FEEDING HABITS AND TROPHIC LEVEL OF *CHANNA PUNCTATUS* IN GAMBHIR RESERVOIR (M.P.)

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Abstract: The estimation of trophic levels (TROPHs) is essential for the management of fisheries resources as well as for quantifying the ecosystem effects of fishing. The present study in based on feeding habits of the spotted snakehead (Bloch) *Channa punctatus* in Gambhir River. Our results indicate that the *Channa punctatus* feeds on teleosts, decapoda and diptera mainly. The estimated trophic level (TL) and Omnivory Index (OL) of this species is 3.03 and 0.53 respectively. Overall *Channa punctatus* is a carnivorous fish occupying the intermediate levels of the trophic pyramid.

Keywords: foraging behavior, Omnivory, predator, troph**.**

Introduction: The quality and quantity of food among the fishes directly affecting the growth and indirectly, maturation and morality in fish. In addition, diet composition data also play a key role for the research for the following ecological issues:

(a) Within and between-species competition;

(b) Prey selection; (c) Predator-prey size relationships; (d) Foraging behavior.

Finally diet composition data are also used for the estimation of trophic levels (Pauly and Christensen, 2000; Pauly and Sa-a, 2000), the latter being of paramount importance for the management of aquatic resources.

The estimation of trophic level is also very useful for quantifying the effects of fishing on ecosystems because it allows the development of new approaches to the analysis of fresh water food webs.

In this paper I (a) describe the feeding habits of the fish *Channa punctatus* species in the Gambhir River. (b) Estimate fractional trophic levels for describing the position of this species in the fresh water food webs.

Material and methods: Samples were collected from the various areas of the Gambhir River near Gambhir dam (near Ujjain, M.P.) on a seasonal basis from 2009 July to 2010 June using gill net. Specimens caught were presented in 10% formalin. In the laboratory, total length (tl) and weight were recorded for each specimen, then the digestive tract was removed and stomach contents were identified under the microscope. Then prey items were identified upto possible lowest taxonomic level using keys provided by Admondson, (1959), Needham & Needham (1974). Next diet items were weighted and expressed as a percentage of the total stomach content (W%).

Seasonal feeding intensity was calculated using the vacuity index (VI). The VI is the proportion of empty stomach (Natarajan, A.V. and Jhingran, A.G., 1961) using the formula:

$$VI = \frac{N_{es}}{T_s} \times 100$$

Where N_{es} is the number of empty stomachs and T_s is the total number of stomachs.

To express the importance of different prey in the diet of both the species, the frequency of occurrence (O %= (number of stomachs containing prey / total number of stomachs containing prey) ×100), percentage of abundance (% N = (number of prey i / total number of prey) ×100), and percentage of weight (% W = (weight of prey i / total weight of all prey) × 100) were calculated. To assess prey dominance, the index of preponderance (I_p) was used. This index ranks prey in order of weight dominance within the diet and is calculated using the formula (Natarajan, A.V. and Jhingran, A.G., 1961).

$$I_p = \frac{W_i \times O_i}{\Sigma (W_i \times O_i)}$$

Where, W_i and O_i are percentage weight and occurrence of prey in the stomach, respectively.

The trophic level of the fish species were estimated from diet composition data using formula (Lindeman, 1942).

$$TL_i = 1 + \sum_{j=1}^{G} DC_{ij} \times TROPH_j$$

Where DC_{ij} is the proportion of prey $_j$ in the diet of (predator) consumer $_i$, $TROPH_j$ is the trophic level of prey $_j$ and $_G$ is the number of groups in

the diet of predator $_i$. A dimensionless Omnivory Index (OI) was calculated using the formula (Pauly,1992):

$$OI_i = \sum_{j=1}^{n} \left[TL_j - (TL_i - 1)\right]^2 . DC_{ij}$$

Where TL_j, the trophic level of prey $_j$, TL_i; is the trophic level of predator $_i$ and DC_{ij} is the proportion of prey $_i$ in the diet of consumer (predator) $_j$. When the value of Omnivory Index (OI) is zero, the consumer in question is specialized (ie, it such on a single trophic level). A large value indicates that the consumer feeds on many trophic levels.

