

Seasonal Fish Availability of the Ram Ganga River, Moradabad, Uttar Pradesh

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Abstract: Water plays an important role in aquatic life as it has potential to alter the distributional pattern, reproductive cycle, and population survival. As a result, it become one of the most important elements of the lives of both terrestrial and aquatic species. The Ram Ganga River was visited extensively on regular basis to examine fish diversity and local fish market was also examined in depth for additional information. During the study period, a total of 27 fish species were recorded. The recorded species are belonging to 5 orders viz., Cypriniformes (n = 14), Siluriformes (n = 8), Perciformes (n = 3), Clupeiformes (n = 1) and Osteoglossiformes (n = 1) and in term of their species proportion, their percentage are as Cypriniformes (51.9%), Siluriformes (29.6%), Perciformes (11.1%), Clupeiformes (3.7%) and Osteoglossiformes (3.7%). A large number of observed fish species as listed as least concern (65.4%), data deficient (15.4%), and near threatened (7.7%) whereas vulnerable are noted as 11.5%. In conclusion, present faunas are observed with higher diversity in the river Ram Ganga. It also highlighted that a wide range of research possibilities are existed to explore more about the undiscovered faunas of Ram Ganga River in Moradabad, Uttar Pradesh.

Keywords: Fish Diversity, Seasonal availability, Threatened level

1. Introduction

The assessment of water quality and its conservation is crucial for life's existence as water is among the most important component of terrestrial and aquatic species survival. Depending on natural conditions, life may not be possible or limited without water (Bagatin *et al.*, 2014). Concerning aquatic life, water becomes of prime importance as insufficient amount of water may alter the distributional pattern, reproductive cycle, and population survival. The Ganga river and its basin represent India's largest and the world's fifth - biggest river system (Abbas and Subramanian, 1984). It has several cultural, economic, and environmental significance in various aspects as it serves water for nearly 450 million people in India (Sarkar *et al.*, 2012; Branciaro *et al.*, 2020). Furthermore, the Ganga river is also used for fishing and farming (Dwivedi *et al.*, 2018). Fisheries offer jobs, revenue, and nutritious food across their distribution. Fish has long been known to be exceptionally nutritious, providing important fatty acids, micronutrients including Fe, Zn, Ca, and vitamin A, as well as several proteins (Simpson *et al.*, 2011). Variations in the environmental parameters are critically linked with the aquatic fauna especially fish diversity as they reproduce and survive in aquatic bodies (Varadharajan and Soundarapandian, 2014). Therefore, this study is aimed to investigate the seasonal availability of fish in the Ram Ganga River, Moradabad, Uttar Pradesh.

2. Materials and Methods

The periodic sampling was carried out at the Ram Ganga River, Moradabad, Uttar Pradesh during 2020 and 2021. Because water levels and fish diversity are varied hence, fish sampling was done periodically. During sampling, specific information such as use of nets and their types were noted on the regular basis. The systematics methods which was adapted with small alterations from diverse resources such as library, textbooks, literature, and other resources are used for sampling. Certain information on fish diversity,

abundance, and threatened level were monitored on priority basis whenever it was feasible and practicable to record. Furthermore, specimens, photographs, sampling locations, and other morphological parameters were measured during the time of sampling. In addition, information such as detail of the study sites, GPS coordinates, date of visit, and observations were also been recorded. Most of the samples are consistent throughout sampling periods, which was validated by using identifying keys, and existing literature, with special focus on the western region of Uttar Pradesh.

In case of any typical specimen, proper communication was made with fisheries experts and scientists for identification. The nearby local fish markets such as Shiv Nagar Fish Market, Kapoor Company Fish Market, Taj Fish Company, Taharpur Bazar Fish Market, Gulab Bari Fish Market, and Nanpur Bazar Fish Market have been visited regularly for the assessment of fish availability in the local markets. Furthermore, the most recent IUCN red list database on species threatened status was mapped, and conservation actions were also initiated around the study area of Moradabad, Uttar Pradesh.

