The AJAS THE ASIAN JOURNAL OF ANIMAL SCIENCE
Volume **10** | Issue 2 | December, 2015 | 153-158
◆ e ISSN–0976–8963
DOI : 10.15740/HAS/TAJAS/10.2/153-158
Visit us | *www.researchjournal.co.in*

***RESEARCH ARTICLE*.....**

Food and feeding habits of marine catfish, *Osteogeneiosus militaris* (Linn., 1758) off Mumbai waters

P.K. PARIDA, B.K. KHUNTIA, **B.K. PATI,** B. SAHU **AND** S.K. UDGATA

ABSTRACT..... The food and feeding habits of the marine cat fish, *Osteogeneiosus militaris* (Linn.,1758) off Mumbai waters was studied. The species was found to be carnivorous and predacious in feeding habit. Index of preponderance values indicated that, it feeds mainly on crustaceans (shrimps, crabs), molluscs (bivalves, squids) and small fishes (*Coilia* spp., ribbon fish). Among the food groups, crustaceans dominate throughout the year in comparison to molluscs and fishes. In the crustacean group, *Acetes* spp. was found to be the dominant food item contributing to 43.34 per cent followed by penaeid shrimps, which shared 27.65 per cent of the total food in all the months. Analysis of month-wise percentage food composition revealed that, the species fed the highest percentage of *Acetes* spp. during the month of November (34.92%) while penaeid shrimps was consumed in the largest percentage in January (35.10%). With respect to the size (length) of the fish, the percentage of *Acetes* spp. as a food item was highest (52.99%) for the length group of 391-420 mm and lowest (25.64%) for 361-390 mm. The guts were found to be empty for fishes having length of more than 420 mm. Results of the feeding intensity delineated that, the species is not a voracious feeder as none of the individuals studied was found to have gorged or full stomach over the entire period of investigation. Among the different length groups, the highest feeding fishes were in the length group of 211-240 mm. Gastro-somatic index was highest during August for males and during November for females while the pooled value was highest in January (3.206).

KEY WORDS..... Food and feeding habits, marine catfish, *Osteogeneiosus militaris*

HOW TO CITE THIS ARTICLE - Parida, P.K., Khuntia, B.K., Pati, B.K., Sahu, B. and Udgata, S.K. (2015). Food and feeding habits of marine catfish, *Osteogeneiosus militaris* (Linn., 1758) off Mumbai waters. *Asian J. Animal Sci.*, **10**(2): 153-158.

ARTICLE CHRONICLE - Received **:** *27.10.2015;* Revised **:** *09.11.2015;* Accepted **:** *15.11.2015*

Author for Corresponding -

B.K. PATI
Department of Fishery Engineering and Technology, College of Fisheries (O.U.A.T.) Rangeilunda, BERHAMPUR (ODISHA) INDIA
Email: bikas_81@rediffmail.com

See end of the article for **Coopted authors'**

INTRODUCTION.....

The basic functions of an organism are growth, development and reproduction which take place from the energy liberated by the conversion of the food it consumes. Hence, food intake becomes one of its prime activities. However, the food and feeding habits of a fish is closely related to its habitat, individual and social behaviour and feeding mechanism. The horizontal and vertical movement of a fish stock is generally influenced by the seasonal and diurnal abundance of its favourite food organisms in a region. Thus, estimates of the type and quantity of food organisms in a given region not only indicate the possibility of fish concentrating there, but also furnish the information on the growth phase of fish moving to such regions. Hence, knowledge on all these aspects may help in understanding the fishery of any

species.

Marine catfish is one of the important demersal species of Indian waters. Its catch contributed to about 1.92 per cent of the total marine production and 7.11 per cent of total demersal landings of India during 2014 (Anonymous, 2015). Many workers have studied the food and feeding habits of various fish species from different regions of India (Dhulkhed, 1962; Suseelan and Somasekharan Nair, 1969; Badola and Singh, 1980; Abbas, 2010; Mohanraj and Prabhu, 2012; Priyadharsini *et al.*, 2013; Varadharajan and Pusparajan, 2013 and Venugopal *et al*., 2014). Some information is also available on the food and feeding habits of marine catfishes of Madras and Malabar Coast (Devanesan and Chidambaram, 1953 and Venkataraman, 1960). However, the information available on the food and feeding habits of the marine catfish, *Osteogeneiosus militaris* is meager. Further, detail information on the food and feeding habits of this species, particularly that caught off Mumbai waters, is not available. Therefore, the present investigation was undertaken to critically evaluate the food and feeding habits of this species off Mumbai waters.

