International Journal of Enhanced Research in Medicines & Dental Care
(IJERMDC), ISSN: 2349-1590, Vol. 11 Issue 12, December 2024

Food and Feeding Habits of Cyprinus carpio communis in Dal-Lake, from Kashmir

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ABSTRACT

The food and feeding habits of Cyprinus carpio communis in Dal-lake was studied by examining guts collected throughout the year. The fish samples used in the study was within the range of 147mm to 281mm in total length and weight ranging from 26.56g to 181.32g in weight and the sampling duration was from may 2021 to June 2022.During the analysis the food and feeding habits of Cyprinus carpio ,it was concluded that the fish is herbivorous. Its food mainly consists of plant matter 54.5% and 34.65 % animal matter. Macrophytes, which made up around 27.35% of all food items, was the main contributor to the plant food. It was found to be at its highest (32.1%) in July and at its lowest (11%) in January. The primary source of animal food was crustaceans, which accounted for 21.2% of all food items. The highest percentage of crustaceans was reported in the month of April while the lowest percentage was recorded in the month of January.

Keywords: Food, feeding habits, Cyprinus carpio.

INTRODUCTION

The Kashmir Valley is encompassed by the lofty Pir-Panjal range to the south-west and the greater Himalayan range to the north-east, giving it an elliptical bowl shape. The highest mountain peaks surrounding the valley rise to elevations exceeding 5300 m.a.s.l on the great Himalayan side and over 5500 m.a.s.l on the Pir Panjal side. The predominant topography of Kashmir consists mainly of mountains, primarily traversed by the western Himalayas, culminating at Nanga Parbat on the western boundary of Kashmir. Kashmir is intersected by three rivers, namely the Indus, Jhelum, and Chenab. The Jhelum river stands out as the sole significant Himalayan river that flows through the Kashmir valley. Within the Jhelum basin, there are 788 wetlands and water bodies, with 69 being high-altitude lakes and wetlands. Noteworthy lakes in the Jhelum basin, such as Dal and Wular lakes, are renowned for their picturesque landscapes.

In 1959, the introduction of common Carp in Kashmir aimed to enhance fish yield (Sehgal, 1989). Subsequently, this species has proliferated throughout the meandering rivers, floodplain lakes, and wetlands, emerging as a significant commercial fish in the Kashmir valley. Cyprinus, characterized as a robust and rapidly growing fish, is often described as a "natural specialist" or an 'ecological engineer' due to its adaptability to various ecological conditions. According to Sunder et al. (1978), C.c. communis was identified as the primary contributor to the total catch from Dal Lake. Kashmir possesses abundant freshwater fishery resources, including lakes, streams, and low-lying areas. The water bodies in the Kashmir valley harbor both endemic species, such as Shizothorax sp., and exotic species like various carps and trouts. However, the endemic fish in Kashmir has experienced a significant reduction in both population and body size, as reported by Yousuf (1996) and Bhat et al. (2013).

The introduction of the exotic common Carp has led to a significant reduction in the population of Schizothoracine fishes in the Kashmir valley (Yousuf and Qadri, 1992; Zutshi and Gopal, 2000). Among the Schizothorax fishes, Schizothorax niger is a prevalent species in the Kashmir region but faces stiff competition from exotic fishes like Cyprinus carpio.

The feeding behavior of the common carp closely mirrors that of Schizothorax spp., as both species primarily consume detritus and benthos. Given the significant risks faced by Schizothoracids in Kashmir waters due to ecological factors, intra and interspecific competition, and human pressures, there is a pressing need to cultivate Schizothorax fishes under controlled conditions to enhance their natural population. This necessitates a comprehensive understanding of the food and feeding patterns of *Cyprinus carpio.*

The activities of feeding and the search for food play pivotal roles in regulating, or at the very least, influencing the distribution, migration, and growth of fish. Insights into the food habits and growth of fish species offer valuable keys to understanding various aspects of fish biology, physiology, and behavior. Studies on feeding habits also carry direct implications for fishing techniques, such as longlines and fish traps that utilize bait. Knowledge of daily feeding activity cycles, feeding grounds, and prey preferences can guide the selection of bait and optimize fishing strategies.
It's noteworthy that the food and feeding habits of fishes exhibit seasonal variations, influenced by changes in the composition of food organisms during different seasons of the year (Bhuiyan and Islam, 1991). A detailed understanding of the feeding biology of a fish contributes to formulating feeding designs for more effective management and growth of fish populations.It was with this background that a detailed study on food and feeding of Cyprinus carpio was undertaken.

