Bangladesh J. Fish. Res., 6(1), 2002: 29-34

Culture suitability of two exotic catfishes (*Clarias gariepinus* and *Pangasius hypopthalamus*) with an indigenous catfish (*Heteropneustes fossilis*)

Nargis Sultana[1] and M.F.A. Mollah*
Department of Fisheries Biology & Genetics, Bangladesh Agricultural University
Mymensingh 2202, Bangladesh
[1]Department of Fisheries, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur 1703
*Corresponding author

Abstract

Culture experiment of African catfish (*Clarias gariepinus*) and Thai pangas (*Pangasius hypopthalamus*) with indigenous stinging catfish (*Heteropneustes fossilis*) was conducted in the laboratory. The study was conducted for two experiments, where *C. gariepinus* and *P. hypopthalamus* were used separately with *H. fossilis* for a duration of 21days with three feeding treatments, *viz.* Tubificid worms (T_1), SABINCO feed (T_2), and no supplemental feed (T_3). In experiment 1, the initial length and weight of 4.4cm and 0.60g of *C. gariepinus* became 6.74cm and 2.33g when fed Tubificid worms, 7.07cm and 2.84g when fed SABINCO feed in the treatment without supplemental feed the final length and weight were 3.67cm and 0.31g at the end of 21 days of trial. The final length and weight of *H. fossilis* reached 4.55cm and 0.53g from the initial 3.3cm and 0.25g under the treatment fed Tubificid worms while those fed SABINCO feed showed a length and weight of 4.37cm and 0.45g respectively. However, both the initial length and weight were reduced to 2.85cm and 0.12g respectively in the treatment without supplemental feed. In experiment 2, the initial length and weight of 4.37cm and 0.57g of *P. hypopthalamus* became 5.57cm and 0.57g when fed Tubificid worms, 4.85cm and 0.82g when fed SABINCO feed in the treatment without supplemental feed the final length and weight reduced to 3.95cm and 0.34g at the end of 21 days of trial. The final length and weight of *H. fossilis* reached 5.19cm and 0.82g from the initial 3.25cm and 0.20g under treatment fed Tubificid worms while those fed SABINCO feed showed the final length and weight of 4.93cm and 0.70g respectively. And both the initial length and weight were reduced to 3.07cm and 0.04g respectively in the treatment without supplemental feed. No predatory effect of *C. gariepinus* and *P. hypopthalamus* on *H. fossilis* was observed in the experiments.

Key words: *C. gariepinus, P. hypopthalamus*, *H. fossilis*, Feeding, Predation

Introduction

To mitigate the shortage of fish, 13 exotic high yielding and fast growing varieties of fish, which are disease resistant and well adapted to the prevailing environmental conditions, were introduced in Bangladesh. Among them two of the catfishes – *C. gariepinus* and *P. hypopthalamus* are predators. According to Mollah *et. al* (1995) *C. gariepinus* is a passive predator in nature and *C. gariepinus* had no predatory effect on the fingerling of carp species (*Labeo rohita*). On the other hand, Alam (1998) observed that *C. gariepinus* and *P. sutchi* (later changed to *P. hypopthalamus*) have predatory effect on *Barbodes gonionotus*. It, therefore, seems that predatory fishes have got some species specificity and their predation habits depend upon many factors, viz. size and density of prey fishes, extent of hunger of predator species, body shape of the prey, relative body depth of the prey in relation to mouth gap of the predator (Hoyle and Keast 1987, Paszakowski and Tonn 1994, Das *et. al.* 1999) and so on. In this context, the present experiment was conducted to determine the culture suitability of two exotic catfishes, viz. *C. gariepinus* and *P. hypopthalamus* with an indigenous catfish – *H. fossilis*. This will ultimately provide information about the compatibility of culturing these species with the indigenous one.

Materials and methods

The fry of *C. gariepinus* used in this experiment were obtained from the fish artificially bred by using a mixture of 500 IU HCG and 2 g PG extract/kg body wt. On the other hand, *H. fossilis* fry were produced upon treating the female at the rate of 7mgPG/100g body wt. of fish. The fry of *P.hypopthalamus* were collected from Bangladesh Fisheries Research Institute, Mymensingh. Preys and predators were acclimatized for ten days before starting the experiment.

