Volume : 2 | Issue : 5 | May 2013 • ISSN No 2277 - 8179

Food And Feeding Habit Of *Amblypharyngodon mola* (Hamilton-Buchanan, 1822) In West Bengal, India

Fisheries

KEYWORDS : *Amblypharyngodon mola*, Food, Feeding habit, West Bengal, India

Sandipan Gupta — Aquaculture Research Unit, Department of Zoology, University of Calcutta, 35, Ballygunge Circular Road, Kolkata- 700019, West Bengal, India

Samir Banerjee — Aquaculture Research Unit, Department of Zoology, University of Calcutta, 35, Ballygunge Circular Road, Kolkata- 700019, West Bengal, India

ABSTRACT

To get success in culture of any fish species, detail knowledge on food and feeding habit of that particular fish species is really essential. Except the work of Piska et al. (1991) no such detail work till date has been performed on food and feeding habit of Amblypharyngodon mola in agro-climatic context of India. So the present study has been performed to get the information on the food and feeding habit of this fish species. Gastro-Somatic-Index, Relative Length of Gut, Gut Fullness & Feeding Intensity and Gut Content Analysis have been studied. Results have revealed Amblypharyngodon mola as herbivorous fish and phytoplankton as the basic food group for this fish species; chlorophyceae has been observed as the most preferable food class. Feeding activity has been observed to vary according to the breeding season; lowest and highest feeding activity has been observed during intense breeding season and pre-spawning months respectively.

Introduction

Amblypharyngodon mola, commonly known as Mola Carplet or Pale Carplet is a freshwater species; a natural inhabitant of ponds, streams, ditches, beels, baors, reservoirs and inundated fields. The species is distributed in India, Bangladesh, Pakistan and Myanmar (Talwar and Jhingran, 1991). In West Bengal it is locally known as mourala, mowa or mowka. It is a popular food fish here in West Bengal due to its good taste as well as high nutrient value with presence of good amount of vitamin A, protein and mineral contents (Zafri and Ahmed, 1981; Saha et al., 2009). In recent times, it has also got its entry in ornamental fish trade and has been reported to be available in ornamental fish markets with moderate demand and availability (Gupta and Banerjee, 2012).

Feeding is the dominant activity of the entire life cycle of fish (Royce, 1972) and food is the main source of energy which plays an important role in determining the population levels, rate of growth and condition of fishes (Begum et al., 2008). The success on good scientific planning and management of fish species largely depends on the knowledge of their biological aspects, in which food and feeding habits include a valuable portion (Sarkar and Deepak, 2009). Study of food and feeding habits of fishes have manifold importance in fishery biology and in fisheries management programme (Khan and Fatima, 1994; Sarkar and Deepak, 2009).

Like all organisms, fishes require energy to fuel their body machinery and processes, including growth, metabolism and reproduction. For successful fish farming a thorough knowledge about the food and feeding habit is necessary (Bhuiyan et al., 2006; Begum et al., 2008). As the nature of food depends to a great extent upon the nature of environment, the problem is interesting from specific, as well as ecological point of view. The food and feeding habit of fishes vary from season to season; seasonal change in temperature not only influence food consumption and rate of digestion but also quality and quantity of available food organisms.

Earlier detail work on food and feeding habit of *Amblypharyngodon mola* have been carried out in Bangladesh (Mustafa, 1991; Miah and Siddique, 1992; Mamun et al., 2004) but the same is lacking here in India except the work of Piska et al. (1991). So, the present work has been conducted to study the food and feeding habit of *Amblypharyngodon mola*.

Materials and Methods

Monthly samples of *Amblypharyngodon mola* have been collected from September, 2009 to August, 2010 from an undisturbed wetland near Baruipur, South-24-Paraganas, West Bengal, India (Latitude N 22°34', Longitude E 88°43'). In total, 240 specimens have been collected during the entire study period for studying the feeding biology.

