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Floral and Faunal Diversity of River Ramganga

GRB EMP : Ganga River Basin Environment Management Plan

by

Indian Institutes of Technology



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Preface

In exercise of the powers conferred by sub-sections (1) and (3) of Section 3 of the Environment (Protection) Act, 1986 (29 of 1986), the Central Government has constituted National Ganga River Basin Authority (NGRBA) as a planning, financing, monitoring and coordinating authority for strengthening the collective efforts of the Central and State Government for effective abatement of pollution and conservation of the river Ganga. One of the important functions of the NGRBA is to prepare and implement a Ganga River Basin: Environment Management Plan (GRB EMP).

A Consortium of 7 Indian Institute of Technology (IIT) has been given the responsibility of preparing Ganga River Basin Environment Management Plan (GRB EMP) by the Ministry of Environment and Forests (MoEF), GOI, New Delhi. Memorandum of Agreement (MoA) has been signed between 7 IITs (Bombay, Delhi, Guwahati, Kanpur, Kharagpur, Madras and Roorkee) and MoEF for this purpose on July 6, 2010.

This report is one of the many reports prepared by IITs to describe the strategy, information, methodology, analysis and suggestions and recommendations in developing Ganga River Basin: Environment Management Plan (GRB EMP). The overall Frame Work for documentation of GRB EMP and Indexing of Reports is presented on the inside cover page.

There are two aspects to the development of GRB EMP. Dedicated people spent hours discussing concerns, issues and potential solutions to problems. This dedication leads to the preparation of reports that hope to articulate the outcome of the dialog in a way that is useful. Many people contributed to the preparation of this report directly or indirectly. This report is therefore truly a collective effort that reflects the cooperation of many, particularly those who are members of the IIT Team. Lists of persons who have contributed directly and those who have taken lead in preparing this report is given on the reverse side.

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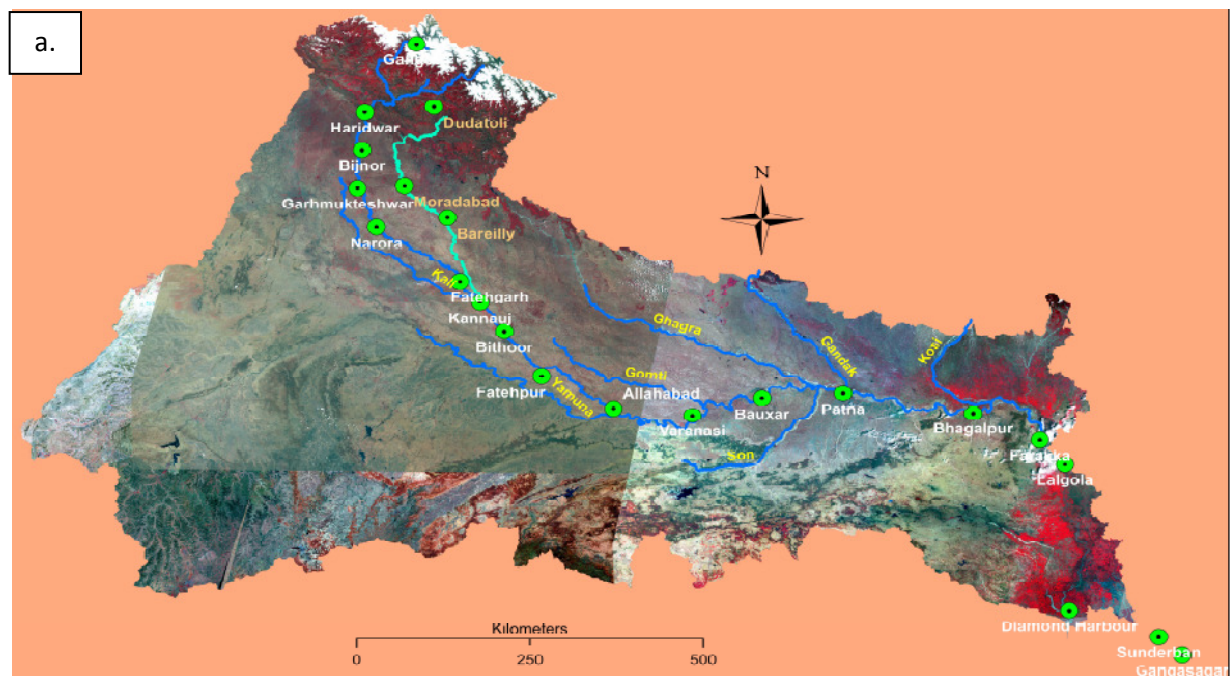
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1. Introduction

