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Growth status and production performance of Pabda (*Ompok pabda*) and native magur (*Clarias batrachus*) in poly-culture at the pond of Bapard campus, Gopalganj

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Abstract
A culture experiment was conducted to see the growth and production performance of Pabda (*Ompok pabda*) with native Magur (*Clarias batrachus*) at different stocking densities in poly-culture at the Pond of BAPARD campus, Gopalganj from 16 August to 16 November. The size of ponds were 10 (T_1) and 10 (T_2) decimal with an average depth of 5 feet. Two different stocking densities were tested, namely treatments T_1 (250 fish /decimal, 200 Pabda and 50 native magur) and T_2 (300 fish /decimal, 250 Pabda and 50 native magur). Nourish feed was used in all treatments two times daily (only for Pabda) from the beginning of the fry stocking. The initial weight of Pabda and Native Magur were 1.0±0.01g and 2.5±0.01 g respectively. The initial length of Pabda and Native Magur were 4.5±0.02 and 5.2±0.02 cm respectively. The average highest final weight gain of Pabda was (24.70±2.50 g) observed in T_1 and followed by T_2 (20.90±3.40 g). Similarly, the average highest final weight gain of Native magur (145.30±27.75 g) was observed in T_1 and followed by T_2 (142.05±27.95 g), respectively. The survival rate of the stocking Pabda and Native magur were recorded 74.73 and 54.73 % in T_1; 65.12 and 45.12 in T_2 respectively. Fish production (Pabda+Native magur) in T_1 and T_2 were 7.65 and 6.60 kg/decimal/120 days, respectively.

Keywords: species, stocking densities, growth, production performance

1. Introduction

Bangladesh is one of the world's leading inland fish producing countries, contributing about 3.50% to GDP (Gross Domestic Product), 25.71% to agricultural production and 1.50% to export earnings [14]. The sector provides full time employment opportunities to 1.2 million people and part time employment 2.0 million people [14]. The aquaculture and fisheries sub-sector also plays an important role in alleviation of protein deficiency. Fish is the major protein source contributing about 60% of total animal protein intake [14]. At present, fish consumption requirement is about 21.90 kg per capita per year but we produce 22.84 kg per capita per year [14]. Among the available exportable fish and fishery products 30.06 percent was exported to USA, 48.51 percent to European countries, 9.32 percent to Japan and the remainder to Thailand and Middle Eastern countries [18]. In 2018-19 Bangladesh earned Taka 4309.94 million by exporting 68935.72 MT of fish and fisheries products [14]. There are about 4724993 hectares of inland water areas, of them 3927142 hectares are open water and 797851 hectares closed water. In closed water, the total area of ponds and ditches are 391753 hectares which is the main source of inland production [14]. Polyculture has been practiced with the aim that different species stocked in the ponds occupy different niches with their complementary feeding habits, utilizing all the natural food available in the ponds and increasing fish production of the ponds [47]. Polyculture of carps in pond is a widespread practice in Bangladesh [13], but, there is no information on polyculture practice of *Ompok pabda* and *Clarias batrachus* in Bangladesh. The local name of *Ompok pabda* and *Clarias batrachus* is Pabda and Magur [21]. So, this polyculture technology is a completely new one in South East Asia [10]. *Ompok pabda* (Hamilton, 1822), an indigenous catfish belongs to the family Siluridae of the order Siluriformes. Catches of this fish have drastically declined from open waters like rivers, beels, haors, etc. in recent year due to various ecological change in the inland water bodies and this fish is now considered as an endangered species [22]. This species is omnivorous in nature [46]. It can withstand harsh environmental conditions such as low oxygen and wide range of temperature fluctuations [46]. This small fish plays an important role in the inland fisheries catch because of its nutritive value and high market price. Due to rich lipoprotein content and soft bony structure this fish species is considered delicious and nutritious to the people of East India, North East India and Bangladesh [12, 15, 25, 31]. It has extensive geographical distribution covering India, Bangladesh, Pakistan, Afghanistan and Burma [3, 4, 9, 23, 40]. Despite its greater economic value this species did not receive sufficient attention in aquaculture. Insufficient existence of live samples in nature and poor survival of the larvae are major constrain of the observations [4]. *Clarias batrachus* is an indigenous Walking Catfish of South-East-Asia, which is locally known as "Magur" in different parts of Bangladesh. It contributes 2.12% in the total inland water fish production [13]. It is not only recognized for its excellent taste and market value but is also highly sought after for its nutritional and medicinal benefits. The species has high content of protein (15.0%), low fat (1.0%) and high iron