After collection, fish specimens have been transferred to ice box and morphometric study has then been performed after reaching laboratory. Total Length (TL) in cm has been measured for each of the individual fish from tip of the mouth to tip of the caudal fin using a measuring scale to the nearest of 0.1 cm and the Total Body Weight (TBW) in grams has been measured for each individual fish species to the nearest of 0.01 gm using an electronic balance (Sartorius, Model No. BT 223S). Before weighing, each of the specimens has been washed with water and left exposed to air and the excess of moisture has been dried off with the help of a blotting paper for taking accurate weight. After that fish specimens have been dissected and then gut has been removed carefully. Then Total Weight of Gut (TWG) and Total Length of Gut (TLG) have been measured to the nearest of 0.01 gm and 0.1 cm respectively. Gastro Somatic Index (GaSI), Relative Length of Gut (RLG), Gut Fullness & Feeding Intensity and Gut Content Analysis have been done to study the food and feeding habit of *Amblypharyngodon mola*.

Gastro Somatic Index (GaSI) has been measured using the following equation:

$$GaSI = \frac{\text{Total Weight of Gut (gm)} \times 100}{\text{Total Body Weight (gm)}}$$

Relative Length of Gut (RLG) value has been measured following the formula (Al-Hussaini, 1949):

$$RLG = \frac{\text{Total Length of Gut (cm)}}{\text{Total Body Length (cm)}}$$

The RLG values calculated have then been grouped in response to different size classes (length interval of 1.0 cm) to know any change of RLG value in respect to size.

After that gut fullness has been assessed according to the subjective scale described by Lebedev (1946) as empty, ¼ full, ½ full, ¾ full and full. The data have then been used to calculate the monthly Fullness Index (FI) to determine the percentage of feeding intensity:

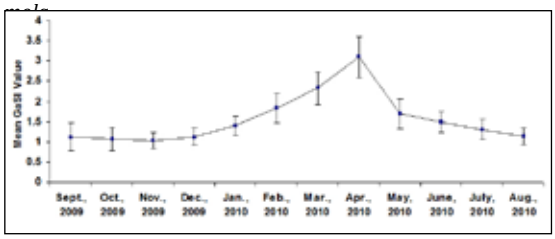
$$FI = \frac{\text{Number of gut with same degree of fullness} \times 100}{\text{Total number of gut examined}}$$

GaSI Value

The mean monthly values of Gastro-Somatic-Index (GaSI) have

been observed to become high during February to April with the peak being in April. Then it started to drop down from May onwards; reached the lowest value in the month of November and then gradually started to increase from December onwards to reach the peak again in the month of April. (Fig. 2)

Fig.2: Monthly variation of GaSI values in *Amblypharyngodon mola*



Gut Content Analysis:

The food types which have been observed during the gut content analysis of *Amblypharyngodon mola* have been categorized into eight classes namely Chlorophyceae, Bacillariophyceae, Cyanophyceae, Euglenophyceae, Planktonic Crustacea, Rotifera, Plant Parts and Unidentified Species. Results of monthly analysis of gut content following percentage of occurrence method and points method have been represented in Table 1 and Table 2 respectively.

Chlorophyceae has been observed with an average of 44.46% according to the percentage of occurrence method. Chlorophyceae has been found as the most abundant group and has been observed on regular basis in the gut contents throughout the study period. *Pediastrum*, *Tetraedron*, *Scenedesmus*, *Spirogyra*, *Coelastrum* have Gut Content Analysis has been performed following two methods; namely Percentage of Occurrence (Hynes, 1950) and Points Method (Pillay, 1953). To estimate the dominant food items, results of the percentage of occurrence and points method have been combined to yield the Index of Preponderance (IP) proposed by Natarajan and Jhingran (1961):

$$IP = \frac{V_1O_1 \times 100}{\Sigma V_1O_1}$$

V_1 = Volume of the particular food item
O_1 = Occurrence of the particular food item
IP = Index of Preponderance