The river Ramganga one of the major tributaries of river Ganga, originates as two separate streams as Western and Eastern Ramganga and flows down into the plains independently.

Western Ramganga originates near Gairsain (Uttarakhand) of Doodha-Toli ranges in the lower Himalayas of Pauri Garhwal at an altitude of about 3,110m (amsl). It lies between and latitude of 29° 51' N and 80° 11' E. It enters the Nainital district before re-entering the district Pauri Garhwal. The river then flows through Patali Dun of lower Shivaliks and passes through Moradabad, Rampur, Bareilly, Badaun and Shajahanpur districts of Uttar Pradesh and finally merges with river Ganga at Farrukhabad. Ramganga during its course traverses more than 100 km before entering Corbett National Park near Marchula. Inside the park it flows roughly for 40 km and comes out at Kalagarh where it enters the plain. It is the precious perennial sources of water in Corbett National Park. Three main tributaries of Ram Ganga: Palain, Mandal and Sonanadi merge with it during its course through the park. Total length of Ramganga river is 569 km and the drainage basin is 30,641 sq km Figure 1 (a-b).

The Kalagarh dam on the river Ramganga was built for irrigation and power generation in 1963-1973. It provides water for irrigation of 57,500 ha farm land and generates 198 MW of energy. A feeder canal (82 km long) downstream of Harveli barrage diverts water from Ramganga to Ganga river 10 km upstream to Garhmukteshwar to augment flow for Narora atomic power station. The river flows another 300 km before draining into the Ganga downstream of Farrukhabad.