3. Results and Discussion

A total of 27 fish species were recorded in the present study. The observed species are highly diversified in terms of their diversity and occurrence. It was found that the recorded species are belonging to 5 order viz., Cypriniformes (14 species), Siluriformes (8 species), Perciformes (3 species), Clupeiformes (1 species) and Osteoglossiformes (1 species). The recorded fishes which are belonging to order Cypriniformes are *Catla catla*, *Cirrhinus mrigala*, *C. reba*, *Cyprinus carpio*, *Labeo rohita*, *L. calbasu*, *L. bata*, *Puntius sarana*, *P. ticto*, *Ctenopharyngodon idella*, *Hypophthalmichthys molitrix*, *Amblypharyngodon mola*, *Oxygaster bacaila*, *O. gora* and fishes belonging to the order Siluriformes are *Sperata seenghala*, *S. aor*, *Mystus cavasius*, *M. vittatus*, *M. tengara*, *Heteropneustes fossilis*, *Clarias batrachus*, *Wallago attu*, whereas *Channa punctatus*, *C.*

srtiatus, *C. marulius* are belonging to the order Perciformes and *Trichogaster fasciata* and *Chitala chitala* are belonging to the order Clupeiformes and Osteoglossiformes (Table 1). Apart from the diversity aspects, the recorded fish's order are

highly varied in terms of their proportion as they contributed as Cypriniformes (51.9%), Siluriformes (29.6%), Perciformes (11.1%), Clupeiformes (3.7%) and Osteoglossiformes (3.7%; Figure 1).

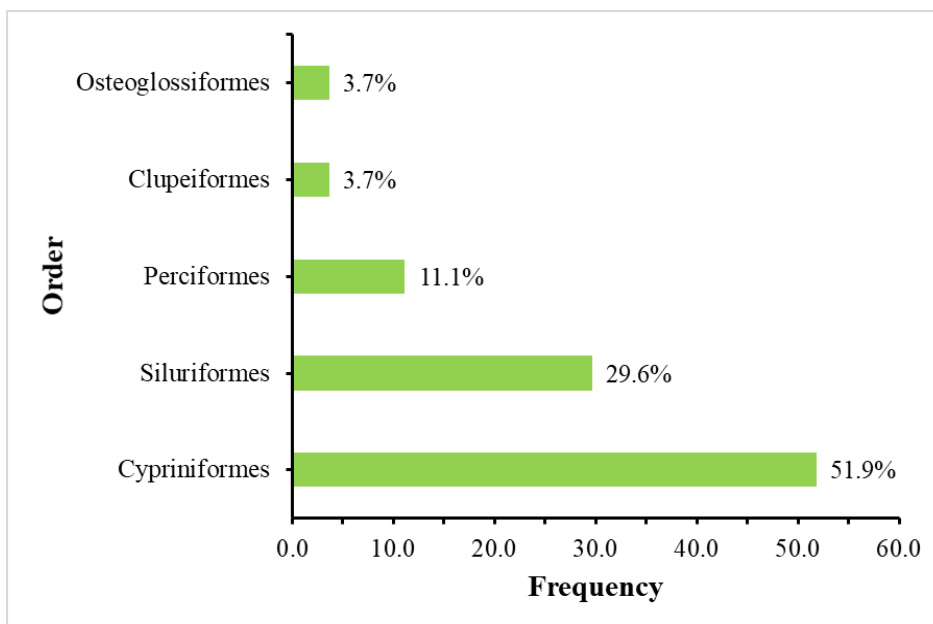


Figure 1: Mean proportion of observed fishes order of the Ram Ganga River, Moradabad, Uttar Pradesh.

It was found that the observed species are belonging to eight diversified fish families in terms of their geographical distribution and availability. The abundance of diversified fishes indicated the availability of higher resources and lower threatened levels. Out of the 27 recorded fish species, Cyprinidae family was observed as the highest diversity of

14 species, Bagridae was observed with 5 species, Channidae includes 3 species, lower most diversity was recorded as single species of Heteropneustidae (1 species), Clariidae (1 species), Siluridae (1 species), Anabantidae (1 species) Notopteridae (1 species; Figure 2).

