

FOOD COMPOSITION AND FEEDING INTENSITY OF *CHANNA STRIATA* FROM SELECTED STATIONS OF RIVER KRISHNA, ANDHRA PRADESH

Abstract

Aim of the current piece of work was to analysis the food composition and feeding intensity of *Channa striata* from Krishna River were studied between June, 2019 and July 2020. The stomach contents of 240 fishes were analysed from the three stations to understand the food composition of the fish. The major components of food items in the gut of fish composed: fishes and their larvae, crustaceans, insect larvae, annelids with semi digested material and unidentified items. Fishes are identified as of teleost, but most of the fish remains could not be identified since they are found in advanced stages of digestion with only skeleton remains. Gastropods identified as polychaete larvae, and Crustaceans are prawn and shrimp, crab larvae. The percentage occurrence of fishes and their larvae and intensity of feeding indicated their preference for fish's food.

Keywords: *Channa striata*, food composition and feeding intensity.

Introduction: Murrels belonging to family channidae are predatory air-breathing fishes well distributed in Asian continent and African countries [1]. This family was the most economic food fish among the local market with traditionally identified pharmacological benefits with wound healing and in boosting energy of the disease persons particularly *Channa striata*. The *Channa* has highest species diversity with 46 valid species [2]. Nearly 22 species of *Channa* have been described from India, out of which 19 sps are found in the Eastern Himalayan region [2]. The food and feeding habits of fishes from various habitats has shown that the requirements at different stages in their life different ecosystems [3]. It is very important in fishery biology as it relates to various activities of the fish like shoaling behaviors and even entire fishery [4]. Feeding biology is an important aspect of the life history stages of a species to understand its function of the fish within their ecosystem [5]. Food quality and occurrence is the major factor controlling fish production. Quality and quantitative assessment of food in fishes is therefore an important aspect of fishery management and a study of food and feeding of fishes can shed light on the behavior, habitat use, energy intake of the various fish species and inter/ intra specific

interactions that occur in the aquatic ecosystem [6]. The food and their quality of fishes changes with a number of factors such as extrinsic (biotope, region) or intrinsic (species, size, behavior) and thus information on food of fishes is an important to understand the basic functioning of fish assemblages which are important for developing of Ecosystem Based Fisheries Management (EBFM) models [7, 8]. The concept of critical feeding period has been found to be valuable in understanding of the variations in recruitment of wild fish stocks [9] and also an understanding of how the various fish species utilize available food resources and other factors like water quality also affect their distribution and abundance [10,11].

Fishes are directly depend upon their surrounding aquatic environment for food and are highly adopted that environment and also utilizing most of the readily available food organisms [12]. Seasonal occurrence and diurnal abundance of different food organisms may influence the movements and migration of different fishes. Hence, it is very essential to gain an insight into the relationship between the fishes and their food organisms for prediction or otherwise exploitation of fish resources. Krishna et al., [13] have reported that the food and feeding habits of some selected fishes basis on percentage of the food in the guts of the fishes and categorized that fishes into herbivores which feeding on plant material, carnivores which feeding on animal material. The omnivores which fed on one or more groups of organisms, i.e., plankton, benthos [11]. The scale of fish population in a region is dependent on function of its food potentialities [8]. There are also terms like Piscivorous- feeding mainly on fish, Carnivorous-feeding mainly on crustaceans, Planktivorous -feeding on plankton, Detrivorous -feeding on detritus and Cannibalistic-feeding on their own kind. The magnitude of fish population in a particular region is a function of its food potentialities and also other factors ecosystem. The knowledge of the food and feeding intensity of fish helps in finding out the distribution of fish population and water quality of that habitat a through survey of literature indicates that such knowledge is highly essential for successful management of a fishery and such studies are undoubtedly important in any fisher's research program [13].

The diet composition and feeding habits of *Channa striata* in Krishna River is scanty. Therefore, the results of current study provides valuable information for the future studies in the Krishna River region fishery management. In the present study murrel *Channa striata* was selected for the observation of diet composition and feeding habits in the selected area of river Krishna, Andhra Pradesh.