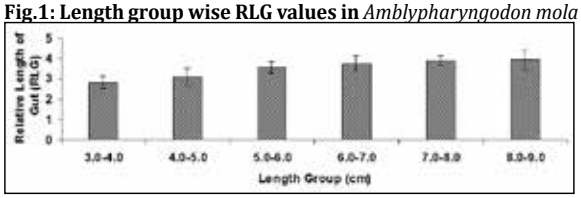
All prey items in the gut content have been identified at genus level following standard keys (Philipose, 1960; Jana, 1973; Battish, 1992; Sharma, 1999; Venkataraman, 1999; Khan, 2003; Bilgrami and Saha, 2004).

Results

RLG Value

Total Body Length versus Total Length of Gut ratio has been observed to vary from 1:2.81 (length group 3 cm - 4 cm) to 1:3.92 (length group 8 cm - 9 cm) with a mean value of 1:3.51 (Fig. 1). No such significant change in RLG values has been observed with changing Total Body Length of the fish specimens while studying the length group wise change of RLG values.

Fig.1: Length group wise RLG values in *Amblypharyngodon mola*



been observed as the dominant genus among them. The highest percentage of chlorophyceae has been observed during June and lowest percentage in January. Chlorophyceae has been observed with an average of 40.21% according to the points method. The highest percentage has been observed in July and lowest percentage has been observed in January.

Bacillariophyceae has been observed with an average of 24% according to the percentage of occurrence method. Bacillariophyceae has been found to be the second most abundant group. *Navicula*, *Nitzschia* and *Melosira* have been observed as the dominant genus among them. The highest percentage of bacillariophyceae has been observed during February and lowest percentage in July. Bacillariophyceae has been observed with an average of 24.38% according to the points method. The highest percentage has been observed in April and lowest percentage has been observed in July.

Cyanophyceae has been observed with an average of 11.58% according to the percentage of occurrence method. Cyanophyceae has been found to be the third most abundant group. *Anabaena* and *Microcystis* have been observed as the dominant genus among them. The highest percentage of cyanophyceae has been observed during December and lowest percentage in July. Cyanophyceae has been observed with an average of 12.92% according to the points method. The highest percentage has been observed in December and lowest percentage has been observed in June.

Euglenophyceae has been observed with an average of 8.30% according to the percentage of occurrence method. Euglenophyceae has been found as the fourth most abundant group. *Euglena* has been observed as the only genus identified. The highest percentage of euglenophyceae has been observed during November and lowest percentage in August. Euglenophyceae has been observed with an average of 9.41% according to the points method. The highest percentage has been observed in January and lowest percentage has been observed in August.

Rotifera has been observed with an average of 6.38% according to the percentage of occurrence method. Rotifera has been found as the fifth most abundant group. *Brachionus* and *Keratella* have been observed as the most dominant genus among them. The highest percentage of rotifera has been observed during June and lowest percentage in December. Rotifera has been observed with an average of 7.49% according to the points method. The highest percentage has been observed in January and lowest percentage has been observed in June.

Planktonic Crustacea has been observed with an average of 3.07% according to the percentage of occurrence method. *Diaphanosoma*, *Daphnia*, *Mesocyclops* have been observed as the most dominant genus among them. The highest percentage of planktonic crustacea has been observed during July and lowest percentage in December. Planktonic Crustacea has been observed with an average of 3.89% according to the points method. The highest percentage has been observed in January and lowest percentage has been observed in July.

Unidentified Species has been observed with an average of 1.30% according to the percentage of occurrence method. The highest percentage of this group has been observed during May and lowest percentage in September. This food item has been observed with an average of 0.89% according to the points method. The highest percentage has been observed in January and lowest percentage has been observed in July.