In both the experiments, there were three treatments (T) and each of the treatments had three replications. Fish in T_1 and T_2 were fed with Tubificid worms and SABINCO feed (Starter-1), respectively and no supplemental feed was provided in T_3. Proximate composition of the feed used are presented in Table 1. For each experiment nine aquaria of size 91cm x 25cm x 30cm were used with a water depth of 15cm. In both the experiments, the ratio of predator and the prey was maintained at 1:2. The fishes were fed twice a day at their satiation level. They were considered satiated when they stopped searching food and assembled at the corner.

Eight fry of *C. gariepinus* of length 4.4 cm weighing 0.6g and sixteen fry of *H. fossilis* of length 3.3cm weighing 0.25g were used for each replicated treatment in experiment 1. On the other hand, eight fry of *P. hypopthalamus* of length 4.37cm and weight of 0.57g and sixteen fry of *H. fossilis* of length 3.25cm and weight of 0.20g were used for each replicated treatment in experiment 2.

The experiments were conducted for a period of 21 days. Weight and length of fish were recorded at 7 days intervals. Mortality if any was also recorded at that time.

Table 1. Proximate composition of Tubificid worms* and SABINCO feed (Starter-1)** on dry weight basis

Elements	Tubificid worms	SABINCO feed (Starter-1)
Crude protein (%)	63.82	39
Crude lipid (%)	28.84	3
Ash (%)	7.95	18
Fibre (%)	--	6

*Source: Mollah and Ahamed (1989) ** Source: SABINCO (without date)

Results and discussion

In experiment 1, the growth in terms of length and weight of *C. gariepinus* was the highest in treatment T_2, where the fishes were fed with SABINCO feed (Stater-1) than those in T_1, where Tubificid worms were fed to the fishes. The growth of the fishes was found to decrease in treatment T_3, where no supplemental feed was provided (Table 2). Similar findings were also reported by Alam (1998), where the highest weight gain was observed in *C. gariepinus* fed with SABINCO feed. In the study of Degani *et al.* (1989) it was revealed that feed containing 40% protein favoured to gain the highest growth in *C. gariepinus*. Madu and Tsumba (1989) also reported better growth in *C. anguillaris* fed with feed containing 40% crude protein than those with lower or higher protein contents.

Table 2. Effects of different feed on the growth parameters and mortality rate of predator (*Clarias gariepinus*) and prey (*Heteropneustes fossilis*) and the predation rate of *C. gariepinus*

Parameters	Treatments		
	T_1 (Tubificid worms)	T_2 (SABINCO feed)	T_3 (Without feed)
Initial length (cm)			
Clarias gariepinus	4.4	4.4	4.4
Heteropneustes fossilis	3.3	3.3	3.3
Final length (cm)			
Clarias gariepinus	6.74^a	7.07^a	3.67^b
Heteropneustes fossilis	4.55^a	4.37^a	2.85^b
Gain in length (cm)			
Clarias gariepinus	2.34^a	2.67^a	-0.73^b
Heteropneustes fossilis	1.25^a	1.07^a	-0.45^b
Initial weight (g)			
Clarias gariepinus	0.60	0.60	0.60
Heteropneustes fossilis	0.25	0.25	0.25
Final weight (g)			
Clarias gariepinus	2.33^a	2.84^a	0.31^b
Heteropneustes fossilis	0.53^a	0.45^a	0.12^b

Gain in weight (g)			
Clarias gariepinus	1.73[a]	2.24[a]	-0.29[b]
Heteropneustes fossilis	0.28[a]	0.19[a]	-0.13[b]
Mortality rate (%)			
Clarias gariepinus	Nil	Nil	Nil
Heteropneustes fossilis	Nil	Nil	5.0
Predation rate (%)	Nil	Nil	Nil

Values in the same row having same superscript are not significantly different ($p<0.01$)

On the other hand the growth performance of *H. fossilis* was the best in treatment T_1 that received Tubificid worms than those in T_2 and T_3, receiving SABINCO feed and no supplemental feed, respectively (Table 2). Similar finding was observed by Gheyas (1998) where the growth performance of *H. fossilis* was the best when fed with Tubificid worms. Haque and Barua (1989) also reported the highest growth and survival of *H. fossilis* with Tubificid worms, followed by the feed with zooplankton and beef liver. It, therefore, seems that different species have different preference for food. During the present study *C. gariepinus* was observed to prefer SABINCO feed to Tubificid worms while the case was reverse for *H. fossilis.*

In experiment 2, the growth in terms of length and weight of *P. hypopthalamus* was the highest in treatment T_1, receiving Tubificid worms. On the other hand the growth of *P. hypopthalamus* decreased in T_3, where fishes were not provided with feed. The increase in growth with Tubificid worms might have resulted due to higher content of protein in Tubificid worms (about 64%) than SABINCO feed (39%).