RESEARCH METHODS.....

Samples of the marine catfish, *O. militaris* (Linnaeus, 1758), were collected weekly from New Ferry Wharf, Versova and Sassoon Dock landing centers of Mumbai from September to August except the month of July during which there was ban on fishing. The landings in these places were only those caught off Mumbai waters. A total of 405 numbers of fish were dissected. The gut of each fish was cut with the help of a pair of sharp scissors and the gut contents were transferred into a clean petri dish. The food items were sorted out into different groups and the volume of each group was measured using a measuring cylinder. Percentage food composition was determined on the basis of the volume of different food items found in the gut. The index of preponderance method of Natarajan and Jhingran (1961) was employed for the ranking of the food items. For studying the feeding intensity, stomach was graded as gorged, full, ¾ full, ½ full, ¼ full, trace or empty based on the degree of its distension. Volume of the stomachs was determined by displacement method and the gastro-somatic index (GSI) was calculated by the following formula:

$$GSI = \frac{\text{Volume of stomach}}{\text{Weight of the fish}} \times 100$$

Statistical analysis was done to find the means and standard deviations using SPSS (2000) statistical package.

RESEARCH FINDINGS AND ANALYSIS.....

The results obtained from the present investigation as well as relevant discussion have been summarized under the following heads :

Index of preponderance :

During the present study, gut contents analysis indicated that *O. militaris* feeds mainly on crustaceans, molluscs and small fishes. The crustaceans included *Acetes* spp., penaeid shrimps, small crabs and squilla. The molluscs found in the gut consisted of bivalves, gastropods and cephalopods. The fishes like *Coilia* spp., flat fish, ribbonfish and semi-digested fish constituted the fish component of its food. Analysis of gut contents following index of preponderance method revealed that among all the food components, *Acetes* spp. ranked first (43.34%) followed by penaeid shrimps (27.65%) (Fig. 1). These two food items were dominant throughout the period of study. Crabs ranked 4th by contributing to 6.15 per cent of the total quantity of food items while the share of squilla was very less (0.84%) due to which it occupied the 9th rank. This indicates that, crustaceans are the principal food of *O. militaris*.

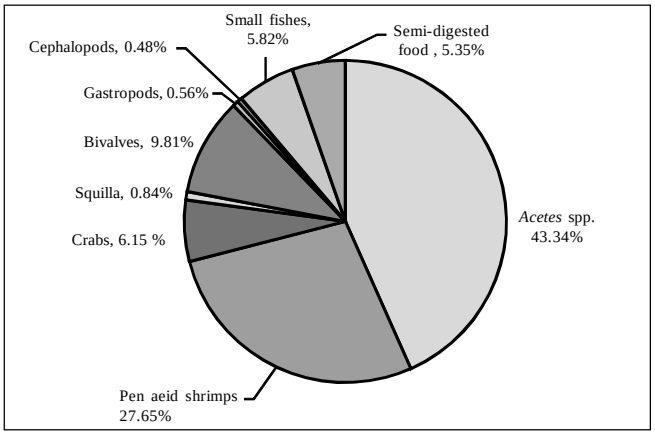

Fig. 1 : Index of preponderance of *O. militaris* off Mumbai waters

Similar observations have been made by Raje (2006) who also used index of preponderance to find out the dominant food of *O. militaris* off Mumbai. He observed

the occurrence of high percentage of crustaceans followed by molluscs, teleosts and polychaetes in the diet of this species concluding that this species is a carnivorous feeder and feeds on the bottom. On the other hand, Devanesan and Chidambaram (1953) and Venkataraman (1960) have reported that *O. militaris* is a bottom feeder feeding mainly on polychaetes, molluscs, cuttle fish, crabs, prawns and brittle stars. However, the absence of polychaetes in the present study and its decreased rank in the study of Raje (2006) is indicative of probable decrease in the population of polychaetes in off Mumbai waters. Over the period, the change in the dominant food of *O. militaris* from polychaetes to crustaceans implies the decrease in polychaetes population and simultaneous increase in crustacean population in off Mumbai waters and such dynamic population of these two species need further studies.

Among molluscs, bivalves contributed to 9.81 per cent of the total and ranked 3rd, whereas gastropods and cephalopods were found in very small quantities (0.56% and 0.48%) ranking 8th and 9th, respectively. Small fishes ranked the 5th position contributing to only 5.82 per cent of the total food in the gut. Some portions of the food items were digested to such extents that they were unable to be identified. Such semi-digested matter ranked the 6th position, contributing to 5.35 per cent of total food in the gut. All these results indicate that, like other marine cat fishes, this species is also carnivorous and predaceous in feeding habit.

