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Stomach content analysis of Catfish -*Arius maculatus* (Thunberg, 1792) From Parangipettai Coast, South East Coast of India

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Abstract

Food and feeding ecology of fish may be a crucial characteristic of the life-history strategy of species to know the foremost necessary functional role of the fish inside they are living ecosystems food and feeding habitat is very necessary to derived energy is consumed in many vital role, they assist us to grow, become stronger, provide us energy, survival and reproduction for all the metabolic activities, cell repair, muscular contractions secretary functions, impulse physical event and build up a stronger immune system and to repair previous harmed cells and also the upkeep of correct health. In this study were investigate the feeding habits of *Arius maculatus* and analysis of the stomach contents there penetrating any other foreign particle. The various food items recorded from the stomach of A. maculatus during the study period. In general, the food items found in the examined stomachs were grouped into eight categories. The cat fish of A. maculatus stomach contents as identified. The feed compositions in the following order; Miscellaneous< Crustacean < Fish < Polychaetes < Sand grains < Digested matter < Zooplankton < Phytoplankton were recorded as respectively.

Keywords: Food, feeding habits, *Arius maculatus*, stomach analysis.

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INTRODUCTION

The food and Feeding habitat of fish may be a crucial characteristic of the life-history strategy of a species to know the foremost necessary functional role of the fish inside their living ecosystems (Blaber, 1997; Cruz-Escalona et al., 2000; Hajisamae et al., 2003; Abdel-Aziz and Gharib, 2007). Food and feeding habitat is very necessary that in derived energy is consumed in many vital ways they assist us to grow, become stronger, provides an energy, survival and reproduction for all the metabolic activities (Kuthalingam MDK, 1987 and Kagwade PV, 1967). Most of the fish became custom-made to be adapted variety of foods. The information of food and feeding habits of any fish is important as a result of copiously useful for understanding the biology. Fish are established and also the rate of feeding is stimulating on the spawning of the fish (Kagwade PV, 1967 and Luther G (1985). The provision of food in fish it should be influencing the horizontal and vertical movements of the fish stocks. Food and feeding of assorted ornamental fish unit being studied throughout the world viz., Kader et al. (1988) has a Gobioides rubicundus from Bangladesh, Priyadharsini et al. (2012) has a Dascyllus trimaculatus from Gulf of Mannar, Rema Madhu et al. (2008) has an ornamentals fish from Mandapam. An identification of fish gut content allow us to identify concerning food consumption of marine fish, feeding and digestion functions and even fish atmosphere segregation sort of researchers had also thought of entirely different aspects of food and feeding behavior of an extra range of fish from Indian coastal waters (Chackop, 1949, Qasim SZ, 1957, Qasim, 1972, Serajuddin M, 1994, Serajuddin M, et al., 1998, Serajuddin M, et al., 2005, and Suresh VR, et al., 2006). In general, The A. maculatus referred to as in the name of spotted Cat fish. The A. maculatus is generally edible and larger verities are in smart demand. (Situ Y and Sadovy YJ, 2004). The aim of this study was conducted to analyze the sort of food eaten by Catfish A. maculatus (Thunberg, 1792). Such studies can be necessary in the rational management of this species.

MATERIALS AND METHODS

Total two hundred (200) fish samples were collected from Mudasalodai landing centre in Parangipettai (Lat.11°29'N; Long.79°46'E) coastal area on the duration of the January 2012 to December 2012. After the collections of catfish were stored in an ice boxes, later the stomachs contents were removed and fixed 10% buffered formalin than gut contents were analyzed in the laboratory. The dissecting of the alimentary system of catfish, different components on the stomachs were recorded. They were splits open by a pair of scissors and emptied on a Petri dish for measurements with the help of zoom dissection phase contrast microscope. The food items from catfish were identified up to the family level wherever possible. For the duration of the analysis, regurgitated stomach was discarded (Dan, 1975). Occasion technique is the simplest way of recording the food relating to the number of stomach containing one or more individuals of each food item and the number were expressed as percentage of all stomachs those containing food (Hynes, 1950 and Pillay, 1952). The occurrence of various apparatus in the food of the species was estimated by the occasion method (Natarajan, Jhingran, 1961) and the same was expressed in percentages.

RESULTS

The *A. maculatus* stomach contents of the available specimen during the study period are presented in Table No: 1.Totally eight various food items were found in the gut portion of *A. maculatus* viewing an unreliable statistical abundance and qualified percentage abundance. In the gut portion various food items like Crustaceans, Fish, and Polychaetes, Phytoplankton, Zooplankton, Sand grains, Digested matter and Miscellaneous are recorded. The results were shows on Table No: 2.