Plant Parts have been observed with an average of 0.91% according to the percentage of occurrence method. The highest percentage of this group has been observed during July and lowest percentage in January. This food item has been observed with an average of 0.81% according to the points method. The highest percentage has been observed in July and lowest percentage has been observed in January.

Indices of Preponderance determined for chlorophyceae, bacillariophyceae, cyanophyceae, euglenophyceae, rotifera, planktonic crustacea, unidentified species and plant parts are 67.15%, 21.99%, 5.62%, 2.93%, 1.79%, 0.45%, 0.04% and 0.03% respectively. (Table 3)

Volume : 2 | Issue : 5 | May 2013 • ISSN No 2277 - 8179

Gut Fullness and Feeding Intensity

Gut fullness has been categorized into five classes namely: empty, ¼ full, ½ full, ¾ full and full. Fishes with full gut have been observed from January to July with highest percentages being observed from February to April. Fishes with ¾ full gut have been observed from January to September with highest percentages being observed from February to April. Fishes with ½ full gut have been observed all through the season with highest percentages being observed from May to July and again in December and January. Fishes with ¼ full gut have been observed all through the season expect in the month of April; highest percentages being observed from August to December. Fishes with empty gut have been observed in January and then again from May to December; highest percentages being observed in October and November. (Table 4)

The Fullness Indices determined are 15.38%, 16.41%, 26.82%, 25.42% and 15.97% for full, ¾ full, ½ full, ¼ full and empty gut respectively (Table 4).

Table 1: Monthly variation in composition of different food items following percentage of occurrence method in the gut content of *Amblypharyngodon mola*

Month	Chlorophyceae	Bacillariophyceae	Cyanophyceae	Euglenophyceae	Planktonic Crustacea	Rotifera	Plant Parts	Unidentified Species
Sept., 2009	44.38	25.12	13.53	6.41	3.25	5.90	0.89	0.52
Oct., 2009	45.97	22.23	10.18	8.85	3.47	7.46	0.75	1.09
Nov., 2009	45.61	20.20	9.95	13.01	2.88	6.44	0.61	1.30
Dec., 2009	42.20	21.59	17.80	10.99	1.60	3.72	0.46	1.62
Jan., 2010	36.48	27.63	12.37	9.77	3.63	9.06	0.37	0.70
Feb., 2010	39.13	33.69	10.40	7.73	2.34	4.90	0.54	1.27
Mar., 2010	43.92	22.61	13.04	10.78	2.23	5.65	0.66	1.11
Apr., 2010	44.46	26.36	10.68	9.08	2.90	4.77	0.71	1.04
May, 2010	45.32	26.79	10.79	6.10	2.44	4.93	0.90	2.73
June, 2010	50.47	19.44	9.94	4.95	2.71	9.90	1.26	1.33
July, 2010	48.68	18.05	8.80	7.74	6.03	6.63	2.42	1.65
Aug., 2010	46.75	24.27	11.53	4.22	3.37	7.21	1.37	1.28
Yearly Average (% Occurrence)	44.46	24.00	11.58	8.30	3.07	6.38	0.91	1.30

Table 2: Monthly variation in composition of different food items following percentage of points method in the gut content of Amblypharyngodon mola

Month	Chlorophyceae	Bacillariophyceae	Cyanophyceae	Euglenophyceae	Planktonic Crustacea	Rotifera	Plant Parts	Unidentified Species
Sept., 2009	43.92	21.29	13.41	6.44	3.62	9.66	0.88	0.78
Oct., 2009	37.87	27.24	13.23	9.11	3.29	7.84	0.72	0.70
Nov., 2009	41.63	22.15	10.81	10.84	4.91	7.94	0.56	1.16
Dec., 2009	34.38	22.94	17.77	11.64	4.70	6.80	0.46	1.31
Jan., 2010	31.03	21.24	12.69	14.03	7.45	11.49	0.29	1.78
Feb., 2010	36.59	24.67	14.08	12.30	3.24	7.92	0.42	0.78
Mar., 2010	38.57	25.33	14.59	11.33	3.10	5.77	0.50	0.81
Apr., 2010	36.54	32.11	12.43	8.27	2.31	6.78	0.67	0.89
May, 2010	40.27	27.52	12.34	7.68	3.39	6.99	0.90	0.91
June, 2010	46.55	24.13	9.31	7.92	5.04	5.20	1.31	0.54
July, 2010	49.91	18.59	12.82	7.70	2.05	6.75	1.86	0.32
Aug., 2010	45.27	25.32	11.51	5.65	3.61	6.79	1.13	0.72
Yearly Average (% Points)	40.21	24.38	12.92	9.41	3.89	7.49	0.81	0.89