MATERIAL AND METHODS

With the assistance of a local fisherman, fish specimens of *Cyyprinus carpio var communis* were collected for the study from the Dal and Wular lakes between 2021 and 2022.

Each month, 25 specimens *of C. carpio* were gathered from the designated places. Fish were dried off and weighed using a "electronic weighing balance" to the closest gramme. Using a fish measuring board, divider, and digital vernier calliper that measures to the closest millimetre, several morphometric measurements were made.

The abdomen was opened, and the distension of the stomach was used to document the condition of the stomach. Additionally, the intestinal coils were noted. The alimentary canal was extracted from the oesophagus to the cloaca using tiny forceps. To avoid harming the gut, the stomach was gently stretched open and the adherent viscera was extracted using a pair of blunt forceps. Using a scale, the entire length of the intestine was measured from the cloacal aperture to the front end of the stomach. A blotting paper was used to wipe the wet stomach dry. To determine the weight of the food contained within the empty intestine, it was weighed once again. The gut contents were stored in 5% formalin and their total volume was measured in tubes graded in CC.

The contents of the intestine were quantitatively examined. To identify the meal items, a well-mixed slurry of the stomach contents was spread out and examined under a stereoscope. Using typical taxonomic works in the field, various food items, including semi-digested, fragmented, and minute particles, were recognised as much as feasible upto the generic level (Edmondson, 1959; Pennak, 1978). The following quantitative analysis was completed: -

Strip Counting: -
When necessary, the original sample was diluted. Following a thorough shaking of the material, lml was examined under a microscope in a Sedgewick rafter cell .The count of the detected food items was used to determine the total number of food items in the stomach.

Total no of each food item =No. of food items calculated ×volume of total sample

Occurrence Method: -
The gut contents underwent additional analysis using the occurrence method, which involved recording the percentage of guts containing each type of food.

RESULTS

Gut content Analysis
The gut contents of Cyprinus carpio were primarily made up of 34.65 % animal food, namely crustaceans, and 54.5% plant stuff, mostly macrophytes. (Fig. 1, Table 1).

Macrophytes, which made up around 27.35% of all food items, was the main contributor to the plant food. It was found to be at its highest (32.1%) in July and at its lowest (11%) in January. Green algae, which made up around 16.1% of all food items, were the second most important food item and were mostly represented by Closteridium ulothix, Spirogyra, and Scenedesmus. In the stomach, they were observed at their lowest in January (10.1%) and at their highest in July (19.02%).

About 9.04% of total food items were diatoms, which are the third most significant plant matter in the stomach, primarily represented by Navicula, Synedra, Fragilaria, and Turbelluria. December had the highest diatom concentration (13.0%), while August had the lowest (5.1%).

About 2.01% of total food items were made up of blue green algae, which are the fourth most significant plant food in the stomach represented by Cosmarium and Oscillatoria. The highest percentage of this food item (4.5%) was recorded in the month of September.

Animal matter:The primary source of animal food was crustaceans, which accounted for 21.2% of all food items. Crustaceans were most abundant in April and least abundant in January with Cyclops, Diaptomus, and Bosmina being the most common species. Following crustaceans, rotifera accounted for 7.56% of all dietary items. The highest concentration of rotiferans in the gut was observed in May (65%) and the lowest in February (1.18%). The primary components of rotifera were Monostyla and Keratella.

Additionally found in the gut contents, protozoa and oligochaetes made up approximately 3.89% of the total food items. Arcella was the protozoa's component, while Nais and Lumbriculus were the oligochaetes.

Other than the above mentioned animal matter Gill rakers and other items were also present and which formed about 2% of the gut content.