Crustacean:

The Crustaceans were observed the mass of abundant food items in *A. maculatus.* It forms the mass of the fish dietary system. The highest percentage were recorded in the month of August 140.28 % followed by 137.98 % was in October and the lowest percentage were recorded at February 82.94 % and 87.24 % in the March.

Polychaetes:

The Polychaetes were twisted the majority plenteous food items in the *A. maculatus*. The maximum percentages of catfish occurrence of polychaetes were recorded 5.336 % in the month of December and 3.920 % in September. The minimum percentage occurrences of polychaetes were recorded 1.850 % and 2.434 % in the month of February and March.

Fish:

The small fish formed the most abundant food thing in *A. maculatus*. They occur in high quantities during the year. The maximum percentage occurrence of catfish were recorded in the month of December has 56.141% and 54.732 % has in July. The minimum percentage occurrences of small fish were recorded 31.946 % in January and 34.530 % in February.

Phytoplankton:

In *A. maculatus,* the Phytoplankton formed a most abundant item. They occur in the high level amount during the year. In spotted catfish, Phytoplankton was shows maximum percentage occurrence 27.825 % and 24.486 % in December and October. The minimum percentage occurrences of phytoplankton were recorded 15.423 % and 16.377% in March and May.

S. No	Food item	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Minimum (Year)	Maximum (Year)	Average (Year)
I	Crustacean															
1	Crab	5.3	3.5	3.6	5.6	4.3	4.2	4.3	1.2	3.5	5.5	3.1	1.3	1.2	5.6	3.78
2	Tannaids	4.5	5.2	6.8	5.2	6.6	6.6	6.6	7.5	7.3	6.8	6.2	7.7	4.5	7.7	6.41
3	Isopods	7.8	3.6	5.4	6.2	5.2	6.8	4.3	7.8	7.1	5.2	6.3	5.8	3.6	7.8	5.95
4	Amphipods	5.0	5.8	6.2	7.2	6.2	6.4	5.2	6.5	6.3	4.9	5.2	5.7	4.9	7.2	5.88
5	Small prawn	3.2	7.1	6.8	7.0	5.2	6.5	5.4	6.3	6.0	6.1	7.1	6.4	3.2	7.1	6.09
6	Shrimps	6.1	5.3	3.5	4.6	3.1	2.2	6.2	5.8	5.2	5.6	5.6	5.1	2.2	6.2	4.85
7	Mysids	6.5	5.8	4.6	5.8	6.2	6.3	5.7	5.9	5.6	5.3	5.8	7.5	4.6	7.5	5.91
8	Copepods	5.4	4.7	4.3	6.3	7.3	7.1	6.2	6.1	5.3	6.9	6.1	6.8	4.3	7.3	6.04
9	Lucifer	4.6	3.6	3.8	4.5	5.8	6.8	6.4	7.5	6.1	7.7	6.8	6.9	3.6	7.7	5.87
10	Egg and Larva	5.3	2.3	3.1	3.4	6.1	6.3	4.5	6.4	5.9	6.5	5.2	5.7	2.3	6.5	5.05
II	Polychaetes															
1	*Armandia sp*	3.2	3.5	4.2	5.3	5.9	6.3	3.4	3.6	4.7	3.9	5.2	6.5	3.2	6.5	4.64
2	*Capitella sp*	4.2	3.6	4.6	3.4	2.9	4.4	2.6	3.4	2.3	3.2	3.3	4.3	2.3	4.6	3.51
3	*Eunice sp*	1.3	-	1.4	2.3	2.5	3.2	3.4	3.6	3.1	3.3	3.5	3.9	1.3	3.9	2.86
4	*Glycera sp*	3.9	3.2	3.1	3.6	4.2	5.3	3.4	4.6	5.2	3.3	3.5	4.7	3.1	5.3	4
