World Journal of Fish and Marine Sciences 6 (6): 551-556, 2014
ISSN 2078-4589
© IDOSI Publications, 2014
DOI: 10.5829/idosi.wjfms.2014.06.06.9114

Feeding Habits and Diet Composition of Asian Catfish *Mystus vittatus* (Bloch, 1794) in Shallow Water of an Impacted Coastal Habitat

[1]Md. Reaz Chaklader, [2]Ashfaqun Nahar, [1]Muhammad Abu Bakar Siddik and [1]Rajib Sharker

[1]Department of Fisheries Biology and Genetics, Patuakhali Science and Technology University, Bangladesh
[2]Department of Marine Fisheries and Oceanography,
Patuakhali Science and Technology University, Bangladesh

Abstract: The aim of the study was to investigate the variation in diversity and abundance of food of M. vittatus along with differences in the diet due to season. This study also intended to show food preference and feeding habits of M. vittatus which may reflect the availability of prey items in coastal waters of Bangladesh. Among the wide variety of prey consumed, fishes (47.08%) were the most important dietary component of this species. The next major food group was diatoms (12.08%) followed by insects (11.75%), green algae (8.75%), crustaceans (5.67%), blue green algae (3.67%), plant matter (2.67%), worms (2.67%), copepods (0.58%), mollusks (0.92%). There was a monthly variations noticed in the percentage composition of the food items. The outcome of the study facilitates the examination of complex food and feeding pattern of fishes and identifies groups of species that use similar resources within a specific community and can serve as a reference for feeding ecology of fishes in highly impacted tropical habitats.

Key words: Feeding Habit · Diet · Plankton · *Mystus vittatus* · Sustainable Management

INTRODUCTION

Estuaries, coastal rivers and shallow coastal waters are generally productive systems, used by a variety of species as nurseries and feeding ground [1-4]. The Asian Catfish *Mystus vittatus* is a typical resident species of estuarine and coastal waters occurs widely distributed throughout the Indian subcontinent including Bangladesh, India, Pakistan, Sri Lanka, Nepal and Bhutan, but it has been also reported from Myanmar, Malaysia, Laos, Vietnam and Cambodia [5-8]. This species usually inhabits marginal vegetation in lakes, swamps and coastal beds with muddy substrates and feeds on plants, shrimps, insects, mollusks and fishes [9, 10]. This small indigenous fish species of Bangladesh has a high nutritional value in terms of protein, micronutrients, vitamins and minerals not commonly available in other foods [11, 12].

Habitat type is an important factor influencing the feeding strategy of a species [13, 14]. The southwestern coastal belt of Bangladesh is characterized by various types of human-modified and natural coastal habitats. The area is heavily impacted by numerous construction and development activities [15-18]. Seasonal change in feeding habits is also another feature that may be caused by either the life history pattern of food organisms or the feeding activity of the fishes themselves [19, 20]. Analysis of feeding habits and seasonal changes of food for fishes within this unique ecosystem will enhance the knowledge of fish ecology.

There is no available information regarding feeding habits and seasonal changes of diet of *Mystus vittatus* in Bangladesh or possibly in the Indian subcontinent. Among closely related species in southern Bangladesh, it is evident that the *Mystus gulio* primarily preys upon aquatic insects. In a similar study based on the stomach contents in *Clupisoma atherinoides* and *Ompok pabda* [21, 22] shown that more that 70% of food items in this species consist of small fishes and insects. Feeding habits have also been reported in different species of fishes including *Notopterus notopterus* by Hossain *et al.* [23], *Heteropneustes fossilis* by Karod and Radhakrishnan [24] and *Wallago attu* by Kumer and Roy [25]. These studies have shown feeding habit and a wide variety of preys consumed, but seasonal variations of diets did not

Corresponding Author: Ashfaqun Nahar, Department of Marine Fisheries and Oceanography,
Patuakhali Science and Technology University, Bangladesh. E-mail: nahar@pstu.ac.bd.

contributed. The present investigation aims to determine variation in diversity and abundance of food of M. vittatus along with differences in the diet due to season. This study also intended to show food preference and feeding habits of M. vittatus which may reflect the availability of prey items in coastal waters of Bangladesh.