The intensity of feeding as indicated by the VI is interpreted as:

- Edacious species : $0 \leq VI < 20$
- Relatively edacious species : $20 \leq VI < 40$
- Moderate feeder : $40 \leq VI < 60$
- Relatively abstemious : $60 \leq VI < 80$
- Abstemious : $80 \leq VI < 100$

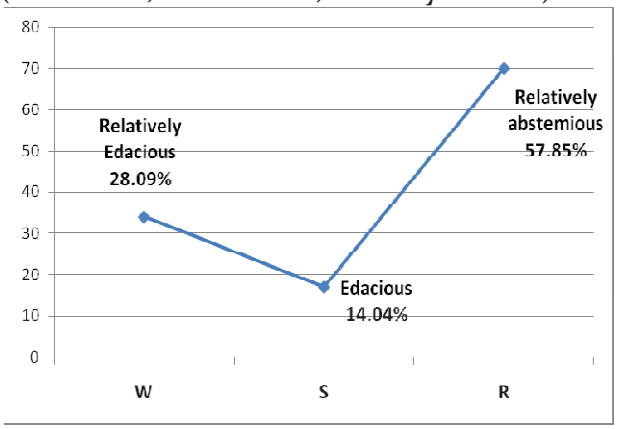
Result:A total of 121 stomach (N=121) of *Channa punctatus* were examined. Fish total length ranged from 6 cm to 35 cm and weight between 5-650 gms.

Stomach contents of *Channa punctatus* were divided into 12 types. The diet of fish was dominated by teleosts (25.20%), diptera (11.73%) and decapoda (11.93 %.) in terms of weight % contribution (W%) and preferred prey for *Channa punctatus*. The remaining components of the diet were copepods (1.03%), ostracoda (0.67%), cladocera (0.73%), hemiptera (2.60%), odonata (4.80%), coleoptera (4.77%), mollusca (3.10%), semidigested material (22.80%) and miscellaneous (10.63%). (Table-1)

The Vacuity Index (VI) changed seasonally. During winter the mean Vacuity Index (VI) was 28.09%, which decreased to 14.04% in summer, increased to 57.85% during rainy season. (Fig.-1)

In the present study Index of preponderance (I_p) was found higher for teleosts (I_p=45.08%), diptera (11.99%) and decapoda (I_p= 10.67%). In this study the Omnivory Index (OI) and TROPH value (TL) of *Channa punctatus* was found 0.53 and 3.03 respectively.

Fig. 1: Vacuity Index in *Channa punctatus* (W=winter, S= summer, R=rainy season)



Discussion: Our result suggests that *Channa punctatus* feeds mainly on teleosts, decapoda & diptera which agrees with the findings of Alikunhi (1957), for the same species of Madras where *Channa punctatus* fed mainly on small fishes, aquatic insects, micro-crustaceans and occasionally mollusca. Rao (1998) noticed feeding preference of *Channa punctatus* for crustaceans and fishes in the ponds and canals of east Godawari dist., Andhra Pradesh. In the present study Index of preponderance (I_p) also indicates the feeding preference of *Channa* for teleosts (I_p= 45.48%) decapoda (I_p= 10.67%) and diptera (I_p=11.99%). Saikia et. al (2012) also confirms the carnivorous type of feeding habit of *Channa punctatus* in paddy field of Shrisagar dist. Assam. The VI index reflects the frequency of feeding i. e. the fraction of the population having food in the digestive tract (Euzen, 1987). Values of seasonal feeding intensity or Vacuity Index (VI) in the present study showed periods of fasting during the rainy and winter seasons as indicated by the high percentage of empty stomachs in these seasons. Thus in this study *Channa punctatus* was shown to be a edacious feeding (VI=14.04%) in summer season, relatively edacious feeding (VI=28.09%) in winter season and relatively abstemious feeding (VI=57.85%) in rainy season. Saikia et al. (2012) also recorded lower feeding in winter from paddy field Shivsagar dist., Assam.

