



## Research Article

# Gut contents analysis and preponderance index based study on feeding habit of *Cirrhinus mrigala* from Ukai Dam

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## ABSTRACT

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The information on the feeding habits of fish helps to know about the inter-specific relationship of aquatic fauna and the productivity of the water body. In the present study, the feeding habit and preferred food contents of *Cirrhinus mrigala* from Ukai reservoir of Gujarat was discussed with reference to index of preponderance. The quantitative composition of food components was analysed during June, 2013 to May, 2014 and found that the gut was consisted by decay matter, phytoplankton, plant material, zooplankton and insects. The results showed that decay matter and plankton dominated in gut contents and considered as main food component during breeding, post breeding, pre-breeding seasons and pooled data. Hence, it can be concluded that *C. mrigala* was omnivorous in feeding habit and findings were also verified by the index of preponderance.

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## INTRODUCTION

*Cirrhinus mrigala* is a very fast growing big sized carp and commonly known as mrigala (Dwivedi *et al.*, 2006). Assessment of the food and feeding habits is important to evaluate the ecological role and position of the fish in the food web of ecosystems (Allan and Castillo, 2007; Pradhan and Patra, 2015). The information on food and feeding habit provides further support to aquatic management and fish production. In fishes, assessment of food and feeding habit using gut content analysis has long been used for preliminary assessment (Hyslop, 1980; Cortes, 1997 and Ellis *et al.*, 1996) while these were recorded qualitatively, quantitatively and percentage abundance (Pillay, 1952; Baker *et al.*, 2014; Pelicice and Agostinho, 2006 ; Imran *et al.*, 2014; Saikai, 2015). Rahman *et al.*, 2006 studied the food preference of rohu in Bangladesh and reported that food ingestion in fish is highly variable and depends on the availability of food items, species combination and their interactions. Kumar *et al.*, 2007 reported that *Catla catla* from Daya reservoir was planktophagus and primarily feeds on zooplankton. Omondi *et al.*, (2013) studied the feeding habit of three freshwater fishes (*Protopterus aethiopicus*, *Clarias gariepinus* and *Oreochromis niloticus*) of Baringo Lake (Kenya) and concluded that the zooplankton were dominated in diets of *O. niloticus* and *C. gariepinus*. Study on food and feeding habits reported that *Labeo dyocheilus* was herbivorous and column feeder (Verma, 2013) whereas *Labeo rohita* from Vallabhsagar was reported herbivorous (Soni and Ujjania, 2017). Quantification of food, feeding

habit and feeding intensity relationship of fishes was done by the number of indices and importance of preponderance index was elaborated by (Kumar *et al.*, 2007; Padmakumar *et al.*, 2009; Saikia, 2015 and Bakhtiyar *et al.*, 2017). Considering these facts, an attempt was made to study the gut content analysis-based on feeding habit of *C. mrigala* from Ukai reservoir in different seasons and was verified by preponderance index.

## MATERIALS AND METHODS

Total 556 specimens of *C. mrigala* were randomly collected during June, 2013 to May, 2014 from commercial fish landing centres (Serula, Ukai, Chacharbunda, Thuthi, Jamli and Parchuli) of Ukai or Vallabhsagar reservoir which is situated on river Tapi at 21° 15'N Latitude and 73° 35'E Longitude geographical location. Each specimen was weighed to the nearest 1.0 gm with the help of single pan balance (Sartorius 'PT' 600) and then dissected to collect gut contents for analysis. Gut contents were preserved in 4 % formalin solution and brought to Research laboratory, Department of Aquatic Biology, Veer Narmad South Gujarat University, Surat for further analysis. Qualitative analysis of gut contents was done with the help of Trinocular microscope (Olympus CH 20i) to follow the frequency occurrence methods of Hynes, 1950 and Pillay, 1952. The analysis was done for the breeding (June-September), post-breeding (October-January) and pre-breeding (February – May) seasons and observation of gut contents were grouped

in different categories like zooplankton, phytoplankton, plant material, insects and decay matter. The relative importance of all food contents was quantified by the index of preponderance and was calculated with the help of percentage composition (volume and occurrence) of food contents to follow the equation of Natrajan and Jhingran (1963).