5	*Onuphis sp*	3.1	3.3	2.3	2.1	2.5	-	4.2	3.9	4.5	4.6	2.7	3.7	2.1	4.6	3.35
III	Fish															
1	*Stolephorus indicus*	2.3	2.5	3.2	3.5	3.9	4.2	4.5	4.7	3.3	5.3	4.8	3.8	2.3	5.3	3.83
2	*Arius arius*	2.5	3.2	4.5	4.7	4.2	5.2	5.6	3.9	1.8	5.3	3.7	5.9	1.8	5.9	4.20
3	Terapon puta	2.3	2.5	-	3.2	3.5	3.7	4.2	4.8	3.9	2.7	1.7	3.6	1.7	4.8	3.28
4	Fish larvae	3.2	3.4	4.2	4.6	4.5	3.1	4.8	5.1	4.8	3.9	5.7	5.3	3.1	5.7	4.38
5	Fish eggs	3.3	3.1	3.5	4.9	3.4	3.6	4.2	4.6	4.3	3.9	5.6	5.3	3.1	5.6	4.14
IV	Phytoplankton															
1	*Coscinodiscus sp*	2.8	3.4	-	3.6	2.6	2.5	2.4	2.5	2.3	2.1	2.6	4.2	2.1	4.2	2.54
2	*Cyclotella sp*	2.6	2.4	3.6	2.7	2.6	-	2.5	2.9	2.1	4.2	4.3	4.6	2.1	4.6	3.13
3	*Triceratium sp*	2.7	2.6	-	2.8	2.5	3.4	2.6	2.1	2.4	2.3	2.7	2.8	2.1	3.4	2.62
4	*Navicula sp*	2.1	2.4	3.8	3.4	-	3.2	2.9	2.7	2.5	3	3.8	2.6	2.1	3.8	2.94
5	*Odentella sp*	2.9	2.8	2.3	2.4	2.6	2.7	2.8	2.6	4	3.8	-	3.3	2.3	4	2.92
V	Zooplankton															
1	*Acartia sp*	1.8	1.6	1.5	1.4	1.8	1.9	1.6	2.6	2.7	2.5	2.6	2.8	1.4	2.8	2.06
2	*Canuella sp*	1.7	1.3	1.4	-	1.6	1.9	2.5	2.6	2.7	2.9	2.8	-	1.3	2.9	1.94
3	*Sagitta sp*	1.3	1.6	1.8	2.6	2.1	1.4	-	1.4	1.5	1.3	1.6	-	1.3	2.6	1.50
VI	Sand grains	10.2	10.3	11.1	12.3	10.4	11.7	12.4	13.6	11.9	11.6	10.5	13.3	10.2	13.6	11.60
VII	Digested matter	9.2	8.3	10.2	7.3	6.3	5.4	7.9	8.9	6.4	6.4	8.2	8.7	5.4	10.2	7.76
VIII	Miscellaneous	20.2	21.2	20.4	18.3	20.3	21.5	23.8	25.8	23.9	28.9	24.6	24.6	18.3	28.9	22.79
	Maximum (Monthly)	20.2	21.2	20.4	18.3	20.3	21.5	23.8	25.8	23.9	28.9	24.6	24.6			
	Minimum (Monthly)	1.3	1.3	1.4	1.4	1.6	1.4	1.6	1.2	1.5	1.3	1.6	1.3			
	Monthly- Average	4.53	4.43	4.82	5.00	4.87	5.30	5.21	5.51	5.11	5.44	5.36	5.95			

Table 1: Different food items recorded from the stomachs of *A. maculatus (Thunberg, 1792)* (January2012-December 2012)

	Food item	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Monthly Average
1	Crustacean	108.73	82.94	87.24	117.40	118.23	132.34	113.21	140.28	128.14	137.98	124.22	130.78	118.46
2	Polychaetes	2.465	1.850	2.434	2.789	3.240	3.686	2.890	3.648	3.920	3.349	3.312	5.336	3.243
3	Fish	31.946	34.530	36.175	49.094	45.806	46.510	54.732	54.262	42.517	49.564	50.504	56.141	45.982
4	Phytoplankton	20.829	21.624	15.423	23.691	16.377	18.76	20.988	20.352	21.147	24.486	21.306	27.825	21.068
5	Zooplankton	5.76	5.4	5.64	4.8	6.6	6.24	4.92	7.92	8.28	8.04	8.4	72	12
6	Sand grains	14.209	14.348	15.462	17.134	14.487	16.298	17.273	18.945	16.577	16.159	14.627	18.527	16.170
7	Digested matter	8.574	7.736	9.506	6.804	5.872	5.033	7.363	8.295	5.965	5.965	7.642	8.108	8.574
8	Miscellaneous	55.166	57.897	54.620	49.977	55.439	58.717	64.998	70.460	65.271	78.926	67.183	67.183	55.166

