

## Feeding Behaviour and Acceptability of Different Feeds by *Puntius nigrofasciatus*

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**ABSTRACT.** In Sri Lanka until recent times, ornamental fish industry has been depending mainly on fish caught from natural water bodies. *Puntius nigrofasciatus* is a species of fish, considered to be endangered mainly due to over exploitation (Wickramanayake and Moyle, 1998).

This study was a preliminary investigation of a detailed study on *P. nigrofasciatus* to provide information on feasibility of growing this fish under suitable culture systems. Feeds of *P. nigrofasciatus* consumed under natural condition were determined by observing the gut contents of fish collected from a tributary of the Mahaweli River near Keels Aqua Farm in the Blackwater Estate, Ambagamuwa, Ginigathhena. In addition, experiments were conducted to develop appropriate natural/artificial feeds for them by offering different live and artificial feeds. The standard length of the fish which were selected for this experiment from a sample of 214 male and female fish was  $3.20 \pm 0.4$  cm with a weight of  $0.72 \pm 0.12$  g. The mean gut weight was  $0.04 \pm 0.016$  g whereas the gut length was found to be  $7.03 \pm 0.25$  cm having a relative gut length  $2.22 \pm 0.249$  cm. When the gut contents were examined, *Microcystis* spp, *Euglina* spp, *Anabaena* spp, *Coelosphaerium* spp, *Lyngbya* spp, *Nostoc*, *Zygnema* were found revealing that the major feeds of *P. nigrofasciatus* under natural condition are planktons.

Mosquito larvae, blood-worms (*Tubifex* spp), micro worms (*Anguillula silusae*) and formulated feeds were offered to adult fish on separate days and continuously for two days. Fish showed a higher preference to mosquito larvae and blood-worms but, ate micro worms and formulated feeds. Hence it can be inferred that *P. nigrofasciatus* are

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*voracious and indiscriminate feeders and prefers live feeds to artificial feeds. This fish is an omnivore and can be reared under different farming systems.*

## INTRODUCTION

The international demand for fresh water ornamental fish has shown an increase in the past few years (Hettiarachchi and Cheong, 1994) and the ornamental fish trade has become an important source of foreign exchange for Sri Lanka (Edirisinghe, 1999; De Silva *et al.*, 1985). This country has both the necessary climate and water resources required for successful production of many species of fresh water ornamental fish and plants.

The number of species of fresh water fish currently under commercial production in Sri Lanka is reasonably small, probably less than fifty species, although numerous commercial varieties exist for an individual species (Jonklass, 1991). A total quantity of 963,997 kg of fresh water fish have been exported for a value of Rs. 4.7 million during the year 1998 (Anon, 1998). In addition to the ornamental value, biologists are particularly interested in fresh water fish because they ingest mosquito larvae as part of their diet.

*Puntius nigrofasciatus* (Black ruby barb), a fresh water fish belonging to *Barbus* species having a potential for commercial production as an ornamental fish is found in shallow slow moving streams and ponds in Sri Lanka (Pethiyagoda, 1991) with a significant number of co-occurring fish species (Weerasooriya *et al.*, 1998). The body colour of this fish is dull olive green and darker dorsally. Mature males develop a red coloration on the body especially in the head region and on the caudal fin. There are three hazy dark bars on the sides of the fish (Pethiyagoda, 1991). Today, *P. nigrofasciatus* is approaching for extinction, due to direct and indirect interference by human.

This experiment was conducted to determine the preferred feeds of these fish under both natural and artificial conditions with the aim of developing suitable culture systems in order to increase their population density. Such determinations will lead to protect not only *P. nigrofasciatus*, but also other co-occurring species that are in the wild.

## MATERIALS AND METHODS

### Collection of *P. nigrofasciatus*

*P. nigrofasciatus* were caught (n=214) from a tributary of the Mahaweli River near Keels Aqua Farm, in the Black Water Estate, Ambagamuwa, Ginigathena. The sampling site was 1-3 m wide, 0.4-1.0 m deep with a stony, sandy substratum. The water flow in the stream was moderate. The collected fish were transported to the Dept. of Animal Science, Faculty of Agriculture, University of Peradeniya in oxygenated water. The fish were stocked in hatchery jars for acclimation prior to be used in the experiments.

### Body measurements of *P. nigrofasciatus*

Total length (cm), standard length (cm) and gut length (cm) of fish were measured by using a measuring board, and the body weight (g), gut weight (g) were measured by using an electronic balance.

### Determination of gut contents

The gut contents were determined according to the method described by Wickramanayake and Moyle (1998). The average weight of an individual fish was  $0.72 \pm 0.12$  g. Since the digestive system of these fish are small and fragile, entire gut with food contents were weighed, and the gut lengths were measured. Next the gut contents were removed and the different ingested matter present were taken to a slide and identified under a light microscope.