Materials and Methods: Fish sampling are collected from 3 stations of the River Krishna, Guntur district of Andhra Pradesh and they are Station-ST1: Amaravati - Its located 16°34'50.36"N Latitude and 80°21'10.65"E Longitude. Station-ST2: Venkatapalem - Its located 16°31'01.67"N Latitude and 80°33'31.71 "E Longitude. Station-ST3: Seethanagaram, near Prakasam barrage - Its located 16°30'00.76"N Latitude and 80°36'01.99"E Longitude with the help of fisherman during June, 2019 to May, 2020. The collected fishes were brought to the laboratory for further analysis. The total length, and weight of fishes were measured with the help of electronic weighing balance. The gut content of fishes was dissected and preserved 5% formalin. The content each stomach was examined using binocular microscope. A weight of the stomach of the individual fish was recorded, based on the weight of the stomach and body weight of the fish. Gastro somatic index of individual fish was calculated using the following formula.

$$\text{Gastro Somatic Index (GSI)} = \frac{\text{Weight of the stomach}}{\text{Weight of the fish}} \times 100$$

Twenty fishes are sacrificed in each month for data collection. Quantitative analysis was carried out by using both occurrence and point's volumetric method [14]. The items of food were smaller in size, their volume could be estimated only by allotment of points. From the food content, volumes obtained for individual fish by the above method, season and monthly averages and percentages were calculated. The volume index was evaluated from the total points of the entire item recorded over the period of study. In order to get a clear picture of frequency of occurrence as well as volume of various items, the index of preponderance method [16] was used. The index of preponderance was worked out using the following formula:

$$I_p = \frac{V_i \times O_i}{\sum V_i \times O_i} \times 100$$

Where: I_p - Index of preponderance (%); the percentage of one food type. where V_i and O_i represent the percentage of volume and percentage of occurrence indices of each food item respectively.

Feeding intensity during various season and months was determined from the data on the degree of fullness of the stomach. The condition of feed was determined by the observations of the degree of distension of the stomach as described by [15]. Fishes with stomach gorged, full, $\frac{3}{4}$ full, $\frac{1}{2}$ full were considered to have been feeding actively, while, stomach $\frac{1}{4}$ full and empty were

considered to denote poor feeding activity. Only actively fed specimens were taken for further analyses of stomach content. The percentage occurrence of stomach under different conditions of feeding was also calculated for the whole period of study.

The food items recorded in the stomach was divided into six groups.

1. Gorged: Stomach was filled with heavy food
2. Full: Stomach was full with food items
3. $\frac{3}{4}$ Full: Stomach was $\frac{3}{4}$ full with food items
4. $\frac{1}{2}$ full: Stomach was $\frac{1}{2}$ full and slightly distended food items
5. $\frac{1}{4}$ full: Stomach was $\frac{1}{4}$ of food items
6. Empty: Stomach without food items

Point's method: The degree of seeming fullness of the stomach was determined and points were assigned. Gorged (1.25); Full (1.00), $\frac{3}{4}$ Full (0.75), $\frac{1}{2}$ full (0.50), $\frac{1}{4}$ full (0.25) and empty was (0.00)

Results and discussion: During study period a total 240 (120 males and 120 females) guts of *Channa striata* were examined. The food composition of *Channa striata* male fishes were represented in figures (1 to 4) and the female fishes were represented in figures (5 to 8). The feeding intensity of *C.striata* males were presented in Table (1) and the females were presented in Table (2). The gut content of murrel composed, of fishes and their larvae, crustaceans, insect larvae, annelids with semi digested items and unidentified materials. Fishes are identified as of teleost particularly major carps and minor carps larvae, but most of the fish remains could not be identified since they are found in advanced stages of digestion with only skeleton remains. Gastropods identified as polychaete larvae, and crustaceans are prawn, shrimp and crab larvae. The percentage occurrence of fishes and their larvae and intensity of feeding indicated their preference for fish's food.

Fig. 1: Percentage of food composition of *male Channa striata* in the South West Monsoon, 2019-2020.