Variation in food composition in relation to month:

Based on the index of preponderance, as described above, *Acetes* spp. was the dominant food in the stomach of *O. militaris.* Among the eleven months of study period, it was found in highest quantity in the month of November (34.92%) followed by January (25.40%) (Table 1). Lowest percentage was recorded in the month of June (0.05%) followed by August (1.91%). For penaeid shrimps, which ranked 2nd as per the index of preponderance, the highest was found in January (35.10%) followed by November (22.70%) and the lowest was in June (0.44%). Bivalves were recorded in the highest percentage during January (32.94%) and lowest during June (0.47). The contribution of crabs varied from 0.93 per cent (lowest) in June to 22.31 per cent (highest) in September. Fish component of the food was maximum in November (25.31%) followed by January (21.1%), but was absent in June. Among the different fish species found in the stomach of *O. militaris*, the dominant one was *Coilia* spp. Digested matter was also found in variable quantities being highest in January (34.31%).

Variation in food composition in relation to size of the fish :

The variation in the food composition of *O. militaris* in relation to its size (length) has been presented in Table 2. *Acetes* spp. and penaeid shrimps were the dominant food items for most of the length groups as indicated by their highest mean percentage values of 35.72 per cent and 25.16 per cent, respectively. Among the different length groups, the percentage of *Acetes* spp. as a food item was highest (52.99%) for the length group of 391-420 mm and lowest (25.64%) for the length group of 361-390 mm. The guts of the fish in the length groups of 421-450, 451-480 and 481-510 mm were found to be empty. The second abundant food item, penaeid shrimps, was dominant (48.25%) in the length group of 301-330

Table 1: Variation in food composition of *O. militaris* off Mumbai waters in relation to month

Months	*Acetes* spp.	Penaeid shrimps	Small crabs	Squilla	Cephalopods	Gastropods	Bivalves	Small fishes	Semi-digested matter
January	25.40	35.10	11.60	18.50	9.36	40.54	32.94	21.10	34.31
Feb.	2.54	2.06	9.30	0	0	0	2.82	3.37	0
Mar.	4.76	3.76	11.21	33.30	0	0	2.12	7.59	8.58
Apr.	3.38	3.54	9.77	3.80	31.30	16.22	4.24	8.86	3.60
May	9.26	7.63	5.58	14.80	9.36	5.40	3.76	5.06	2.06
Jun.	0.05	0.44	0.93	0	0	0	0.47	0	0
Aug.	1.91	0.77	4.19	0	6.22	0	0.94	2.95	1.37
Sep.	8.26	13.40	22.31	0	9.36	16.22	13.18	8.86	0.34
Oct.	6.19	7.95	9.31	14.80	0	0	9.41	15.21	27.78
Nov.	34.92	22.70	11.61	14.80	0	16.22	25.41	25.31	17.84
Dec.	3.33	2.65	4.19	0	34.40	5.40	4.71	1.69	4.12

mm. Among all the length groups, fish of the length group of 361-390 mm showed consumption of small fishes to a considerable level. For the length group of 151-180 mm the gut contained only bivalves.

In tropical waters the rate of digestion gets accelerated because of high temperature. Hence, even if food is present along the entire gut, the only place where it is in a recognizable state is the stomach. The rest of the gut could be ignored unless there is a special reason for doing so (Qasim, 1972). Devanesan and Chidambaram (1953) found that *O. militaris* is a bottom feeder and feeds mainly on polychaetes, molluscs, cuttle fishes, crabs, prawns and brittle star. Venkataraman (1960) reported that polychaetes, molluscs, crab and prawn were the main food items of soldier catfish in Calicut waters. According to Krishna (1981), *O. militaris* prefers crustaceans followed by fishes, molluscs and polychaetes. Many workers (Menon, 1979; Suseelan and Somasekharan Nair, 1969 and Mojumder, 1969) have reported that catfishes are bottom feeder that feed mainly on crustaceans, small worm, bivalves, demersal fishes and polychaetes. Brittle star and polychaetes as recorded by Krishna (1981) were not found in the gut during the present investigation, while other food items were found. Such result might be due to the meager population of brittle star and polychaetes in the waters off Mumbai. In contrast, *Acetes* spp. and penaeid shrimps are abundant off Mumbai, which might have contributed to the highest percentage in the gut of the species.

