

Dietary analysis and Feeding intensity of Freshwater Spiny Eel *Mastacembelus armatus* (Hamilton) from Marathwada region

Ahirrao Sunil

Department of Fisheries Shri Shivaji College, Parbhani, Maharashtra, India

Abstract

Marathwada is one of the most productive region of Maharashtra state. It has wide distribution of the rivers, tributaries, lakes and reservoirs with the great biodiversity of aquatic flora and fauna. The ichthyofauna of this region is consisting of Major carps minor carps, exotic carps, minnows, weed fishes, forage fishes. These fishes are supporting the small scale minor capture and culture fisheries of this area. The *Mastacembelus armatus* commonly known as freshwater spiny eel is one of the most important food fish among the commercially important fishes and found abundantly throughout the study area. In the present investigation Dietary analysis and Feeding intensity with different aspects of has been studied. The food analysis and Feeding intensity study is the tool for monitoring growth and management of a particular fish stock from a particular environment. The presents study is carried out by using frequency occurrence and numerical method of food analysis. The study reveals that the food of *Mastacembelus armatus* mainly consist of Insect and crustaceans in a greater extent which is followed by the unidentified materials ,fish larvae and debris in intermediate percentage while the Molluscs and Annelids are at the lower percentage, thus indicating the carnivorous and predatory feeding of the species. Similarly the feeding intensity was found higher in summer season, intermediate in winter season and found lower intensity in monsoon season. The feeding intensity is also found different in different maturity stages. The feeding intensity was found higher in early maturity stages and lower in mature and repining stages of maturity.

KEYWORDS- *Mastacembelus armatus*, Dietary analysis and Marathwada region.

Introduction:

Mastacembelus armatus is a freshwater fish found in all over the India in various lotic and lentic freshwater systems. It is commonly known as freshwater spiny eel, Tire track eel and Zig zag eel. In local language it is known as Bam. It belongs to family Mastacembelidae. *M. armatus* and *M. panalus* (Hamilton) these are two species found in this area. It is very popular commercially important large sized food fish of this area. In the IUCN Red list this genus is enlisted in least concern category while as per conservation Assessment and Management Plan (CAMP) report it is included under lower risk near threatened (LRnT-category) Datta and Banerjee (2014). The knowledge of food and feed habit is very important for fish biology, fish farming, stock management and fisheries of particular species. Similarly it is also important for biological process such as growth development reproduction, migration and other metabolic activities. This food and feeding habits may depend on number of ecological factors such as water quality, temperature stocking density and presence of other species. The *M. armatus* has been

studied by various researchers like Serajuddin and Ali (2005), Manjurul Alam et al.(2013), Santoshkumar and Biswas (2011), Ahirrao (2002) studied the gonado- somatic index , some morphometric studies (Ahirrao 2002), Length- weight relationship (Ahirrao 2008), Nutritional status and energy content during reproductive cycle(Ahirrao 2008), Fecundity (Ahirrao 2015) and also studied the proximate composition under herbal treatment of *M. armatus* from the Marathada region (Ahirrao 2015).The detail study of the food and feeding habits of this commercially important fish is not available from ecological habitat of Marathwada region therefore the present study is undertaken for evaluation of food and feeding habits of this species.

Materials and methods:

Monthly sampling were done from Feb 2014-Jan 2015 from different freshwater resources of Parbhani district including the major river system Godavari and medium reservoirs of this area. Total 169 sample of different size were collected from the landing centers with the help of local fishermen by using the cast net, Gill net and drag net. After the collection fishes were killed and five percent formalin solution was injected to the gut in order to restrict the further digestion and decomposition of food items. To study the food and feeding intensity the stomach were dissected out and the degree of fullness of stomach is determined. The percentage of food composition were estimated by using gravimetric method as per the guidelines of Lagler (1966) and The percentage of occurrence method adopted by Hynes(1650).