$$I = \frac{V_1 O_1}{\sum V_1 O_1} \times 100$$

Where:

I = Index of preponderance

V<sub>1</sub> = Percentage volume of particular food component

O<sub>1</sub> = Occurrence of particular food component

## RESULTS AND DISCUSSION

The result showed that in gut contents, decay matter (30.90%) > zooplankton (20.22%) > plant material (18.40%) > phytoplankton (17.53%) > Insects (12.95%) were found during breeding season (Fig. 1 A); decay matter (30.52%) > zooplankton (20.00%) > phytoplankton (19.21%) > plant material (17.36%) and > Insects (13.42%) during post-breeding season (Fig. 1 B) whereas decay matter (46.00%) > phytoplankton (19.33%) > plant material (18.33%) > zooplankton (9.00%) and > Insects (8.00%) were observed during pre-breeding season (Fig. 1 C). The observations of pooled data showed that the decay matter remain as main ingested food consisting 27.67% of total consumed food followed by phytoplankton 25.71%, plant material 18.03%, zooplankton 17.14% and insects 11.78% (Fig. 1 D).

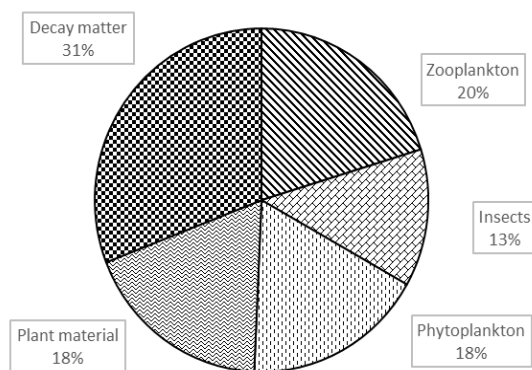


Fig. 1.A–Breeding season

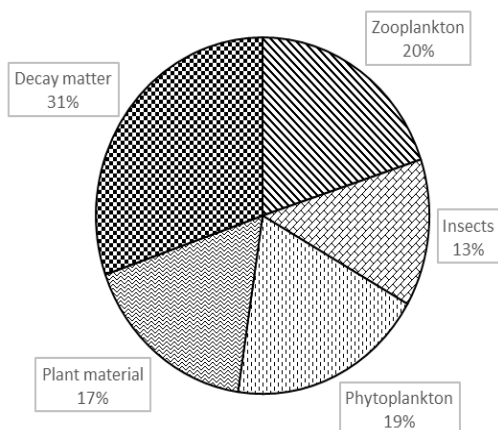


Fig. 1.B–Post breeding season

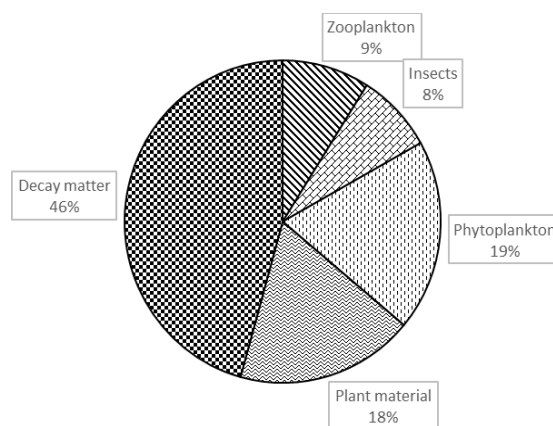


Fig. 1.C–Pre breeding season

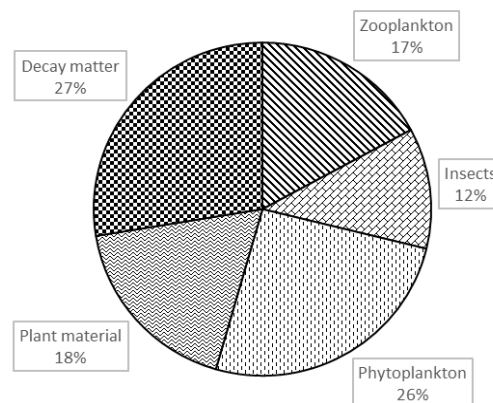


Fig. 1.D–Pooled data

**Fig. 1 (A-D). Representation of seasonal and annual gut contents of *Cirrhinus mrigala* from Ukai reservoir**

Results showed that the seasonal qualitative changes in feeding composition was not observed while quantitatively food content was dominated by decay matter, phytoplankton, plant material, zooplankton and insects which may be due to food preference, feeding zone of fish and availability of different food contents in the water body. Amir *et al.*, (2013) studied the feeding habit of mrigal and reported that it was bottom feeder and gut contents were dominated by debris whereas Khabade (2015) reported results of gut contents of mrigal dominated by zooplankton. Maheshwari (2015) analysed the gut contents of Indian major carp (rohu) from Singanallur lake, Coimbatore (Tamil Nadu) and reported that itchy fly feed on phytoplankton and plant materials. Similarly, Rajanna *et al.*, (2015) evaluated the food preference of *Labeo fimbriatus* from Vanivalas Sagar of Karnataka and reported the result of phytoplankton as main ingested food ingredient. Manon and Hossain (2011) studied the food and feeding habit of *Cyprinus carpio* from Nawgao Bangladesh and reported the studied fish as plant feeder.

