International Journal of Advanced Multidisciplinary Research
ISSN: 2393-8870
www.ijarm.com
DOI: 10.22192/ijamr Volume 3, Issue 12 -2016

Research Article

DOI: http://dx.doi.org/10.22192/ijamr.2016.03.12.002

Feeding ecology of ticto barb *Puntius Ticto* (Hamilton, 1822) of the river old Brahmaputra in Bangladesh

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Keywords

Food, Feeding, Environment, Consumer and Ecology.

Abstract

Feeding ecology of *Puntius ticto*, of the river Old Brahmaputra near Bangladesh Agricultural University, Mymensingh was studied. The fish, locally known as Tit punti, belongs to the family Cyprinidae. Fishes were sampled from February 2010 to January 2011. Stomach content, seasonal variation of food and feeding habits and size group relationship with their food and feeding habits were analyzed in the research work. To conduct the work numerical method, frequency of occurrence method, index of fullness method and point's method were done. The stomach was found to contain various groups of phytoplankton, zooplankton and other unidentified stuffs. Phytoplankton (97.33%) dominated the diets. Thirty-seven genera of phytoplankton were found in the gut content of *P. ticto.* Among them, Bacillariophyceae (10 genera), Chlorophyceae (17 genera), Cyanophyceae (7 genera), Euglenophyceae (2 genera) and Rhodophyceae (1 genera) were idenfied. Eight genera of zooplankton belonging to Crustacea (1 genera) Rotifera (6 genera) and Cladocera (1genera) were recorded from the guts. Among the phytoplankton, Chlorophyceae was observed highest in abundance, and Cyanophyceae, Bacillariophyceae and Euglenophyceae took second, third and fourth position respectively. Among the zooplankton (2.67%), Rotifera was dominant group and Crustacea was the least one. Ticto barb *P. ticto* fed on phytoplankton much more than zooplankton. The average amount of stomach content was higher in May, June, July, March and April than other months of the year. There was no empty stomach found throughout the study period. Maximum plankton was found in the stomach of the fish of size group-2 (45-54 mm) and minimum was found in the stomach of the fish of size group-4 (65-74 mm). From the research work, it was found that *P. ticto* was a planktivorous fish species with preference for phytoplankton to zooplankton where Chlorophyceae was the most preferable food for them.

Introduction

Bangladesh is called the country of river. It is situated in the north eastern part of the south Asian sub-continent, has an area of 1, 47,570 square kilometers (56,977 sq. miles). There are about 46, 52,665 ha of inland and 16, 60,730 ha of marine waters (DoF, 2010). Fish is a major food item and plays a very important role to food and nutrition security in Bangladesh. Fish and fisheries are inseparable part in life and culture of the people of this country. The economy of Bangladesh basically depends upon agriculture, livestock and fisheries. Fisheries play

an important role in supplying food, providing employment opportunity and earning foreign exchange. Fisheries contribute about 58% to the nation's animal protein intake (DoF, 2010). Bangladesh produced about 2.8 million metric tons of fish per year and about 82% of the total production comes from inland resources of which about 38% from culture and 35.52% from capture fisheries (Anonymous, 2010). Fish is one of the most important sources of animal protein and has been widely accepted as a good source of protein and other elements for the maintenance of healthy body (Andrew, 2001). *Puntius ticto* (Hamilton, 1822), is one of the Cyprinid fish species under the class Actinopterygii (ray-finned fishes), the order Cypriniformes and the family Cyprinidae. The Fish Base name of this fish is ticto barb locally known as tit punti in Bangladesh. This is one of the most common, small-sized Cyprinid caught in large quantities from various habitats living in standing and flowing waters. They are distributed in the rivers of India and Bangladesh affluent to the Bay of Bengal, reported from Pakistan and Afghanistan also. It is a plankton feeder and mostly feed on phytoplankton (Rahman, 1989).

Puntius ticto locally known as tit punti is one of important ones. This small fish is esteemed as a quality food containing high amount protein, fat, carbohydrate, calcium and vitamin. In spite of having enormous economic and nutritional importance of this fish species to the rural people and fishing community, no adequate studies on their population parameters, namely age, growth, recruitment, reproduction and mortality have done in Bangladesh.

Small indigenous fish species (SIS) are a valuable source of macro and micro nutrients play an important role to provide essential nutrients for the people of Bangladesh. Analysis of SIS showed that they contain large amounts of vitamin–A. According to a recent nutrition survey approximately 30,000 children are becoming blind each year due to vitamin-A deficiency in this country (Thilsted *et al*., 1997).

Materials and Methods

Information about the study area

The research work was conducted with the fishes which were collected from the part of the river old Brahmaputra, near Bangladesh Agricultural University, Mymensingh. It lying between latitude $23^0$58'and $25^0$25'N and longitude $89^0$38' and $91^0$15'E with the average elevation of the area in 11.59 meter above the sea level and finally it falls into the Meghna and the Meghna falls into the Bay of Bengal.

Collection of *P. ticto* sample

Hundred fish samples of *P. ticto* were collected from part of the river Old Brahmaputra near Bangladesh Agricultural University campus once in a month from February 2010 to January 2011 in the morning.