Feeding intensity:

The fullness of stomach was calculated according guidelines of Lebedev (1946). The degree of fullness of gut was visually classified as Full, $\frac{3}{4}$ Full, $\frac{1}{2}$ Full, $\frac{1}{4}$ Full, Nearly empty and Empty and further categorized as Active feeder, Moderate feeder and Poor feeder following the methods used by Rao and Rao(2002) and Raje (2006). The food items of the gut was identified by following the standard keys of Philopose (1960),Jana(1973), Battish (1992), Sharma(1999), Venkataraman(1999) and Bilgrami and Saba(2004).

Volumetric method: In this method the content was taken as a unit and various items were expressed as percentage volume by eye inspection (Pillay 1952).The gut content was vigorously shaken with distilled water and a drop of content was examined under microscope. At least ten drops were examined and average of each of drop was noted.

Occurrence method: In this method the number of gut containing the particular food item was expressed as percentage of the total number of gut examined (Hynes1950). In this method firstly all the food items were sorted out and recorded their presence or absence in particular gut. In second step the total numbers of gut in which particular food item present are noted and data for all the food items is pooled and converted in to percentage.

Results and Discussion:

Food composition: The diet of *M. armatus* is found consisting of various types of organisms with their developmental stages as shown in table 1 fig.1. The stomach content is mainly consisting of the dominant group Insects 21.28% and crustacean with 19.66% which is followed by the medium unidentified group 14.61% while the lower groups of food items are recorded as small fish larvae 12.57%, Debris 11.90%, Molluscs 10.08% and Annelids 9.37%. The higher percentage of insects and crustaceans in the diet confirms the carnivorous predatory habit of *M. armatus*. The green material is found in

very small quantities and very rarely this may be an accidental food. The higher percentage of insects (26.74%) and crustaceans (26.56%) found in the month of May. The percentage of unidentified group of food items may be depend up on the digestive activity and overall physiological condition of fish which is related with the number of ecological factors such as temperature Ph and Pollution factors associated with aquatic system. The unidentified group of food items was recorded in the range of 6.66 – 19.34 %.The fish larvae was observed in the range of 4.63-21.23%, while molluscans and annelids were recorded in the range of 6.50-15.5% and 5.50-15.32% respectively. Dutta and Banerjee(2014) has Studies the gut content of *Macrognathus aral* (Bloch And Schneider, 1801)and recorded the above food items along with the copepods, cladocerans and rotifers but in the presents study some items was not so distinct so can not identified and included under unidentified group. The insects were observed as dominant group in the food composition. Manjurul et al .(2013) studied the Diet Composition and feeding intensity of *Mastacembelus armatus* and observed the same food items like Fish 16.60%, aquatic insects 14.75 and overall feeding intensity 48.54% full gut, 16.4% moderately full, 16.26% semi full, 12.40 %semi empty and 6.67% empty gut were recorded. Serajuddin and Rustam Ali (2005) have studied the Food and feeding habits of Striped Spiny Eel *Macrognathus Pancalus* (Hamilton) with respect to seasonal maturity stages. Venkatachalam Uthayakumar et. al. (2013) studied the Impact of seasonal variation and feeding on reproductive behavior of fresh water spiny eel *Mastacembelus armatus* from Cauvery River. Ashraf Abbas (2010) has also discussed the Food and Feeding Habits of Freshwater Catfish *Eutropiichthys Vacha*,(Bleeker) and found no major shiftment from carni-omnivorous orientation of the fish during its various life stages and recorded the above food items from the diet similar to the *Mastacembelus armatus*. All these investigations are from different ecological habitat but no one has reported the food and feeding habits from the Marathwada region because the environmental and ecological habitat may be responsible for change in food and feeding habits of particular species. In the present study the observations were found in the similar lines of the above workers with the little changes.

