater Station, Paikgacha, Khulna. All ponds were 500 m^2 each. Three stocking densities viz. 8 (T1), 12 (T2) and 16 (T3) Nos/m^2 were tried each with two replications..The ponds were prepared by drying, liming (CaO @ 250 kg/ha) and then filling with tidal water up to 100 cm. Water of the ponds were treated with rotenone @ 1.5 ppm to kill all unwanted animals. After removing all dead animals, ponds were treated with dolomite @ 20 ppm. After five days of liming, water of the ponds were fertilized with 25 ppm urea, 30 ppm TSP and 1 ton/ha cattle dung and the ponds were made ready for stocking. After seven days of fertilization, required quantity of one month old fries of catfish was stocked at different treatment. The stocked fishes are being fed with commercial pellet feed (30% crude protein) @ 4-6% of estimated fish biomass. Growth of fishes was checked fortnightly for the adjustment of feed. Physico-chemical parameters of water *viz*., transparency, temperature, pH, dissolved oxygen and alkalinity were determined as per methods described in APHA (1992) and plankton samples were analyzed at seven days interval. After five months of rearing, all fishes were harvested and production was estimated and compared.

Data analysis

Data were analyzed statistically using Microsoft Excel. A one-way ANOVA was used to examine stocking density on weight gain, survival, growth and production. If the effects were significant, difference between the means was analyzed by a post-hoc (Tukey test) for multiple comparison of mean ($p<0.05$ level of significance).

RESULTS AND DISCUSSION

Temperature and salinity of water during study period were 22.5-33.75°C and 2.0-10.5 ppt that were almost same in all ponds (Figure 1). As shown in figure 1d, transparency of water was initially higher in all ponds and gradually decreased with the progress of culture period.

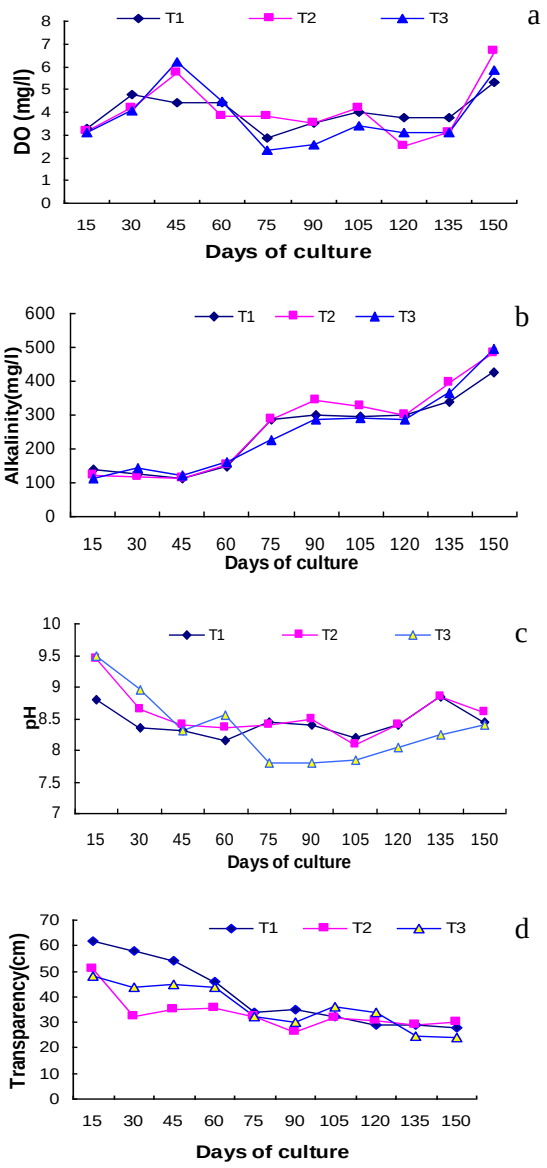

Figure 1
Variation in some water quality parameters of the ponds used for culture technique of *Mystus gulio* at different treatment.

Low transparency of 24-28 cm was recorded in ponds (T_1). Transparency was 26-51 cm and 28-62 cm in ponds (T_2) and (T_3). pH of water of all the ponds was congenial for nursery rearing and varied from 7.8-9.45 (Figure 1c). Alkalinity was (111-495 mg/l) in all ponds.

