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STUDY ON FOOD AND FEEDING BIOLOGY OF *TRICHOGASTER FASCIATA* BLOCH & SCHNEIDER, 1801 FROM A WETLAND OF NADIA DISTRICT OF WEST BENGAL

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Study on relative length of gut, food and feeding habit, gastrosomatic index and hepatosomatic index of *Trichogaster fasciata* were carried out from a wetland of Nadia district, West Bengal. A total 462 specimens of 27 to 89 mm size were collected for a period of one year (April 2003 to March 2004). The size at first maturity was recorded at 60 mm and the fishes were categorized into two groups, size group-I (< 60 mm) and size group-II (≥60 mm) for easy interpretation. The relative length of the gut (RLG) for the size group-I varied from 3.156 to 5.525 with mean value as 4.483±0.37 and in size group-II from 4.955 to 5.907 with mean value as 5.647±0.31. The food items observed in the guts were algae, diatoms, zooplankton, insects and mosquito larvae, decayed organic matter etc. Algae were the most dominant groups of food for both the groups with 23.0% and 25% followed by decayed organic matter with 20.6 % and 25.1% in group I and in group II, respectively. The common algae observed in the gut content were *Spirogyra* sp., *Ulothrix* sp., *Chlorococum* sp., *Oscillatoria* sp., *Tribonema* sp., *Cymbella* sp., *Pinnularia* sp. and *Navicula* sp. The highest percentage of algae (28.02%) was found in the month of February and that of zooplankton (9.99%) during the month of June. The value of the Gastrosomatic index (GaSI) for male varied from 0.104 to 4.955 and female 0.261 to 5.655. The HSI for male & female ranged from 0.669 to 1.351 & 0.808 to 1.397 respectively.

Key words: *Trichogaster fasciata*, food and feeding habit, RLG, GaSI, wetland, Nadia district.

Introduction

Knowledge about food and feeding habits is necessary for successful management practices in fisheries and aquaculture. Food is a basic prerequisite for growth, development, reproduction and survival of all organisms and nature of food depends upon the types of environment. Food and feeding habits of a species of fish are intimately associated with the ecological niche that they occupy in the natural environment. Study of foraging of fish needs to be done at regular intervals for bio management of fisheries (Oren, 1981).

Feeding intensity refers to the degree of feeding as indicated by the relative fullness of the stomach. It varies along with the seasonal variation, availability of preferred food items, maturity stage of the fish and spawning season of the species. The feeding intensity of mature fish decreases during the spawning period, as compared to the non-spawning period. The feeding intensity of a fish can be determined by the gastrosomatic index. Study of food and feeding habits of fishes have manifold importance in fishery biology (Singh *et al.,* 2013). Mookherjii *et al.* (1964) classified the feeding habits of some

fishes on the basis of the presence of maximum percentage of the type of food in the guts of the fish. The relationship between the food and feeding habits and structure of the alimentary canal was studied by Dasgupta (2004), Dey and Das (2006), Sarkar and Das (2006), Mishra *et al.* (2013), Rao *et al.* (2013), Chakraborty *et al.* (2016) and Dey *et al.* (2016).

The giant or banded gourami *Trichogaster fasciata* Bloch & Schneider, 1801 locally known as 'khalisha' or 'khailsha' is a small indigenous fish,which has gained popularity due to its good taste, nutritional value as well as high market price. The fish has good ornamental values and is good predator of mosquito larvae (Islam *et al.*, 2016). The species is distributed in Bangladesh, Eastern India, Nepal, upper Myanmar and Pakistan (Khongngain *et al.*, 2016). The fish inhabits the swamps, ponds, ditches, marshes and the shallow margins of rivers covered with thick vegetation and weeds (Menon, 1999; Rahman, 1989). The natural resources of this species are declining due to habitats destruction, over- exploitation for human consumption and for the aquarium trade (Mitra *et al.*, 2007). Sporadic works have been done on the food and feeding habits and other biological parameters of *T. fasciata* in certain water bodies (Moitra and Ray, 1977; Dasgupta, 2004; Gupta, 2015 and Islam *et al.*, 2016). But biological studies of *T. fasciata* from wetland of West Bengal are very rare, except the works of Mitra *et al.* (2007). The present study was conducted in the aspect of food and feeding habits and certain bio-indices of *T. fasciata* occurring in the wetland of Nadia district of West Bengal, India. The knowledge of food and feeding habits of a species helps to find out the distribution of the species which helps in successful management of the fishery.