MATERIALS AND METHODS

Samples Collection: A total of 90 adult individuals of *M. vittatus* were collected from Payra, an impacted coastal river located in the south western part of Bangladesh for a period of 12 months from Jun 2013 to May 2014 by commercial gill net. The sizes of the collected individuals were ranging from 82-190 mm in total length and 6.0-76.5 g in total weight. It is believed these coastal waters are an important spawning and feeding ground for *M. vittatus* in Bangladesh.

Laboratory Work: Collected specimens were preserved in10% Formalin in order to prevent the breakdown of the food materials and bringing them in the laboratory of Patuakhali Science and Technology University for further examinations. For removing excess water from their body surfaces, the specimens were mopped on filter paper. A ruler which were nearest to mm used for measuring total lengths (mm) as the distance from snout to tip of the caudal fin and total weight was taken nearest to g of each specimen. The stomach of each one was dissected out and weight of the gut was noted with the help of electronic balance. Then, every gut was opened and contents were preserved in 5% formalin in order to prevent digestion of food items.

Food Content Analysis: The preserved content of stomach of the individual was transferred properly in the Petridis. Then, the samples of the gut contents were taken randomly and dropped on slides with a dropping pipette and observed under the binocular microscope. The number of each food items was expressed as the percentage of the total number of food items found in the stomachs and the contents of the stomach were followed by Gravimetric method [26, 27].

RESULTS

The Monthly Variations of Gut Content of *Mystus Vittatus*: There were 10 categories were made up of stomach contents of this fish. It comprises of fishes (46.63%), insects (11.71%), diatoms (12.02%), green algae (8.55%), crustaceans (5.54%), blue green algae (3.69%), plant matter (2.65%), worms (2.63%), copepods (0.57%) and mollusks (0.92%). The experiment on gut content analysis of fishes presented that the fish feed on variety of food items. Food organisms are found in the stomachs such as fishes (small size of fish and body parts), insects (body parts), green algae (*Crucigenia apiculata, Closterium linula, Palmella miniata, Tetraspora lubrica, Euglena granulata, Euglena proxima, Chlorella vulgaris, Scendesmus quadricauda, Paediastrum duplex, Pediastrum simplex, Cladophora glomerata*), diatoms (*Cyclotella meneghiniana, Cyclotella stelligera, Fragillaria crotonensis, Diatoma vulgare, Diatoma elongatum, Melosiera* sp*., Navicula gracilis, Navicula salinarum, Cymbella prostrate and Cymbella ruttneri*), crustaceans (prawn body parts, Nauplius and Cypris) (*Amphibalanus amphitrite*), blue green algae

Table 1: Monthly percentage frequency of different prey types in the gastro-intestine of *M. vittatus* during the study periods

	Frequency of occurrence (%)											
	2013						2014					
Food items	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Diatoms	14.6	28.3	4.88	17.06	15.03	10.07	7.13	11.50	5.24	7.4	18.0	5.0
Blue green algae	5.75	0.96	2.1	4.5	2.03	3.76	5.78	3.0	1.5	0	3.05	11.87
Green algae	3.13	6.78	7.12	10.04	6.98	5.53	7.02	11.97	14.06	8.76	10.07	11.08
Plant matter	4.5	0	1.76	0.92	2.03	2.79	8.09	5.67	3.0	1.0	1.0	0.98
Insects	18.07	9.87	1.97	9.04	12.57	10.06	32.13	10.08	2.0	0.82	7.0	27.0
Crustaceans	6.89	0	0.73	1.0	2.0	0.22	0	8.01	10.65	17.89	17.0	2.0
Mollusks	0	3.0	0	2.0	0	1.0	1.0	0	0	0	0	4.0
Fishes	32.23	77.08	50.05	53	57.08	55.03	27.07	35.9	53.07	48.03	32.06	39.01
Worms	2.05	2.98	8.05	0.67	2.06	2.57	6.0	2.0	0	4.0	0.12	1.0
Cladocerans	0	1.0	0	0	0	1.0	6.0	0	3.0	0	0	0
Copepods	0	0	0	0	0	0	0	5.08	1.76	0	0	0