Preservation of collected fish samples

In total of 1200 fish samples were collected randomly. Immediately after collection, the fishes were preserved in a plastic bottle with 10% formalin to prevent further digestion of food materials.

Collection of stomach

Fifteen fishes were chosen randomly to study the stomach contents at each month.

Analysis of stomach content

Each stomach contents were analyzed separately. The body cavity of fish was carefully opened and the alimentary canal was dissected out into a clean petridish.

Quantitative Study

The quantitative study of plankton was done by S-R cell under microscope.

Counting

The cell was filled and covered with cover slip so as to eliminate air bubbles and left to stand for 15 minutes to allow the plankton to settle. The under microscope plankters were counted in 10 or more fields randomly.

Calculation

Calculation of plankton of concentrated sample is done by the using of the following formula (Rahman, M.S. 1992).

$$N = \frac{A*1000*C}{V*F*L}$$

Where,
N= No of plankton cell
A= Total no of plankton counted
C= Volume of final conc sample in ml
V= Volume of a field in cubic mm
F= No of field counted
L= Volume of original water in liter

Methods to identify food items

There are several methods used for the determination of food items taken by the fish, these are-
i) Numerical method.
i) Frequency of occurrence method.
ii) Index of fullness method and
iii) Point's method

Results

The result of stomach content of *P. ticto* was analyzed on the basis of 3 aspect of feeding ecology:
A. General investigation of diets;
B. Seasonal variation in feeding ecology;
C. Relationship between fish size and feeding ecology;

A. General investigation of diets;

i) Food items found in the stomach of *P. ticto*

Eight major groups were identified in the stomach content of *P. ticto.* Five groups of phytoplankton (Bacillariophyceae, Chlorophyceae, Rhodophyceae, Cyanophyceae, Euglenophyceae) and three groups of zooplankton (Rhotifera, Cladocera, Cruscea) were found.

ii) Monthly pattern of feeding

Stomach contents

The stomach of the examined *P. ticto* was found to contain various groups of phytoplankton, plant parts and zooplankton.

Percentage of empty stomach

No fishes with empty stomachs were recorded throughout the study period (From February 2010 to January-2011).

Average index of fullness

The values of average index of fullness fluctuated and revealed monthly variations. The highest index value (4.00) was recorded in May and July and the lowest was (1.50 in January Table1).

Table1. Monthly patterns of feeding of *P. ticto* based on the number of fish, percentage of empty stomach and average index of fullness during February 2010 to January 2011.

Month	Items			
	No. of fish examined	No. of stomach with contents	Percentage of empty stomach	Average index of fullness
February	10	10	0	3.00
March	10	10	0	3.70
April	10	10	0	3.60
May	10	10	0	3.50
June	10	10	0	3.60
July	10	10	0	4.00
August	10	10	0	3.10
September	10	10	0	3.30
October	10	10	0	2.90
November	10	10	0	3.80
December	10	10	0	2.50
January	10	10	0	1.50

B. Seasonal changes of feeding

P. ticto fed maximum in summer and minimum in winter. It started to feed more from spring which was peak in summer and thereafter gradually decreased from autumn to winter. Seasons were classified as, Spring- from February to April, summer from May to July; autumn from August to October and Winter- from November to January.

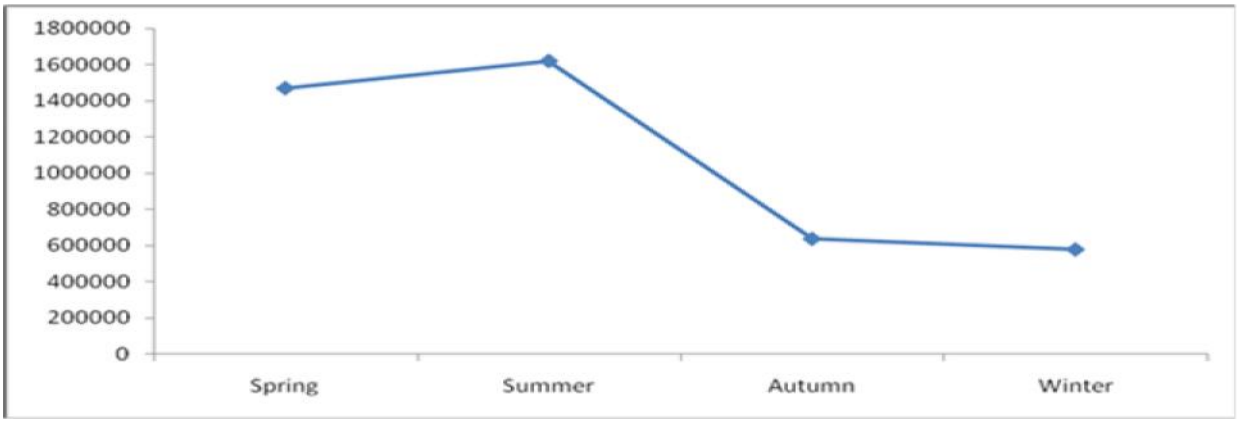

Table 2: Seasonal changes of average gut contents of *P. ticto* during the experimental periods

Ontogenetic Relationship between fish size and feeding ecology

The results based on food categories according to occurrence method and total points methods.