Materials and methods

The present work was conducted in Shanti Jheel situated in Mohanpur locality of Nadia district, West Bengal. The wetland is a perennial water body having water spread area of 10.8 ha with an average water depth of 1.5 m. A total 462 specimens of *Trichogaster fasciata* were collected for a period of one year (April 2003 to March 2004). Fortnightly sampling was done for collection of specimens and around 30-60 samples were examined in every month. The total length of the specimens varied from 27 to 89 mm with minimum size at first maturity was recorded at 60 mm (Table 1). The species was categorized into two groups *viz*., group I (<60 mm) and group II (≥60 mm) for the convenience of interpretation. The total length and weight of each individual were measured to the nearest millimetre (1.0 mm) and gram (0.1 g), sex was also recorded for each specimen. The length of gut was measured with the accuracy of 1.0 mm in order to obtain the RLG and the value was recorded accordingly. The RLG value was calculated by using the following formula of Al-Hussaini, 1949. Relative Length of Gut (RLG) = length of the gut/total length of the fish.

For stomach content analysis, specimens were dissected to remove gut contents and preserved in 6% formalin. Gut contents were analyzed by both quantitative and qualitative method. The qualitative analysis consists of identification of the organisms in the gut (Pillay, 1952 and Hyslop, 1980). For quantitative estimation of food items in the gut, the point (volumetric) method was used (Hynes, 1950). For quantitative and qualitative analysis, stomach contents were washed into petri dish and food item was identified by naked eye for large organisms and by microscope for micro organisms.

Gastro-somatic index (GaSI) is the measure of gastric weight in relation to the body weight of fish. Feeding intensity of fishes was examined through the gastro-somatic index (Sinha, 1972). The monthly fluctuation of GaSI indicates the variation in feeding intensity. The GaSI was determined by the equation: GaSI = weight of the gut/weight of body × 100. The hepato-somatic index (HSI) or liver somatic index was determined using the formula: HSI = weight of the liver/weight of body × 100. The mean values of parameters were analyzed by Student's t-Test as well as Analysis of Variance technique (ANOVA) for testing their significance.

Results and discussion

In the present study minimum size at first maturity was recorded at 60 mm for female. Mitra *et al*. (2007) reported that female *T. fasciata* matured at 57 mm in the total length in floodplain wetland of Ganga river basin. But according to Das and Kalita (2006), the species matured at the size of 65 mm and 52 mm for male and female respectively in captive condition. The present finding in the maturation of the species falls within the range of the previous studies.

The RLG values recorded for the size group I varied from 3.156-5.525 with mean value 4.483±0.37 (n=228) and in the group II the value was varied from 4.955-5.907 with mean value being 5.647±0.31 (n=234) (Table 1). The higher RLG value in group II compared to the group I indicates that the larger fish ingests more food items over the juveniles. The RLG value has a close relationship with the nature of food fishes consumed.

Mitra *et al*. (2007) found that intestine of *T. fasciata* is long and coiled with size ranging from 3.3 to 9.7 cm. Dasgupta (2004) reported RLG values of 3.1, 2.89, 2.82 and 1.36 for *T. fasciata, Puntius sarana, P. javanicus* and *Cyprinus carpio* from West Bengal. He also opined that the RLG value was found to have a close relation with the vegetable matter and animal matter present in the gut content. The value increases with the increased vegetable matter in the gut and decreased with more animal matter in the gut. Das and Nath (1965) also stated RLG values of two omnivorous fishes, *viz. Puntius conconius* and *Barbus hexastichus* as 3.3 and 2.3 respectively.

In the present study, the RLG values are congruent to the outcomes of such studies and thus can be considered as herbi-omnivore fish.

