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# Study the production performance of climbing perch (Vietnamese Koi-*Anabas testudineus*) in dewatering canal at BAPARD campus, Gopalganj

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**Abstract**
The present study was carried to observe the production performance of Vietnamese koi (*Anabas testudineus*) in dewatering canal at BAPARD in Kotalipara Upazilla under Gopalgonj district Bangladesh from October to December 2019. The fingerlings of 3.8±0.04 cm and 0.5±0.01gm were stocked with three treatments ($T_1$, $T_2$ and $T_3$) each with two replications. The stocking densities were 1000 in $T_1$, 1200 in $T_2$ and 1400 fingerlings/dec in $T_3$, respectively. Supplemental feeds (30% protein) were applied for the fish. SGR (%) value (5.24±0.07) was recorded in $T_1$ and the lowest (5.08±0.23) in $T_3$. The survival rates were 64.73±1.5, 54.12±1.7 and 50.50±1.84 for $T_1$, $T_2$ and $T_3$ respectively. The FCR was 1.50±0.67, 1.60±0.14 and 1.78±1.15 in $T_1$, $T_2$ and $T_3$ respectively. The highest production was 36.05±2.25 kg/dec in $T_1$, followed by $T_2$ (34.35±2.75 kg/dec) and $T_3$ (34.28±3.65/dec) respectively. The highest benefit or net return for $T_1$ Tk. 1624.50 /dec and BCR of 1.43 followed by Tk. 1124.50/dec and BCR value of 1.28 in $T_2$ and Tk. 452.00/dec and BCR value of 1.10 in $T_3$.

**Keywords:** production performance, stocking density, Vietnamese koi, dewatering canal

## 1. Introduction
The climbing perch fish *Anabas testudineus* (Bloch) is one of the important freshwater small indigenous fish of Bangladesh [1]. It is locally known as koi. It is very popular for its delicious taste and flavor. It is found in paddy fields, haors, baors, ponds, swamps, marshes and canals. It can withstand harsh environmental conditions such as low oxygen, wide range of temperature and other poor water conditions [13]. The fish contain high values of physiologically available iron and copper essentially needed for hemoglobin synthesis [27]. In late 1980s, the number of this fish have drastically reduced from open waters due to environmental degradation, over fishing, use of large amount of pesticides, herbicides and fertilizers, destruction of suitable habitats, obstruction to breeding migration, poor management etc. In the face of diminishing natural population of climbing perch-planners, policy makers, aqua culturists, and fisheries biologists are thinking of its cultivation through intensive farming [11]. Indiscriminate destructive practices have caused havoc to aquatic biodiversity [15]. It contributes 1.4% in the total inland water fish production [12]. Recent studies suggest that worldwide 20 % of all fresh water species are extinct, endangered or vulnerable [23]. International Union of Conservation of Nature [16] enlisted *Anabas testudineus* as not threatened perch fish in Bangladesh. But due to rough and unplanned water management policy for irrigation, over exploitation, illegal practice of capture fisheries and various ecological changes in its natural habitat; this native species is threatened now [8]. Considering the importance of this species in nutritional, economics and biodiversity point of view, it is required to develop an appropriate culture technique of *Anabas testudineus*. Keeping these in view, seed production technology through artificial propagation was developed in captive condition by the Bangladesh Fisheries Research Institute. But in culture aspects, the growth rate of native strain is very slow in ponds ecosystem [19]. To improve this situation, another variety of koi known as Vietnamese koi (*Anabas testudineus*) have been imported from Vietnam in 2013 by Sarnolata Agro Fisheries Ltd. Induced breeding was proved helpful to get the seeds at large scales. The seedlings thus obtained were used for rearing in ponds in different regions of the country. But to standardize the culture technology with a view to get maximum growth, yield and economic benefit experiments were conducted through a designed manner and the results are worthy for publication. Now a days farmers have been cultured this species with high stocking densities to earn more profit. But they have been unable to earn more profit. Some of problems (diseases, oxygen depletion, increase ammonia gas etc) have been occurred due to high stocking density. For this purpose this experiment has been undertaken to growth performance of Koi in dewatering canal. So that farmers achieve more knowledge about culture practices and obtain more profit.

