



Short Communication

Evaluation of Growth Performance of Striped Murrel, *Channa striata* Larvae Produced in Pre-Monsoon and Monsoon Season Under Controlled Condition

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ABSTRACT

The growth performance of striped murrel, *Channa striata* larvae which were produced in the pre-monsoon season (April- May) and another in monsoon season (June-August) under controlled conditions has been evaluated with a 30-day experiment. The experiment was conducted for pre-monsoon and monsoon season separately. Two quadruplicate was assigned as T1 (pre-monsoon season i.e., Beyond breeding season) and T2 (spawn produced during monsoon season i.e., breeding season). At the end of the trial, significant ($P < 0.05$) improved weight gain percent, thermal growth coefficient (TGC), survival, and reduced cannibalism were recorded in larvae produced during the pre-monsoon season (T1). From the present study, it is concluded that larvae produced in the pre-monsoon season (T1) could be an additional benefit for the farmers to generate additional revenue in terms of seed production as well as monetary profit.

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Authors' Contribution

.DD: Execution of work, methodology, analysis, writing original draft. RK: Supervision, fund acquisition, planning, review and editing. BA: Supervision, planning and review and editing of draft. BRP: Supervision and review and editing. DM: Review and editing. PC: Review and editing. JD: Execution of work, data analysis. SKS: Resource facility and review and editing.

Key words

Pre-monsoon, *Channa striata*, Weaning, Thermal Growth Coefficient (TGC), Striped murrel

Every fish breeder and seed producer's utmost desire is to produce a large number of quality seeds (Marimuthu and Haniffa, 2007). But it's the fact that in seed production system maximum mortality has been reported during nursery and fry rearing phase and especially during nursery rearing. Obtaining hatchery produced *Channa striata* seed is very difficult, and then second problem is the unavailability of commercial feed and lastly its highly cannibalistic nature right from spawn stage (Kumar *et al.*, 2022; Hien *et al.*, 2017; Yadav *et al.*, 2016; War and Altaf, 2014). Snakehead larvae can consume the other snakehead of its one third size (Kumar *et al.*, 2021, 2022; Kumar and Mohanty, 2018). The newly hatched larvae are found floating upturned due to large size yolk sac (Kumari *et al.*, 2018).

The spawn starts feeding in 72 h after hatching. Initially they feed upon minute zooplankton specially rotifers or Artemia (Kumari *et al.*, 2018; Ling, 1977). Later they can be fed with the mix zooplankton, which they easily prey on in their natural habitat. Mostly farmer who do not have breeding facilities, they used to catch wild fry and then they train the fry to feed on artificial diet, which may contain fish paste and rice bran (Diana and Chang, 1985).

The critical period in the spawn to fry rearing is to switch over from live food to man-made diet (Kubitza and Lovshin, 1999). The farmer involved in snakehead culture have observed that the fingerlings obtained from wild is very tough or otherwise not possible as these fishes might have passed through the phase where they can be weaned to artificial diet. Weaning is a dependent process which relies on many factors such as size of the fish at the time of weaning, pellet acceptability, feeding method and feeding behaviour of fish (Hien *et al.*, 2017; Kumari *et al.*, 2018; Parma *et al.*, 2013; Pantazis *et al.*, 2014). Larvae starts feeding on small size fish crushed in fine size. A lipid/protein ratio of 65/450 g kg⁻¹ is considered adequate for good growth performance and survival of *Channa striatus* fry (Aliyu-Paiko, 2010a, b) the maximum dietary protein share comes from fishmeal (Siddaiah *et al.*, 2022, 2023).

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The fish fed with mosquito larvae has shown better growth performance than fishes which were fed with Chironomus larvae and planktons. The survival was also better in fishes those were fed with mosquito larvae and captive condition may play vital role to achieve less mortality and growth rate (Kumar *et al.*, 2008). Tubifex was found suitable as live food for better growth and survival and may be considered as suitable food for large scale seed production of *Channa punctatus* (Rahman *et al.*, 2018). The rate of cannibalism can be reduced with the increase in feeding rate and sorting the shooters (Siddaiah *et al.*, 2022; Kumari *et al.*, 2018; Qin and Fast, 1997a). The temperature limits for *Channa striata* were 25.5-32.7°C (Muslim, 2019). *Channa striata* can withstand in low oxygen level (Courtenay and Williams, 2004). The *C. striata* can survive in acid and alkaline water beside the fact that this fish is very sensitive to the pH and growth may not be achieved without optimum pH required for growth (Pillay, 2008). The tolerable range of pH for the species is recorded as 4.25-9.4 (Djokosetiyanto *et al.*, 2017). Lesser pH for prolonged periods may kill the fish or fish may become weak, which ultimately may be a reason for the attack of parasite or disease occurrence. *C. striata* larvae can tolerate an ammonia concentration of 1.57 mg/litre (Qin *et al.*, 1997b). In market the price of this fish is almost double than other freshwater fish like major and minor carp and triple of fishes like tilapia and pangasius. Therefore, this fish provides an ample opportunity to the farmers to double their income through adoption of its farming. The aim of the present study was to determine the growth performance with reference to larvae produced in different season viz. pre-monsoon and post monsoon season.