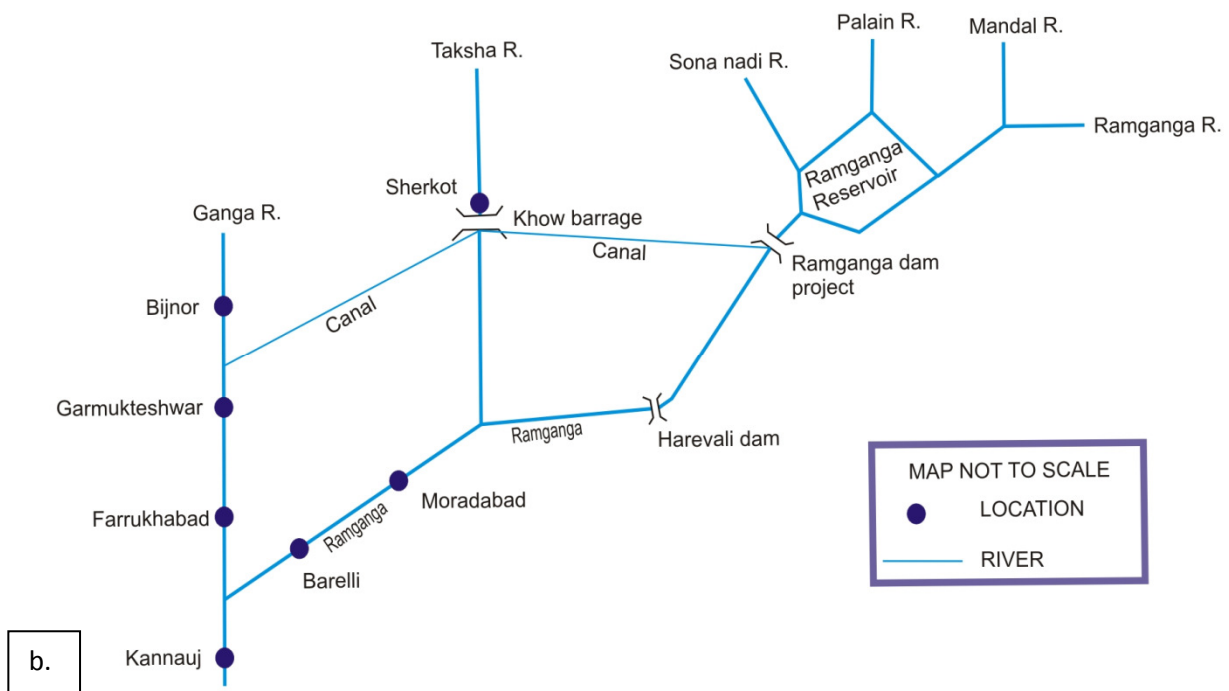


Figure 1a-b: (a) Ganga basin map showing the confluence of Ramganga at Farrukhabad
(b) Line digram of Ramganga river

The important tributaries of Ramganga are:

- I. The **Sonanadi** was so named due to the presence of gold particles in alluvial sand sometimes. It adjoins Wild Life Sanctuary, Jim Corbett National Park from the north-west direction and meets the Ramganga at the reservoir.
- II. The **Mandal** rises in the eastern height in Talla Salan in Chamoli district and flows for 32 km before joining the Ramganga at Domunda a little distance above Gairal. During the dry season, the Mandal contains very little water but during the monsoons it turns into a rapid torrent. It is an important breeding sites for the endangered Mahseer.
- III. The **Palain** is the third important tributary of the Ramganga and enters the park from northern direction. It meets the Ramganga about 3 km north of the Ramganga reservoir.

Eastern Ramganga originates from the hills of Nandakot of Namik glacier in Pithoragarh district of Uttarakhand and flows towards east. The river is fed by numerous streams and finally joins river Sarju at Rameshwar ghat near Pithoragarh. Thereafter this river is called Saryu, it finally confluences with river Kali, which originates from Milan glacier in Kumaon region. The Kali finally merges with Ganga at Farrukhabad.

The condition of water in river Ramganga is reported to be good till Kalagarh dam. The fresh water of the river provides platform for the survival a number of fish species, some higher vertebrates and other microorganism. Bulk of the water downstream of Kalagarh is drawn for irrigation and the flows are meagre at Moradabad and Downstream. Domestic waste and industrial effluents find their way at number of places in Uttarakhand and Uttar Pradesh making it a polluted stretch.

2. Biological diversity of Ramganga river

The available data on floral and faunal diversity of the river Ramganga is very meager and fragmentary. The information is only as presence of an organism at a surveyed location. The biotic communities of an aquatic system sum up the prevailing abiotic parameters which have a telling effect on biota. There is no reference available historically to compare the prevailing situation.

2.1. Phytoplankton

Phytoplankton which constitutes the main autotrophic component comprises of three important classes Bacillariophyceae (26 taxa), Chlorophyceae (9 taxa), Myxophyceae (11 taxa) and Xanthophyceae (1 taxa). They together make up 92% of the total population. The important genera are *Anabaena* and *Oscillatoria* of Myxophyceae, *Achnantheidium*, *Cymbella*, *Navicula* among diatoms, *Spirogyra*, *Ulothrix* and *Rhizoclonium* of Chlorophyceae at Corbett National Park (Khare and Suseela, 2004). The list of algae reported in Ramganga is given in Table 1 and Figure 2.