content (710 mg/100 g tissue) [37]. Due to its high nutritive value the fish is recommended in the diet of the sick and the convalescents [39]. Being a lean fish it is very suitable for people for whom animal fats are undesirable [33]. Therefore, objectives of the present study were to evaluate the growth, survival rate and production performance of Pabda *Ompok pabda* and native Magur (*Clarias batrachu)* at different stocking densities in poly-culture system and to evaluate the combination of Pabda and Native magur in the poly-culture ponds.

2. Materials and Methods

a) Experimental site and pond facilities

The experiment was carried out for a period of 120 days from 16 August to 16 November, 2019. It has been located at the Pond of BAPARD campus, Gopalganj. The ponds were same in size (10 dec.) and similar in shape and depth.

b) Pond preparation

The ponds were drained out completely and aquatic weeds were removed manually. Liming was done in all ponds at the rate of 1 kg/decimal. One week after liming the ponds were filled with water and fertilized with urea and TSP at the rate of 100 gm/decimal and 50 gm/decimal respectively. TSP was soaked overnight, then urea and TSP were dissolved together and spread manually on pond water surface at sunny day (10-11 am).

c) Collection of experimental fish and stocking

The initial weight of Pabda and Native Magur 1.0±0.01g and 2.5±0.01 g were collected from Reliance Aqua Farm, Mymensingh and Lulu hatchery Jashore respectively. The initial length of Pabda and Native Magur were 4.5±0.02 and 5.2±0.02 cm. Two different stocking densities were tested, namely treatments T_1 (250 fish /decimal, 200 Pabda and 50 native magur) and T_2 (300 fish /decimal, 250 Pabda and 50 native magur).

d) Experimental design

Table 1: Experimental design the experiment was carried out with two treatments (T_1 and T_2) each with two replications.

SL	Treatments	Replications	Stocking density/Dec	Species Name	Culture Duration
01	T_1	2	200	Pabda (*Ompok pabda*)	120
			50	Magur (*Clarias batrachus*)	
02	T_2		250	Pabda (*Ompok pabda*)	
			50	Magur (*Clarias batrachus*)	

e) Feeding

Fertilization was done weekly in the ponds of all treatments at the same rate (urea, 100g /dec and TSP, 50 g/dec). The feed was applied at the rate of 10% of the body weight of fishes at the beginning of the experiment, then it was reduced to 7% after one month and 3% after two months. Feed was applied twice a night, half in the evening (7.00 pm) and the rest in the beginning (4.00 am).

f) Sampling

Five percent of the total fish were sampled fortnightly by a cast net to monitor the fish growth and to adjust feeding rates. The weight of fish during sampling was measured by using a portable digital balance.

g) Water quality parameters

The water quality parameters such as air temperature, water temperature, dissolved oxygen (DO), water pH, soil pH, ammonia, transparency and total alkalinity were recorded fortnightly. The temperature and dissolved oxygen of the ponds were determined by a DO meter. Secchi disc visibility was measured using a Secchi disc at the time of water sampling. The water pH was recorded by a pH meter.

h) Statistical analysis

Computer analysis of the data was done by using MS excel, SPSS (Statistical Package for Social Science) version-20. Significance was assigned at 0.05% level.

3. Results

a) Water quality parameters

Mean values of physico-chemical parameters over the period of Pabda *Ompok pabda* and Native Magur (*Clarias batrachus*) fish farming are presented in Table 2.