Variation in feeding intensity in relation to month:

During the study, 11.11 per cent of *O. militaris* examined were found to have moderate feeding rates (stomachs ¾ full or ½ full), 57.04 per cent had low feeding rates (stomachs ¼ full or has traces of food), while 31.85 per cent had empty stomachs (Fig. 2). None of the 405 fish examined was found to have gorged or full stomach, which implies that the species was never found in its highest feeding intensity during the study period. From this, it can be concluded that, *O. militaris* is not a voracious feeder.

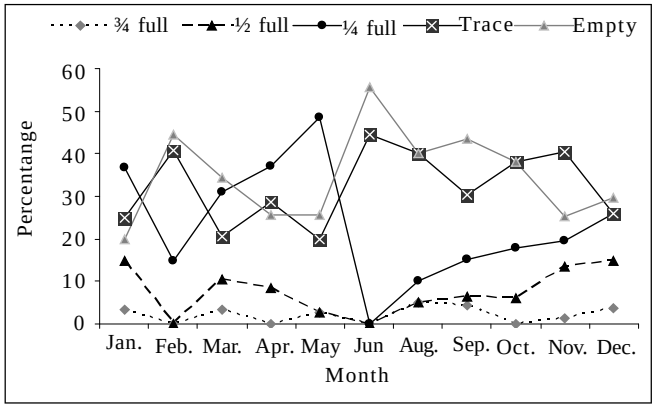

Fig. 2 : Variation in feeding intensity of *O. militaris* in relation to months

Among the fish with moderate feeding rates, the percentage of fish with ¾ full stomach remained lowest followed by that of fish with ½ full stomach throughout the study period. In contrast, among the fish with low

Table 2 : Variation in food composition of *O. militaris* off Mumbai waters in relation to its length

Length group (mm)	*Acetes* spp.	Penaeid shrimps	Small crabs	Squilla	Bivalves	Cephalopods	Gastropods	Small fishes			Semi-digested fish	Digested matter
								Flat fish	Ribbon fish	*Coilia* spp.		
151-180	0	0	0	0	100	0	0	0	0	0	0	0
181-210	40.90	27.30	27.30	0	4.50	0	0	0	0	0	0	0
211-240	26.66	45.46	3.20	0.80	11.20	0.67	0.30	2.80	0	6.75	0.56	1.60
241-270	42.40	20.10	1.92	0.76	13.70	0.95	0.60	0	0	3.64	2.13	13.80
271-300	52.16	25.55	4.73	1.06	6.38	0.18	0.90	0	4.11	0	2.10	2.83
301-330	33.91	48.25	3.04	0.43	4.18	0.54	0.10	2.86	0	0	0.72	5.97
331-360	46.79	28.6	8.32	3.12	4.85	0.52	2.60	0	0	2.10	1.02	2.08
361-390	25.64	9.31	21.40	0.37	22.00	0	0.40	0	5.72	5.72	2.86	6.58
391-420	52.99	21.85	5.30	0	10.59	3.97	0	0	0	0	0	5.30
421-450	0	0	0	0	0	0	0	0	0	0	0	0
451-480	0	0	0	0	0	0	0	0	0	0	0	0
481-510	0	0	0	0	0	0	0	0	0	0	0	0
● Mean	35.72	25.16	8.36	0.73	19.71	0.76	0.54	0.63	1.09	2.02	1.04	4.24
± sd	± 16.68	± 15.34	± 9.47	± 0.98	± 30.64	± 1.25	± 0.83	± 1.25	± 2.20	± 2.72	± 1.07	± 4.34

● Mean and standard deviations of all the length groups excluding those in which the stomachs were empty

feeding rates, the percentage of fish with ¼ full stomachs and that of fish with traces of food in the stomachs fluctuated widely over the entire period of study. This indicates that, though the species continues to feed most of the times in a year, there are periods when it completely stops to feed as delineated by the empty stomachs or traces of food in the stomachs during these periods. Percentage of empty stomach was highest in the month of June (55.56%) followed by February (44.44%) and September (43.47%).

Variation in feeding intensity in relation to size of the fish :

O. militaris in the length group of 211-240 mm were having highest percentage of moderately fed stomachs (19.36%) (Fig. 3). Fishes in the length group 361-390 mm followed by 391-420 mm were lowest fed. Larger fishes (420 mm to 510 mm) had 100 per cent empty stomachs which indicates cessation of feeding after attaining a length of 420 mm. However, digested matter was found in the intestine that implies fast digestion of whatever small quantity of food taken for survival.