## 2. Material & Methods
### Dewatering canal selection and preparation
The experiment was conducted for a period of three months (90 days) from 16 October to 16 December 2019 in dewatering canal with six segments of length 40±0.5 meter and width 1.5±0.25 meter each with a depth of 1.00 meter at

BAPARD campus, Kotalipara, Gopalganj. Prior to stocking, dewatering canals were cleaned with bleaching powder and quick lime.

**Experimental design**
Three different stocking densities of Vietnamese koi (*Anabas testudineus*) were tested in the experiment. Stocking density was maintained as treatment and which replicated twice.

**Source of fingerlings**
The fingerlings of Vietnamese koi (*Anabas testudineus*) were used in this experiment were collected from a private hatchery of Jashore, Bangladesh.

**Fish stocking**
Fingerlings of Vietnamese koi (*Anabas testudineus*) were stocked in 16 October 2019, according to the experimental design.

**Fish sampling**
Random sample of ten fishes from each dewatering canal was sampled fortnightly by using a scoop net. The total weight was measured by using a portable electronic balance (Tanita, Japan).

**Fig 1:** Pictorial view of sampling for Vietnamese koi (*Anabas testudineus*)

**Feeding**
After stocking, in order to meet up the increasing dietary demand, commercial fish feed named Nourish Feed (Nursery-2 to Grower) containing average 30% crude protein were applied as supplementary feed at the rate of 3-10% of standing biomass of fish twice daily.

**Fig 2:** Pictorial view of feed that applied in study area

**Water sampling and analysis**
Physico-chemical parameters of pond water were monitored every 15 days interval between 9.00 AM to 10.00 AM. Water temperature was recorded using a Celsius thermometer and transparency (cm) was measured by using a Secchi disc of 20 cm diameter. Dissolved oxygen and pH were measured directly using a digital electronic oxygen meter (YSI, Model 58, USA) and an electronic pH meter (Jenway, Model 3020, UK). Total alkalinity was determined by titrimetric method [6]. Total ammonia of water samples was determined with the help of a Hach Kit (Model DR 2010, USA).

**Harvesting of fish**
At the end of the experiment, the fishes were harvested by removing water from canal. The harvested fishes were counted and weight was recorded.

**Data analysis**
Data were analysed using the SPSS Version-20. ANOVA was performed on all the dependent variables to see whether the treatment had any significant effect or not. An economic analysis was carried to estimate the net profit from different treatments. The analysis was based on local market prices for harvested fish and all other items. The costs of fingerlings, lime and supplemental feeds are shown in Table 3. The net return was measured by deducting the gross cost from the gross return per decimal. The benefit cost ratio was also measured as a ratio of net benefit to gross cost.

## 3. Result

**Water quality parameters**
Water quality parameters like air temperature, water temperature, water pH, dissolved oxygen, ammonia, transparency and total alkalinity were observed at 15 days interval throughout the study period (Table. 1).

**Table 1:** Water quality parameters observed during the experimental period.

| Parameters | Treatments | | |
|---|---|---|---|
| | $T_1$ | $T_2$ | $T_3$ |
| Air temperature ($^0$C) | 29.83±1.95 | 29.11±1.86 | 30.88±2.63 |
| Water temperature ($^0$C) | 29.94±1.70 | 30.16±1.35 | 30.33±1.37 |
| Water pH | 7.75±1.00 | 7.63±0.85 | 7.39±1.26 |
| DO (mg/L) | 4.21±1.70 | 4.10±1.34 | 4.10±0.70 |
| Ammonia (mg/L) | 0.25±0.05 | 0.25±0.10 | 0.50±0.25 |
| Total alkalinity(m/L) | 213.66±26.73 | 277.00±90.32 | 258.22±62.32 |
| Transparency (cm) | 28.50±0.45 | 30±0.25 | 31.50±0.35 |

