

Aquatic Resources of Gorakhpur District (U.P.): Status and Need of Conservation.

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Abstract: Gorakhpur district has several water bodies, including major rivers like the Ghaghara and Rapti, smaller rivers such as Ami and Rohin, and numerous lakes like the prominent Ramgarh, Mheshara and Chilua Lake. The district also contains various ponds, seasonal lakes, and drainage canals, but many of these are under threat from pollution and encroachment due to urbanization and development. 57 species of plankton (Both), 15 species of molluscan and 87 species of freshwater fishes have been reported from Gorakhpur District with these native aquatic-fauna

Keywords: Gorakhpur district.

I. INTRODUCTION

Available literature shows that no any recent report comes after the study of Srivastava, 1967. Gorakhpur is a part of Eastern Uttar Pradesh and lies at 26° 48'N and 82° 08'E. Its height above mean sea level is 114 m. Districts of Maharajganj, Santkabir Nagar, Deoria and Mau bounded it. The main Rapti River flows from northern border. The others rivers are Ghaghra, Rohini and Kakra. It is well known that we have no sufficient information (in reference of Gorakhpur). The present note is result of about three years of field observation. The economic importance and the present status of fishes are also discussed. The fishes are examined were mostly fresh or in some cases fixed (Table 1).

The list of aquatic diversity and their resources are given in Fig. 1 and Table 1-5. Except these native varieties, some exotics fishes like *Ctenopharyntgodon idella* (Grass carp), *Cyprinus carpio* (Common carp), *Hypophthalmichthys molitrix* (Silver carp) and *Aristichthys nobilis* (Bighead) are also present in this region. *Clarias gariepinus* (exotic magur) is also recorded for the first time in 1991. These fishes are transplanted in this district to enhance the fish production. *Clarias gariepinus*, is highly carnivorous and predatory in nature and no knowledge on its breeding behaviour. Another side its flesh is less tasty in comparison to our native magur (*Clarias batrachus*). Hence should be cautious, while advocating propagating of exotic magur in ponds. Its escapement in to open waters may pose serious threat to native fish fauna (Srivastava, 2000).

A marked variation in the availability of different finfishes has been observed over the years. Based on the IUCN (International Union for Conservation of Nature and Natural resources) criterion, fishes have been assigned different status tentatively, according to the extent of threat to the individual species.

Materials and methods

Samples of Ramgarh Lake, Rapti river and Maheshra tal were collected monthly in the mid-month \pm 1day at three sampling sites from March 2015 to June 2018. Samples from the surface and bottom layers were collected at each site. All the glass wares were rinsed with 10 % HCl, deionized water and double distilled water. Sampling of aquatic biodiversity was observed at regular interval at selected sites. The final list of all diversities is ascertained after more observations and classify them according to Berg, 1940.

Results:

Composite fish culture of Bhakur (*Catla catla*), Rohu (*Labeo rohita*), and nain (*Cirrihinus mrigala*) along with exotic carps (grass, common, silver and beghead) is becoming more and more popular day by day in Gorakhpur. Though, some workers like Pandey, 1977, 1999 and Srivastava, 2000 report it, the culture of smaller live fishes *Channa striatus*, *Anabas testidineus*, and *H. fossilis* not much break-through has been achieved in this direction. They also favour and recommended the mono or polyculture of *Channa spp.*, *Hetropnestus fossilis*, *A. testidineus* and *C. batrachus* in ponds. This will be helpful in augmenting fish production of this district as well as improve the economic status also (Table 2). The members of families cyanophyceae, bacillariophyceae represented the phytoplankton community of Ramgarh Lake, Maheshra tal and Rapti river. Among these families Melosiraceae, Aphanizomenonaceae, Tabellariaceae, Microcystaceae, Cyanophyceae, Bracillariophyceae, Ulophyceae, Zygnematophyceae, Xanthophyceae, Volocaceae and Naviculaceae were observed predominant throughout the year and were comprised of 18 genera (Melosiraceae-01 genera, Aphanizomenonaceae-01 genera, Tabellariaceae-01 genera, Microcystaceae-02 genera, Cyanophyceae-03 genera, Bracillariophyceae-02 genera, Ulophyceae-02 genera, Zygnematophyceae-03 genera, Xanthophyceae-01 genera, Volocaceae-01 genera and Naviculaceae-01 genera), chiefly including *Melosira varians*, *Nodularia pumigena*, *Asterionellopsis Formosa*, *Microcystis aeruginosa*, *Aphanizomenon flosaquae*, *Nostocale srivularia*, *Nostocales nostoc*, *Nostocales anabena*, *Naviculales pinnularia*, *Naviculales stauroneis*, *Ulotrichale sulothrix*, *Ulotrichales protest*, *Desimidiales closterium*, *Desimidiales desmidium*, *Spirogyra*, *Mischoccales opiocytium*, *Volvox* and *Pennales alchetron* (Table 3). The most important planktonic group encountered in the present study was cyanophyceae and Zygnematophyceae. *Nostocale* and *Desimidiale* encountered as other genera which existed in the lake, tal and river water of the habitat. In Bacillariophyceae group represented by two genera i.e. *Naviculate spinnularia* and *Naviculales stauroneis*. Members of this group exhibited luxuriant growth from March to June. The data reveals that diatoms preferred to colonize during the warmer part of the year and they had a lean population during winter.

