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STUDY ON GUT CONTENT OF MALE FRESHWATER MURREL CHANNA PUNCTATUS OBTAINED FROM VARIOUS WATER BODIES IN PATNA DISTRICT OF BIHAR

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ABSTRACT

The present study on gut content of freshwater murrel *Channa punctatus* in different water bodies in Patna district of Bihar indicates that the average Relative Length Gut value from the fishes in group A (having size lesser than 12 cm) was 0.678, while for the fishes in group B(having size greater than 12 cm), it was 0.636. The average Gastro-Somatic Index ranged from 2.1 to 4.8 for male species of *Channa punctatus* fishes. The maximum value of the Gastro-Somatic Index (GaSI) was 4.86 for males during October. Analysis of gut content indicated the various patterns of season, with the gut content comprising of insects at about 36.48%, followed by plant matter which was found to be 18.45%, the fishes were at 16.21%, the crustaceans were found to occur at 9.11%, zooplankton at 10.3%, miscellaneous content at 7.25%, and annelids at 2.2%, sorted according to preference. This reflects a broad food spectrum of *Channa punctatus* but is dominated by carnivorous items with 81.45%.

Keywords: Food and feeding habit, Relative Length of Gut, Gastro-Somatic Index, Analysis of Gut content

1. INTRODUCTION

The freshwater murrel *Channa punctatus*, is also named as spotted snakehead or a freshwater murrel, is a species of snakehead. These fishes are also basically found to occur in different water bodies in Patna district of Bihar. These can easily be found to occur in river, swamps, ponds, and ditches. However, the stagnant water with suitable amount of vegetation is preferred by this species of fishes. They have been reported as valuable source of food and have become aggressive invasive species. [1,2]. Channa *punctatus* usually grows 15.0 cm (5.9 in) approximately in length, and 31.0 cm (12.2 in) length in males. Because of less knowledge of the major threats for *Channa*, this freshwater murrel is listed in the Least Concern category of Red Data list of IUCN.[3]

This snakehead species has habit of mainly feeding on carnivorous items. The small fishes, the flies, the yolk part of egg and fish larva have been found to be favourite items for this species[3]. Insects, crustaceans, small fishes, mollusc, semi digested food items and very less amount of plant matter is found to be consumed by the fishes in its natural habitat. But the gut content of this species changes seasonally. In adult or mature fishes, the food consumption is very low specially during the spawning period whereas in the juvenile stage, fish has been found to be voracious feeder. [3]

Amino acids, vitamins, fatty acids, minerals, and energy-producing macro-nutrients (protein, lipid, and carbohydrate) are one of the essential nutrition for fish. Fish diets need to include all the vital nutrients and energy food items that is required to meet the physiological demands of developing animals. For certain farmed fish species, nutrient adequacy guidelines provide the bare minimum of nutrients needed to support growth and avoid nutrient deficiency symptoms.[5]. In fish biology, food plays a significant role in controlling migratory patterns, fertility, and growth. Changes in the seasonal and daily abundance that control their migratory patterns, fecundity, and growth. In any given region, fluctuations in the diurnal and seasonal abundance of the preferred food organisms of various fish species may have an impact on the variety of stocks of fish during vertical and horizontal migrations, respectively. Therefore, an accurate understanding of the interaction between fish and food organisms is necessary for fish stock prediction, estimation and exploitation.[6] Knowledge about the gut content of fish is necessary for piscicultural practices. Several workers investigated the food and feeding habits of *Channa* species in India. There have been reports of studies on the connection between diet, feeding practices, and alimentary canal anatomy [5, 11]. There have been reports of studies on the food preferences, dietetic intensity and dietary spectrum and seasonal fluctuation of *C. punctatus* [5-12]. Having an understanding of diet of the species and eating patterns aids in determining its range, which promotes effective fishery management. The feeding habit and dietary composition will also reveal information about the potential habitats it may visit. The dietary preferences and gut content of the *Channa* species in the different water bodies of Patna are not accurately documented. Therefore, the presnt study was conducted to reveal and address the lack of data regarding the diet and feeding behaviors of *Channa punctatus*, particularly from aquatic bodies in the Patna district of Bihar.