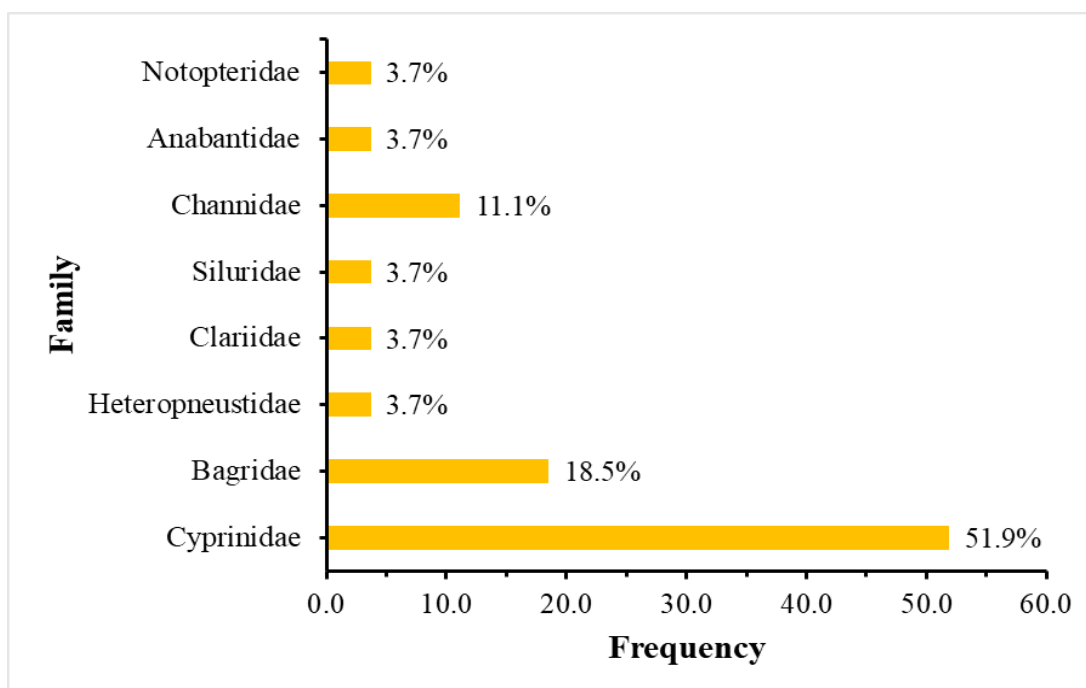


Figure 2: Mean occurrence of fishes family of the Ram Ganga River, Moradabad, Uttar Pradesh

It has been noted that fish diversity is entirely dependent on water quality because, due to their evolutionary characteristics, they reproduce, grow, and survive in aquatic bodies. Hence the presence of other factors such as anthropogenic causes, pollution load, predatory fauna, and

overfishing activities has a significant impact on fish diversity, and the number of survivors spontaneously decreases with such conditions (Gebrekiros, 2016) . Based on the observed fish species variety, it may be inferred that Ram Ganga river has enough supplies and favourable

circumstances for the reproductive success and survival of the existing faunal diversity (Osmundson *et al.*, 2002). It was often found that the number of fishes and their occurrence frequencies varied by month and season, which was most likely attributable to resource availability and use.

Furthermore, aquatic bodies are regarded as garbage collection center because they are constantly exposed to polluted water. However, in addition to fish, other microorganisms, aquatic organisms, and plants are actively engaged in detoxification and impurities irradiation mechanisms, resulting in long-term survivorship and relationships that help to improve and maintain aquatic as well as fish diversity. Fishes are strongly impacted by seasonal variations in water quality as a key source of living premises due to their aquatic residency and adaptation. In such circumstances, seasonal fluctuation in terms of availability in the local market and seasonal variability is bound to be limited. Furthermore, inconsistencies in the availability of local fish may have an impact on consumption frequency. In general, several fish species may be available throughout the year, indicating that they are particularly popular in this region.

Although, the Ram Ganga has a wide spectrum of floral and faunal diversity, a large number of fish have been observed during the study period. A substantial number of fish species were identified as least concern species by IUCN Red list while few other species are observed under the data deficient category. According to the findings, the river Ram Ganga has fewer anthropogenic causes and is in under less threatened group, hence current faunas are seeing very little population decline due to minimal risk factors.

On the other hand, among the species that have been reported, others have no records or are only somewhat threatened. It revealed that there is still a broad range of study opportunities available to learn more about the unknown fauna through a series of investigations. In comparison to least concern and data deficient observations, the recorded species are also marked with two more IUCN red list categories as near threatened (7.7%) and vulnerable (11.5%). According to the recorded category of fishes threatened level, a few man-made and natural factors have a key impact in determining seasonal availability and diversity of river Ram Ganga around Moradabad region of Uttar Pradesh (Figure 3).

