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Stomach content analysis of snake headed fish *Channa Marulius* (Hamiliton) from Rapti river of Balrampur, U.P., India

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Abstract
The quality and quantity of available food in a particular aquatic environment affect the growth of fish. Present study is an attempt to investigate the food and feeding habit of snake headed fish, *Channa marulius* (Hamiliton). The stomach content analysis adult fish showed various types of food items such as crustacean, insects, molluscan, fishes, plant matter and dead organic matter but the quantity of animal origin matter is higher than plant origin matter. The quantitative analysis of gut content shows that about 77% animal origin matter present in the gut of *Channa marulius*. The result of the present study indicated that adults *Channa marulius* is a carnivorous fish and it feeds mainly on small fishes, molluscans, aquatic insects and crustaceans.

Keywords: food and feeding, *Channa marulius*, Rapti River

Introduction
Gut content analysis is a method for determining the food and feeding habits of fishes by which we can easily find what the fish take as food. The qualitative and quantitative food analysis of fish in their natural habitats helps in understanding the growth, abundance, productivity of water body. Fishes have become adapted to a wide variety of food and used to describe food habits, feeding patterns of fishes. Fishes are highly adaptable in their feeding habits and utilize the readily available food (Prakash, 2016) [6]**.** Fish performs their various physiological activities such as growth, development, locomotion and reproduction etc. with the help of energy obtained from the food and is highly adopted in their feeding habits with utilizing most of the readily available food components.

Studies of food and feeding habit of fishes have great importance to carry out successful fish farming. Now day's studies of food and feeding habit of fishes are also important for ecological as well as agricultural point of view. The food and feeding habits of fish varies with the time of day and season of the year depending upon the availability of food components, different species consume different types of food (Prakash, 2015) [5]**.** Thus gut content analysis provides an important insight in to the feeding pattern and qualitative as well as quantitative assessment of feeding habits of fish (Prakash, 2017) [7]**.**

The variations of the different food items generally depend upon their availability or any preference shown by the fish, as also the intensity of feeding which is influenced by the growth and maturation in many fishes. The condition of feeding was also related to maturity of fish. The immature fishes were found to feed with almost equal intensity throughout the year (Dewan and Saha, 1979 and Kumar, *et al*., 2015) [1, 4]. Present study revealed detail account of food and feeding habit of snake headed fish, *Channa marulius.*

Study area: The study area, Balrampur (27^0 25′ 48″N to 27^0 43′08″ N, altitude and $82^0$18′48″ E to $82^0$30′18″ E longitude) district is situated in North Terai region of U.P. adjacent to Indo-Nepal border. Rapti is the main river traversing in this area and plays a vital role in the topography and causes serious flood havoc in the monsoon season. A systematic survey of Rapti River was conducted for collecting the snake headed fish *Channa marulius*. Fish samples were collected from Mirzapur and Kodhari Ghat of Balrampur district.

Fig 1: Satellite view of Rapti River in Balrampur District

Fig 2: Balrampur Rapti River, fish collection site.

Materials and Methods

Total 140 *Channa marulius* were collected from Rapti River, Balrampur, U.P. during April, 2020 to Sept., 2020. Out of 140 specimens, 110 adult fishes were sorted and used for stomach content analysis. The collected fishes were dissected to collect stomach contents for analysis. Stomach contents were preserved in 4 % formalin solution and brought to Ichthylogy laboratory for further analysis under binocular microscope for the food composition, preference and relative importance of various food items. The observation of stomach contents were grouped in different categories. The estimation of the percentage composition of different food items was carried out by using Gravimetric method (Hynes, 1950) [2].

Result and Discussion

The stomach content of 150 specimen of *Channa marulius* were examined during the month of April, 2020 to Sept., 2020. Result of stomach content analysis of *Channa marulius* were presented in the table 1-2. Table 1 illustrates the fullness and emptiness of gut of fish during investigation period. The stomach content of 110 fishes was analyzed of which 71.55 % contained food and the rest 28.45 % were without food, which varies from month to month. During investigation the highest percentage of empty gut was in the month of June 2020 (60.86%) and the lowest percentage of empty gut was in the month of August 2020(23.69 %).