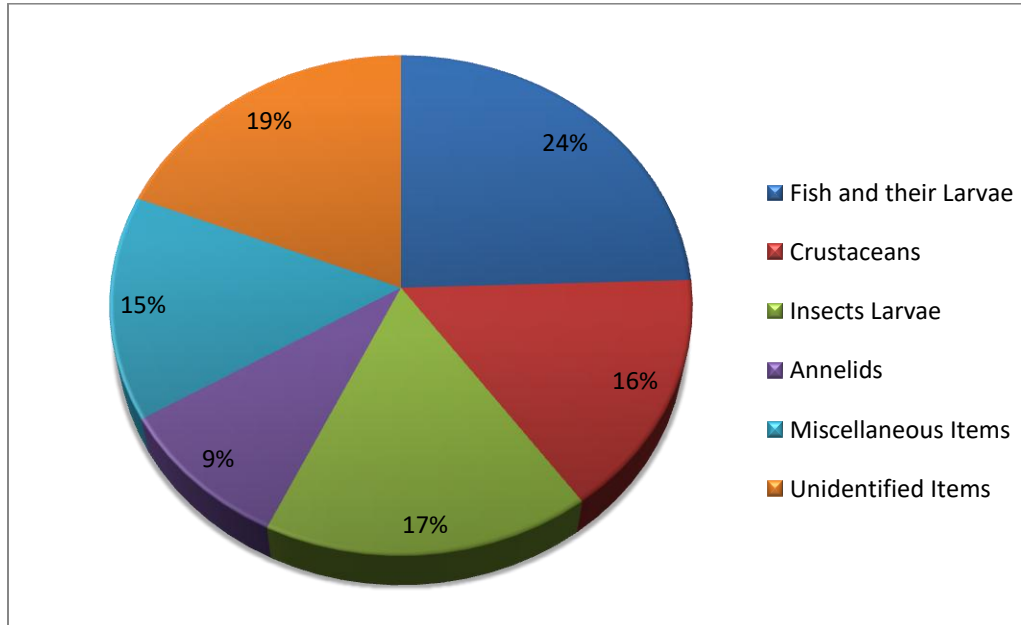


Fig. 2: Percentage of food composition of male *Channa striata* in the Post Monsoon, 2019-2020.

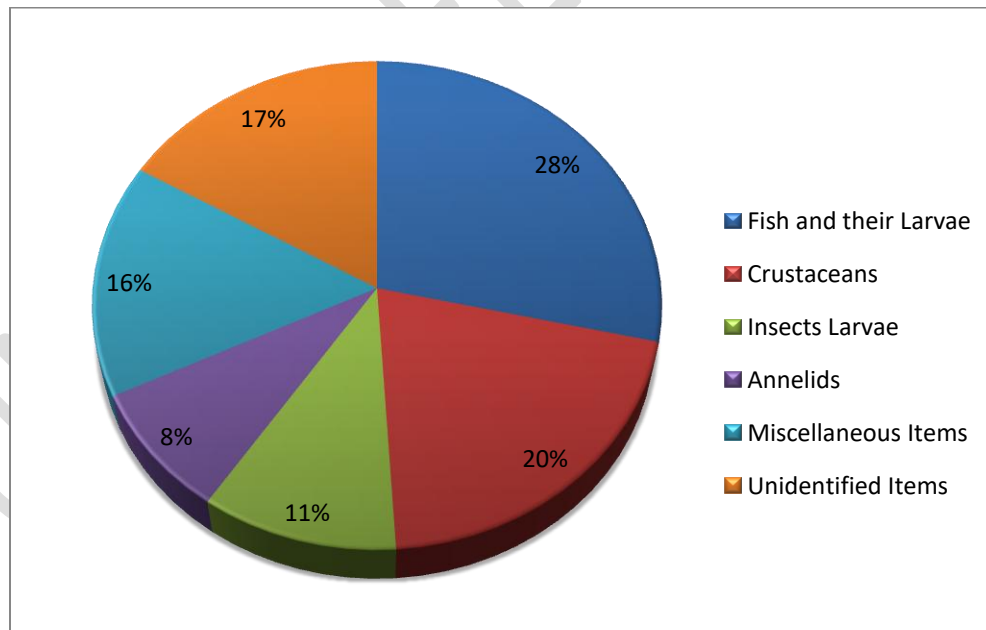


Fig.3: Percentage of food composition of male *Channa striata* in the North East Monsoon, 2019-2020