The protozoans contribute 50 percent of the total zooplankton population during the year of 2015. The period from March to June was observed to be conducive for its growth whereas the period from June to August recorded its lean population. Eighteen genera represented this group *Amoeba verrucosa*, *Amoeba proteus*, *Amoeba vespertilio*, *Amoeba vulgaris*, *Amoeba gibbosa*, *Pelonyxa palustris*, *Difflligia muriformes*, *Acanthocystis*, *Lionotus fasciola*, *Nassula ornate*, *Glaucoma pyriformis*, *Monochilum ovale*, *Ophryoglena flava*, *Paramaecium Caudatum*, *Paradoxorhabditis paradoxus* and *Arcella* (Table 4).

The nematode contributed 20 percent to the total zooplankton population in the year, recording their presence throughout the year. The nematode was represented by the families - Cyclindrocorporidae and haplodamidae. The member of the phylum arthropoda belongs to the family streptocephalidae, tropsidae, arcellidae it belongs to the genera viz. *Streptocephalus dichotomus*, *Branchinella kugenumaensis*, *Arcella*, *Eocyzius pulmosus*, *Triops longcaudatus*.

Monitoring the physico-chemical parameters is very important for studying the influence of parameters on the distribution of various components of diversity in water. Water quality is influenced by geological, hydrological, climatic and anthropogenic factors Water temperature is considered as one of the important factors that controls aquatic life (Table 4). Another side fifteen species of molluscan are also observed in present study (Table 5). These molluscan ae indicator of environmental pollution and play an important role in aquatic regions. These are also a rich source of protein supplement for people living in neighboring area.

Discussion:

The members of cyanophyceae exhibited their maximum appearance during the summer month till the onset of the monsoon. The possible reason seems to be the availability of enough nutrients due to the increased decomposition rate. The variations of plankton population with respect to their number space and time may be due to the high rate of sewage pollution and affinity for different climatic conditions.

The taxonomy of zooplankton and their seasonal fluctuation in relation to different physico-chemical factors have been variously discussed by Nandy, et al. 1997; Balmurugan, et al. 2001 and Singh, 2010. The zooplankton population of

Ramgarh Lake, Maheshra tal and Rapti river showed a direct correlation with dissolved oxygen. It is generally assumed that the zooplankton depends upon the phytoplankton abundance and as such the peak of the latter follows the fall of the farmer.

Aquatic diversity of fishes and snails are in sensitive positions due to anthropogenic factors. Jayram (2010) and Manickram et al., 2014 also discussed the threats and conservation action for the aquatic diversity.

The aquatic environment is an area controlled by the changes in factors such as light, heat, humidity and contamination of various effluents in the water body. The results from this study indicated the status of plankton, followed by rich nutrients and an elevated level of zooplankton abundance in the lake, tal and river during the summer season. The study provides the role of phytoplankton, zooplanktons and molluscan as bioindicators in detecting the health and trophic status of aquatic bodies. Some species withstand the extreme conditions and survive well in the polluted environment indicating high tolerance level while sensitive species were absent representing their low tolerance.