### Production Performance

**Fig 3:** Pictorial view of Vietnamese koi (*Anabas testudineus*)

**Table 2:** Details of stocking, growth, FCR, SGR and production of Vietnamese koi (*Anabas testudineus*) in the three treatments during the study period are shown in Table 2.

| Parameters | Treatments | | |
|---|---|---|---|
| | $T_1$ | $T_2$ | $T_3$ |
| Stocking densities (No. /Dec.) | 1000 | 1200 | 1400 |
| Initial Length (cm) | 3.8±0.04 | 3.8±0.04 | 3.8±0.04 |
| Initial Weight (gm) | 0.5±0.01 | 0.5±0.01 | 0.5±0.01 |
| Culture duration (days) | 90 | 90 | 90 |
| Final Length (cm) | 14.40±1.70 | 14.05±1.84 | 13.50±1.90 |
| Final weight (gm) | 55.70±2.50 | 52.90±3.49 | 48.50±4.12 |
| Survival rate (%) | 64.73±1.5 | 54.12±1.7 | 50.50±1.84 |
| FCR | 1.50±0.67 | 1.60±0.14 | 1.78±1.15 |
| SGR (%) | 5.24±0.07 | 5.18±0.05 | 5.08±0.23 |
| Production (Kg/Dec) | 36.05 | 34.35 | 34.28 |

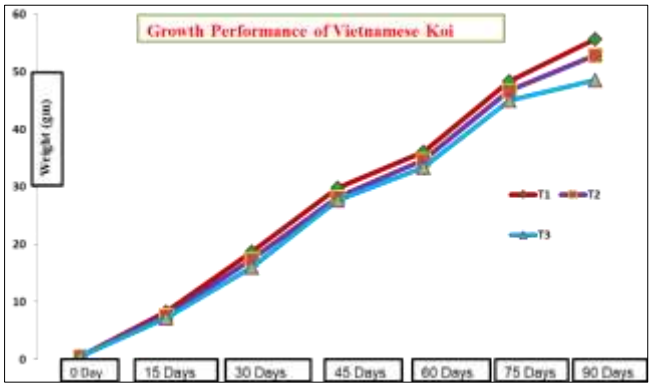


**Fig 1:** Growth Performance of Vietnamese Koi (*Anabas testudineus*)

**Table 3:** Economic analysis for Vietnamese koi (*Anabas testudineus*) production in ponds reared for 90 days

| Components | Treatments | | |
|---|---|---|---|
| | $T_1$ | $T_2$ | $T_3$ |
| Expenditure (Tk. /Dec.) | | | |
| Fingerlings cost | 1000.00 | 1200.00 | 1400.00 |
| Feed cost | 2703.00 | 2748.00 | 3050.00 |
| Lime cost (15 Tk/kg) | 80.00 | 80.00 | 80.00 |
| Medicine | - | - | 160.00 |
| Total expenditures (Tk/dec.) | 3783.00 | 4028.00 | 4690.00 |
| Income | | | |
| Gross return (Tk/dec.) | 5407.50 | 5152.50 | 5142.00 |
| Net return (Tk/dec.) | 1624.50 | 1124.50 | 452.00 |
| BCR (Benefit Cost Ratio) | 1.43 | 1.28 | 1.10 |