Index of preponderance give summary information of the frequency of occurrence and bulk of various food items. Similarly, it also provides the definite and measurable grading basis of various food elements. In the present study, the preponderance index for decay matter (42.66%, 28.62%, 68.43% and 33.36%), phytoplankton (13.33%, 26.58%, 14.35% and 18.87%), plant material (17.08%, 14.64%, 10.92% and 18.06%), zooplankton (19.48%, 23.15%, 2.47% and 17.50%) and insects (7.46%, 7.01%, 3.83% and 12.21%) during breeding, post breeding, pre-breeding seasons and pooled samples (Table 1).

**Table 1. Preponderance index of *Cirrhinus mrigala* from Ukai reservoir.**

Food components	Index of preponderance			
	Breeding season	Post breeding season	Pre breeding season	Pooled
Zooplankton	19.48 (II)	23.15(III)	2.47 (V)	17.50(IV)
Insects	7.46 (V)	7.01 (V)	3.83 (IV)	12.21 (V)
Phytoplankton	13.33(IV)	26.58(II)	14.35(II)	18.87 (II)
Plant material	17.08(III)	14.64(IV)	10.92(III)	18.06(III)
Decay matter	42.66 (I)	28.62 (I)	68.43 (I)	33.36 (I)

The seasonal and pooled variations in gut contents showed the feeding behaviour of the fish which was also confirmed by the preponderance index value which reveals the omnivorous and bottom feeding behaviour of mrigal fish. Cannibalistic feeding behaviour of *Glossogobius giuris* from Mithamain Haor, Bangladesh was verified by preponderance index study by Hossain *et al.*, (2016). Pradhan and Patra (2015) studied the index of preponderance of *C. mrigala* from Pond of Tankapani village, Odisha and classify fish as omnivorous. Kumar *et al.*, (2015) also used the index of preponderance to classify Catla as planktivorous from Udai Sagar, Rajasthan. Kumar and Roy (2009), Kumar *et al.*, (2007) and Das and Moitra (1963) on their analysis of feeding habits of fishes vividly explained the omnivore nature of freshwater fishes in different water bodies.

## CONCLUSION

The study on availability and preference of food contents by the fish helps to find out the feeding habit of fish and accordingly fisheries management in the water body. In the present study, decay matter was the dominant food content followed by phytoplankton, plant material, zooplankton and insects in the fish gut. On the basis of these observations it can be concluded that mrigal is omnivorous in nature.

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