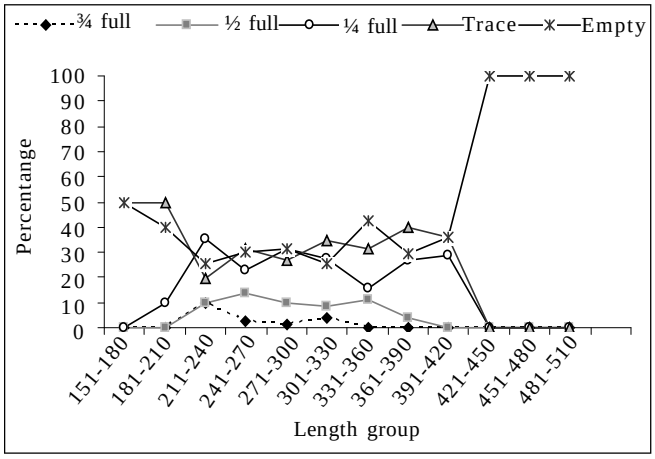

Fig. 3 : Variation in feeding intensity of *O. militaris* in relation to its size

Raje (2003) reported more than 50 per cent empty stomachs in *T. tenuispinis* from Veraval coast, similar to the present investigation. The feeding intensity of male was low during the spawning season, which may be correlated to parental care, *i.e.*, buccal incubation of fertilized eggs. Therefore, during this period the feeding rate of adult males was very low. Females have shown very high feeding rate in post spawning phase during November to January. Hence, empty stomachs and low feeding recorded in certain months and particular sizes is the result of spawning and parental care shown by this species.

Gastro-somatic index:

The pooled values of gastro-somatic index (GSI) of *O. militaris* was found to be the highest in January (3.206) followed by December (3.062) and May (3.008) (Fig. 4). The highest value of GSI in the males during August may be the result of high rate of feeding just before the start of the breeding season from August. This is because, the males have to incubate the fertilized eggs in their oro-buccal cavity during which these gestating males starve (Day, 1878; Silas *et al.*, 1980 and Raje, 2006). In contrast, the highest GSI found in females during January followed by November indicates more feeding in the post spawning season.

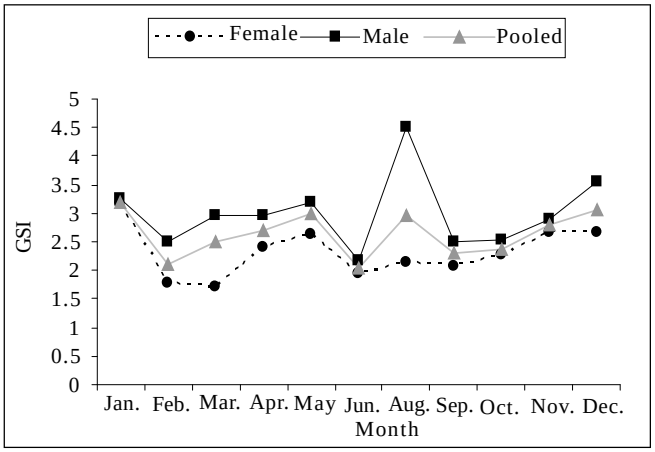

Fig. 4 : Gastro-somatic index (GSI) in *O. nilitaris* off Mumbai waters

Acknowledgement:

We are greatful to the Director, Central Institute of Fisheries Education (ICAR–Deemed University), Mumbai for encouraging and providing facilities for the present work.

COOPTED AUTHORS' –

P.K. PARIDA, ICAR-Central Inland Fisheries Research Institute, KOLKATA (W.B.) INDIA Email-pranayaparida@gmail.com

B.K. KHUNTIA, Department of Fishery Technology, College of Fisheries (O.U.A.T.) Rangeilunda, BERHAMPUR (ODISHA) INDIA Email-basantak@yahoo.com

B. SAHU, Department of Fish Nutrition, College of Fisheries (O.U.A.T.) Rangeilunda, BERHAMPUR (ODISHA) INDIA Email-brundabans@yahoo.co.in

S.K. UDGATA, Department of Fishery Microbiology, College of Fisheries (O.U.A.T.) Rangeilunda, BERHAMPUR (ODISHA) INDIA

LITERATURE CITED.....

Abbas, A. (2010). Food and feeding habits of freshwater catfish, *Eutropiichthys vacha* (Bleeker). *Indian J. Sci. Res.*, **1**(2) : 83-86.