Table 1- Percentage of seasonal Dietary Composition of *M. armatus*.(%)

Months	No of fish Examine	Fishes	Insects	Crustaceans	Molluscs	Annelids	Debris	Unidentified
Feb.	08	10.25	16.58	23.50	6.50	5.50	8.33	19.34
March	16	8.43	20.14	22.86	7.22	9.25	14.65	18.33
April	20	7.64	18.32	22.58	7.00	8.99	15.92	20.33
May	23	5.22	26.74	26.56	9.36	5.66	12.55	13.68
June	15	8.54	19.41	18.39	15.54	12.58	10.88	14.65
July	10	4.63	127.65	18.11	15.12	8.00	11.98	14.65
August	22	13.63	25.08	18.60	13.05	15.32	9.33	9.49
Sept	13	20.55	21.55	15.32	9.68	10.75	10.40	11.44
Oct	08	21.23	18.26	18.11	7.66	8.01	13.22	13.25
Nov	09	21.04	22.36	14.00	10.11	9.65	14.66	6.66
Dec	16	18.33	20.95	18.25	8.26	9.52	9.56	15.24

Jan	09	11.35	18.36	19.68	11.55	9.32	11.35	18.36
Average %		12.57	21.28	19.66	10.08	9.37	11.90	14.61

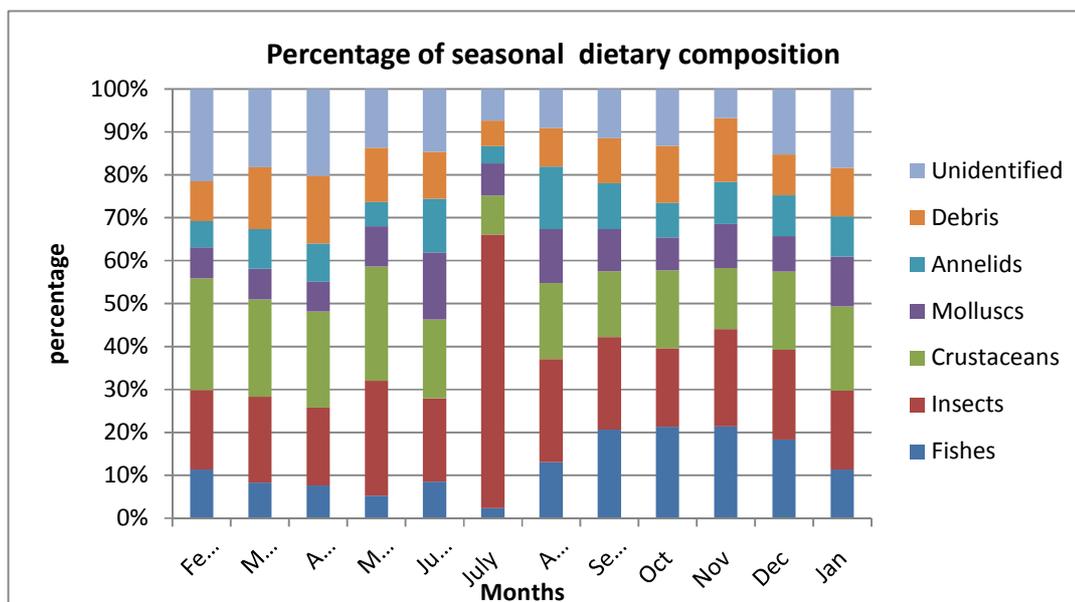


Fig.1- Percentage of seasonal Dietary Composition of *M. armatus*

Feeding intensity: The feeding intensity was observed for the year and presented in table 1 figure 1. For the study of feeding intensity depending on degree of fullness of stomach four categories have been made like Active feeding category including the numbers of Full gut and $\frac{3}{4}$ full gut, Moderate feeding category including the no of $\frac{1}{2}$ full gut and category poor feeding including the numbers of $\frac{1}{4}$ full gut and nearly empty gut while category Empty gut including the no of totally empty gut. The observations were found as individuals with full gut 10.18%,

individuals with $\frac{3}{4}$ full gut 10.56%, individuals with $\frac{1}{2}$ full gut 9.95%, individuals with $\frac{1}{4}$ full gut 12.02%, individuals with nearly empty gut 13.16% and individuals with totally empty gut 23.88% was observed in the present investigation.