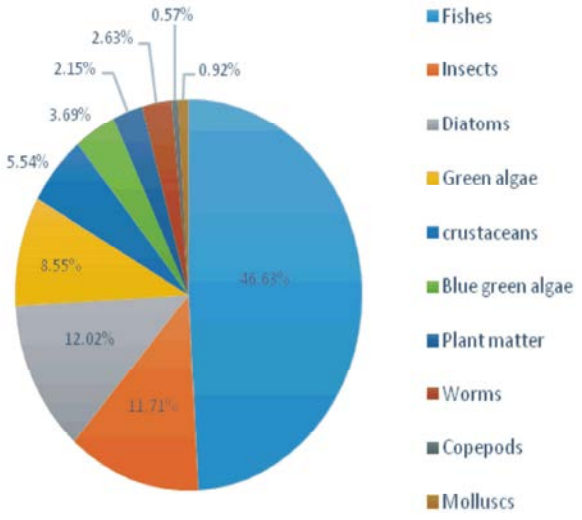

Fig 1: Proportion of food items in the gastro-intestine of *M. vittatus*

(*Oscillatoria curricess, Anabaenacircinalis, Anabaena fertilissima, Anabaena variabilis, Anabaena oryzae, Nostoc carneum, Nostoc commune, Nostoc spongiaeforme, Microcystis protocystics*), plant matter, worms, Copepods (*Cyclops vicinus*), Molluscs (Table 1 and Fig. 1).

Percentage Composition of Food Items in Relation to Months: The highest percentage composition of fishes was reported in the month of August 2013 (78%) and the lowest in December 2013 (27%). Insect percentage compositions were highest in the month of December 2013 (32%) and low during March 2014 (1.40%). The percentage of green algae was recorded high during February 2014 (14.30%) and low in June 2013 (3.96%). The percentage composition of diatoms was highest noticed in June 2013 (26.34%) and lowest in May 2014 (3.70%). Crustaceans were recorded the highest in percentage during March 2014 (28.87%) and the low in December 2013 (0.23%). The blue green algae were observed in highest percentage during May 2014 (13.31%) and lowest in March 2014 (0.28%). Plant matter was reported in high during December 2013 (8.62%) and low in July 2013 (0.24%). The highest percentage of worms was examined high in December 2013 (4.89 %) and low in April 2014 (0.24%). Copepods were recorded high in January 2014 (4.48%) and low in February 2014 (1.99%). Mollusks were reported high in February 2014 (2.91%) and low in January 2014 (0.20%). From this analysis it indicates that the *M. vittatus* prefer the food item like fishes and insects in all months (Fig. 2).

Percentage Composition of Food Items in Relation to Seasons: The dominated food items were fishes (40.66%) and insects (14.85%) whereas green algae (11.44%), diatoms (8.05%), crustaceans (6.46%) and plant matter (6.44%) included in low level at the time of post monsoon (December 2013-February 2014). Furthermore, summer and premonsoon (March 2014 - May 2014) fishes (41.08%), crustaceans (18.93%), insects (11.87%), diatoms (10.11%) and green algae (10.06%) which are highly dominated but at the same time blue green algae (5.83%), worms (1.37%) and plant matter (1.02%) are low. Likewise fishes (58.16%), diatoms (13.81%), insects (10.57%) and green algae (6.73%) are the highest in percentage while worms (3.57%), blue green algae (3.13%), plant matter (2.51%) and crustaceans (2.35%) in low level. Subsequently, In spite of having highest percentage of fishes (54.9%), diatoms (14.57%), insects (12.15%)during post monsoon (December 2013-February 2014), green algae (7.67%), blue green algae (4.27%), plant matter (2.14%) and worms (1.69%) were in low. Hence, the present findings are clearly indicates that food items are significantly varied among all the seasons (Fig. 3).

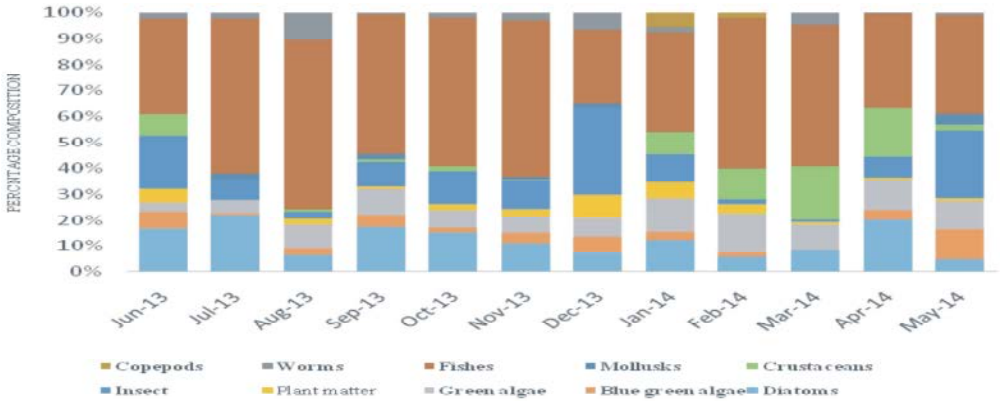

Fig 2: Monthly percentage compositions of food items of *M. vittatus* from June 2013 to May 2014