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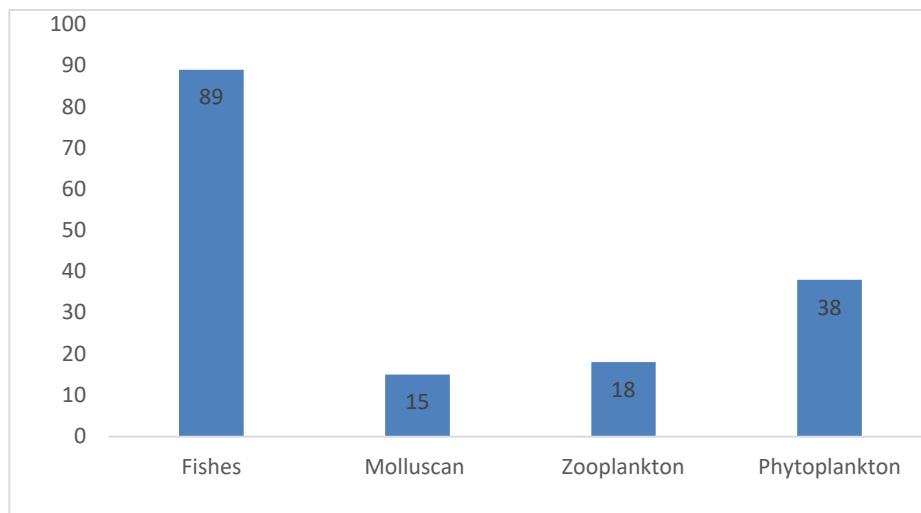


Fig. 1: Aquatic diversity of Gorakhpur District.

Table 1: Aquatic water bodies of Gorakhpur District.

S.No.	Type of Water bodies	Name of Water bodies
1	Major rivers	<p>Ghaghara River is a major river system in the district.</p> <p>Rapti River is river flowing through the region, and often called "Gorakhpur's Sorrow" due to recurrent floods.</p> <p>Ami River is another significant river, which has experienced high levels of pollution.</p> <p>Rohin River: A river associated with the eastern part of Gorakhpur city</p>
2	Lakes	<p>Ramgarh Tal is a large, prominent lake in the urban area of Gorakhpur.</p> <p>Chilua Lake is an ox-bow lake located in the north-eastern part of the district.</p> <p>Seasonal and perennial ponds: The district contains numerous lakes and ponds of varying sizes, including those created by river processes.</p> <p>Maheshara Lake is an ox-bow lake located in the north-eastern part of the district.</p>
3	Other water bodies	<p>Canals and drainage channels: Various artificial and natural channels exist throughout the district.</p> <p>Groundwater: Groundwater is a significant water source for domestic and irrigation needs, although its overuse is a concern.</p>

Table 2: Fish genetic resources of Gorakhpur District.

S.N.	Order/ Family	Scientific name	Local name
	Clupeiformes		
1	Clupeidae	<i>Gudusia chapra</i>	Suhia
2	-do-	<i>Gudusia godanahiai</i>	Godanahia suhia
3	-do-	<i>Hilsa hilsa</i>	*Hilsa

4	-do-	<i>Ilisha motius</i>	Sunari
5	-do-	<i>Gonialosa manmina</i>	Majhali suhia
6	Engraulidae	<i>Septipinna phasa</i>	Phasi
7	Notopteridae	<i>Notopterus chitala</i>	*Moi
8	-do-	<i>Nonopterus notopterus</i>	*Patra
	Cypriniformes		
9	Cyprinidae	<i>Amblypharyngodon mola</i>	Dhawai
10	-do-	<i>A. microlepis</i>	-do-
11	-do-	<i>Aspidoparia morar</i>	Kewachi / Harda
12	-do-	<i>Chagunius chagunio</i>	Gelhari
13	-do-	<i>Chela laubuca</i>	Dendula
14	-do-	<i>Catla catla</i>	*Bhakur
15	-do-	<i>Cirrihinus chaudhryi</i>	Nain
16	-do-	<i>Cirrihinus mrigala</i>	*Nain or Mrigal
17	-do-	<i>Cirrihinus reba</i>	*Raia
18	-do-	<i>Crossocheilus latius</i>	Petphorni
19	-do-	<i>Danio devario</i>	Patukari
20	-do-	<i>Esomus danricus</i>	Dendua
21	-do-	<i>Labeo angra</i>	*Thuthunahia raia
22	-do-	<i>Labeo calbasu</i>	*Karonchar
23	-do-	<i>Labeo dero</i>	*Basanahawa raia
24	-do-	<i>Labeo rohita</i>	*Rohu
25	-do-	<i>Osteobrama cotio</i>	Gurda
26	-do-	<i>Oxygaster bacaila</i>	°Chilwa
27	-do-	<i>Oxygaster gora</i>	Dariyai chilwa
28	-do-	<i>Puntius chola</i>	°Sidhari
29	-do-	<i>Puntius chonchonius</i>	°-do-
30	-do-	<i>Puntius sarana</i>	°Sidhar
31	-do-	<i>Puntius sophore</i>	°Sidhari
32	-do-	<i>Puntius ticto</i>	°-do-
33	-do-	<i>Ctenopharyntgodon idella</i>	*Grass carp
34	-do-	<i>Cyprinus carpio</i>	*Common carp
35	-do-	<i>Hypophthalmichthys molitrix</i>	*Silver carp
36	-do-	<i>Aristichthys nobilis</i>	*Bighead
37	-do-	<i>Botia Dario</i>	Baghua
38	-do-	<i>Botia lohachata</i>	Bagha
39	-do-	<i>Lepidocephalichthys guntea</i>	Nakati
40	-do-	<i>Somileptis gongota</i>	Baluwari
41	Siluridae	<i>Ompok bimaculatus</i>	*Jalkapoor
42	-do-	<i>Wallago attu</i>	*Barari
43	Bagaridae	<i>Mystus blekeri</i>	°Tengra
44	-do-	<i>Mystus cavassius</i>	°Suthwa tengra
45	-do-	<i>Mystus tengara</i>	°Tengna
46	-do-	<i>Mystys aor</i>	°Dariyai tengra