Table 2: Water quality parameters

Parameters	Treatments	
	T_1	T_2
Air temperature (^{0}C)	29.70±1.50	29.60±1.55
Water temperature (^{0}C)	28.90±1.70	28.92±1.75
Water pH	7.75±1.00	7.60±0.80
DO (mg/L)	4.20±1.75	4.10±1.25
Ammonia (mg/L)	0.25±0.05	0.25±0.10
Total alkalinity(m/L)	215.60±25.70	218.00±25.50
Transparency (cm)	28.50±0.45	30±0.25

b) Growth and production

Fig 1: Pictorial view of Pabda & Native magur

Table 3: Details of stocking, growth, FCR, SGR and production of Pabda *Ompok pabda* in the two treatments during the study period are shown in Table 3.

Parameters	Treatments	
	T_1	T_2
Stocking density/Dec	200	250
Initial length (cm)	4.5±0.02	4.5±0.02
Initial weight (g)	1.0±0.01	1.0±0.01
Culture duration (days)	120	120
Final length (cm)	14.44±1.70	13.05±1.8-
Final weight (g)	24.70±2.50	20.90±3.40
Survival rate (%)	74.73	65.12
FCR	1.55±0.17	1.80±0.20
SGR (%)	2.67±0.08	2.53±0.07
Production (Kg/Dec)	3.67	3.40

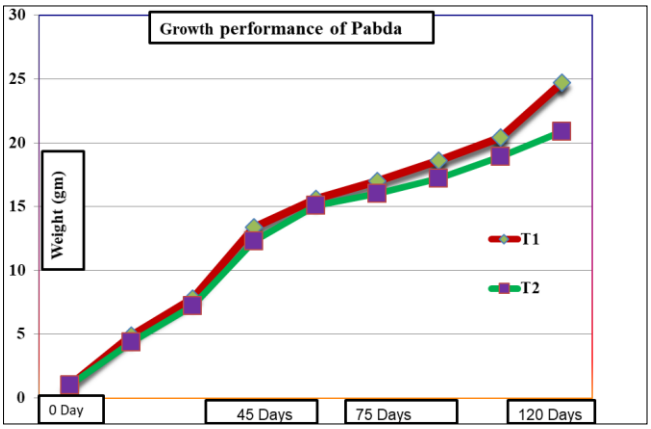

Fig 1: Growth performance of Pabda (*Ompok pabda*)

Table 4: Details of stocking, growth, FCR, SGR and production of Native Magur (*Clarias batrachus*) in the two treatments during the study period are shown in Table 4.

Parameters	Treatments	
	T_1	T_2
Stocking density/Dec	50	50
Initial length (cm)	5.2±0.02	5.2±0.02
Initial weight (g)	2.5±0.01	2.5±0.01
Culture duration (days)	120	120
Final length (cm)	24.50±2.50	23.05±2.65
Final weight (g)	145.30±27.75	142.05±27.95
Survival rate (%)	54.73	45.12
FCR	-	-
SGR	3.36	2.76
Production (Kg/Dec)	3.98	3.20

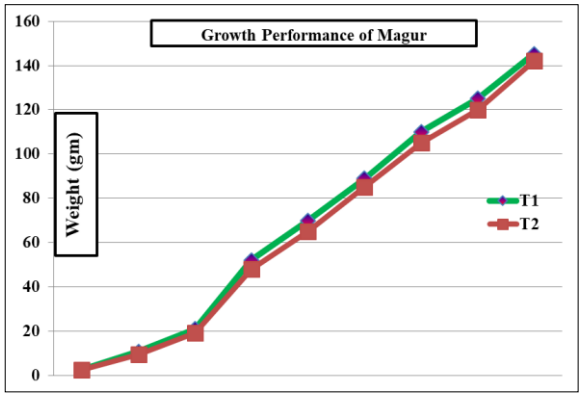

Fig 2: Growth performance of Native magur (*Clarias batrachus*)