During stocking some variations among different treatments were observed with the progress of culture period. However, total alkalinity of water was 115-425 mg/l, 115-483 mg/l and 111-495 mg/l in T_1, T_2 and T_3, respectively. Morning dissolved oxygen was always congenial for normal survival of fish fry in all ponds. As shown in figure 1d, concentration of dissolved oxygen was 2.85-4.8 mg/l, 3.1-6.7 mg/l and 2.3-5.85 mg/l in T_1, T_2 and T_3, respectively. Concentration of both phyto- and zoolplankton was increased with the progress of culture period. Phytoplankton counts (No/l) were 25.3-78 x 10^3, 13.1-93.5 x 10^3 and 11.85-88.35 x 10^3 (Figure 2a) and zooplankton counts (No/l) were 0.6-7.99 x 10^3, 0.75-3.3.5 x 10^3 and 0.66-4.79 x 10^3 (Figure 2b) in T_1, T_2 and T_3, respectively.

After five months of rearing, growth of fishes was almost uniform in all treatments and was 12.42 g, 12.13 g and 11.83 g in ponds at 8, 12 and 16/m^2 density, respectively (Table 1). Average survival of fishes was 64.41%, 53.26% and 50.17% with the above three stocking densities. But production of fishes in treatment T_3 (950kg/ha) was significantly highest than those of T_1 (650 kg/ha and T_2 (775 kg/ha). The feed conversion ratio (FCR) was 1.50-2.00. The findings indicate that *Mystus gulio* can be reared at higher density

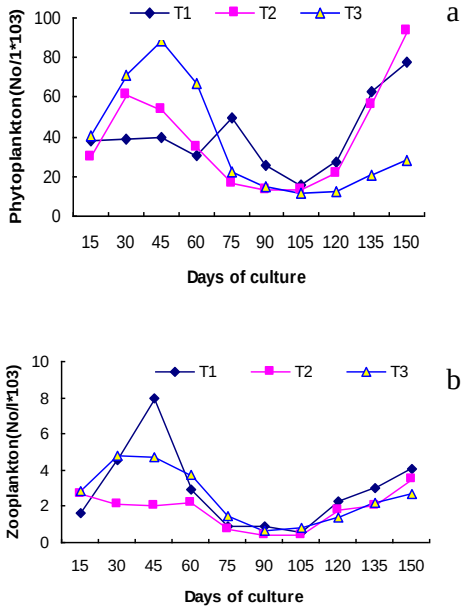

Figure 2
Concentration of phyto- and zooplankton of the ponds used for culture technique of *Mystus gulio* at different treatments.

Table 1
Production performance of *Mystus gulio* at different stocking densities.

Treatments	Replications	Final ABW (g)	Survival (%)	Production (kg/ha)
T1 (8/m^2)	R1	12.34	66.83	660
	R2	12.5	64	640
	Mean±SD	12.42±0.11a	64.41±2.00a	650±14.14a
T2 (12/m^2)	R1	11.76	53.85	760
	R2	12.5	52.67	790
	Mean±SD	12.13±0.52a	53.26±0.83b	775±21.21b
T3 (16/m^2)	R1	11.76	48.89	920
	R2	11.9	51.45	980
	Mean±SD	11.83±0.10a	50.17±1.81c	950±42.43c

Mean values in the same column with different superscript differ significantly ($p<0.05$)

Stocking density is critical factor for many aquatic animals for their growth and survival (Rahman and Verdegem 2010; Weatherley 1976). In intensive aquaculture, stocking density is an important indicator that determines the economic viability of the production system. Increase in stocking density results in increasing stress causing a reduction in growth rate and food utilization

The present study provides empirical evidence on the effects of *Mystus gulio* stocking density on its growth, survival and production. There are no previous studies comparing the effects of *Mystus gulio* density on its growth and survival in aquaculture ponds.

A trial on the growth and survival of *Mystus gulio* at different stocking densities as well as the effect of different dietary protein levels on its growth and maturity have been given by Begum et al. (2008) but the data is not available online to compare with the present study. However in a study it was reported that the mean survival of the stocked fries (250 Nos/m^2) was highest 69.35±8.79% in ponds fertilized only with organic fertilizer (T_1), which followed by 57.19±6.22% in ponds fertilized with mixture of organic and inorganic fertilizers (T_3) whereas in this study survival rate at the highest density of 16/N was 50.17% in ponds fertilized with 25 ppm urea, 30 ppm TSP and 1 ton/ha cattle dung. The study indicates that stocking 16 Nos/m^2 of *Mystus gulio* will yield a good production to fish farmers in Bangladesh.

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