Materials and methods

The larvae obtained from pre-monsoon (April- May) and monsoon period (June-August) were reared in FRP Tanks (0.50 m³). The experiment was conducted in eight FRP tanks applying two treatments viz. spawn produced during pre-monsoon season (T1) and spawn produced during monsoon season (T2), each treatment was assigned with four replications. Each tank was stocked with 150 fish and then reared for 30 days. The experiment was conducted for pre-monsoon and monsoon season separately. The heterogeneous mixture of plankton with abundance of rotifers and copepods were continuously produced in well fertilized culture pond through phased manuring method (Shirgur, 1971) of Air-Breathing Fish Culture Unit, ICAR-CIFA, Bhubaneswar and later collected to fed to larvae from fourth days onwards till 14th day spawns in ad libitum. On 15th day weaning starts means larvae starts taking powdered feed. In the experimental tanks commercial power feed (300-500 µm particle size) with 52% crude

protein and 12% lipid was used soon after weaning. The feeding was done @ 10-20% of their total biomass. Initially up to fourteenth day only plankton was given to the larvae but after fourteenth day they were fed four times a day. The leftover feed and excreta were siphoned out daily with siphoning pipes to avoid the deterioration of water quality. Every third day the water was exchanged completely. The layer of waste particles was removed completely for the clear visibility which helps to reduce higher cannibalism and to keep water quality in good condition.

The performance indices were evaluated using the method and formulae followed by Daudpota *et al.* (2016).

All the physicochemical parameters of water were analysed as per the standard methods (APHA, 2005).

The data generated with the experiments were analysed for interpretation and all the data were analysed with MS Excel (2019) with the use of mathematical formulae for different parameter.

Table I. Growth performance of larvae produced in pre-monsoon and monsoon.

Growth indices	Larvae produced in	
	Pre-monsoon season (T1)	Monsoon season (T2)
Initial length (mm)	4.48±0.3	4.55±0.26
Final length (mm)	43.45±2.04	44.35±2.93
Initial weight (mg)	4.91±0.34	5.5±0.36
Final weight (mg)	627.01±125.82 ^a	610.23±125.23 ^b
Weight gain (mg)	622.1±126.08 ^a	604.73±124.08 ^b
ADWG (mg)	20.74±3.2	20.16±4.23
Weight gain %	13349.59±3810.93 ^a	10892.81±3710.53 ^b
Condition factor	0.75±0.07	0.68±1.44
SGR %	16.03±0.8	15.43±1.53
TGC	241.49±46.97 ^a	232.1±48.77 ^b
CV of length	0.56±0.04	0.68±0.38
CV of weight	0.01±1.32	0.01±0.1
Survival%	86.83±2.56	82.00±1.45
Cannibalism %	8.5±0.61 ^b	9.83±1.03 ^a

*Values with different superscript with in the column differ significantly P<0.05% level.

Results and discussion

The performance of the larvae produced in the pre-monsoon period was better than the larvae produced in the spawning season in some parameters. A significant difference in the weight gain, percentage weight gain, specific growth rate, thermal growth coefficient (TGC), survival and cannibalism (Table I) was observed between the larvae produced in T1 (pre monsoon) and T2 (in monsoon). Weight gain at the end of experiment was