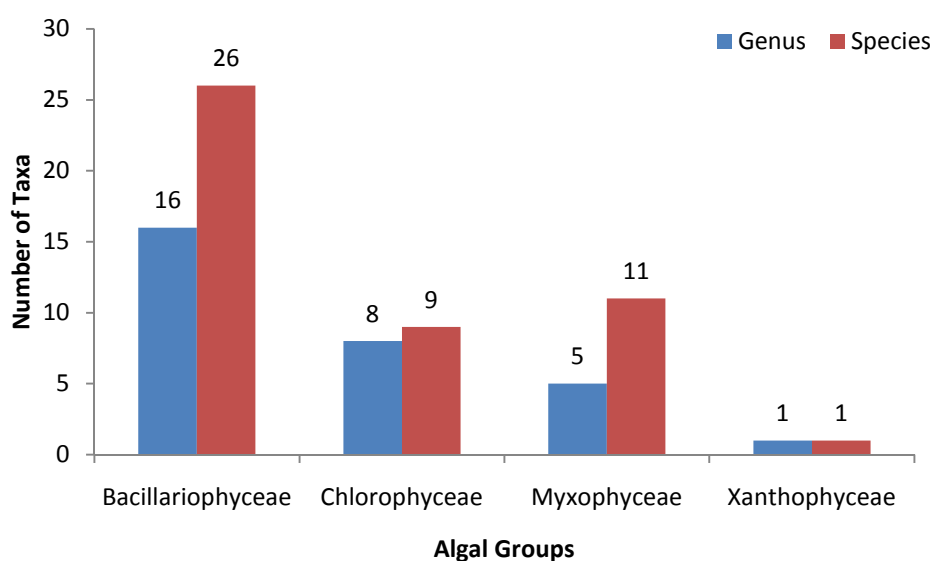


Figure 2: Distribution of various classes of algae in Ramganga

Table 1: List of phytoplankton present in river Ramganga

Bacillariophyceae	
	<i>Achnantheidium biasolettianum</i>
	<i>A. minutissimum</i>
	<i>Achnanthes inflata</i>
	<i>Anomoeoneis sphaerophora</i>
	<i>A. subhudsonis</i>
	<i>Cymbella cymbiformis</i>
	<i>C. tumida</i>
	<i>C. ventricosa</i>
	<i>Diatoma vulgare</i>
	<i>Diploneis subovalis</i>
	<i>Epithemia turgida</i>
	<i>Gomphonema gracile</i>
	<i>Gyrosigma moresbyana</i>
	<i>G. spencerii</i>
	<i>Hantzschia amphioxys</i>
	<i>Licmophora flabellata</i>
	<i>Navicula cuspidata</i>
	<i>N. subrhynchocephala</i>
	<i>Nitzschia frustulum</i>
	<i>N. palea</i>
	<i>N. subtilis</i>
	<i>N. sinuata</i>
	<i>Pinnularia braunii</i>
	<i>Rhopalodia gibba</i>
	<i>R. ventricosa</i>
	<i>Tabellaria flocculosa</i>
Chlorophyceae	
	<i>Actinastrum hantzschii</i>
	<i>Closterium moniliforme</i>
	<i>Cosmarium moniliferum</i>
	<i>Geminella</i> sp.
	<i>Mongeotia</i> sp.
	<i>Rhizoclonium hieroglyphium</i>
	<i>R. hookeri</i>
	<i>Spirogyra africana</i>
	<i>Ulothrix variabilis</i>
Myxophyceae	
	<i>Anabaena circinalis</i>
	<i>A. fertilissima</i>
	<i>A. oscillaroides</i>
	<i>A. sphaerica</i>
	<i>Crinalium magnum</i>
	<i>Oscillatoria curviceps</i>
	<i>O. hamelii</i>
	<i>O. limosa</i>
	<i>O. nigra</i>
	<i>Phormidium purpurascens</i>
	<i>Spirulina meneghiniana</i>
Xanthophyceae	
	<i>Ophiocytium cochleare</i>

2.2. Periphyton

Periphytons are the complex mixture of algae, Cyanobacteria, heterotrophic microbes and detritus that are attached to submerged surface in the euphotic zone of the aquatic ecosystems. In terms of group composition Chlorophyceae and Bacillariophyceae are the sole component of periphyton. Chlorophyceae comprised of 24.4-47.9% whereas diatoms constitute 52.1-75.6% of the total annual population. Green algae were most dominant in Khoh river, tributary of Ramganga (Sharma and Mishra, 2002).