The percentage composition of diet during different months is given in Fig. 1. The food items observed in the guts were algae, diatoms, zooplankton, insects and mosquito larvae, decayed organic matter *etc*. Algae were the most dominant groups of food for both the groups with 23.0% and 25.0 % followed by decayed organic matter with 20.6 % and 25.1%, diatoms with 11.4% and 10.3%, zooplankton with 9.7% and 7.2% and insects and mosquito larvae with 7.4% and 8.3% in group I and in group II, respectively. Miscellaneous food items constituted 27.9 and 24.1% for group I and group II respectively. There was a considerable amount of sand and mud in the gut content which was not taken into consideration as food items. The common algae

Table 1. Relative length of gut (RLG) of *Trichogaster fasciata* in different size groups

Size group	Sample size 'n'	RLG value (range)	Average (± SD)
Group I (<60 mm)	228	3.156-5.525	4.483 ± 0.37
Group II (≥60 mm)	234	4.955-5.907	5.647 ± 0.31

observed in the gut content were *Spirogyra* sp., *Ulothrix* sp., *Chlorococum* sp., *Oscillatoria* sp., *Tribonema* sp., *Cymbella* sp., *Pinnularia* sp. and *Navicula* sp. The highest percentage of algae (28.02%) was found in the month of February and that of zooplankton being maximum share (9.99%) in the month of June.

Mitra *et al.* (2007) stated that in *T. fasciata* plant materials dominated the gut contents (91%) with *Anabaena* sp., *Anomoinies* sp., *Closterium* sp., *Diatoma* sp., *Microsystis* sp., *Navicula* sp. and *Nitzchia* sp. The zooplankton commonly occurring was *Brachionus* sp., *Chironomus* sp. larvae, *Cyclops* sp., *Cypris* sp. and *Notholca* sp. Hence, the species was placed under herbivore category based on the dominant availability of plant matters in the gut (Mitra *et al*. 2007 and Mookerjee *et al.* 1946). Islam *et al.* (2016) also reported that the alimentary canal of *T. fasciata*

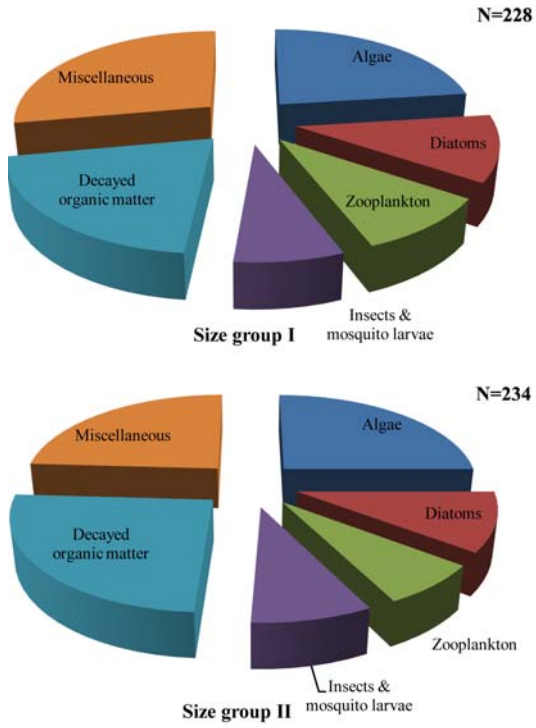

Fig. 1 Percentage composition of the diet in Trichogaster fasciata as per size groups

was long and coiled and plant materials (48.0%) dominated the food items and categorized the species as an herbivore. Some authors also mentioned that the species is typically omnivore due to presence of both plant and animal matter in the gut (Das and Moitra 1963; Moitra and Ray 1977; Das and Kalita 2006).

Dasgupta (2004) categorized fish species according to their food habits and mentioned that *T. fasciata* is omnivore with vegetable matter 84.66% and animal matter 15.54%. Mitra *et al.* (2007) found a correlation of feeding intensity with the breeding periodicity of *T. fasciata*; low feeding activity has been reported during spawning months while intense feeding has been observed in post-spawning season. In another gourami *Trichogaster trichogaster*, Alfred (1962) observed the seasonal variation of food items in the gut. Prasad and Prasad (1985) studied the feeding behavior of *T. fasciata* and reported that in larval stages fishes ingest small organic matter, in juvenile ingest zooplankton and insect larvae and adults ingest mixed varieties of food.