2 MATERIALS AND METHODS

2.1 STUDY AREA

The capital and largest city of the Indian state of Bihar is Patna, formerly known as Pāṭaliputra. With a population of 2.35 million as of 2018, Patna was ranked as the 19th largest city in India by the UN. With a population of over 2.5 million and an area of 250 square kilometers, it is the 15th largest urban agglomeration in India. The southern bank of the Ganges River is home to the majority of the modern city of Patna. The Son, Gandak, and Punpun rivers are also crossed by the city. The city is approximately 35 kilometers long and 16 to 18 kilometers wide. 25° 36' 55.37" N latitude and 85° 06' 3.71" E longitude are the coordinates.

2.2 SAMPLE COLLECTION AND ESTIMATION OF GUT PARAMETERS

Many samples of *Channa punctatus* were obtained from aquatic environments in the Gangetic area. The collection of fishes was done along with the fishermen, and subsequent to the collection of the fishes, specimens were taken to the pisci-culture laboratory for additional investigation. The overall length and weight of the fish were measured using a Vernier calliper and an electronic weighing balance, respectively. Fishes were classified into two categories: group A (less than 12 cm) and group B (greater than 12 cm) for the sake of discussion. Following the measurement of length and weight, the complete gastrointestinal tract was excised and kept in 5% formaldehyde for further study of various dietary components. A total of 40 digestive tracts were analysed to assess the diet and eating habits of *Channa punctatus*. The preserved intestines were subsequently uncoiled, cleansed, and the associated tissues were excised. The below approaches were employed to study the dietary patterns and feeding behaviours of fish.

2.3 Estimation of Relative Gut Length (RLG): The following standard formula was used to determine the RLG value, [11-13]. **Relative Gut Length = Total Gut length of fish /total length of the fish**

2.4 Estimation of Gastro-somatic index (GaSI): The following formula was used to determine the dietetic intensity, also known as the gastro-somatic index (GaSI).[11-12]

GaSI = Total Weight of the gut/Total weight of the fish x 100

2.5 Estimation and Analysis of Gut content: Gut contents in the collected fishes specimen were (gut which were preserved in 5% formaldehyde) analyzed by the method of quantitative and qualitative estimation. For analyzing the gut content of fish, the points method was followed [13].

3 RESULTS AND DISCUSSIONS

The Relative Gut Length value was observed, analysed calculated from October 2023 to May 2023. The results that were obtained have been shown clearly in Table 1. The study was based on two groups.

1) First Group A had fishes with size lesser than 12 cm whereas
2) the second group, Group B had fishes with size greater than 12 cm.

The Relative Length of Gut value varied from 0.60 to 0.898 with average value 0.678 in fishes of group A (having size lesser than 12 cm) while in fishes of Group B observed value was from 0.5 to 0.76 (having size greater than 12 cm) with an average value of 0.636. The Relative Gut Length value was observed maximum in fishes of group A. This indicates a slow and gradual decline in RLG values as the fish grows. The RLG value in *Channa punctatus* was observed to decrease with the increasing length of the fish indicating the change of feeding habit from fry stage to adult stage. Similar observation made by [14] in *C. punctatus*, from different habitats and considered these fish species as carnivorous. The value of RLG is generally low in carnivorous fish, higher in omnivorous fish and highest in herbivorous fish [15]. The findings of the present study indicates the gut contents of *C. punctatus* is carnivorous and corroborated with the earlier workers.

Table 1: Relative Length Gut value of *Channa punctatus* in different size groups

MONTHS	FISHES (<12CM)			FISHES (>12CM)		
	GUT LENGTH	TOTAL LENGTH	RLG	GUT LENGTH	TOTAL LENGTH	RLG
OCT	6	10	0.6	6.1	12.2	0.5
NOV	7.5	10.8	0.694	7.1	12.6	0.56
DEC	7.9	10.9	0.724	7.6	12.8	0.593
JAN	8.2	11	0.745	8.3	13	0.638
FEB	8.9	11.2	0.794	8.4	13.5	0.622
MARCH	9.6	11.4	0.842	9.8	14	0.7
APR	10.00	11.5	0.869	10.2	14.2	0.718
MAY	10.6	11.8	0.898	11.4	15	0.76
		AVG.RLG	0.678			0.636

Table 2: GaSI value of *C. punctatus* in different size groups

MONTHS	FISHES (<12CM)			FISHES (>12CM)		
	GUT WEIGHT	TOTAL WEIGHT	GaSI	GUT WEIGHT	TOTAL WEIGHT	GaSI
OCT	240	50	4.8	284.2	58	4.9
NOV	135.2	52	2.6	145.5	58.2	2.5
DEC	110.3	52.5	2.1	128.92	58.6	2.2
JAN	147.40	52.6	3.675	158.76	58.8	2.7
FEB	200.64	52.8	3.8	255.4	59	4.33
MARCH	206.7	53	3.9	261.8	59.5	4.4
APR	223.44	53.2	4.2	270	60	4.5
MAY	240.3	53.4	4.5	284.35	60.5	4.7
		AVG.GaSI	3.69			3.77