The category active feeding was found prolonged from August–December which is followed by the category moderate feeding have been observed in the months of Jan-Feb. The category poor feeding is recorded in the months of March-May and category Empty gut is found in the months of June –July thus showing the different feeding intensity according to seasons. Santosh kumar et al.(2013)has also determined the feeding intensity in *M.armatus*. Dutta and Banerjee(2014) have also estimated the feeding intensity in *Macrognathus aral* (Bloch and Schneider) on the basis of fullness of gut.

Table -2 Seasonal variation of feeding intensities (% of fullness of gut) in *M.armatus*

Months	fish Examine	Active Feeding		Moderate Feeding	Poor Feeding		% of Empty gut
		% of Full gut	% of $\frac{3}{4}$ Full gut	% of $\frac{1}{2}$ Full gut	% of $\frac{1}{4}$ Full gut	% of Nearly empty gut	
Feb.	08	62.2	12.5	12.5	12.5	--	--
March	16	62.5	12.5	12.5	6.25	6.25	--
April	20	35.0	25.0	15.0	10.0	10.0	5.0
May	23	13.04	8.69	34.78	30.43	13.04	--
June	15	--	--	13.33	20.0	13.33	53.33
July	16	--	6.25	6.25	31.25	12.5	43.75
August	22	36.36	22.72	18.18	22.72	--	--
Sept	13	61.53	15.38	15.38	7.69	--	--
Oct	08	62.5	12.5	25.0	--	--	--
Nov	09	66.66	11.11	11.11	11.11	--	--
Dec	16	62.5	12.5	18.75	6.25	--	--
Jan	09	66.66	11.11	11.11	11.11	--	--

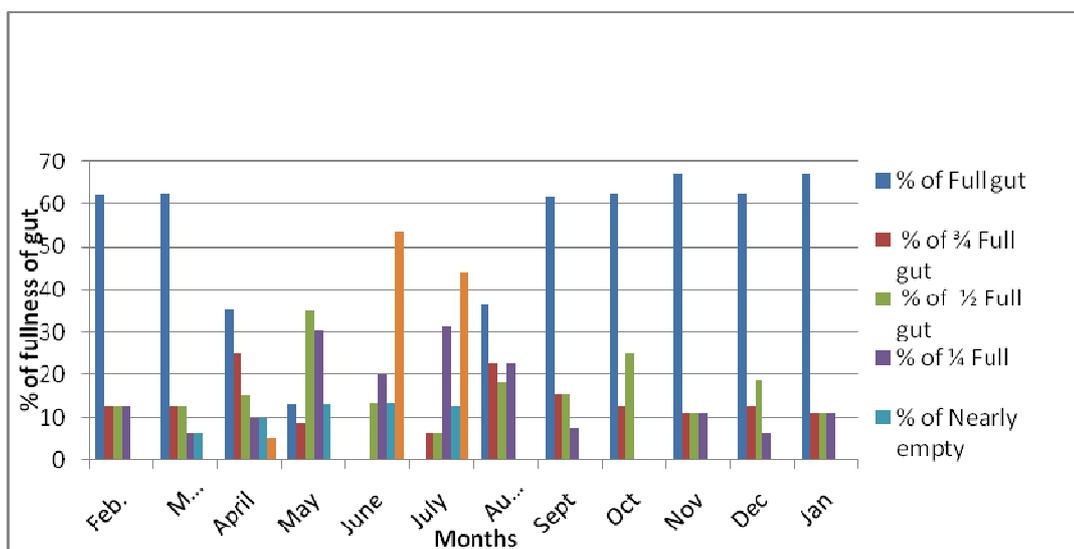


Fig.2- Seasonal variation of feeding intensities (% of fullness of gut) in *M.armatus*