The gastrosomatic index indicates the fullness of the stomach. Throughout the study period, the highest value of GaSI for male was recorded during the month of December (3.055) and lowest during July (1.806) (Fig. 2). In females, the highest value was recorded during the month of September (4.232) and lowest during July (0.916). There was a significant difference ($p<0.05$) in GaSI value in different months. The highest GaSI value during winter season indicates ingestion of more food items in that season and lowest during monsoon indicates spawning periods of the species. Chaturvedi and Saksena (2013) studied GaSI of *Mystus cavasius* and reported maximum value in the month of January (5.43±0.10) and minimum during the month of June (2.97±0.47) which has resemblance with the present study.

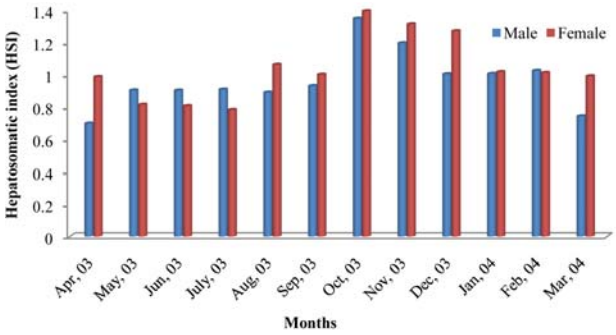

Fig. 2. Monthly variations in GaSI in *Trichogaster fasciata*

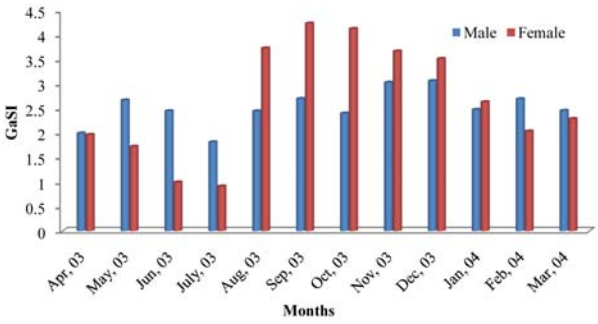

Fig. 3. Monthly variations of the Hepatosomatic index (HSI) in *Trichogaster fasciata*

Dewan and Saha (1979) reported that *Tilapia* species showed low feeding intensity during the month of February to June. In *Rita rita*, Mushahida-Al-Noor *et al*. (2013) found maximum number of empty stomachs in the month of June.

The HSI is a reliable indicator of gross changes as various metabolic activities of the body are entered in liver (Saxena, 2000). In the present study, HSI varied from 0.699 to 1.351 in male and from 0.784 to 1.397 in female (Fig. 3). A definite trend of variation in HSI was lacking in the present study. There was significant variation ($p<0.05$) in the values in different months. A relatively low value of HSI was observed during the month of May, June and July which happens to be pre-spawning and spawning period of the fish and high value was observed during the months of October, November and December. The HSI value was found low during the months of May-July and February in female compared to male and was more during rest of the months. It indicates that female *T. fasciata* maintains a gradual increment of energy reserves from August onwards till next April which coincides with the post- spawning and pre-spawning period of the species. Wingfield and Grimm (1977) found the HSI was highest in the pre-spawning season and lowest in the post-spawning period of the Irish Sea plaice (*Pleuronectes platessa*). Inverse correlation of liver weight and gonad weight were found in *Gasterosteus aculeatus* (Wootton *et al.*, 1978); *Salvelinus fontinalis* (Larson, 1974); *Xiphophorus helleri* and it resembles with the present work.

Chaturvedi and Saksena (2013) reported that in *Mystus cavasius* highest HSI value was observed (3.55±0.17) during December, and it was minimum (1.87±0.39) in June. A similar result was also reported by Sadekarpawar and Parikh (2013) in *Oreochromis mossambicus*. So, it can be inferred that hepatosomatic index is maximum in active feeding season and minimum during low feeding activity period of this species.

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