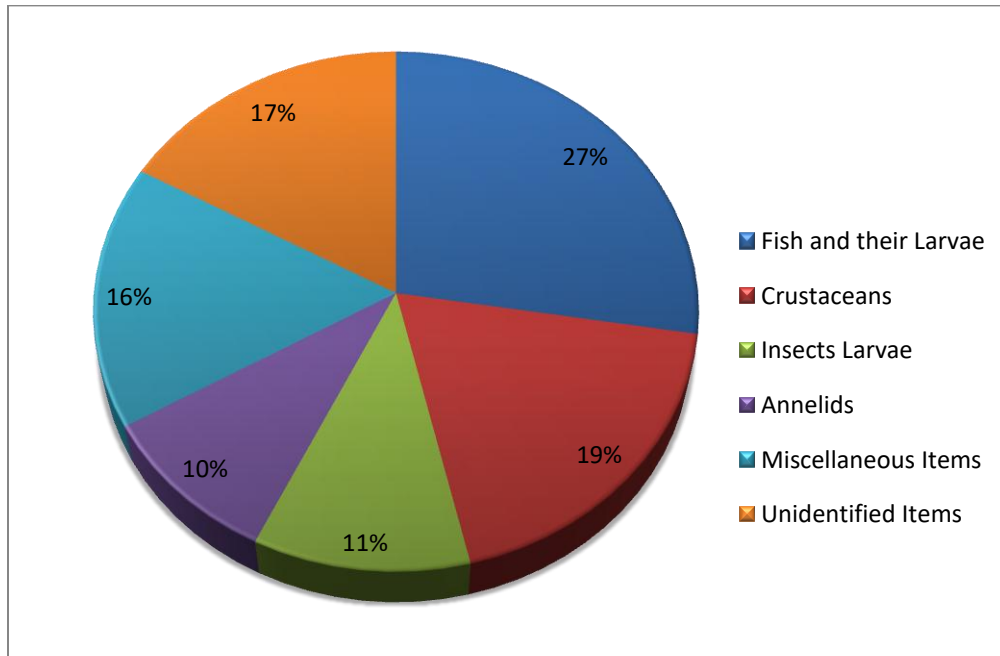


Fig.4: Percentage of food composition of male *Channa striata* in the Summer, 2019-2020.

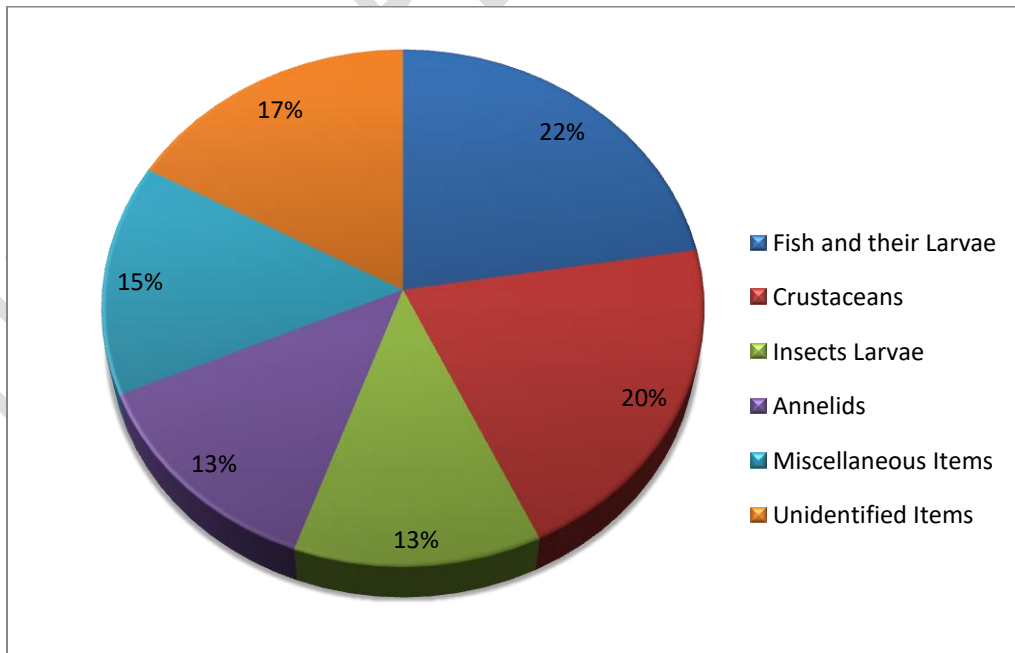


Fig. 5: Percentage of food composition of female *Channa striata* in the South Monsoon, 2019-2020.