2.3. Zooplankton

Zooplankton occupies an intermediate position in the food web in an aquatic ecosystem. Zooplankton comprises of Protozoans, Rotifers and Crustaceans. In Ramganga all groups of zooplankton are present although they are very less in number. The important genera of the river Ramganga are mentioned below:

Protozoa: *Arcella*, *Centropyxis*, *Diffugia*, *Volvox* and *Vorticella*

Rotifera: *Asplanchna*, *Brachionus*, *Philodina*, *Pompholix*, *Polyarthra* and *Trichocera*

Crustacea: *Bosmina*, *Ceriodaphnia*, *Cyclops*, *Daphnia*, *Helobdella* and *Nauplius* stages

The zooplankton population ranged between 58 and 77 ind./l. Protozoans comprised 24-44.7% of total zooplankton. The percent population of the other zooplankton varied from 59.1-76.0%. Annually, the population was apportioned between protozoans (35.6%) and other zooplankton (64.4%) (Sharma and Mishra, 2002; Pathani and Upadhyay, 2006). A graphical representation of various zooplankton in river Ramganga is given in Figure 3.

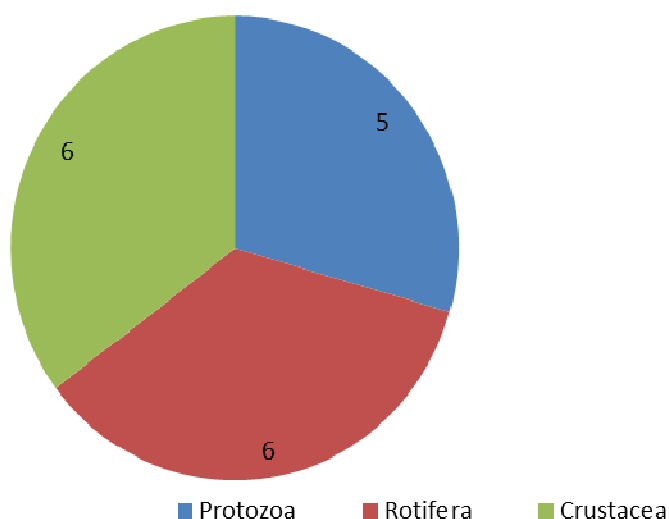


Figure 3: Distribution of Zooplankton in Ramganga

2.4. Zoobenthos

The benthic fauna of the river comprised of larvae of Ephemeroptera, Odonata, Plecoptera, Hemiptera and Diptera. The Ephemeroptera are most abundant. Only single mollusc, *Lymnaea* has been reported (Sharma and Mishra 2002; Pathani and Upadhyay, 2006). A list of zoobenthos reported in Ramganga is given in Table 2 and a graphical representation in Figure 4.