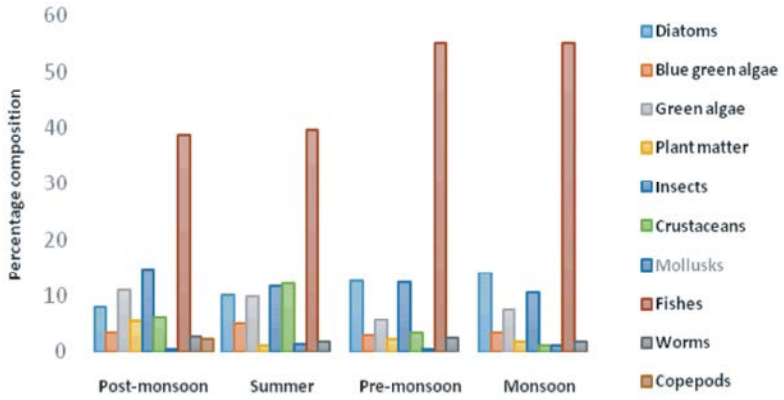

Fig 3: Seasonal variations of percentage compositions food items of *M. vittatus*

DISCUSSION

Different types of food items are eaten by *Mystus vittatus* such as fish, molluscs, crustaceans, copepods, diatoms, green algae, blue green algae, worms, insects, plant materials and in their gut indicated that this species prefer animal food. The present report revealed that the gut of this fish was abundant with fish (parts), diatoms, green algae and insects. Other food items eaten by the fishes were regarded as not abundantly. The study on the food contents of *M. vittatus* strongly suggested that this fish is an omnivorous. The existence of sand and mud in the guts of these fishes is providing the evidence about their feeding at the bottom (bottom feeder). the food and feeding habits of *M. vittatus* stated that it was mainly feed on plankton with preference to zooplankton in addition to fed mainly on copepods, cladocerans, rotifers, ostracods, insects, oligochaetes, *chlorophyceae*, *bascillariophyceae* and debris [28]. The most important food item of the carnivorous *Ompok pabda* in adults was the fishes, crustaceans, protozoans and insects [22]. Similar observation was found in *Notopterus notopterus* [23], *Heteropneustes fossilis* [24], *Wallago attu* [25] and *Mystus gulio* [29] also made similar observations. Khan *et al.* [10] concluded that *Mystus nemurus* among the bottom feeders, mud and sand were found in large quantities in their stomachs. It was noted that the surface feeders were both omnivorous and carnivorous which feed on algae, rotifers, micro crustaceans and their larvae, the mid or column feeders were herbivorous and carnivorous which feed on algae, aquatic plants, adults crustaceans, insects, fish, mud and sands and the bottom feeders are herbivorous, omnivorous and carnivorous which fed ort decomposed aquatic vegetation, bryozoans, insects, crustaceans, mollusks, fishes, sand, mud etc. [30-32].

A comparative study on the food and feeding habits of *M. vittatus* has been reported by Reddy and Rao [5]. According to the analysis of food in the gut contents, it is evident that the *M. vittatus* is neither a true surface feeder nor a true bottom feeder, rather its food substance namely fish parts, crustaceans, molluscs, insects, plant parts, algal filaments and sand and mud were distributed throughout the different layers of the water bodies. This species may therefore be conveniently regarded as an omnivorous catfish because of different food items found in the stomach contents. The presence of food items in the stomach of *Mystus gulio* suggest that they are euryphagous *i.e.* feeding on a wide range of organisms [29]. It was also observed that *M. gulio* can be classified as an omnivorous feeder as the diet covers a wide spectrum of food ranging from various types of plankton to invertebrates and plants. The fish also exhibits an overlapping in food and feeding habits in order to avoid inter and intra specific competition for available food. Such as a euryphagous feeding behavior is documented in most of the species of catfishes [22, 24, 28]. From the above findings it can be concluded that the different food groups varied monthly in their abundance in the gut contents of the fish.