West

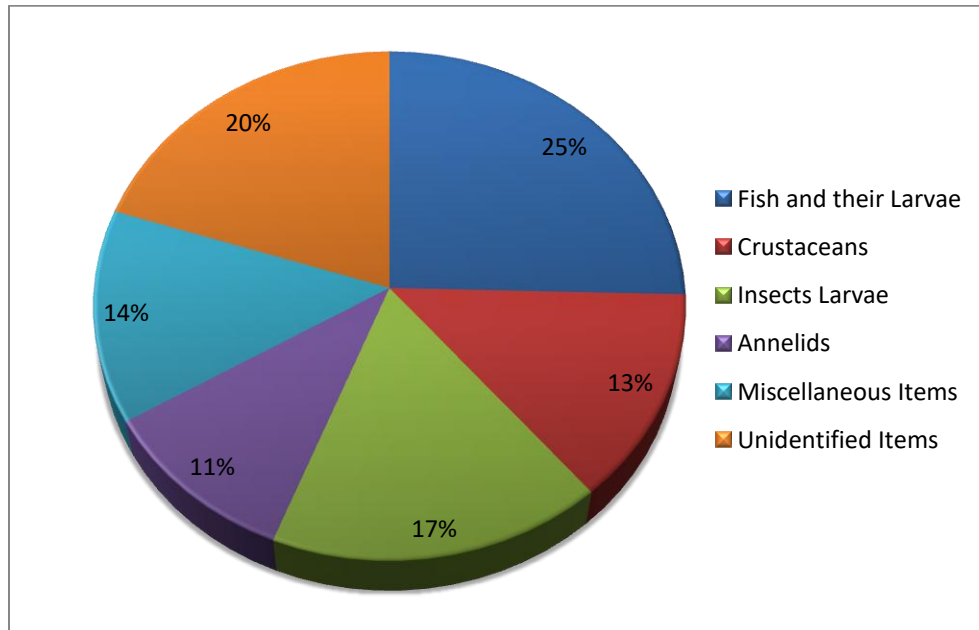


Fig.6: Percentage of food composition of female *Channa striata* in the Post Monsoon, 2019-2020.

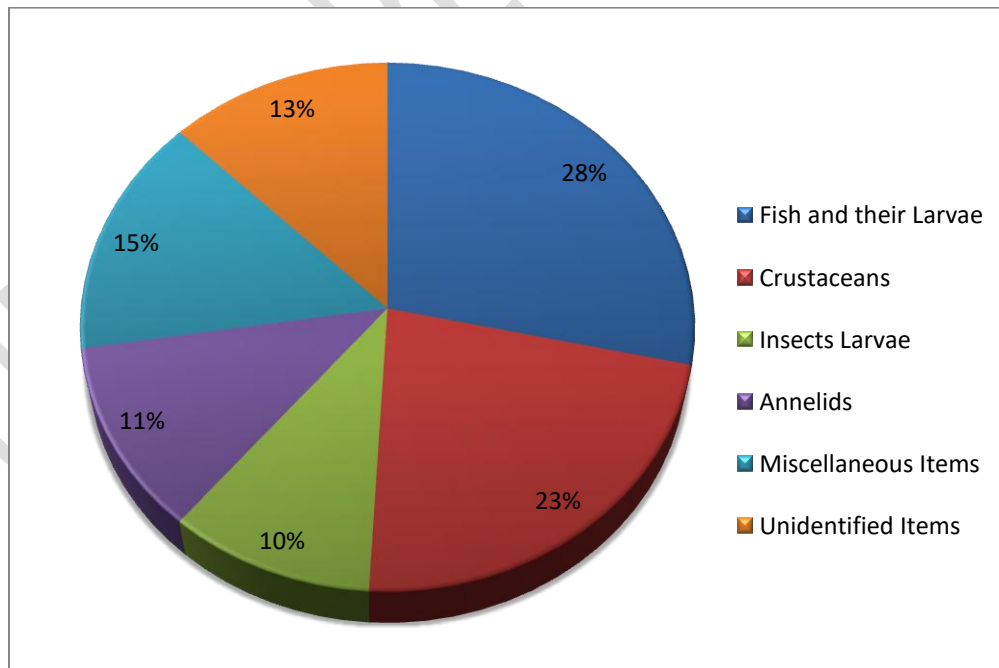


Fig. 7: Percentage of food composition of female *Channa striata* in the North East Monsoon, 2019-2020.

