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Food And Feeding Habits Of Schizothorax Niger In Dal-Lake,From Kashmir

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Abstract:
The food and feeding habits of Schizothorax niger in Dal-lake was studied by examining guts collected throughout the year.The fish samples used in the study was within the range of 200mm to 340mm in total length and weight ranging from 100g to 424g in weight and the sampling duration was from March 2021 to April 2022.During the analysis the food and feeding habits of S.niger it was concluded that the fish is herbivorous.Its food mainly consists of plant matter 67.53% and 23.43% animal matter. Green algae, which made up around 30.01% of all food items, was the main contributor to the plant food. It was found to be at its highest (32.64%) in July and at its lowest (10.18%) in January. The primary source of animal food was crustaceans, which accounted for 16.20% of all food items. The highest percentage of crustaceans was reported in the month of February (30%), while the lowest percentage was recorded in the month of July (9%).

Keywords: Food, feeding habits, Schizothorax niger

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. This lacustrine fish is commonly found in substantial numbers in lakes such as Dal Lake and Wular Lake. Unlike some Schizothorax species, Schizothorax niger does not exhibit spawning migration and instead spawns in the shallow peripheral areas of lakes (Vass and Raina, 1979). It plays a crucial role in the capture fishery of the flatland lakes in the valley, particularly Dal, Manasbal, and Wular. There is a belief that in Kashmir lakes, 'Schizothoracids are rapidly declining due to the higher fecundity of common carp and its preference for spawning in confined waters (Sundar et al., 1978). The decline and degradation of the breeding grounds for local fish species, particularly *Schizothorax,* in Kashmir can be attributed to various factors, including the introduction of carps, negative impacts of tourism, and the excessive fertilization of floating gardens leading to algal blooms. Unlike Cyprinus, which can tolerate organic pollutants and low oxygen concentration in water (Weber et al., 2010*), Schizothorax* cannot. Restoring the Schizothorax fisheries in Kashmir's lakes is crucial for maintaining socio-economic, cultural, and fishery sustainability. The altered trophic levels in Dal and Wular lakes have significantly affected native fish species, leading to the expulsion of some like *Botia birdi* (Gazala, 2004), while others such as Schizothorax spp. are rapidly losing ground.

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 thefood and feeding patterns of *Schizothorax niger.*

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 *Schizothorax niger* was undertaken.

Material and Methods:

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

Each month, 25 specimens *of S. niger and 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 Schizothorax niger were primarily made up of 22.48% animal food, namely crustaceans, and 68.59% plant stuff, mostly green algae. (Fig. 1, Table 1).
Green algae, which made up around 30.01% of all food items, was the main contributor to the plant food. It was found to be at its highest (32.64%) in July and at its lowest (10.18%) in January. The green algae species found there were pediastrum, ulothrix, spirogyra, closteridium, and scenedesmus.
Diatoms, which accounted for around 21.5% of the total food items and were the second-most important plant food in the stomach represented by navicula, cymbella, and synedra, came behind green algae. In the stomach, they were observed at their lowest in October (10%) and at their highest in July (26%).
Macrophytes were the third major food item found in the gastrointestinal contents, making up around 13.8% of all food items. The intestines contained the highest percentage of macrophytes—25.8%—and the lowest percentage—6.4%—in the month of January.
After macrophytes, blue-green algae accounted for 3.28% of the total food items, reaching its highest percentage in April (8.42%).
Animal matter: The average animal fced makes up roughly 22.48% of the gut's total composition. The primary source of animal food was crustaceans, which accounted for 16.20% of all food items. The highest percentage of crustaceans was reported in the month of February (30%), while the lowest percentage was recorded in the month of July (9%); these crustaceans included cyclops, diptomus, and bosmina.
Rotifer made up 3.91% of the gut's total contents, with the highest and lowest amounts found in the gut during the months of February (9.2% and 7%, respectively). Rotifera were primarily made up of Monostyla and Keratella. Paramecium and arcella were among the protozoa that were found in the gut contents, which made up around 1.02% of the entire gut content.
Gill rakers and other objects were found in addition to the animal stuff already stated, making up roughly 1.35% of the gut content.
Additionally, mud and sand particles were observed in the gut, making about (8% of the total gut content).
Table 1lists the relative importance of the main foods that Schizothorax niger consumes.

Table(1) The proportion of various food items in S. Niger.

Food items	Percentage	Rank
Macrophytes	13.8	4
Diatoms	21.5	2
Green algae	30.01	1
Blue, Green Alage	3.28	7
Crustacea	16.20	3
Rotifera	3.91	6
Protozoa	1.02	9
Gill rakers and other items	1.35	8
Sand particles and mud	8.00	5

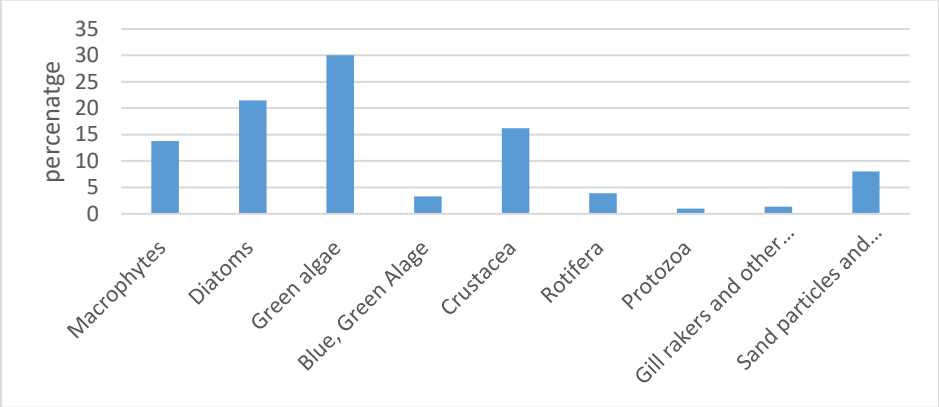

Fig. 1: Variations in the proportion of dietary items found in S. niger's stomach.

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%.

The present study's research of the intestinal content of Schizothorax niger indicated that the fish consume 22.48% of animal food, primarily made up of crustaceans, and 68.59% of plant materials, which is dominated by green algae. As a result, the fish can be classified as herbivores.

Schizothorax niger is reportedly a sight feeder, according to Yousuf and Khan (2002). According to Shazia (2009), S. niger is a herbivore that consumes 63.3% of its meal as plant materials. S. niger is a herbivorous, omnivorous fish that has 23.43% animal matter and 67.53% plant matter, according to Iqra (2021). The same fish were identified by Sabha et al. (2017) as herbiomnivores, with green algae accounting for the highest percentage of food items (89%) among them. Other reported food items were plant fragments (45.2%), sand/silit (5%) and miscellaneous (2.5%). Fish are herbivores that mostly eat higher aquatic plants, according to research done in 1981 by Pisolkar and Karam Chandani on the diet and feeding habits of Tortoreans. According to Langer (1984), S. longipinnis is mostly a herbivore that consumes decomposing organic materials (54.2%), sand, and mud (25.7%), with 20.1% coming from plant and animal sources.

Yousuf et al. (2003) found that fish are benthophagic carnivores that only eat benthic insects when researching the eating and feeding habits of Glyptosternum reticulum. In their 2020 study, Khilare and Khandare described Mystusarmatus as an omnivorous fish that consumes mud particles, tiny fish, mollusks, crustaccans, and aquatic insects.

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