Table3. Average composition of stomach contents of *P. ticto* based on percentage of occurrence and percentage of total points.

Food group	No. of fish examined	No. of fish in which occurred	Percentage of occurrence	Percentage of total points
Bacillariophyceae	120	120	100	21.75
Chlorophyceae	120	120	100	*35.6*
Cyanophyceae	120	120	100	24.6
Rhodophycea	120	90	75	4.5
Euglenophyceae	120	120	100	7.22
Rotifera	120	120	100	5.35
Cladocera	120	80	66.67	0.43
Crustacea	120	50	41.67	0.53

C. Relationship between fish size and patterns of feeding

A total of 180 fish species belong to five size groups were examined. Size group- 1 (25-34 mm), Size group-2 (35-44 mm), Size group-3 (45-54 mm), Size group-4 (55-64 mm), Size group-5 (65-74 mm). These size groups were studied to determine the relationship between size of fish and feeding pattern.

Table 4. Relationship between size and fullness of stomach *P. ticto* based on average index of fullness and average points per fish.

Items	Size group-1 (25-34mm)	Size group-2 (35-44mm)	Size group-3 (45-54mm)	Size group- 4 (55-64mm)	Size group-5 (65-74mm)
No. of fish examined	20	30	40	23	7
Average index of fullness	3.16	3.95	3.79	2.93	3.62
No. of fish with empty stomach	0.00	0.00	0.00	0.00	0.00
Percentage of empty stomach	0.00	0.00	0.00	0.00	0.00

Discussion

In the period of experiment, total numbers of 45 genera belonging to 8 planktonic groups were identified from the stomach contents of the examined fishes. Phytoplanktons are mainly composed of 5 major phytoplankton groups: Bacillariophyceae, Chlorophyceae, Cyanophyceae, Rhodophyceae and Euglenophyceae and zooplankton composed of three groups: Rotifera Cladocra, Crustacea. The present recording of 37 genera of phytoplankton belonging to Bacillariophyceae (10 genera), Chlorophyceae (17 genera), Cyanophyceae (7 genera) and Euglenophyceae (2 genera) Rhodophyceae (1 genera) agreed with findings of Ahmed *et al.*, (1993) who recorded 27 genera of phytoplankton and Wahab *et al.*, (1994) also identified 24 genera of phytoplankton. In present study, Chlorophyceae was dominant group among the phytoplankton which is supported by Wahab *et al.*, (1995), Nirod (1997), Kohinoor (2000), Raihan (2001) and Uddin (2002). Chlorophyceae dominated the plankton population in terms of number in abundance whereas Cyanophyceae, Bacillariophyceae, Euglenophyceae and Rhdophyceae was 2nd, 3rd, 4th and 5th position. Among the genera of phytoplankton, the most dominant genera were Aphanothece, Spirogyra, Microcystis, and Oscilatoria, Chlorella, Tetraedon which were closely followed by Ankistrodesmus and Cyclotella. The values of average index of fullness revealed to monthly variation. The highest value was recorded in May (4.00), and July (4.00) and the lowest in January (1.50). Average stomach content of the fishes belong to size group-2 was found more than those of other 4 size groups.

Some particles were found in the stomach of examined fishes but were not properly identified. They may be debris, plants parts or anything else. Therefore, by numerical findings of stomach content, average index of fullness, frequency of occurrence and points methods, it is confirmed that *P. ticto* is a plankton feeder and the fish showed highest preference for Chlorophyceae. This fish also pelagic and planktivorous in the surface of water body.

Conclusion

A total of 120 fish specimens belong to five groups were studied to determine the relationship between fish size and feeding pattern. Average stomach content of the fish belong to size group-2 was found highest and the lowest was found in size group-4 based on average index of fullness.

Therefore, considering the findings of the present research work, the following conclusions can be drawn.The stomachs of *P. ticto* were found to contain various groups of phytoplankton and only three groups of zooplankton. Among phytoplankton, Chlorophyceae was dominant group followed by Cyanophyceae. Among zooplankton, three groups, Rotifera was found. *Spirogyra, Tetraedon, Chlorella, Aphanothece*, *Microcystis* and *Oscillatoria* were dominant genus among phytoplankton on the other hand *Asplanchna* was dominant genus among zooplankton. Therefore, finally it was concluded that *P. ticto is a* planktivorous small indigenous fish species, which feeds in the surface and sub-surface of the water body.

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	Website: www.ijarm.com
	Subject: Fishery Science
Quick Response Code	
DOI:10.22192/ijamr.2016.03.12.002	

How to cite this article:
Md. Mozammel Hoque, Zoarder Faruque Ahmed and Kaniz Fatema. (2016). Feeding ecology of ticto barb *Puntius Ticto* (Hamilton, 1822) of the river old Brahmaputra in Bangladesh . Int. J. Adv. Multidiscip. Res. 3(12): 6-11.
DOI: http://dx.doi.org/10.22192/ijamr.2016.03.12.002