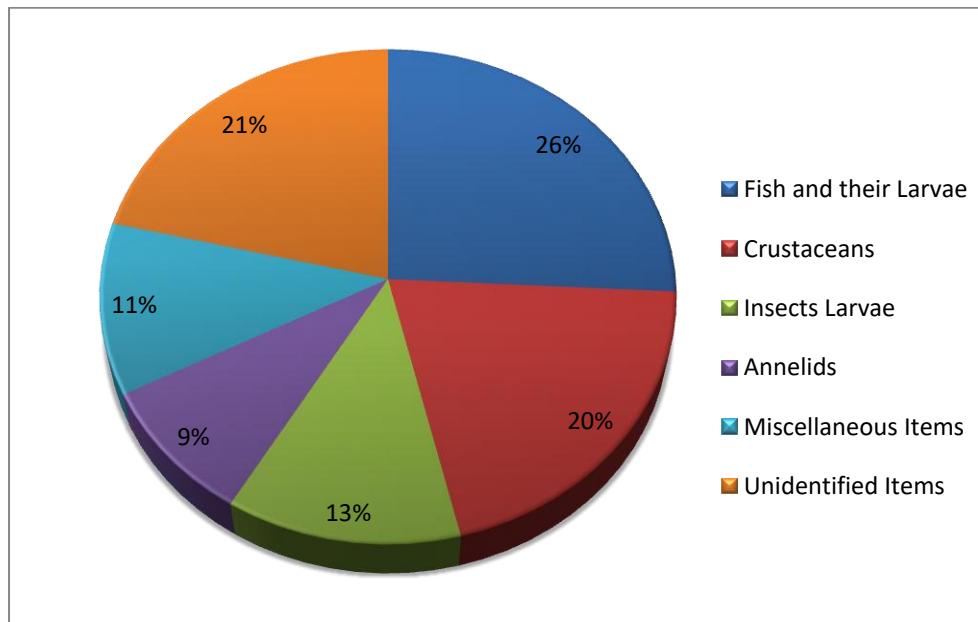


Fig. 8: Percentage of food composition of female *Channa striata* in the summer, 2019-2020.