Table 3: Index of Preponderance (IP) of food items in the gut content of *Amblypharyngodon mola*

Food Class	% of total points	% of occurrence	V x O	IP	Grade
Chlorophyceae	40.21	44.46	1787.74	67.15	I
Bacillariophyceae	24.38	24.00	585.12	21.99	II
Cyanophyceae	12.92	11.58	149.61	5.62	III
Euglenophyceae	9.41	8.30	78.10	2.93	IV
Rotifera	7.49	6.38	47.79	1.79	V
Planktonic Crustacea	3.89	3.07	11.94	0.45	VI
Unidentified Species	0.89	1.30	1.16	0.04	VII
Plant Parts	0.81	0.91	0.74	0.03	VIII

Table 4: Monthly variation of percentage of different classes of gut fullness in *Amblypharyngodon mola*

Month	Full Gut	¾ Full Gut	½ Full Gut	¼ Full Gut	Empty Gut
Sept., 2009	-	5.12	25.86	45.14	23.88
Oct., 2009	-	-	21.62	41.91	36.47
Nov., 2009	-	-	17.05	45.29	37.66
Dec., 2009	-	-	36.89	49.92	13.19
Jan., 2010	14.43	25.67	38.62	13.65	7.63
Feb., 2010	33.22	40.84	16.78	9.16	-
Mar., 2010	48.28	37.33	12.64	1.75	-
Apr., 2010	61.73	31.45	6.82	-	-
May, 2010	17.07	16.04	47.73	13.93	5.23
June, 2010	6.89	15.72	38.31	21.95	17.13
July, 2010	2.99	16.03	34.43	22.58	23.97
Aug., 2010	-	8.69	25.05	39.75	26.51
Feeding Intensity	15.38	16.41	26.82	25.42	15.97

Discussion

In *Amblypharyngodon mola*, the RLG values have been observed to vary from 2.81 to 3.92 with a mean value of 3.51±0.41. Al-Hussaini (1947) earlier enlisted the RLG values for carnivorous (0.5-2.4), omnivorous (1.3-4.3) and herbivorous (3.7-6.0) fishes. Das and Moitra (1963) later also mentioned that RLG value is generally low in carnivorous fish, higher in omnivorous fish and highest in herbivorous fish. Thus observation on RLG values in the present study depicts the herbivorous feeding habit of *Amblypharyngodon mola*. RLG values have not shown any significant appreciable difference along with the different size groups; so indicates no significant change of feeding habit along with growth in this fish species.