Table 1: Feeding activity of *Channa marulius* based on the number of fish, percentage of fullness and emptiness of gut during April, 2020 to Sept, 2020.

Month	No. of Fish Examined	% of Stomach Fullness	% of Stomach Emptiness
April	16	69.34	30.66
May	14	68.12	32.58
June	16	59.14	60.86
July	20	72.28	27.72
Aug.	16	76.31	23.69
Sept.	18	73.16	26.84
Mean±SD	18.33±2.12	71.55±11.16	28.45±11.16

Table 2 illustrates the Grading of various food items of stomach contents of fish (*Channa marulius*) during the study period.

Table 2: Percentage occurrence of various groups of food items of *Channa marulius*

Month	No. of Fish Examined	Crustacean	Aquatic Insects	Molluscan	Fishes	Plant Matter	Decayed Organic Matter
April	16	12.15	18.88	24.36	25.29	10.66	8.66
May	14	11.48	16.37	20.22	27.65	10.14	14.14
June	16	14.12	17.79	19.46	22.34	12.84	13.45
July	20	10.78	19.14	18.14	28.24	13.74	9.96
Aug.	16	11.47	17.43	20.14	26.15	9.12	15.69
Sept.	18	12.34	17.92	21.01	29.11	10.12	9.50
Mean±SD	18.33±2.12	12.04	17.92	20.56	26.46	11.10	11.90

The findings revealed that the food items found in the gut of adult *Channa marulius* consists of Crustaceans, Aquatic insects, molluscans, fishes and Decayed organic matter. The number of researcher have studied the gut content analysis and feeding habits of snake headed fish from different localities and concluded similar results (Tandon, 1963; Qayyum and Qasim, 1964; Reddy, 1976; Islam, 2004; Prakash, 2017) [3, 7, 8, 9, 10].

The fishes (Fry and fingerling) formed the main item of stomach contents forming 23.46% of total food consumption of *Channa marulius*. The highest percentage of fishes was recorded in the month of Sept. (29.11%) and lowest in June (22.34%).

Molluscans (Larvae of Snail and bivalve) formed the next important food items in the stomach contents forming 20.56 % of the total food consumption of *Channa marulius*. The highest percentage of molluscans was recorded in the month of April (24.36%) and lowest in July (18.14%).

The aquatic insects (Coleoptera-beetles; Diptera- Syrphidae; chironomids larvae; mosquito) was another important food items in the stomach content forming 17.92% of the total food consumption of *Channa marulius*. The highest percentage of aquatic insects was recorded in the month of July (19.14%) and lowest in May (16.37%).

The Crustaceans (Cladocerans, Ostracods and Copepods) was also important food items in the stomach content forming 12.04% of total food consumption of *Channa marulius.* The highest percentage of Crustaceans was recorded in the month of June (29.11%) and lowest in July (10.78%).

Plant matter (green algae and remnants of macrovegetation etc) formed a part of stomach of *Channa marulius* by constituting 11.10%. The highest percentage of plant matter was recorded in the month of July (13.74%) and lowest in August (9.12 %).

Decayed and semi-decayed organic matter (mud, sand, fish scales, dead animal and plant tissues) in the stomach of *Channa marulius* constituted about 11.90 %. The highest percentage of decayed organic matter was recorded in the month of August (15.69%) and lowest in April (8.66 %).

The food and feeding habit of 110 adult *Channa marulius* was were analysed and the result revealed that food of adult fish consist of Crustacean (12.0%), insects (17.92%), molluscans (20.56%), fishes (26.46%), plant matter (11.10%) and decayed organic matter (11.90%). The result of the present study indicated that adults *Channa marulius* is a carnivorous fish and it feeds mainly on the food animal origin (crustaceans, aquatic insects, molluscans and small fishes) and very small amount of plant material.

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