Unidentified matter
It contained undefinable plant and animal materials and made up 7.06% of the total food items.
Additionally observed in the gut were sand particles and mud, which made up roughly 2.79% of the overall gut content.

Table (1):lists the relative importance of the main foods that Cyprinus carpio consumes.

Food item	Percentage (%)	Rank
Macrophytes	27.35	1
Diatoms	9.04	4
Green algae	16.1	3
Blue green algae	2.01	9
Crustacea	21.2	2
Rotifera	7.56	6
Protozoa	2.60	8
Oligochaetes	1.29	11
Gill rakers and other items	2.0	10
Unidentified matter	7.06	5
Sand particles and mud	2.79	7

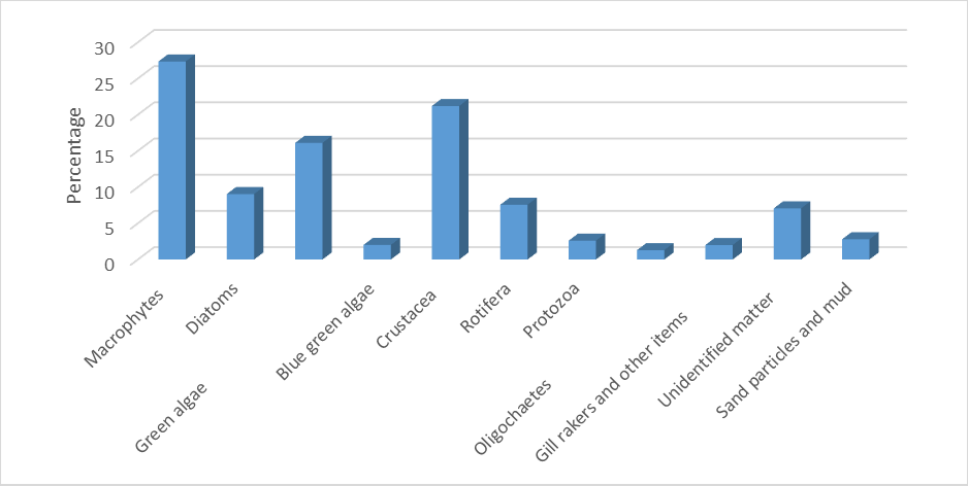

Fig1: Changes in the proportion of food items found in the stomach of *C. carpio var communis*

DISCUSSION

Researchers Jan (1973), Sunder and Subla (1985), Devadoss (1989), Dasgupta (1990), Wijeyaratne and Costa (1990), de and Datta (1990), Nasreen (1993), Dasgupta (1996), Singh and Dhawan (1996), Das and Goswam (11997), Hamsa and Rao (1997), Basuda and Vishwanath (1999), Rao and Padmaja (1999), Yousuf and Firdous (2001), and Yousuf and Khan (2002), have all studied fish food and feeding habits. Even while fish are typically classified as herbivorous, omnivorous, or carnivorous, the majority of them have extremely flexible eating habits and make use of the food that is easily accessible. The type of food determines whether or not the fish will consume it; only a few species are exclusively herbivores (Khanna, 1997). Plankton feeders are fish that feed on debris and plains; Hore and Pillay (1962) classified these fish in a different class.

The kind of food and the alimentary canal's length are directly correlated. Nikolskii (1963) states that the alimentary canal length in carnivorous fishes is less than 100% of the body length, whereas in herbivorous fishes, it is greater than 100%.

Stomach content analysis of Cyprinus carpio communis in the present study revealed that macrophytes and crustaceans are the most important food items consumed by the fish and thus are the dominating food items followed by secondary food items which include diatoms, green algae, bluegreen algae, rotifera, unidentified matter. Protozoans, oligochaetes, gill rakers were occasionally present. So, on the basis of gut content analysis the fish can therefore be regarded as illiophagic ommnivore. According to Yousuf and Firdous (2001), regarded the same fish as an illiophagic omnivoreas they found that the fish's primary food source is macrophytic tissues, which are followed by crustaceans. According to Jan and Das (1970), 34% of the plant matter consisted of insects, zooplankton, and rotifers found in the same fish, while 57% of the plant matter was composed of macrophytes.

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