The mean monthly values of Gastro-Somatic-Index (GaSI) have been observed to remain high during February to April with the peak being in April. Then it started to drop down from May onwards; reached the lowest value in the month of November and then gradually started to increase from December onwards to reach the peak again in the month of April. The low values of GaSI along with the declining trend from May to November depicting the poor feeding activity in this fish species during this time period which is in correspondence to their intense breeding periodicity (Gupta and Banerjee, 2013). Similar kind of observation on low GaSI value during the breeding season has been observed earlier in many fish species (Joadder, 2006; Mitra et al., 2006; Gandotra et al., 2007; Begum et al., 2008; Sarkar and Deepak, 2009; Mondal and Kaviraj, 2010; Kanwal and Pathani, 2012). GaSI has been observed to increase gradually after spawning season with increasing feeding activity and during pre-spawning season feeding activity has been found to increase maximally represented by high GaSI values during that with gut containing food is also suggesting the good food availability all through the season in the waterbody from where the fish species have been collected (Ikusemiju and Olaniyan, 1977). The gut content analysis has represented Chlorophyceae as the most dominant food group and also has been supported by the index of preponderance value (67.15%). Bacillariophyceae has been observed as the second most dominant food group and the index of preponderance value is 21.99%. Cyanophyceae has been observed as the third most abundant group and the index of preponderance value is 5.62%. The fourth most abundant food group has been observed as the Euglenophyceae and it has been supported by the index of preponderance value of 2.93%. Rotifera has been found as the fifth most abundant group with index of preponderance value of 1.79%. The sixth most abundant food group has been observed as Planktonic Crustacea; the index of preponderance value is 0.45%. Unidentified Species and Plant Parts have been observed with index of preponderance value of 0.04% and 0.03% respectively. So the indices of preponderance values depicting herbivorous feeding habit of *Amblypharyngodon mola* supported by the presence of maximum percentage (97.69%) of the phytoplankton group in the gut content. This result also is depicting phytoplankton as the basic food for *Amblypharyngodon mola*. Among the four classes of phytoplankton available in the gut, Chlorophyceae has been observed with maximum percentage both in points method and percentage of occurrence method; and thus has taken the first position in index of preponderance value, representing maximum preference of *Amblypharyngodon mola* for this food group.

So, the present study has revealed the following about food and feeding habit of *Amblypharyngodon mola*:

1. It is a herbivorous fish and phytoplankton is time period. The maximum feeding activity during the pre-spawning season may be related to the food abundance or to store energy for spawning (Serajuddin et al., 1998; Kanwal and Pathani, 2012).

The changing trend of monthly GaSI values is in synchronization with the changing percentage of gut fullness. The high values of GaSI from February to April correspond to the availability of high percentage of fishes with full gut during this period; percentage of fishes with ¾ full gut has also been observed to be high during this time span. Then from May onwards percentage of fishes with full gut has been found to decrease while percentage of fish with empty gut has been observed to increase gradually resulting in gradual decrease of GaSI values and in November the lowest value of GaSI has been found with maximum percentage of fish containing empty gut. Then from December onwards, GaSI values have been observed to increase with decreasing percentage of fish with empty gut. Percentage of empty gut containing fish has been found to reach maximum during June to November, the intense breeding period for this fish species. High occurrence of empty gut containing fish during the intense spawning season may be due to decreased feeding activity since the mature and ripe gonads occupy more space in the peritoneal cavity, compressing the gut and making feeding more difficult during this time period (Serajuddin et al., 1998).

The Fullness Indices (15.38%, 16.41%, 26.82%, 25.42% and 15.97% for full, ¾ full, ½ full, ¼ full and empty gut respectively) depicting the good feeding activity all through the season. Fishes with medium gut fullness (½ full and ¼ full) have been observed almost all through the season, suggesting that feeding has never been discontinued and even during the breeding season no cessation on feeding has been observed there. High percentage of fishes

the basic food group for this fish species; chlorophyceae is the most preferable food class. Mustafa (1991) documented green and blue green algae along with rotifera and planktonic crustacea in its diet; while Piska et al. (1991) reported its preference towards algae. Mamun et al. (2004) also reported the preference of phytoplankton for this fish species. So, the result of the present study is in accordance to the earlier records.

2. Size group has no significant effect on food preference of this species.
3. Lowest feeding activity has been observed during the intense breeding season (May to November) while highest feeding activity has been observed during pre-spawning season (February to April).