47	-do-	<i>Mystus seenghala</i>	°-do-
48	-do-	<i>Rita rita</i>	*Hunna or Rita
49	Sisoridae	<i>Bagarius bagarius</i>	*Gonch
50	-do-	<i>Gagata cenia</i>	Tinkatia
51	-do-	<i>Glyptothorax telchitta</i>	*Belgagra
52	-do-	<i>Hara hara</i>	Panhi
53	-do-	<i>Sisor rhabdophorus</i>	Bistuia
54	-do-	<i>Erethistes pussilus</i>	Panhi
55	Schilbeidae	<i>Ailia coila</i>	°Minti or baspatta
56	-do-	<i>Cluisoma garua</i>	*Karhi
57	-do-	<i>Eutrpichthys vacha</i>	*Banjhoo
58	-do-	<i>Pangasius pangasius</i>	*Pangas
59	-do-	<i>Pseudotropius atherinoides</i>	Pyas
60	Heteropneustidae	<i>Heteropneustes fossilis</i>	*Singhi
61	Clariidae	<i>Clarius bartachus</i>	*Magur
62	-do-	<i>Clarias gariepinus</i>	*Bidesi magur
63	Chacidae	<i>Chaca chaca</i>	Chacwa
	Beloniformes		
64	Belonidae	<i>Xenentodon cancila</i>	Kauwa
65	Himerhamphidae	<i>Hemirhamphus gorakhpuriensis</i>	Kauwa ka Bachha
	Mugiliformes		
66	Mugilidae	<i>Rhinomugil corsula</i>	Hundra
67	-do-	<i>Sicamugil cascasia</i>	Lotia
	Ophicephaliformes		
68	Ophiocephalidae	<i>Channa punctatus</i>	°Girai
69	-do-	<i>Channa gachua</i>	°Chanaga
70	-do-	<i>Channa marulius</i>	°Sauri
71	-do-	<i>Channa striatus</i>	°Sauri
	Symbranchiformes		
72	Amphipnoidae	<i>Amphipnous cuchia</i>	Andhya sanp
	Cyprinodontiformes		
73	Cyprinodontidae	<i>Aplochilus panchax</i>	Dendula
	Perciformes		
74	Centropomidae	<i>Chanda baculis</i>	Chanri
75	-do-	Chanda nama	-do-
76	-do-	<i>Chanda ranga</i>	-do-
77	Sciaenidae	<i>Sciaena coitor</i>	Mola
78	Nandiae	<i>Badis badis</i>	Sumha
79	-do-	<i>Nandus nandus</i>	Dhebari
80	Anabantidae	<i>Anabas testudienus</i>	°Kawai or Sumha
81	-do-	<i>Colisa fasciatus</i>	°Khosti
82	-do-	<i>Colisa chuna</i>	Kholisa
83	Gobiidae	<i>Glossogobius giuris</i>	°Bulla
	Mastacembaliformes		

84	Mastacembalidae	<i>Macragnathus aculeatus</i>	°Malga or Patya
85	-do-	<i>Mastacembalus aramatus</i>	°Bam
86	-do-	<i>Mastacembalus pancalus</i>	°Malga
	Tetradontiformes		
87	Tetradontiformes	<i>Tetraodon cutcutia</i>	Galphulni

Table 3: Phytoplankton resources of Gorakhpur District.