Kamarudin *et al.* (1987) also found that the higher the protein percentage in the feed the higher the growth rate of *P. sutchi* fingerlings. Similar finding was reported by Seidel *et al.* (1980) where Atlanic silversides cultured on artificial diet with less protein percentage showed poor growth than that of supplied with live brine shrimp nauplii having more percentage of protein.

The growth of *H. fossilis* was the highest in treatment T_1, where fishes were provided with Tubificid worms and decreased in T_3, where no feed was provided during the period of the experiment (Table 3). Haque and Barua (1989) also reported the highest growth and survival of *H. fossilis* fed with Tubificid worms followed by those fed with zooplankton and beef liver. In another study of BFRI (1997) live Tubifex showed the best performance when fed to *H. fossilis* in terms of growth and survival and live zooplankton showed the poorer performance than that of Tubificid worms.

Table 3. Effects of different feed on the growth parameters and mortality rate of predator (*P. hypopthalamus)* and prey (*H. fossilis*) and the predation rate of *P. hypopthalamus*

Parameters	Treatments		
	T_1 (Tubificid worms)	T_2 (SABINCO feed)	T_3 (Without feed)
Initial length (cm)			
Pangasius hypopthalamus	4.37	4.37	4.37
Heteropneustes fossilis	3.25	3.25	3.25
Final length (cm)			
Pangasius hypopthalamus	5.57^a	4.85^b	3.95^c
Heteropneustes fossilis	5.19^a	4.93^a	3.07^b
Gain in length (cm)			
Pangasius hypopthalamus	1.02^a	0.48^b	-0.42^c
Heteropneustes fossilis	1.94^a	1.68^a	-0.18^b
Initial weight (g)			
Pangasius hypopthalamus	0.57	0.57	0.57
Heteropneustes fossilis	0.20	0.20	0.20
Final weight (g)			
Pangasius hypopthalamus	1.18^a	0.82^b	0.34^c
Heteropneustes fossilis	0.82^a	0.70^a	0.04^b
Gain in weight (g)			
Pangasius hypopthalamus	0.61^a	0.25^b	-0.23^c
Heteropneustes fossilis	0.62^a	0.51^a	-0.16^b
Mortality rate (%)			
Pangasius hypopthalamus	Nil	Nil	Nil
Heteropneustes fossilis	Nil	Nil	4.0
Predation rate (%)	Nil	Nil	Nil

Values in the same row having same superscript are not significantly different ($p<0.01$).

Neither *C. gariepinus* nor *P. hypopthalamus* were found to predate on *H. fossilis*, in experiment 1 and 2, respectively. This might be due to the size of the prey and the species specificity of the predator. Merron (1993) also observed that the predation of *C. gariepinus* is related to the size and abundance of prey. Ahmed *et al.* (1991) reported that there is no predatory effect of *C. gariepinus* on *Catla catla* but they have a little predation *L. rohita* fry. On the other hand, Mollah *et al* (1995) found that there was no predation of *C. gariepinus* on *L. rohita*. Ermolin (1981) also observed that there exits a linear relationship between the length of predator and length of prey. Here in this experiment, perhaps *H. fossilis* is not a preferred prey for the exotic species used due to its size or ability to avoid predation. *H. fossilis* a first swimmer, has toxic spine and the size of the prey fish used is perhaps larger to be taken by the predator. However, according to Alam (1998) *P. sutchi* has predatory effect on *B. gonionotus*.

The results clearly indicate that predatory species do not predate on all the species, because of their species specificity and predation also depends on the size of prey. It was suggested that *C. gariepinus* and *P. hypopthalamus*, can be cultured with *H. fossilis* in a water body.