CONCLUSION

This study is crucial because it provides important baseline information on *Mystus vittatus* from the Payra River of Bangladesh. For initiating early management strategies and regulations for the sustainable conservation of the remaining stocks of this economically important species in the Payra River ecosystem, the output of the results would be an effective tool for fishery biologists, managers and conservationists. Furthermore, information on the feeding habits of *Mystus vittatus* is essential to bring this species under culture.

Therefore, the results of this study not only provide valuable information for the online database but also provide an important baseline for future studies along the coastal waters of Bangladesh.

ACKNOWLEDGEMENTS

The authors are grateful to Patuakhali Science and Technology University for providing financial support and gratitude to the fishermen for their cooperation to collect samples.

REFERENCES

1. Alam, M.F. and K.J. Thomson, 2001. Current constraints and future possibilities for Bangladesh fisheries. Food Policy; 26(3): 297-313.
2. Islam, M.S., 2003. Perspectives of the coastal and marine fisheries of the Bay of Bengal, Bangladesh. Ocean & Coastal Management; 46: 763-796.
3. Sajina, A.M., Chakraborty, S.K. Jaiswar, A.K. Pazhayamadam and D.G. Sudheesan, 2011. Stock structure analysis of Megalaspis cordyla (Linnaeus, 1758) along the Indian coast based on truss network analysis. Fish Res; 108(1): 100-105.
4. Afroz, T. and S. Alam, 2013. Sustainable shrimp farming in Bangladesh: A quest for an Integrated Coastal Zone Management. Ocean & Coastal Management; 71: 275-283.
5. Reddy, Y.S. and M.B. Rao, 1987.A note on the food of Mystus vittatus (Bloch) from the highly polluted Hussain Sagar Lake, Hyderabad. Indian J. Fish; 34(4): 484-487.
6. Talwar, P.K. and A.G. Jhingran, 1991. Inland fishes of India and adjacent countries. Oxford and IBH Publishing Co. Pvt. Ltd., Rotterdam, pp: 998.
7. Hossain, M.M., M.A. Islam, S. Ridgway and T. Matsuishi, 2006. Management of inland open water fisheries resources of Bangladesh: Issues and options. Fish Res; 77(3): 275-284.
8. Rahman, A.K.A., 2005. Freshwater Fishes of Bangladesh, 2nd edition, Zoological Society of Bangladesh, Department of Zoology, University of Dhaka, Dhaka-1000, pp: 293.
9. Bhatt, V.S., 1971. Studies on the biology of some freshwater fishes, part VI. Mystus cavasius (Ham.). Hydrobiologia; 38: 289-302.
10. Khan, M.S., M.A. Ambak and A.K.M. Mohsin, 1988. Food and feeding biology of a tropical catfish Mystus nemurus (C&V) with reference to its functional morphology. Indian J. Fish; 35(2): 78-74.
11. Ross, N., M. Islam and S.H. Thilsted, 2003. Small indigenous fish species in Bangladesh: contribution to vitamin A, calcium and iron intakes. J. Nutr.; 133: 4021-4026.
12. Hajisamae, S., L.M. Chou and S. Ibrahim, 2003. Feeding habits and trophic organization of the fish community in shallow waters of an impacted tropical habitat. Est. Coast Shelf Sci.; 58(1): 89-98.
13. Crowder, L.B. and W.E. Cooper, 1982. Habitat structural complexity and the interaction between bluegills and their prey. Ecology; 63: 1802-1813.
14. Siddik, M.A.B., A. Nahar, M.M. Rahman, N.T.N. Anh, N. Nevejan and P. Bossier, 2014. Gut Weed, Enteromorpha sp. as a partial replacement for commercial feed in Nile Tilapia (Oreochromis niloticus) culture. W.J. Fish & Marine Sci.; 6(3): 267-274.
15. Hossain, M.S., 2001. Biological aspects of the coastal and marine environment of Bangladesh. Ocean & Coastal Management; 44(3-4): 261-282.
16. Ahamed, F., B. Fulanda, M.A.B. Siddik, M.Y. Hossain, M.M.R. Mondol, Z.F. Ahmed and J. Ohtomi, 2014. An overview of freshwater prawn fishery in Bangladesh: present status and future prospect. Journal of Coastal Life Medicine; 2(7): 580-588.
17. Ahsan, M.E., M.A.B. Siddik, M.R. Sharker, M.A. Alam, A. Nahar and S.N. Pattadar, 2014. Fish species availability in the fish landing centers of Patuakhali, Bangladesh. Intl J Sci & Tech Res; 3(2): 220-225.
18. Nahar, A., M.A.B. Siddik, M.A. Alam, M.E. Ahsan and M.R. Chaklader, 2014. Population Genetic Structure of Paradise Threadfin Polynemus paradiseus (Linnaeus, 1758) Revealed by Allozyme Marker. World J. Zool.; 9(4): 260-266.
19. Lucena, F.M., J. Vaska, T. Ellis and J.R. O'Brien, 2000. Seasonal variation in the diets of bluefish, Pomatomus saltatrix (Pomatomidae) and striped weakfish, Cynoscion guatucupa (Sciae-nidae) in southern Brazil: implications of food partitioning. Envt Biol Fish; 57: 423-434.
20. Siddik, M.A.B., A. Nahar, F. Ahamed, Z. Masood and M.Y. Hossain, 2013. Conservation of critically endangered Olive Barb Puntius sarana (Hamilton, 1822) through artificial propagation. Our Nature; 11(2): 96-104.
21. Bhuiyan, A.S., M. Begum and Q. Nessa, 1997. Observation of the food and feeding habit of Clupisoma atherinoides (Bloch) (Siluriformes: Schilbidae). Univ. J. Zool. Rajshahi Univ; 16: 1-5.