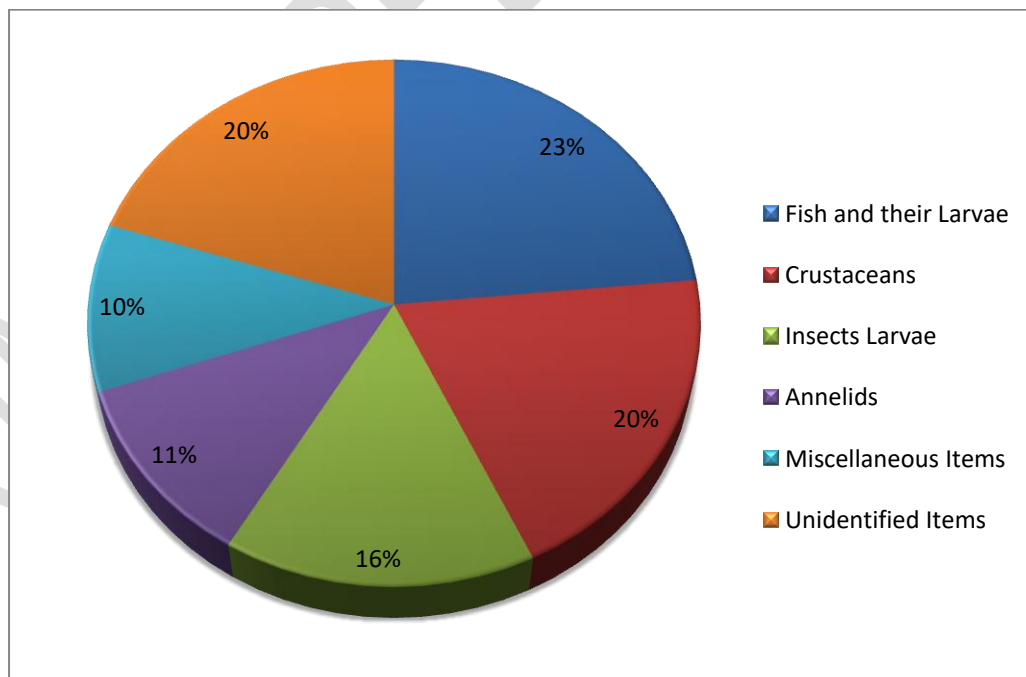


Table: 1- Seasonal variations and Feeding Intensity in *C.striata* males

Seasons	Months	Status					
		Gorged	Full	$\frac{3}{4}$ Full	$\frac{1}{2}$ Full	$\frac{1}{4}$ Full	Empty
South West Monsoon	June	0	0	5	10.5	25.5	59
	July	0	0	6	12.5	29.5	52
	August	0	5	9	14.2	30.5	41.3
	September	3	6	12	16.5	26.8	35.7
Post Monsoon	October	4	8	13	15	22.5	37.5
	November	6	10	15.4	18	12.5	38.1
North East Monsoon	December	5	12	16.5	10	15.5	41
	January	7	13	8	16	18.8	37.2
	February	9	14	10.5	19.5	14.9	32.1
Summer	March	8	12	6.5	15.5	19.3	38.7
	April	4	15	19	14.8	10.6	36.6
	May	0	12	16	15.5	16.8	39.7

Table: 2- Seasonal variations and Feeding Intensity in *C. striata* females

Seasons	Months	Status					
		Gorged	Full	$\frac{3}{4}$ Full	$\frac{1}{2}$ Full	$\frac{1}{4}$ Full	Empty
South West Monsoon	June	0	0	6	11.5	20.5	62
	July	0	0	8	15.4	20.8	55.8
	August	0	7	12	15.6	22.5	42.9
	September	5	12.5	16.8	22.3	13.4	30
Post Monsoon	October	8	14.4	18.5	10.5	15.8	32.8
	November	5	13	18.4	18.5	15.4	30.7
North East Monsoon	December	4	14.5	10.4	10.6	19.6	40.9
	January	5	11.5	16.4	18.5	11.4	37.2
	February	6	13.5	14.2	15.5	15.6	35.2
Summer	March	6	9.5	17.2	14.3	22.2	30.8
	April	3	12.5	13.5	13.4	19.5	38.1
	May	0	6	12	11.5	24.5	46

Murrels are air breathing fishes and they have unique capacity to utilize atmospheric oxygen for respiration by certain morphological adaptations in addition to the usual bronchial respiration ability. They can survive for many hours or few days out of water and able to travel across land from one fresh water pond to other. They are capable for thriving for number of days with minute quantity of water, if their body is kept moist [4]. They are carnivorous and great parental care is observed in various species particularly *C. striata*. This fish contribute important fresh water fishery in various parts of India and in great market demand because of their pleasant tasty flesh and presence of less number of bones/ spines and also medicinal value. The fish was popular for culture and breed in confined water bodies. Although they popular in fishery, but proved a curse in other species for having an aggressive carnivorous nature. Murrels acclaimed all over the country for their flavor, medicinal and recuperative attributes high quality i. e mineral and low fat contents and also keeping superiority taste. They are also considered a pest fish since they destroy other natural species of water body where they inhabitant [4].

The investigation revealed that *C. striata* was omnivore species feeding mainly on fishes, crustaceans, insects and annelids followed by gastropods. One various components of the food variety indicate that this species mainly fed on benthic and sub-benthic organisms. Murrels fishes feed on small benthic crustaceans, worms, molluscs, and small fish [17, 18]. Braga et al., [19] explained that the feeding ecology of a species linked its population dynamics, knowledge of feeding ecology and its contributes. The understanding of such subjects as resource partitioning habitat preferences, prey selection, predation, evolution, competition and energy transfer within and between ecosystems. Such ecological information strategies and is therefore, a key element in the protection of species and ecosystems. Further, reviews the geographic and /or biogeographic reasons where the majority of the studies concerning the feeding ecology of fish have been conducted, with the goal of identifying reasons and /or environment also needs of further attention. Shamsan and Ansari [20], reported that small fishes and crustaceans are the most important food items in gut of carnivore's fishes. In the present study preferential food Channa species are fishes and their larvae are most dominant food item in the monsoon period and intensity of feeding indicated their preference for fish and their larvae.