Table: 2. Monthly Variation in the Percentage Composition of Food of Male and Female in *A. maculatus (*2012 January – 2012 December)

Figure 1A: Stomach content analysis of *A. Maculatus* fish species

Figure 1B: Stomach content analysis of A. Maculatus fish species

Figure 1C: Stomach content analysis of *A. Maculatus* fish species

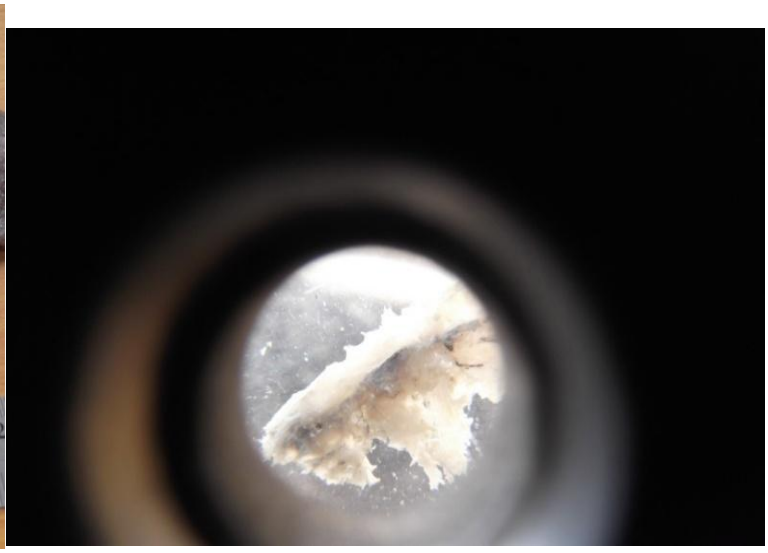

Figure2: Stomach content analysis of *A. Maculatus in microscopic view of small fish*

Zooplankton:

Zooplankton formed most abundant item in the food of spotted catfish. They occur in a large amount quantity during the year. The catfish had maximum percentage occurrence of zooplankton were recorded 72 % in December and 8.28 % in September. The minimum percentage occurrences of zooplankton were recorded 4.8 % in April and 4.92 % in July.

Sand grains:

Sand grains were abundant during the year. The catfish of *A. maculatus* percentage fluctuated between 18.945 % and 18.527 % in August and December. The minimum percentage occurrence of sand grains recorded 14.209 % in January and 14.348 % in February. Percentage occurrence of sand grains in the diet of *A. maculatus* was 27 % of the examined stomachs in October and December. Sand appeared average in male fish 16.170 % of the total examined stomachs during the study period.

Digested matter:

This group was also throughout the year. The catfish *A. maculatus* found throughout the year. The *A. maculatus* lowest abundance of digested matter 5.033 % was noticed in June and the highest was 9.506 % in March.

Miscellaneous:

The food items in which form a minute percentage of total food composition or accidentally taken by fish were group under this category. It included algal filaments and additional animal, plant materials. This group was also found during the year. In male and female *A. maculatus* lowest abundance of Miscellaneous was noticed 49.977 % in April and the highest content was observed 78.926 % in October. In addition to these items an average percentage of 55.166 % of food items could not be identified due to advanced condition of digestion**.**

DISCUSSION

Food and feeding behavior may be a most significant aspect of biology of any animal that has economic values in global level. The data of food and feeding habits are more vital, it offers a lot of information on growth, distribution and biology of the fish. The changes in the feeding selection during completely different seasons, it's considerably helpful to the migratory patterns of the fish studies. In general, the stomach determined for evaluating the food and feeding pattern. In the case of omnivorous fish, the nutrient canals are prolonged and maintaining the food for extended period (Chacko PI, 1949 and Venkataraman G, 1960). The A. maculatus are often classified as euryphagous carnivores, feeding on a broad range of planktonic and benthic marine organisms. The catfish of A. maculatus abdomen contents as known given food composition in the following order; Digested substance, Crustacean, Polychaetes, Fish, Phytoplankton, Zooplankton, Sand grains and Miscellaneous were recorded as there in order. A. maculatus through terribly broad feeding habits are a great acceptable to have whatever issue obtainable in detention and their nutritionary food are easier to assemble. This study established with before studies (Weinberg GG, Linina, Minsk, 1956, Reubens, 1968, Colman JA, 1970, Dhulkhed MH, 1972 and Hajisamae S, et al., 2003).

