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Research Article

A LABORATORY STUDY ON THE EFFECT OF SHELTER AVAILABILITY ON *CLARIAS BATRACHUS* GROWTH PERFORMANCE

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ABSTRACT

During present study effect of shelter availability on growth performance of *Clarias batrachus* was evaluated in laboratory conditions. To quantify the growth performance, the change in mass and length over time was evaluated. The competition for shelter among fishes was observed. The fishes were forcing each other for shelter. Availability of shelter affected the growth performance of *C. batrachus* fish. Decrease in shelter availability was significantly reduced the growth performance of the *C. batrachus.* Present findings have important implications for habitat restoration. In the habitat assessments or stream restoration programmes, concept of shelter availability should be given attention to improve stream environments to maintain native fish diversity.

Keywords: *Clarias batrachus,* Shelter, Growth Performance, Habitat Restoration.

INTRODUCTION

Disturbance in water streams have been become pronounced due to human activities over the centuries (Paul and Meyer, 2001; Allan, 2004). The urbanization leads to severe physical damages like habitat destruction and degradation of habitat quality, which is among the most serious threats to stream organisms (Riley *et al*., 2005; McKinney, 2006; Bernhardt and Palmer, 2007).

Fundamental alterations of the streambed, bank and surrounding habitats through the clearing of vegetation, concrete-lined channels, dredging, an increased sediment load and the compaction of the substrata can reduce shelter availability and habitat complexity, negatively affecting the survival, physiology, growth and, ultimately, the fitness of many stream fauna (Suttle *et al*., 2004; Finstad *et al*., 2007).

Many freshwater fish use shelters to hide from potential predators (Valdimarsson and Metcalfe, 1998). Some recent studies have reported a positive relationship between shelter availability and growth rates (Finstad *et al*., 2007; Olsson and Nystrom, 2009). A reduction in the availability of shelter can have indirect negative impacts on the metabolism, growth performance and population demographic rates of stream fishes.

The walking catfish (*C. batrachus*) is a freshwater air breathing catfish which normally lives in slow-moving and often stagnant waters in ponds, swamps, streams and rivers, flooded rice paddies or temporary pools which may dry up (Rainer and Daniel, 2011). Since the fish growth rate have great value in economy, present study was conducted for *ex situ* evaluation of effect of shelter availability on growth performance of *C. batrachus.*

MATERIAL AND METHODS

Collection of Fish: The fishes were procured from the local aquarium retailer near Kurukshetra University campus, Kurukshetra ($29^0$6'N, $76^0$5'E). These fishes were transferred to the Fish and Fisheries Lab in Department of Zoology, Kurukshetra University, and were housed in glasshouse under a natural photoperiod at 15-20^{0}C with supplemental aeration. The fish

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were fed to satiation with dry, pelleted food once a day.

Experiment Design: The fishes were divided into two groups: Group A was control group with no shelter and, Group B was treatment group with shelter. A large number of circular polyvinyl chloride (PVC) pipes of various sizes were added into the tanks to serve as shelters (Finstad *et al.*, 2007).

To quantify the growth performance, the change in mass and length over time was used as the growth rate for this experiment. We measured the wet mass (gm) and length (cm) of the fishes on the initial day (day 0) and at the end of the experiment (day 40).

RESULTS

In the shelter treatments all the *C. batrachus* fishes consistently entered into the shelter. Although when less number of fishes was introduced, the competition for shelter was less but as more fishes were introduced, the fishes were observed forcing each other to leave the shelter as soon as they entered. The expelled fish usually rested outside and adjacent to the shelter. However no aggressive attacks between fishes were observed.

Present study showed that the availability of shelter affected the growth performance of *C. batrachus* fish. Decrease in shelter availability was significantly reduced the growth performance of the *C. batrachus* (Table 1).

The initial mean size of fishes was 27.75 cm. After 40 days of experiment the fishes mean size increases to 28.15 cm in Group A i.e. without shelter (Figure 1) and increases to 29.3 cm in Group B i.e. with shelter (Figure 2). The initial mean weight of fishes was 192.5 gm. After 40 days of experiment the fishes mean weight increases to 205 gm in Group A i.e. without shelter and increases to 220 gm in Group B i.e. with shelter (Table 1).

Table1. Effect of shelter availability on *C. batrachus* growth performance.

	Initial	Group A (Control) (Without shelter)	Group B (Treated) (With shelter)
Length (cm)	27.75	28.15	29.30
Weight (gm)	192.50	205	220

Figure 1. Control Group (Without Shelter).

Figure 2. Treated Group (With Shelter).

DISCUSSION

The use of shelter has been reported in many stream fish species including Atlantic salmon (Millidine *et al.*, 2006), burbot (*Lota lota*, L.) (Fischer, 2000), stone loach (*Noemacheilus barbatulus*, L.) (Guan and Wiles, 1997; Fischer, 2000), bullhead (*Cottus gobio*, L.) (Guan and Wiles, 1997) and spinous loach (*Cobitis shikokuensis*) (Kawanishi *et al.*, 2010). Present results are consistent with previous laboratory and field studies, in which a lack of sheltering opportunities was shown to have negative effects on the metabolic or growth rate (Millidine *et al.*, 2006; Finstad *et al.*, 2007; Olsson and Nystrom, 2009). Present work supports the earlier findings that reduced shelter availability can have significant negative effects on the growth performance of Japanese crucian carp and cobitid fish (Matsuzaki *et al.*, 2012). Current observations are consistent with the previous studies which suggest that loss of body mass in the absence of shelter resulted may be due to increased mental alertness: a state of heightened

anti-predator vigilance that increases resting metabolism and energetic demands (Fischer, 2000; Millidine *et al.*, 2006).

CONCLUSION

Present study opines that the decrease in shelter availability reduced the growth performance in *Clarias batrachus* fish. Current findings have important implications for habitat restoration. In the habitat assessments or stream restoration programmes, concept of shelter availability should be given attention to improve stream environments to maintain native fish diversity. Further research work is needed to make concept of shelter availability in practical use.

CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest associated with this article.

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