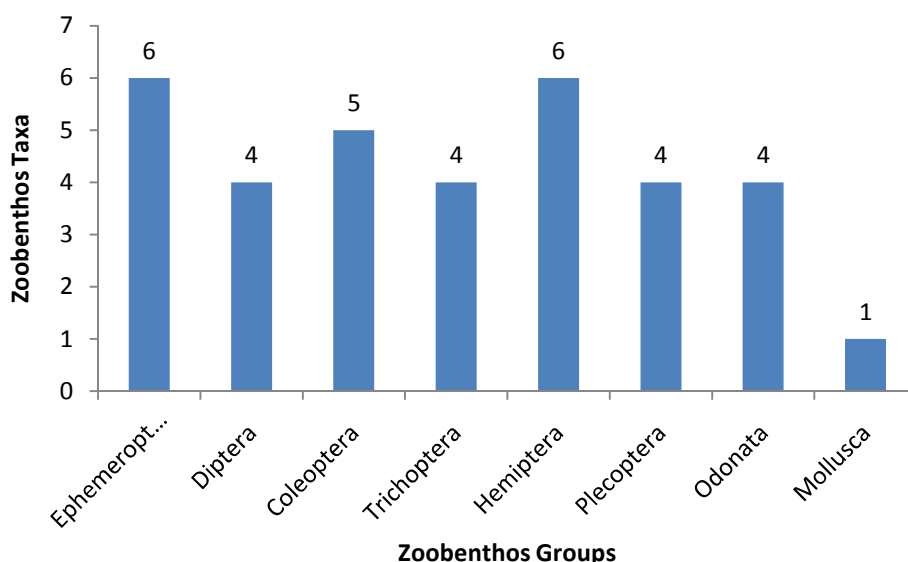


Figure 4: Distribution of Zoobenthos in Ramganga

Table 2: List of zoobenthos present in river Ramganga

Ephemeroptera			
	<i>Ameleus</i> sp.		
	<i>Baetis</i> sp.		
	<i>Caenis</i> sp.		
	<i>Cynigima</i> sp.		
	<i>Ephemer</i> sp.		
	<i>Leptophlebia</i> sp.		
Diptera	<i>Antoch</i> sp.		
	<i>Chironomus</i> sp.		
	<i>Dixa</i> sp.		
	<i>Simulium</i> sp.		
Coleoptera	<i>Hydraticus</i> sp.		
	<i>Laccobius</i> sp.		
	<i>Paedurus</i> sp.		
	<i>Potamonectes</i> sp.		
	<i>Strenolophus</i> sp.		
Trichoptera			
	<i>Glossoma</i> sp.		
	<i>Hydropsyche</i> sp.		
	<i>Limenephilus</i> sp.		
		<i>Stenopsyche</i> sp.	
		Hemiptera	
		<i>Gerris</i> sp.	
		<i>Heleoceris</i> sp.	
		<i>Laccotrephes</i> sp.	
		<i>Micronecta</i> sp.	
		<i>Ptelomera</i> sp.	
		<i>Ranatra</i> sp.	
		Plecoptera	
		<i>Capnia</i> sp.	
		<i>Isoperla</i> sp.	
		<i>Kamimuria</i> sp.	
		<i>Perla</i> sp.	
		Odonata	
		<i>Agrion</i> sp.	
		<i>Corixa</i> sp.	
		<i>Matrona</i> sp.	
		<i>Rhinocypha</i> sp.	
		Mollusca	
		<i>Lymnaea</i> sp.	

2.5. Fish

The river Ramganga is one of the principal rivers from Shivaliks of lower Himalaya, rich in the fish diversity. Mainly Corbett National Park is the home to many species of fresh water fish. The most celebrated of the fish is Golden Mahseer, *Tor putitora* a large fresh water fish belonging to the family Cyprinidae. Fresh water fish are reported in three tributaries of Ramganga in the foothills of Western Himalayas. One tributary is within a protected area (Corbett Tiger Reserve) the other two are outside the protected area. The river supports 49 species of fish belonging to 7 families under 22 genera. Family Cyprinidae is represented by the maximum number of species (Atkore, 2005; Atkore *et al.* 2011; Pathak, 2010). The important fish reported are game fish, *Schizothorax* sp. and *Tor* sp., *Labeo*, *Catla* and *Puntius*. The relative abundance of various fish families is depicted as below:

Cyprinidae (11/28) > Balitoridae (2/8) > Sisoridae (4/5) > Cobitidae (2/4) > Channidae (1/2) > Belonidae and Mastacembelidae (1/1)*

*(Genus/ species)

Species wise distribution of fish is shown in Figure 9. A list of fish is given in Table 3.