In this current study close to tiny variation in the multiplicity of nutritional things in the stomach contents of the A. maculatus for the different month of the year (Qasium SZ, 1972) (Table 2). In the central point of catfish, the crustaceans are the bulk leading food item in most of the months with hit the highest purpose amount in June, August, September, October, and December so as of their great quantity. Venkataraman G, 1956, Venkataraman G, 1960, Prabhu MS, 1955, Harmelin-Vivien ML et al., 1989 and Morte S, et al., were experimental of crustaceans together of the foremost vital food things of marine fish. Polychaetes were dominant in the middle of food items and may be merely identified by prevalence of setae, jaws and irregular body segments. The Polychaetes worms which are plentiful in the sandy and rock-strewn habitats of the catfish were the most food item of this species. The maximum 100 (%) of Polychaetes was observed in the period of August, September, and December and lowest for the period of January, February, March and April. (Seshappa G, 1953) reported that present was a fast decolonization of the inshore the deep bottom as results of polychaetes the bottom fauna constant to be made all through June to September and November. A reported marine fish such as tiny fish, A. maculatus, fish larvae and fish eggs feed mostly on zooplankton. Therefore, the review of the stomach contents showed the mature fish to be mostly zooplankton feeder constituting the single biggest item. Phytoplankton were also a vital food component, the familiar it was experimental most April, October and December and minimum was recorded in the month of March, May and June.(George PC, 1953 and Mukundan C, 1967) observed that the fish stomachs occurrences in plankton almost throughout the year. a further feed composition of zooplankton a large amount of leading food item the highest in the month of September and December was ascertained and lowest was observed in the month of April (Qasim SZ, 1972). The occurrence of sand particles in the stomach can be due to chance eating of the food items that have be chosen awake beside sand particles. It was plentiful during the year, highest was observed in the month of August and December. The lowest was recorded in the month of January and February (Stergiou KI, Karpouzi VS, 2002). Digested matters also were occurrences for the period of the year. The best was observed in the month of January, March and August and lowest amount was

recorded in the month of May and June. Miscellaneous has twisted main food item of adult more or less during the year (Qasim SZ, Jacob PO, 1972, and Kulkarni AV, 1958). Darnell RM, (1967) Indicated that the miscellaneous consists of all types of biogenic substance in several stages of disintegration. It has been originated to be consumed fairly often (Darnell RM, 1967). (Rajan S, 1968) reported on the food and feeding habits of fish from the Chilka Lake. In general, the food and feeding habits of fish be different with the event of the day, size of fish, monthly, seasonally, completely different environmental factors and a mix of feed materials there in the sea water ecosystems. The spawning time of the feeding progress terribly less awaiting in feeding quantity of food with the arrival of after spawning period can be attributed to quantity of high variety of spent fish, which feed aggressively. (Vijayaraghavan P, 1953 and Vijayaraghavan P, 1955) has been reported as in ribbon fish, Trichiurus lepturus feeding amount from September to December from madras coast.

In the present study the standing of feeding observed in several months of the year, it can be deducted that concentrated feeding happens for the period of the months of August and October the feeding is reasonable for the period of the residual amount feeding seems to be reduced. High values of percentage (%) amount of blank stomachs for the amount of February, April and May with peaks in June, July and August indicate an amount of reduced feeding activity that also coincides with kind of large amount of mature fish about to spawn (Tsu-chan Miu, et al., 1990). A quantity of studies discovered that the best percentage of empty stomachs happens during reproduction because of a decrease in food intake in reproduction period for terapontidae.

This study agrees within the past determined on the food and feeding habits of some of marine fish of Sardinella longiceps (Devanesan.1932), Sardinella gibbosa (Devanesan.1932), Thrissocles mystax (Venkataraman.1956), Raconda russellina (Varghese.1961), Coilia feorneenjij (Varghese TJ, 1961), Katsuwonus pelamis (Sivadas M, et al., 1999), Mugil cephalus (Soyinka Olufemi Olukolajo, 2008), Ribbonfish Trichiurus haumeld (Prabhu MS, 1950), sardines Kowala coval and Sardinella longiceps (Nair RV, 1953), Mumbai duck Harpodon nehereus (Bapat SV, 1950), the general anchovy (Vijayaraghavan P, 1951 and Vijayaraghavan P, 1953) there in order. In present study of natural diets of A. maculatus is specifically expensive approach for accepting aspect in biology and ecosystem of species and also need property managing, development of conservation measures.

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