significantly ($P < 0.05$) higher in T1 (larvae produced in pre monsoon season; 622.1 ± 126.08 mg) than T2 (larvae produced in monsoon season; 604.73 ± 124.08^b mg). The length and weight relationship between the larvae produced during pre-monsoon and monsoon is given in Figure 1. As similar to weight gain, the percentage weight gain was higher in T1 (13349.59 ± 3810.93^a %) followed by T2 (10892.81 ± 3710.4993^b %). Thermal growth coefficient value was higher for the T1 (241.49 ± 46.97^a) and lower in T2 (232.1 ± 48.77^b). The survival percentage was comparatively better in T1 (larvae produced in pre-monsoon) than T2 (larvae produced in monsoon season). The rate of cannibalism was recorded higher in T2 (9.83 ± 1.03^a %) compared to T1 (8.5 ± 0.61^b %). Rate of cannibalism was significantly higher in the larvae produced during the spawning season the rate of cannibalism may be brought down with the proper feeding and regular shortening of shooter larvae similar findings is reported by Kumari *et al.* (2018). The cannibalism rate in the present study was comparatively lower than the previous reports by Qin *et al.* (1997a), Mehrajuddin *et al.* (2011), Kumari *et al.* (2018), Nen *et al.* (2018) and Hien *et al.* (2017). Although growth parameters in case of larvae produced in pre-monsoon season was higher and suggest better growth performance than the larvae produced in monsoon season. As both the larvae were reared in different season, the environmental condition may have positive or negative effect on growth of larvae. Therefore, the growth improvement in the larvae reared in the pre monsoon season might be due to the effect of climatological parameters.

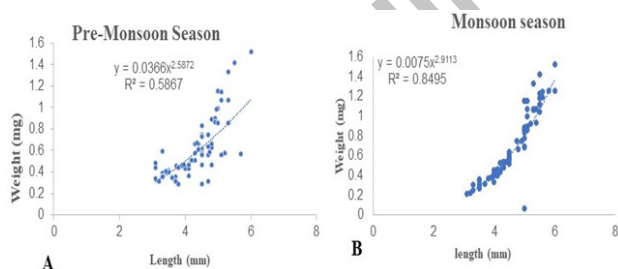


Fig. 1. Length weight relationship in larvae produced during pre-Monsoon (A) and Monsoon (B) season.

Physico-chemical properties of water in experimental water were found within the favourable range. The major difference recorded in the different season were more or less similar except water temperature, therefore average range of the water quality parameters have been given in this section. Water temperature was in slightly higher range (30°C – 32°C) during T1 than the temperature recorded during the T2 experimental period. Dissolved oxygen concentration of all experimental tanks was recorded with

in the range of 5.04 mg L^{-1} to 6.29 mg L^{-1} during the larval rearing. There was no much variation in pH values was observed during the larval rearing experiment. The pH values were recorded with in the range of 7.7 to 8.3. Total alkalinity was found with in the range of 103 mg L^{-1} to 126 mg L^{-1} , whereas hardness was found to be 100 – 117 mg L^{-1} during the experimental period. Water conductivity in experimental tanks was within the range of 0.299 – 0.392 S/m, during the observation of larval rearing phase in the both of the season. Phosphate level in experimental tank water was recorded as 0.005 to 0.028 mg L^{-1} . The total ammonia content of all the experimental tanks were recorded before water exchange. It was found to be in the range of 0.0217 to 0.726 mg L^{-1} . The nitrite-N was found to be in the range of 0.04 to 0.625 mg L^{-1} in the experimental tanks whereas the nitrate-N was found to be in the range of 0.001 to 0.125 mg L^{-1} in the experimental tanks during the study period. All the water quality parameters were congenial to the fish growth during the rearing period of the larvae in the both seasons.

The present study successfully provided the package of practice for larval rearing of striped murrel in captivity during the pre-monsoon and monsoon season. *Channa striata* larvae are reared in the two different monsoon season showed significant changes in the growth and survival. This study also firmly suggested that larvae produced in the different season can be reared successfully. The weaning was achieved through partial and gradual replacement of live feed with formulated feed. From the present study it can be concluded that slightly higher growth and survival of the larvae could be earned by rearing them during pre-monsoon season however the performance of both the season larvae were more or less similar. The aim of the study was to evaluate feasibility of larvae produced in pre-monsoon season. So, there was no intension to prove superiority of different seasoned larvae with this study. As this species is very important high value fish, successful outcome of rearing of larvae in different season will serve as the baseline for the rearing of *Channa striata* larvae at the commercial level which furthermore, allows fish seed producers to produce seeds for longer period and also it will be helpful in availability of seeds for a longer period. The weaning period was reported to be 15 days after hatching (dah) in present study in compare to the 17 days after hatching reported by Hien *et al.* (2017), Nen *et al.* (2018).

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Statement of conflict of interest

The authors have declared no conflict of interest.

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