The consumption of food items or the intensity of feeding in fishes was determined and estimated by using the Gastro-Somatic Index for the fishes in Group A and Group B fishes with defined size and weight. In the present study (Table 2), the highest value reported in October for fish smaller than 12 cm was 4.8 for males and 4.9 for fish larger than 12 cm. In December, the males with size under 12 cm and over 12 cm had minimum values of 2.1 and 2.2, respectively. This intensity of food consumption in fishes varied from month to month in the different months of observation period. The GaSI increased steadily from February to May and then decreased throughout the winter, which could be possibly because the species hibernates in muddy areas and under aquatic plants. December was the month with the lowest GaSI value during the observation period of research. Fish feeding intensity and nutritional composition fluctuate seasonally due to a combination of factors, including gonad maturation and habitat food scarcity. The lack of food in the habitat during the month of December may be the cause of the lower GaSI value in the current study. The

majority of fish discovered in October are in spent stages. Since the GaSI value was highest in October, spent fish displayed the highest GaSI value. The present study was in line with the the findings and observations of previous researchers. [9,15,21].

The food items and its percentage composition in the gut of *Channa punctatus* (shown in Table 3) indicates that the dietary gut content of the fishes can be broadly categorized into the following groups like zooplankton, fishes, crustaceans, annelids, insects, plant matter, and the miscellaneous content. Maximum number of fish feeding by *Channa punctatu*s was done in the October month and the minimum was done in the February month. The gut contents of fish was composed of various diet items during various seasons were examined (Table 3). Seasonal variation in feeding habits was shown to be considerable in the current study. This could be because various food products are not always available in different seasons.

Table 3: Composition of food items expressed in terms of percentage in *Channa punctatus*

MONTH	ZOOPLANKTONS	FISHES	CRUSTACEANS	ANNELIDS	INSECTS	PLANT MATTER	MISC.
Oct.	10.3	16.21	9.11	2.2	36.48	18.45	7.25
Nov.	3.98	15.81	12.76	1.1	39.21	18.72	8.42
Dec.	9.67	14.54	12.9	1.16	37.52	18.32	5.89
Jan.	7.35	13.65	8.6	1.12	42.32	17.83	9.13
Feb.	9.91	15.9	11.2	3.23	42.65	16.60	0.51
Mar.	11.67	16.41	11.3	2.14	43.61	13.70	3.83
Apr.	6.71	15.62	10.2	6.26	43.68	12.24	5.29
May	5.43	16.57	9.4	5.26	44.13	12.29	6.92

In the month of March, the proportion of zooplankton was maximum and at its peak 11.67%, while in May, it was at its lowest 44.93%. The percentage of insects fluctuates between October 36.48% and May. November had the most percentage of crustaceans 12.77%, while January had the lowest 8.62%. Annelid percentages ranged from the highest at 6.26 % in April and from the lowest at 1.1% November, respectively. Between the months of October and May, the percentage of plant matter varies between 12.24% and 18.45 %. Analysis revealed that insect matter makes up the majority of the diet in any season, with the miscellaneous or unidentified components being highest in May at 44.13% and lowest in February at 42.65%.

The eating and gut contents of juvenile and adult *Channa punctatus* are nearly identical. The juvenile and adult stages of *C. punctatus* consume a lower proportion of plant matter and a higher proportion of crustaceans, insects, mollusks, fish, and semi-digested materials, among other things. Therefore, it may be concluded that *C. punctatus* is a carnivorous, surface-feeding fish [20, 21, 22]. The availability of food in the environment, which is influenced by seasonal fluctuations and other factors, is directly tied to the frequency of food and feeding [23, 24, 25]. According to the current study, *C. punctatus* alters its eating habits when the seasons change. This could be because of the diversified food sources found in the water bodies. *Channa punctatus* is a carnivore, according to the present study, and an analysis of its intestinal

material indicated primarily small fish, mollusk, crustacean, and unknown matter body parts, followed by plant matter, zooplankton, insects, and annelids. *Channa punctatus* is classified as a carnivore. The majority of the small fish, insects, and larvae found in the intestine of *C. punctatus* were described as carnivores.[18,23-27]

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