Anonymous (2015). *Annual Report 2014-15*, Central Marine Fisheries Research Institute, Cochin.

Badola, S.P. and Singh, H.R. (1980). Food and feeding habits of fishes of the genera *Tor, Puntius* and *Barilius*. *Proc. Indian Nat. Sci. Acad.*, **46** (1):58-62.

Day, F. (1878). *The Fishes of India, Being a Natural History of Fishes Known to Inhabit the Seas and Freshwaters of India, Burma and Ceylon,* William Dawson and Son Ltd., pp. xx+778 pls 195, Text and atlas in four parts, LONDON, UNITED KINGDOM.

Devanesan, D.W. and Chidambaram, K. (1953). *The common food fishes of the Madras presidency.* Madras Govt. Publication, pp. 207.

Dhulkhed, M.H. (1962). Observations on the food and feeding habits of the Indian oil sardine, *Sardinella longiceps* Val. *Indian J. Fish.*, **9A**(l):37-47.

Krishna, S. (1981). *Studies on morphometry and biology of catfish O. Militaris Off Bombay Coast.* M. Sc. Thesis, Central Institute of Fisheries Education. Mumbai (M.S.) INDIA.

Linnaeus, C. (1758). *Systema Naturae*, 10th Ed. (Systema Naturae per regna tria naturae, secundum, classes, ordines, genera, species, cum characteribus diiferentiis, synonymis, locis. Tomus, I. Editio Decima, Reformata, Holmiae, Impensis Direct, Laurentii Salvii.) pp. i-iv+ 1-824.

Menon, N.G. (1979). *Studies on the Biology and Fishery of Giant Marine Catfish. Tachysurus Thalassinus (Ruppell)*. Ph.D. Thesis, University of Cochin, India.

Mohanraj, T. and Prabhu, K. (2012). Food habits and diet composition of demersal marine fishes from Gulf of Mannar, Southeast Coast of India. *Adv. Biol. Res.*, **6** (4): 159-164,

Mojumder, P. (1969). Food of *Tachysurus thalassinus* (Ruppell). *Indian J. Fish.*,**16** : 161-169.

Natarajan, A.V. and Jhingran, V.G. (1961).Index of preponderance - a method of grading food elements in the stomach analysis of fishes. *Indian. J. Fish*., **8** (1): 54-59.

Priyadharsini, S., Subramaniyan, A., Manoharan, J. and Varadharajan, D. (2013). Food and feeding habits of red lionfish *Pterois volitans* from Cuddalore Coast, South East Coast of India. *J. Aquac. Res. Develop.*, **4**(4): 1-13.

Qasim, S.Z. (1972). The dynamics of food and feeding habits of some marine fishes. *Indian J. Fish.*, **19** (1): 11-28.

Raje, S.G. (2003). Some aspects of the biology *Tachysuru tenuispinis* (Day) from Veraval. *J. Indian Fish. Assoc.*, **30**: 97-103.

Raje, S.G. (2006). Some aspects of biology of catfishes *Tachysurus caelatus* (Valenciennes) and *Osteogeneiosus militaris* (Linnaeus) from Mumbai. *Indian J. Fish.*, **53**(3) : 333-340.

Silas, E. G., Pillai P.P., Dhulked, M.H., Muthiah, C. and Rao, G. S. (1980). Purse seine fishery – imperative need for regulation. *Mar. Fish. Infor. Serv. T. & E. Ser*., **24**: 1-9.

SPSS (2000). *Statistical Sofware Package for Social Sciences for Windows-Release 10*. SPSS Inc., Chicago, Illinois, USA.

Suseelan, C. and Somasekharan Nair, K.V. (1969). Food and feeding habits of demersal fishes off Bombay bay. *Indian J. Fish.*, **16**: 56-74.

Varadharajan, D. and Pushparajan, N. (2013) Food and feeding habits of aquaculture candidate a potential crustacean of Pacific white shrimp *Litopenaeus vannamei*, South East Coast of India. *J. Aquac. Res. Develop*., **4** (1) :1-5.

Venkataraman, G. (1960). Studies on the food and feeding relationships of the inshore fishes off Calicut on the Malabar coast. *Indian J. Fish.*, **7** (1): 275-306.

Venugopal, N., Pillai, N. G. K., and Prakasan, D. (2014). Food and feeding habits of *Johnieops sina* (Cuvier, 1830) along Cochin coast of India. *Indian J. Fish*., **61**(1) : 103-107.