Availability food organisms was play an important role in survival, growth, maturity and healthy condition in fish can be achieved through selection of quality food or better nutrition. It is important to emphasize that the effect of seasonality should always be considered in the

studies of fish feeding, because the temporal changes of biotic and abiotic factors alters the structure of the food web along the year and as a consequence, the fish often shown better side [21]. Gastro somatic index values as an indication of fullness of stomach and find out the feeding rhythm. During the course of the investigation, maximum numbers of fishes were found with empty stomach. The frequent occurrence of empty stomach or stomach with little content might be dependent on the ratio between the size of the fish and size of the prey as cited on the caloric values of the diet as explained by [22]. The occurrence of empty stomachs of fishes does not show any relationship either to seasonal month or to the size of the fish. The fish murels appears to prefer fishes and their larvae sine they constitute major food item in its stomach. The percentage of occurrence of different food items in the spectrum shows that these fishes select their food from the bottom and mid living organisms and a first preferable food item was small fishes followed by crustaceans, polychaetes worms, including insect larvae. Feeding intensity of the fish and metabolism has an influence on feeding behavior and food intake by fish is such that it encounters their energy requirements [23]. Thus if a food has low energy, fish will compensate by eating more within the limits of its stomach capacity [24]. Therefore, this may be one reason why during the pre-monsoon season and summer when the low energy value food constituted by available material was predominant, the occurrence of stomachs with moderate to active feeding activity was observed during above seasons.

The ranking of various food composition with ranked first by fishes dominated during the entire study period followed by crustaceans, insect larva, annelids, worms and Gastropods. This observations comparable with diet composition of carnivorous fishes from coral reef lagoons [25]. Kulbicki et al., [26] reported that fishes are opportunistic feeders, feeding what is available within a more or less restricted range of items and changes in number of prey types reflect the variability of prey in the particular biotope where the fish is feeding. Kapoor et al., [27], observed that the length of the alimentary canal is indicative of the food preferences of the fishes with carnivores having the smallest gut length and detritivores the highest [28]. Further, it observed differences in the relative length of the alimentary tract of juvenile and adult fishes and attributed it to differences in their feeding habits. Wilson [29] had indicated that an increase in microbial activity during the summer season due to elevated temperatures there is an increase in protein levels of food during this period. Madhupratap et al., [30] hypothesized the importance of food chain in determining the success of fisheries *vis-à-vis* oil sardine during periods of

adverse environmental conditions resulting in less than optimum plankton production. The present study was confined to studying the food items available in the guts at the time of analysis which revealed that there are seasonal variations in diet and may influencing feeding patterns in summer months. Because of its varied diet that includes animal matter the murels may be considered as an omnivore. Seasonal fluctuation of the feeding intensity and dietary composition in fishes are influenced not only by the maturation of gonads but also due to non-availability of food in the habitat [4]. Manojkumar et al., [31] have concluded that *Nemipterus japonicus* from Malabar coast, the fish is a demersal carnivorous and the diet consisted of fishes, crustaceans, molluscs, polychaetes and miscellaneous food items. In our results also shows that the *Channa striata* carnivorous and diet containing fish and their larvae, crustaceans, insects and annelids are the major food items. Jambo and Maduako, [32] have reported that the food and feeding habit of *Mugil cephalus* in Niger delta, was fish larvae, crustaceans, insect parts annelids and other plant material along with sand particles. Krishna et al., [33], reported that the Asian sea bass is a top predator and lower trophic level species including crustaceans, fishes, and polychaete worms some extent. Therefore, knowledge of the feeding habits and ecological interactions of *Channa striata* and their prey is essential for the management and conservation of the fishery resources in freshwater ecosystem. Not much difference in the energy levels among the two species was observed in the study indicating it as an opportunistic feeder where diet broadly reflects availability and habitat characteristics.

Feeding intensity and diet composition of fishes are of great concern in the management fisheries. Feeding habit of species of fish is intimately associated with the ecological niche that they occupy in the natural environment. Fishes are directly depend upon their surrounding aquatic environment for their food requirements and are highly adapted in their food and feeding habits utilizing most of the readily available food.

CONCLUSION

Based on the research result, it was concluded that the diet composition and feeding intensity of *Channa striata* from Krishna River were Fishes and their larvae (22- 28%), followed by crustaceans (19- 23%), insect larvae, annelids with semi digested items and unidentified materials. The percentage occurrence of feeding intensity indicated their preference for fish's food. There were empty stomach 62% in the month of May was observed in and the remaining was filled with food in different levels . There was also variation in the percentage composition

of different items of food in the gut in different months. The results indicated the species *C. striatus* is opportunistic carnivorous.

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