Maturity stages and feeding intensity:

In the present investigation feeding habit is also correlated with the maturity stages as shown in Table 3 Fig 3. The highest feeding intensity was found in the category of active feeding with full gut and $\frac{3}{4}$ full gut in the immature stage, while category moderate type of feeding with $\frac{1}{2}$ full gut is found in the maturing and mature stage and the lowest feeding intensity was observed with $\frac{1}{4}$ full gut and nearly empty gut. The category empty gut was observed in ripe and spent stage of maturity. The higher percentage of empty gut in the ripe and spent stage may be due to physiological strain and development of gonads.

Similarly the higher percentage of full gut may be due to high rate of development and growth and for the recovery of physiological loss in the spent stage during immature stage. Thus, in the present investigation results reveals that there is a variation in feeding intensity according to the maturity stages of life as stated by Dutta and Banerjee(2014), Santosh kumar et al.(2013), Manjurul et al .(2013) ,Serajuddin and Ali (2005), and Santoshkumar and Biswas (2011).

Table-3 Percentage of fullness of gut during maturity stages in *M. armatus*

Maturity stages	fish Examine	% of Full gut	% of $\frac{3}{4}$ Full gut	% of $\frac{1}{2}$ Full gut	% of $\frac{1}{4}$ Full gut	% of Nearly empty gut	% of Empty gut
Immature	55	11.20	29.10	27.10	10.30	11.50	10.80
maturing	24	31.22	10.63	24.04	14.53	10.58	09.00
mature	58	09.22	13.85	12.95	10.24	13.78	40.36
Ripe	10	--	--	3.26	15.87	13.44	67.43
Spent	22	--	--	--	9.20	16.54	74.26

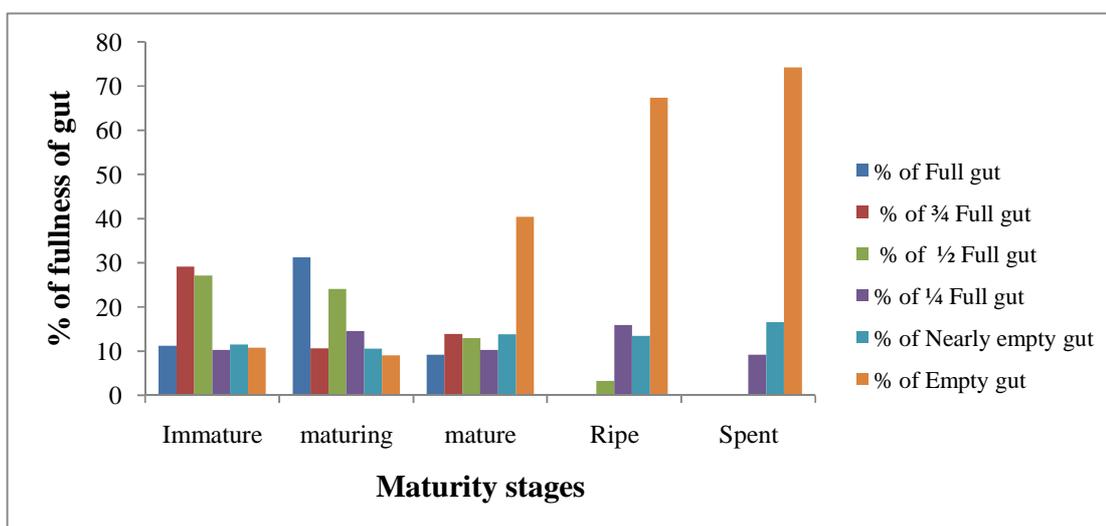


Fig.-3 Percentage of fullness of gut during maturity stages in *M. armatus*

Acknowledgement: Author is grateful to the Principal of this college and Head of the Department of Fisheries, Shri Shivaji College, Parbhani for providing necessary facilities to carry out this work.

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