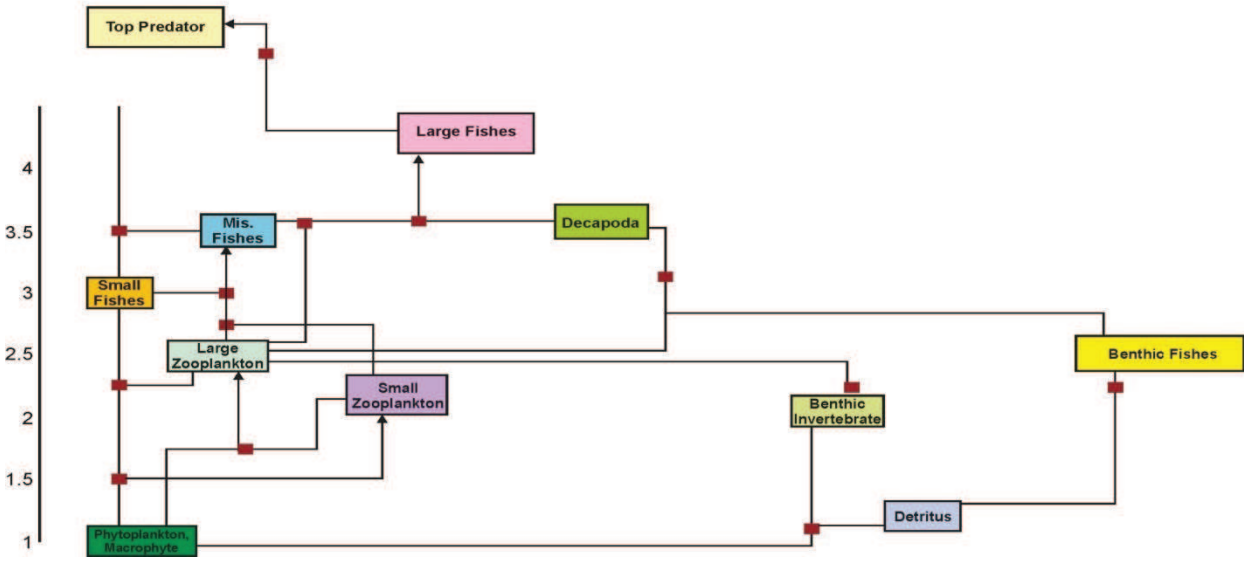


Fig. - 2 Trophic Model Representing Riverine Food Web In Ecosystem
(Fisheries Form Part of Complex Ecosystem)

Aditya (1990) presented higher feeding intensity in summer for air breathing fishes. In the present study low feeding rate or high Vacuity Index (VI) index in rainy season in *Channa punctatus* may be due to fall in metabolism. From the previous study it is known that this species has a partial spawning period during rainy and winter season. With this strategy, the fish accumulates energy reserves for reproduction during the feeding period and avoids periods of competition during the spawning season.

Although information on the trophic levels of the species is scarce, our results indicate that the *Channa punctatus* (TROPH-3.03) is the second-order predator in the Gambhir reservoir of Madhya Pradesh. Usually consumers in fresh water ecosytems have TROPH values between 2.0 (for herbivorous/ detrivorous organisms) and 4 to 5.00 (for piscivorous/carnivorous organisms, Fig-2). Pethiyagoda (1991) also calculated the mean trophic level 2.8 for *Channa punctatus* in tropical region and reported carnivorous feeding habit.

Omnivory Index of Pauly (1987) reflects the degree of diversity of the prey's trophic level. In this study the Omnivory Index (OI=0.53) of *Channa punctatus* was found between to 0 than 1, this indicates that this species is predominantly carnivorous. that feeds on many trophic levels.

An important contribution of this work is that, it is necessary to understand that the management of species with which it interact can cause effects on the ecosystem as a whole food web. In the present study it is difficult to understand the species inter-actions of ecosystems in Study areas, as the number of species involved is much higher. However, these sorts of studies are needed in order to adequately manage and preserve the exploited resources.

Conclusion: The detailed diet information presented in this study will be useful in ecological modelling and to understand the ecological interactions among predators and then prey. It will be necessary to continue with trophic studies for other species inhabiting the area. Variation in biotic and abiotic factors in the area over the long term will also assist in realising an ecosystem approach to fisheries.

Table-1 : % Weight (W%), frequency of occurrence (O%) and index of preponderance (I_p %) in *Channa punctatus*

S. No.	Prey Item	W%	O%	I_p %
1.	Copepoda	1.03	4.96	.40
2.	Ostracoda	.67	6.61	.34
3.	Cladocera	.73	4.13	.23
4.	Hemiptera	2.60	4.96	1.00
5.	Odonata	4.80	4.13	1.53
6.	Diptera	11.73	13.22	11.99
7.	Coleoptera	4.77	5.79	2.13
8.	Mollusca	3.10	3.31	.79
9.	Decapoda	11.93	11.57	10.67
10.	Teleosts	25.20	23.14	45.48
11.	Semidigested	22.80	11.57	20.39
12.	Miscellaneous	10.63	6.61	5.43

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