Volume : 2 | Issue : 5 | May 2013 • ISSN No 2277 - 8179

REFERENCE

References | | Al-Hussaini, A.H. 1947. The feeding habits and the morphology of the alimentary tract of some teleosts living in the neighbourhood of the marine biological station, Ghardaga, Red Sea. Publications of the Marine Biology Station, Ghardaga, Red Sea. 5: 1-61. | | Al-Hussaini, A.H. 1949. On the functional morphology of the alimentary tract of some fish in relation to difference in their feeding habits: Anatomy and histology. Quarterly Journal of Microscopical Science. 90: 109-139. | | Battish, S.K. 1992. Freshwater zooplankton of India. Oxford and IBH Publishing Co., New Delhi, 233 pp. | | Begum, M.; Alam, M.J.; Islam, M.A. and Pal, H.K. 2008. On the food and feeding habit of an estuarine catfish Mystus gulio (Hamilton) in the south-west coast of Bangladesh. University Journal of Zoology, Rajshahi University. 27: 91-94. | | Bhuiyan, A.S.; Afroz, S. and Zaman, T. 2006. Food and feeding habit of the juvenile and adult snakehead, Channa punctatus (Bloch). Journal of Life and Earth Science. 1 (2): 53-54. | | Bilgrami, K.S. and Saha. L.C. 2004. A Text Book of Algae. CBS Publishers and Distributors. 263 pp. | | Das, S.M. and Moitra, S.K. 1963. Studies on the food and feeding habits of some freshwater fishes of India. IV. A review on the food and feeding habits, with general conclusions. Ichthyologica. 11(1-2): 107-115. | | Gandotra, R.; Ahmed, S. and Shanker, R. 2007. Food and feeding habit of Barilius vagra (Ham.) - a minor carp, in different age groups from Jhajhar stream, Jammu (J & K). Aquacult. 8 (1): 1-11. | Khan, R.A. 2003. Faunal diversity of zooplankton in freshwater wetlands of south-eastern West Bengal. Records of Zoological Survey of India. Occasional Paper. No. 204: 1-107. | | Lebedev, N.Y. 1946. Elementary populations of fish. Zoologicheskij Zhurnal. 25: 121-135. | | Mamun, A.; Tareq, K.M.A. and Azadi, M.A. 2004. Food and feeding habits of Amblypharyngodon mola (Hamilton) from Kaptai reservoir, Bangladesh. Pakistan Journal of Biological Sciences. 7 (4): 584-588. | | Miah, M.J.U. and Siddique, W.H. 1992. Studies on the food and feeding habits of mola, Amblypharyngodon mola. Bangladesh Journal of Agricultural Sciences. 19: 165-170. | | Mitra, K.; Suresh, V.R.; Vinci, G.K. and Mazumdar, N.N. 2006. Food habits of the soft-fin barb, Puntius sophore (Ham.-Buch.) in a floodplain wetland, West Bengal. Journal of Inland Fisheries Society of India. 38 (2): 73-76. | | Mondal, D.K. and Kaviraj, A. 2010. Feeding and reproductive biology of Indian shad Gudusia chapra in two floodplain lakes of India. Electronic Journal of Biology. 6 (4): 98-102. | | Mustafa, G. 1991. Composite culture and biology of some indigenous fishes of Bangladesh. Ph.D. Thesis. Faculty of Biological Science, Dhaka University, Dhaka, Bangladesh. | | Natarajan, A.V. and Jhingran, A.G. 1961. Index of preponderance – a method of grading the food elements in the stomach analysis of fishes. Indian Journal of Fisheries. 8: 54-59. | | Philipose, M.T. 1960. Freshwater phytoplankton of inland fisheries. Proc. Symp. Gupta, S. and Banerjee, S. 2012. Indigenous ornamental fish: a new boon in ornamental fish trade of West Bengal. Fishing Chimes. 