22. Bhuiyan, A.S. and M.N. Islam, 1991.Observation on the food and feeding habit of Ompok pabda (Ham.) from the river Padma (Siluridae :Cypriniformes). Pakistan J. Zool.; 23(1): 75-77.
23. Hossain, M.A., S. Parween, A. Taleb and M.H. Rahman, 1990. Food and Feeding Habit of Notopterus notopterus (Pallas). Univ. J. Zool., Rajshahi Univ.; 9: 1-6.
24. Karod, S.A. and C.K. Radhakrishnan, 2010. Food and feeding habits of Heteropneustes fossilis (Bloch) from the Brahmaputra River system, Assam. Indian J. Fish; 43(1): 97-101.
25. Kumer, D. and S.P. Roy, 2009. Food and feeding habits of some representative fishes of different trophic guilds of Kharagpur Lake with a note of their role in energy harvest. The Ecoscan; 3(1&2): 169-176.
26. Hynes, H.B.N., 1950. The food of freshwater sticklebacks (Gasterosteus aculeatus and Pygosteus pungitius) with a review of methods used in studies of the food of fishes. J. Anim. Ecol; 19: 26-28.
27. Pillay, T.V.R., 1954. The biology of the grey mullet (Mugil cephalus L.). Proc. Nat. Inst. Sci. India; 20(2): 18-217.
28. Azadi, M.A., M.A. Islam and S.R. Dev, 1987. Some aspects of the biology of Mystus vittatus (Bloch): In. Food and feeding habits and fecundity. Proceedings of the 12th Annual Bangladesh Science Conference, Bangladesh Association for the Advancement of Science, Dhaka (Bangladesh). BAAS; 21: 10-14.
29. Begum, M., M.J. Alam, M.A. Islam and H.K. Pal, 2008. On the food and feeding habit of an estuarine catfish Mystus gulio (Hamilton) in the south-west coast of Bangladesh. Univ. J. Zool. Rajshahi Univ.; 27: 55-62.
30. Chetri, M., 2006. Diet Analysis of Gaur, Bos gaurus gaurus (Smith, 1827) by Micro-Histological Analysis of Fecal Samples in Parsa Wildlife Reserve, Nepal. Our Nature; 4: 20-28.
31. Manon, M.R. and M.D. Hossain, 2011. Food and feeding habit of Cyprinus carpio var. Specularis. J. Sci. Foundation; 9(1&2): 163-181.
32. Branco, M.A.C., M.A. Arruda and S. Gamito, 2010. Feeding habits of Solea senegalensis in earthen ponds in Sado estuary. J. Sea Res.; 64(4): 446-450.