	Order/ Family	Scientific name
1	Melosiraceae	<i>Melosira varians</i>
2	Aphanizomenonaceae	<i>Nodularias pumigena</i>
3	Tabellariaceae	<i>Asterionellopsis formosa</i>
4	Microcystaceae	<i>Microcystis aeruginosa</i>
5	Cyanophyceae	<i>Aphanizomenon flos-aquae</i>
6	Cyanophyceae	<i>Nostocale srivularia</i>
7	Cyanophyceae	<i>Nostocales nostoc</i>
8	Cyanophyceae	<i>Nostocales anabena</i>
9	Bracillariophyceae	<i>Naviculales pinnularia</i>
10	Bracillariophyceae	<i>Naviculales stauroneis</i>
11	Ulophyceae	<i>Ulotrichale sulothrix</i>
12	Ulophyceae	<i>Ulotrichales protist</i>
13	Zygnematophyceae	<i>Desimidiales closterium</i>
14	Zygnematophyceae	<i>Desimidiales desmidium</i>
15	Zygnematophyceae	<i>Spirogyra</i>
16	Xanthophyceae	<i>Mischoccales opiocytium</i>
17	Chlorophyceae	<i>Volvox</i>
18	Bacillariophyceae	<i>Pennalesal chetron</i>

Table 4: Zooplankton resources of Gorakhpur District.

	Taxonomic Group	Scientific name
1	Amoebidae	<i>Amoeba verrucosa</i>
2	Amoebidae	<i>Amoeba proteus</i>
3	Amoebidae	<i>Amoeba vespertilio</i>
4	Amoebidae	<i>Amoeba vulgaris</i>
5	Amoebidae	<i>Amoeba gibbosa</i>
6	Pelomyxidae	<i>Pelonyxa palustris</i>
7	Diffugiidae	<i>Difflogia muriformes</i>
8	Acanthocystidae	<i>Acanthocystis</i>
9	Fasciolidae	<i>Lionotus fasciola</i>
10	Nassulidae	<i>Nassula ornata</i>
11	Glaucomidae	<i>Glaucoma pyriformis</i>
12		<i>Monochilum ovale</i>
13	Ophryoglenidae	<i>Ophryoglena flava</i>
14	Parameciidae	<i>Paradoxorhabditis cranganorensis</i>
15	Picarilaimidae	<i>Picarilaimus caudatus</i>

16	Parameciidae	<i>Paradoxorhabditis jodhpurensis</i>
17	Parameciidae	<i>Paradoxorhabditis Paradoxus</i>
18	Arcellidae	<i>Arcella</i>
19	Cylindrocoporidae	<i>Gobindonema filicaudatum</i>
20	Haplolamidae	<i>Helicotylenchus crenacauda</i>
21	Haplolamidae	
22	Nematoda	<i>Albunema indicum</i>
23	Nematoda	<i>Monohystera pseudomacrura</i>
24	Ectoprocta	<i>Colony of statoblast</i>
25	Ectoprocta	<i>Statoblast</i>
26	Ectoprocta	<i>Glossiphonia webri</i>
27	Ectoprocta	<i>Herpobdella hexaculata</i>
28	Arthropoda Streptocephalidae	<i>Streptocephalus dichotomus</i>
29	Arthropoda Thamnocephalidae	<i>Branchinella kugenumaensis</i>
30	Arthropoda Triopsidae	<i>Triops longicaudatus</i>
31	Arthropoda Triopsidae	<i>Eocyzius plumosus</i>
32	Arthropoda Dophniidae	<i>Dophnia carinata</i>
33	Arthropoda Dophniidae	<i>Dophnia lumholtzisar</i>
34	Arthropoda Dophniidae	<i>Ceriodophina</i>
35	Arthropoda Dophniidae	<i>Scapholebris</i>
36	Arthropoda Dophniidae	<i>Moina (female)</i>
37	Arthropoda Dophniidae	<i>Moina (Male)</i>
38	Arthropoda Cyprididae	Ostracod

Table 5: Molluscan resources of Gorakhpur District.

Order/ Family	Scientific name
Lymnaeidae.	<i>Lymnaea acuminata</i>
Bulinidae	<i>Indoplanorbis exustus</i>
Thiraidae	<i>Pila globosa</i>
-do-	<i>Pila virens</i>
-do-	<i>Pila nevililana</i>
-do-	<i>Pila theobaldi</i>
Achatinidae	<i>Acatina fluca</i>
Unionidae	<i>Lammendalis marginalis</i>
-do-	<i>Lamellidens corrianus</i>
-do-	<i>Gyraulus convexiusculus</i>
-do-	<i>Bellamyia bengalensis</i>
Helicidae	<i>Helix pormatia</i>
-do-	<i>Bellamyia bengalensis</i>
-do-	<i>Filopaludina bengalensis</i>
Ampullaridae	<i>Angulyagra microchaetophora</i>
Lymnaeidae	<i>Tarebia granifera</i>