References

Alam, S.M.R., 1998. Investigation on predatory effect of *Clarias gariepinus* and *Pangasius sutchi* on *Barbodes gonionotus*. M.S. Thesis, Department of Fisheries Biology and Genetics, Bangladesh Agricultural University, Mymensingh, 57 pp.

Ahmed, G.U., M. Karim, M.F.A. Mollah and R.I. Sarder, 1991. Predation of carp fingerlings by African magur. Paper presented to the Workshop on Magur Culture. Organized by DOF, MOFL, GOB and Institutional Strengthening in the Fisheries Sector, FAO/UNDP Project—BGD/87/045:16-17 February 1991.

BFRI (Bangladesh Fisheries Research Institute), 1997. Breeding and culture of commercially important catfish in Bangladesh. Progress Report, 1996-97. 6 p.

Das, M., N. Sultana, M.H. Alamgir, M.A. Hossain and M.S. Islam, 1999. Predation by *Channa striatus* (Bloch) on *Rana tigrina* (Daudin), *Puntius gonionotus* (Bleekeer) and *Labeo rohita* (Hamilton) in the laboratory. *Bangladesh J. Fish. Res.*, 3(2): 123-129.

Degani, G., Y. Ben-Zvi and D. Levanon, 1989. The effect of different protein levels and temperatures on feed utilization, growth and body composition of *Clarias gariepinus* (Burchell 1822). *Aquaculture*, 76: 293-301

Ermolin, V.P., 1981. Nutrition of the channel catfish in Cherepets' reservoir. Rybnoe Khozyistvo, Moscow 50-51.

Gheyas, A.A., 1998. Studies on cold shock induced gynogenesis and artificial breeding performance in *Heteropneustes fossilis* Bloch. M.S. Thesis, Department of Fisheries Biology and Genetics, Bangladesh Agricultural University, Mymensingh. 132 pp.

Haque, M.M. and G. Barua, 1989. Rearing of shingi (*Heteropneustes fossilis* Bloch) fry under laboratory condition. II. Feeding and growth of fry. *Bangladesh J. Fish.* 12(1): 67-72.

Hoyle, J.A. and J.A. Keast, 1987. The effect of prey morphology and size on handling in a piscivore, large mouth bass (*Micropterus salmoides*). *Can. J. Zool.*, 65: 1972- 1977.

Kamarudin, M.S., R.A. Rahman, Z.A. Aizam, S.S. Siraj and R.I. Hutagalung, 1987. Effects of four different diets on weight gain, growth, specific growth rate, feed conversion ratio and protein efficiency of *Pangasius sutchi* (Fowler) fingerlings. Proc. Tenth Annual Conference of the Malaysian Society of Animal Production, Genting Highlands, Pahang, Malaysia. pp. 192-196.

Madu, C.T. and T.T. Tsumba, 1989. Dietary protein requirement of mudfish (*Clarias anguillaris*) fingerlings: The optimum crude protein level for the diet of mudfish fingerlings in an outdoor rearing system. Annu. Rep. Natl. Inst. Freshwat. Fish. Res. (Nigeria). pp. 104-109.

Merron, G.S., 1993. Peck hunting in two species of catfish, *Clarias gariepinus* and *C. ngamensis* in the Okavango Delta, Botswana. *J. Fish. Biol.*, 43(4): 575-584.

Mollah, M.F.A. and M. T. Ahamed, 1989. A note on preliminary study of culture of Tubificid worms. *Bangladesh J. Fish.*, 12(2): 91-95.

Mollah, M.F.A., M.M. Hossain and G.U. Ahmed, 1995. Predation of African catfish on Indian major carp. *Bangladesh J. Training and Dev.,* 8: 82-84.

Parker, R.R., 1971. Size selective predation among juvenile salmonid fishes in an British Columbia inlet. *J. Fish. Res. Bd. Can.*, 28: 1503-1510.

Paszakowski, C.A. and W.M. Tonn, 1994. Effect of prey size, abundance and population structure on piscivory by yellow perch. *Trans..Am. Fish. Soc.*, 123: 855-865.

Seidel, C.R., P.S. Schauer, T. Katayama and K.L. Simpson, 1980. Culture of Atlantic silversides fed on artificial diets and brine shrimp nauplii. *Bull. Jap. Soc. Sci. Fish.*, 46(2): 237-245.

(Manuscript received 27 September 2001)