### Feeding trials on natural and formulated feeds

Mosquito larvae, blood worms (*Tubifex* spp), micro worms (*Anguillula silusiae*) and a locally prepared formulated feed (Fisheries Division, Dept. of Animal Science, Faculty of Agriculture, University of Peradeniya) were tested for palatability of *Puntius nigrofasciatus*.

### Formulated feed

Protein sources used for the formulated feed were soy bean meal, *tilapia* fish meal and shrimp head meal. The proximate composition of the formulated feed is given in Table 1.

**Table 1. Composition of the Formulated Feed.**

Component	Percentage
Protein	46.3%
Fat	13.5%
Fiber	6.2%
Dry matter	93%
Ash	13.6%

A group of twelve fish were taken for the feeding trial. Each feed was given separately and for two consecutive days. Feeding was done twice a day in the mornings and in the afternoons (10:00 am and 3:00 pm respectively). Their feeding pattern was observed for a period of 30-75 min to determine the acceptability and palatability.

### Feeding behavior after three months of rearing under artificial conditions

Mosquito larvae, micro worms and formulated feed were offered to *P. nigrofasciatus* fed with only formulated feed continuously for a period of three months. They were acclimated one day prior to the experiment. Equal quantities of the feeds were introduced at the same time to three corners of aquarium tanks having *P. nigrofasciatus* to observe the order of preference.

## RESULTS

Total length, standard length, and weight of males were always larger than those of females and higher standard deviation shown could be attributed to this (Table 2). Since the fish were from the same natural habitat, condition factor was found to be similar.

**Table 2.** Important morphometrics of *Puntius nigrofasciatus*.

Parameters	Mean ± S. D
Total length (cm)	4.03 ± 0.379
Standard length (cm)	3.20 ± 0.400
Weight (g)	0.72 ± 0.120
Gut weight (g)	0.04 ± 0.016
Gut length (cm)	7.03 ± 0.252
Relative gut length	2.22 ± 0.249
Condition factor	1.10 ± 0.155

$$\text{Relative gut length (RGL)} = \frac{\text{Gut length}}{\text{Standard length (cm)}}$$

$$\text{Condition factor} = \frac{\text{Weight}}{(\text{Length})^3} \times 100$$

## DISCUSSION

### Feeds consumed under natural conditions

Analysis of the gut contents of *P. nigrofasciatus* collected from natural resources indicated that foregut contents were green in color. The hind gut contents were brownish in colour. *Microcystis*, *Euglina*, *Anabaena*, *Coelosphaerium lyngbya*, *Nostoc*, *Zygnema* were the planktons identified in the gut contents of *P. nigrofasciatus*. Since the foregut contents were green in colour, it was easy to identify the biota present as they were not completely digested. In their natural habitats, different varieties of natural feeds may be present. The presence of different types of algae in the digestive tract infer that they prefer to consume different types of planktons. The gut length was about three times the standard body length, suggesting that this fish is an omnivorous fish. Relative gut length indicates that these fish cannot digest feed which are high in fiber.

### Feeding on natural/formulated feeds

High preference for mosquito larvae was shown by fish. All larvae were eaten immediately after the introduction into the water. A fish ate around 10 larvae within 20 min. Blood-worms were also highly preferred by fish. The rate of feeding was similar to that of mosquito larvae and was around 10 worms in 20 min. Observation of feeding micro-worms in the water is quite difficult since the micro worms are not visible to the naked eye. Therefore, from the frequent movements of fish towards the particular corner, where micro-worms were introduced and from frequent openings of their mouth, it was assumed that these fish were feeding on micro worms. This was confirmed by analysing the gut contents as well. When formulated feed was offered at the first instant, unlike with mosquito larvae and blood worms no preference was shown by fish. Fish has started feeding on the formulated feeds only from the second day onwards.

### Feeding behavior after three months of rearing under artificial conditions

When mosquito larvae, micro worms and formulated feed were offered to *P. nigrofasciatus* which were reared in aquarium tanks for over 3 months on formulated feeds, it was observed that fish were more attracted to artificial feed than the natural feeds. These fish preferred micro worms than

mosquito larvae unlike when they were offered immediately after the removal from the wild.

The change in the feeding behavior indicates that fish have got adopted to the formulated feed. Since the artificial feed composed of shrimp head meal and *tilapia* fish meal it gives a particular smell which helps fish to identify the feed easily. This observation further qualifies that this fish has a good potential of rearing as an ornamental fish since they show a high adaptability to artificial feeding condition.

### CONCLUSIONS

The preliminary observations infer that *P. nigrofasciatus* is an omnivorous feeder. It consumes not only phytoplanktons and zooplanktons, but also other live feeds such as mosquito larvae, blood-worms and micro worms as well as formulated feeds. This fish showed a high adaptability to artificial feeds. Hence, it would be useful to investigate whether *P. nigrofasciatus* could be cultured under different farming systems along with other co-occurring species so as to protect them from complete extinction.

### ACKNOWLEDGEMENTS

The financial assistance received through CARP research grant No. 12/342/247 is greatly acknowledged.

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**Weerasooriya *et al.***

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