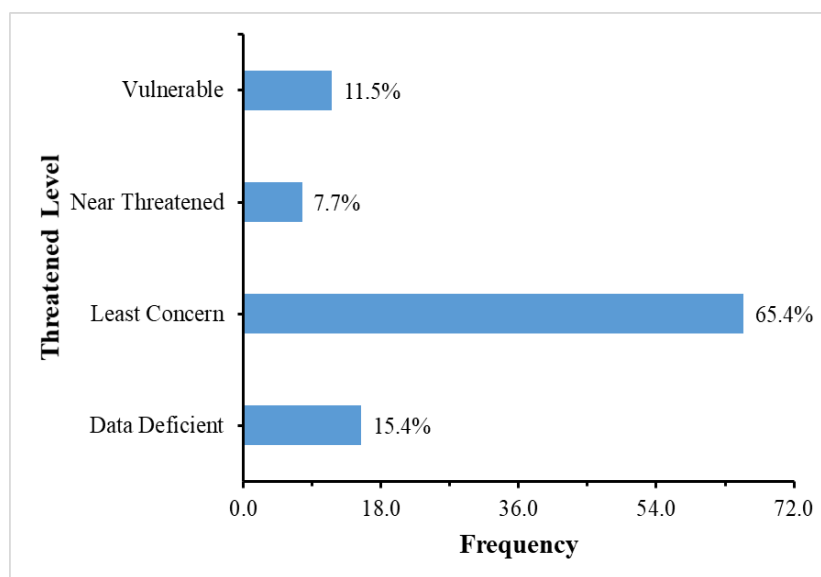


Figure 3: IUCN threatened group of observed fishes of the Ram Ganga River, Moradabad, Uttar Pradesh.

During the study, it was found that the recorded species exhibited considerable diversity and seasonal availability. However, the observed fish species are highly varied in terms of their occurrence probabilities such as *Catla catla* (3.4%), *Cirrhinus mrigala* (4.3%), *C. reba* (4.7%), *Cyprinus carpio* (3.6%), *Labeo rohita* (5.2%), *L. calbasu* (3.5%), *L. bata* (4%), *Puntius sarana* (4.6%), *P. ticto* (2.9%), *Ctenopharyngodon idella* (4.6%), *Hypophthalmichthys molitrix* (4%), *Amblypharyngodon mola* (2.7%), *Oxygaster bacaila* (4%), *O. gora* (2.7%), *Sperata seenghala* (3.8%), *S. aor* (3.3%), *Mystus cavasius* (4.1%), *M. vittatus* (3.3%), *M. tengara* (3.5%), *Heteropneustes fossilis* (1.9%), *Clarias batrachus* (2.1%), *Wallago attu* (4.1%), *Channa punctatus* (4.3%), *C. srtiatus* (3.1%), *C. marulius* (4.4%), *Trichogaster fasciata* (3.9%) and *Chitala chitala* (4.1%); Figure 4). Variations in fish availability revealed that this might be attributed to differences in water quality and fish spawning season. The fluctuation of numerous elements determines

water quality, which affects aquatic organism dynamics and governs ecological processes (Dassenakis *et al.*, 1998). Abiotic variables such as salinity, temperature, dissolved oxygen, sediments, and nutrients are among the biotic factors, whereas biotic factors such as reproductive migrations, predator avoidance, and feeding are among the abiotic factors. The concentration ranges of nitrogen, phosphorus, and dissolved oxygen, among other properties, may be used to measure the water quality, which supports healthy aquatic ecosystems and encourages optimal ecosystem functioning (Labbe and Fausch, 2000). Anthropogenic waste discharge has an impact on water quality, which in turn has an impact on pollutant concentrations and physicochemical variables, as well as ecological processes such as nutrient cycles, primary production, trophic interactions, and species dynamics (Duque *et al.*, 2020).