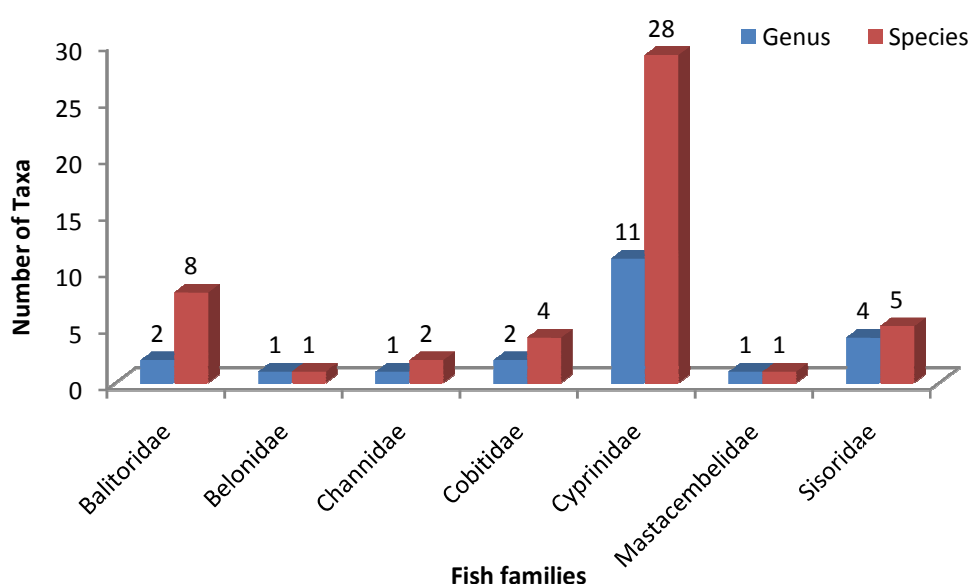


Figure 5: Distribution of fish in Ramganga

Table 3: List of fish present in river Ramganga

Balitoridae	<i>Homaloptera rupicola</i>
	<i>Nemachelius bevari</i>
	<i>N. botia</i>
	<i>N. gharwali</i>
	<i>N. montanus</i>
	<i>N. rubripinnis</i>
	<i>N. rupecola</i>
	<i>N. submontanus</i>
Belonidae	<i>Xenentodon cancila</i>

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Channidae	
	<i>Channa gachua</i>
	<i>C. punctatus</i>
Cobitidae	
	<i>Botia almorhae</i>
	<i>B. lohachata</i>
	<i>B. rostrata</i>
	<i>Lepidocephalus guntea</i>
Cyprinidae	
	<i>Barilius barila</i>
	<i>B. bama</i>
	<i>B. bendelisis</i>
	<i>B. shacra</i>
	<i>B. vagra</i>
	<i>Catla catla</i>
	<i>Chagunius changunio</i>
	<i>Crossocheilus latius latius</i>
	<i>Garra gotyla gotyla</i>
	<i>G. lamta</i>
	<i>Labeo calbasu</i>
	<i>L. dero</i>
	<i>L. dyocheilus</i>
	<i>L. rohita</i>
	<i>Oxygaster bacaila</i>
	<i>Puntius chilinoides</i>
	<i>P. conchoniis</i>
	<i>P. sophore</i>
	<i>P. ticto</i>
	<i>P. tor</i>
	<i>P. vittatus</i>
	<i>Raiamas bola</i>
	<i>Schizothorax plagiostomus</i>
	<i>S. progatus</i>
	<i>S. richardsonii</i>
	<i>Tor mosal</i>
	<i>T. putitora</i>
	<i>T. tor</i>
Mastacembellidae	
	<i>Mastacembelus armatus</i>
Sisoridae	
	<i>Bagarius bagarius</i>
	<i>Glyptothorax pectinoptus</i>
	<i>G. yelchitta</i>
	<i>Luguvia sp.</i>
	<i>Pseudoecheneis sulcatus</i>

2.6. Higher vertebrates

Beside the fish river Ramganga, support the presence of Gharial and Mugger. Corbett has two of the India's three crocodilian species. It is considered to be one of the best spot to see the Gharial. About 100 Gharials have been reported in the Ramganga and can be seen swimming or basking in the sun on its bank. These include Indian Gangetic Gharial *Gavialis gangeticus* and other Mugger *Crocodylus palustris*. Three turtle species have also been reported from river Ramganga. These are *Melanochelys trijuga*, *M. tricarinata* and *Lissemys punctata* are present in the river system.

3. Conclusions

- i. Ramganga originates in the ranges of lower Himalayas of Pauri Gharwal as two streams Eastern and Western Ramganga.
- ii. The quality of water is good and supports biodiversity upto Kalagarh and deteriorates downstream of Harveli barrage.
- iii. Diatoms constitute the dominant group of phytoplankton and periphyton, some Blue green algae and Green algae are also reported in good numbers.
- iv. Zoobenthos is represented largely by insect larvae belonging to seven orders.
- v. The fish population is represented by the class Cyprinidae and includes Trout, Mahseer, *Labeo* and *Puntius*.
- vi. Gharials and Mugger are the two higher forms reported in the river.

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