4. Discussion

The water quality parameters measured throughout the experimental period were found within the acceptable range for fish culture [24]. In the study, water temperature in T_1 and T_2 were 28.90±1.70 and 28.92±1.75, respectively. The variations in temperature among the treatment means were found similar and within the suitable range of growth of fish in tropical ponds [5, 29, 34, 36]. Water transparency (cm) was 28.50±0.4 and 30±0.25 in T_1 and T_2, respectively similar [7]. Boyd (1982) [6] recommended a transparency from 15 to 40 cm. The level of pH in T_1 and T_2 were 7.75±1.00 and 7.60±0.80, respectively. The mean pH level indicated optimum condition for the best growth and health of aquatic organisms [16]. Different authors have reported a wide variations in pH from 7.18 to 9.24 [28], 7.03 to 9.03 [36], 6.8 to 8.20 [5] and 7.50 to 8.20 [8, 35] in fertilized fish pond. The dissolved oxygen (mg/L) content in T_1 and T_2 were 4.20±1.75 and 4.10±1.25, respectively similar [46]. Although catfish usually can tolerate reduce oxygen level [38]. Total alkalinity was 215.60±25.70 and 218.00±25.50 mg/L in T_1 and T_2, respectively. Total alkalinity levels for natural waters may range from less than 5 mg/L to more than 500 mg/L [7]. Kohinoor *et al.*, 1998 [28] and Roy *et al.*, 2002 [36] were found the average total alkalinity above 100 mg/L in their study. The mean value of ammonia was 0.25±0.05 and 0.25±0.10 in T_1 and T_2, similar [43].

The end of experiment, the mean harvesting weights of *Ompok pabda* was 24.70±2.50 and 20.90±3.40 g in T_1 and T_2, respectively. Kohinoor *et al.*, 1991 [26] reported a weight gain of 28-33g for *Ompok pabda* in polyculture with rajputi and minor carp for a rearing period of 6 months. However, it was 48±4.22, 42±2.99 and 38±3.81 in treatments T_1, T_2 and T_3 respectively [5]. The specific growth rate (SGR % per day) of fish in different treatments varied among the treatments. Highest value was obtained in T_1 (2.67±0.08) and lowest in T_2 (2.53±0.07). The SGR values obtained in the present study are T_1 and T_2 similar to reported [27]. The specific growth rate (SGR % per day) of Pabda in different treatments ranged between 2.98 and 3.28 [19]. FCR was significantly lower in T_1 (1.55±0.17) than in T_2 (1.80±0.20) similar [32]. The percentage of survival as recorded in the present study was 74.73 and 65.12 for T_1 and T_2, respectively. The survival (%) of Pabda varied between 75 and 87 % [19]. Islam (2002) [20] found that the survival rate of *O. pabda* larvae fed with different feeding frequencies was in the range of 66.25% to 81.5%. The mean production of *Ompok pabda* was 3.67 and 3.40 kg/dec in T_1 and T_2, respectively similar [30].

The end of experiment, the mean harvesting weights of *Clarias batrachus* was 145.30±27.75 and 142.05±27.95 g in T_1 and T_2, respectively. Similar observation was also noted by various authors [1, 11, 17, 41, 48] who found maximum growth at low stocking densities. The specific growth rate (SGR % per day) of fish in different treatments varied among the treatments. Highest value was obtained in T_1 (3.36) and T_2 (2.76). Similar observation was also noted by [42]. The percentage of survival as recorded in the present study was 54.73 and 45.12 for T_1 and T_2, respectively. These findings have similarities with the findings [2, 44]. The mean production of *Clarias batrachus* was 3.98 and 3.20 kg/dec in T_1 and T_2, respectively. Similar observation was also noted by [44].

5. Acknowledgement

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6. Conclusion

After end of the experiment, it can be decided that treatment T_1 (250 fish /decimal, 200 Pabda and 50 native magur) is suitable due to higher total weight gain, better feed conversion ratios as well as higher net profit. Application of this finding for *Ompok pabda* and *Clarias batrachus* culture might be developed the aquaculture production especially in poly-culture ponds.

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