Table 1: Ichthyofaunal diversity of River Ram Ganga, Moradabad, Uttar Pradesh

Order	Family	Local Name	Scientific Name	IUCN Status
Cypriniformes	Cyprinidae	Katla	<i>Catla catla</i>	DD
		Naini	<i>Cirrhinus mrigala</i>	LC
		Narain, Nain	<i>C. reba</i>	LC
		Common Carp	<i>Cyprinus carpio</i>	VU
		Rohu	<i>Labeo rohita</i>	LC
		Kalmouch	<i>L. calbasu</i>	LC
		Bata	<i>L. bata</i>	LC
		Olive barb	<i>Puntius sarana</i>	LC
		Sehri	<i>P. ticto</i>	LC
		Grass carp	<i>Ctenopharyngodon idella</i>	DD
		Silver carp	<i>Hypophthalmichthys molitrix</i>	NT
		Murla	<i>Amblypharyngodon mola</i>	LC
		Chilwa	<i>Oxygaster bacaila</i>	LC
		Chilwa	<i>O. gora</i>	LC
Siluriformes	Bagridae	Singhara, malli	<i>Sperata seenghala</i>	VU
		Chongna	<i>S. aor</i>	LC
		Teenghara	<i>Mystus cavasius</i>	LC
		Teenghara	<i>M. vittatus</i>	DD
		Teenghara	<i>M. tengara</i>	LC
	Heteropneustidae	Singhi	<i>Heteropneustes fossilis</i>	LC
	Clariidae	Magur	<i>Clarias batrachus</i>	LC
Perciformes	Channidae	Sawli	<i>Channa punctatus</i>	LC
		Sawli	<i>C. srtiatus</i>	DD
		Sawli	<i>C. marulius</i>	LC
Clupeiformes	Anabantidae	Khurda	<i>Trichogaster fasciata</i>	LC
Osteoglossiformes	Notopteridae	Cheetal	<i>Chitala chitala</i>	NT

DD = Data Deficient, LC = Least Concern, NT = Near Threatened and VU = Vulnerable

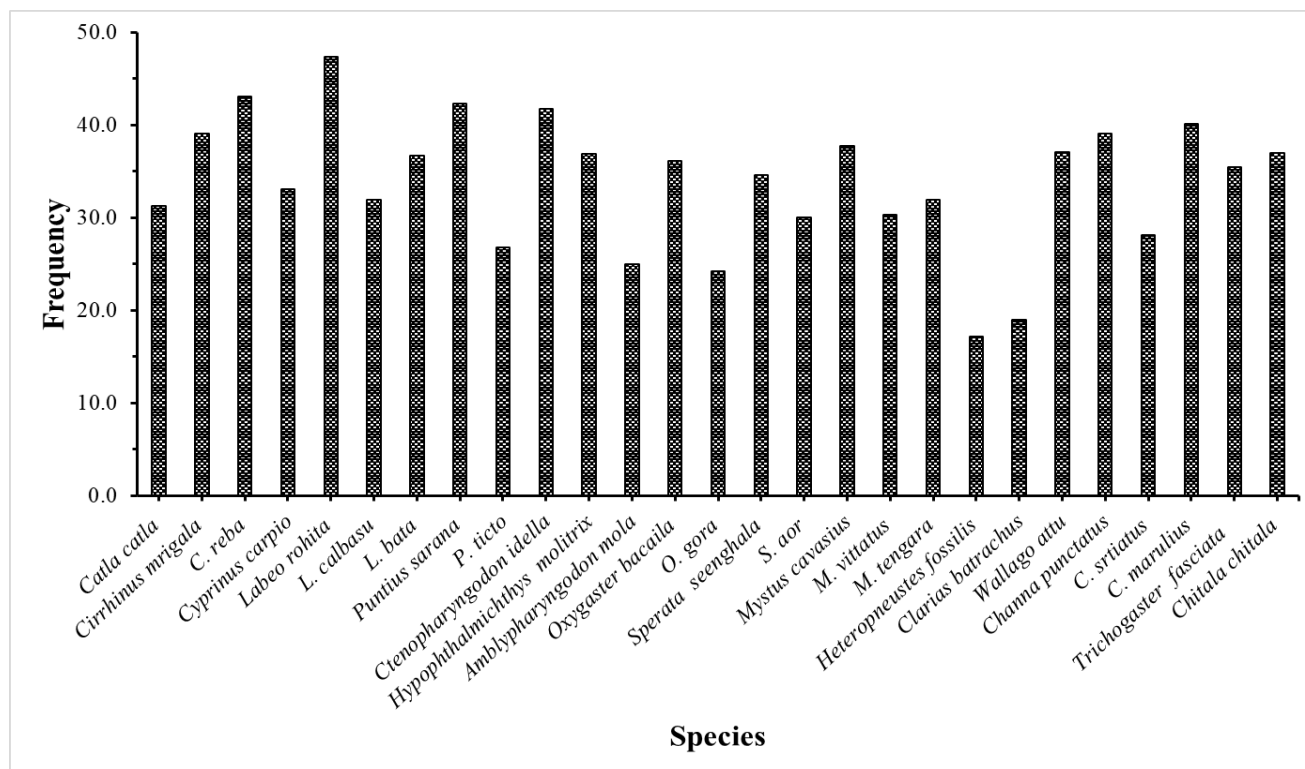


Figure 4: Mean frequency of recorded fishes from the River Ram Ganga, Moradabad, Uttar Pradesh

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