Sale price of Vietnamese koi = Taka 150.00/ kg
Commercial feed= Taka 50.00/ kg

## 4. Discussion

In the present study water quality parameters like air temperature, water temperature, water pH, soil pH, DO (dissolve oxygen), ammonia, transparency and total alkalinity were recorded and assessed. It was found that water temperature were $T_1$ (29.83±1.95 $^0$C), $T_2$ (29.11±1.86 $^0$C) and $T_3$ (30.88±2.63 $^0$C) which report was similar [5, 21, 23, 24, 26]. The range of water temperature from 26.06 to 31.97°C is suitable for fish culture [4]. The water pH value of three treatments were $T_1$ (7.75±1.00), $T_2$ (7.63±0.85) and $T_3$ (7.39±1.26). The pH from 6.5 to 9.0 is suitable for pond fish culture and pH more than 9.5 is unsuitable to fish production [28]. Different authors have reported a wide variation in pH from 7.18 to 7.24 [21], 7.03 to 9.03 [26], 6.80 to 8.20 [5] and 7.50 to 8.20 [7] in fertilized fish ponds and found the ranges to be productive. The DO (dissolve oxygen) was recorded 4.21±1.70, 4.10±1.34 and 4.10±0.70 mg/L in the treatments $T_1$, $T_2$ and $T_3$, respectively, which was similar [21, 24, 25, 28]. The variations in total alkalinity in all the treatments were found in productive range for aquaculture ponds [3, 20, 22, 28]. The transparency was recorded during the experimental period was 28.50±0.45 cm, 30.00±0.25 cm and 31.50±0.35 cm in the treatments $T_1$, $T_2$ and $T_3$, respectively.

The growth rates of *Anabas testudineus* under different stocking densities are shown in Table 2. SGR (%) in treatment $T_1$ (5.24±0.07) was significantly higher than $T_2$ (5.18±0.05) and $T_3$ (5.08±0.23) (Table 2) respectively. There was no significant difference (>0.05) among the different treatments. The average values of SGR (%) of Vietnamese koi were observed as 2.59%, 2.56% and 2.56% in treatments $T_1$, $T_2$ and $T_3$ respectively [2]. The highest survival rate (%)

was observed in $T_1$ (64.73±1.5), $T_2$ (54.12±1.7) and $T_3$ (50.50±1.84), respectively. There was a significant variation (<0.05) in the survival rate in *Anabas testudineus* among different treatments (Table. 2). It was more or less similar with the findings [14, 21]. FCR was comparatively higher in treatment $T_3$ (1.78±1.15) than $T_2$ (1.60±0.14) and $T_1$ (1.50±0.67) respectively (Table 2) however, more or less similar [9, 10, 18]. The average production of koi fish was 36.05±2.25, 34.35±2.75 and 34.28±3.65 kg/dec in the treatment $T_1$ $T_2$ and $T_3$, respectively. The growth rate in treatment $T_1$ was higher than treatment $T_2$ and $T_3$ indicated lower density can produce the maximum size of table fish with minimum size variation which has the similarity with the findings of some authors [17, 21]. The highest production was observed to be 25 kg/dec/90 days in treatment $T_3$, 22 kg/dec/90 days in treatment $T_2$ and the lowest production was observed to be 18 kg/dec/90 days in treatment $T_1$ at stocking densities 150, 250 and 350 fries/dec and designated as treatment $T_1$, $T_2$ and $T_3$ respectively [2].

The total expenditures production was higher in $T_3$ (4690.00 Tk/dec) lower than $T_2$ (4028.00 Tk/dec) and $T_1$ (3783.00 Tk/dec). The net return generated from 90 days culture period was calculated as 1624.50 Tk/dec, 1124.50 Tk/dec and 452.00 Tk/dec for $T_1$, $T_2$ and $T_3$ respectively. The highest net profit of BDT 1624.50 Tk/dec was obtained from $T_1$ where *Anabas testudineus* stocked in 1000 individuals/dec similar [2]. The highest benefit or net return for $T_1$ Tk. 1624.50 /dec and BCR of 1.43 followed by Tk. 1124.50/dec and BCR value of 1.28 in $T_2$ and Tk. 452.00/dec and BCR value of 1.10 in $T_3$. The benefit cost ratio was 1.7, 1.63 and 1.56 in $T_1$, $T_2$ and $T_3$ respectively [2].

## 5. Conclusion

The present study indicated that comparatively highest production was found in treatment $T_1$ which received lower stocking density (1000 fish/dec). From the research it might be suggested that the farmers should maintain stocking density. The more study will be needed to production performance of Vietnamese koi in dewatering canal.

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