32 (1):130-134. | | Gupta, S. and Banerjee, S. 2013. Studies on some aspects of reproductive biology of Amblypharyngodon mola (Hamilton- Buchanan, 1822). International Research Journal of Biological Sciences. 2 (2): 69-77. | | Hynes, H.B.N. 1950. On the food of the freshwater Sticklebacks (Gastrosteus aculeatus | and Pygosteus pungitius) with a review of the methods used in the study of food fishes. Journal of Animal Ecology. 19: 36-58. | | Ikusemiju, K. and Olaniyan, C.I.O. 1977. The food and feeding habits of the catfishes, Chrysichthys walkeri (Gunther), Chrysichthys filamentosus (Boulenger) and Chrysichthys nigrodigitatus (Lacepede) in the Lekki Lagoon, Nigeria. Journal of Fish Biology. 10: 105-112. | | Jana, B.B. 1973. Seasonal periodicity of plankton in freshwater ponds in West Bengal, India. Hydrobiologia. 58: 127-143. | | Joadder, M.A.R. 2006. Food and feeding habits of Gagata yous-soufi (Rahman) from the river Padma in Rajshahi. University Journal of Zoology, Rajshahi University. 25: 69-71. | | Kanwal, B.P.S. and Pathani, S.S. 2012. Food and feeding habits of a hill stream fish, Garra lamta (Hamilton-Buchanan) in some tributaries of Suyal River, Kumaun Himalaya, Uttarakhand (India). International Journal of Food and Nutrition Science. 1 (2): 16-22. | | Khan, A.A. and Fatima, M. 1994. Feeding ecology of the Grey mullet, Rhinomugil corsula (Hamilton) from the river Yamuna, North India. Asian Fisheries Science. 7: 259-266. | Algology, ICAR New Delhi. 272-291 pp. | | Pillay, T.V.R. 1953. Studies on the food, feeding habits and alimentary tract of the grey mullet, Mugil tade (Forsskal). Proceedings of National Institute of Science, India. 19 (6): 777-827. | | Piska, R.; Swamy, B.R. and Devi, P.J. 1991. Food and feeding habits of freshwater cyprinid Amblypharyngodon mola (Ham.). Indian Journal of Fisheries. 38: 126-128. | | Royce, W.F. 1972. Introduction to the fishery sciences. Academic Press, Inc., New York. 351 pp. | | Saha, B.K.; Islam, M.R.; Saha, A. and Hossain, M.A. 2009. Reproductive Biology of the Mola Carplet Amblypharyngodon mola (Hamilton) (Cypriniformes: Cyprinidae) from Netrakona Water. Bangladesh Journal of Scientific & Industrial Research. 44 (3): 377-379. | | Sarkar, U.K. and Deepak, P.K. 2009. The diet of clown knife fish Chitala chitala (Hamilton-Buchanan) an endangered Notopterid from different wild population (India). Electronic Journal of Ichthyology. 1: 11-20. | | Serajuddin, M.; Khan, A.A. and Mustafa, S. 1998. Food and feeding habits of the spiny eel, Mastacembelus armatus. Asian Fisheries Science. 11: 271-278. | | Sharma, B.K. 1999. Freshwater Rotifers (Rotifera: Eurotatoria). Zoological Survey of India. State Fauna Series 3, Fauna of West Bengal. Part 11: 341-468. | | Talwar, P.K. and Jhingran, A.G. 1991. Inland fishes of India and adjacent countries. Vol-1 and Vol-2. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi, Bombay and Calcutta. 1-1063 pp. | Venkataraman, K. 1999. The freshwater Cladocera (Crustacea: Branchiopoda). Zoological Survey of India, State Fauna Series 3: Fauna of West Bengal. Part 10: 251-284. Zafri, A. and Ahmed, K. 1981. Studies on the vitamin A content of fresh water fishes. Content and distribution of vitamin A in mola (A. mola) and dhela (Rohtee cotio). Bangladesh Journal of Biological Sciences. 10: 47-53. |