AN INVENTORY ON ZOOPLANKTON, ZOOBENTHOS AND FISH FAUNA IN THE RIVER RAMGANGA (W) OF UTTARANCHAL, INDIA

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INTRODUCTION

The biota of an aquatic ecosystem directly reflects the conditions existing in the environment in terms of the quality and quantity of the biota. The zooplankton occupies an intermediate position in the food web in the aquatic ecosystem. Similarly, the zoobenthos has significant role in the food chain in the water. Comparison of population density of benthic invertebrates present in different streams and lakes with abiotic features in North America and Europe water systems have been investigated by Edington (1966), Armitage (1962), Hynes (1970), Beaumount (1975), Holland *et al.* (1983) and Lehmann and Lachavanne (1999). Limited literature is available on zooplankton and zoobenthos of Kumaun lotic water (Bhatt and Pathak, 1992 and Bhatt *et al*. 1984). It is also pointed that the headwaters to mouth, the physical features vary significantly within a lotic water system present a continuous gradient of physical variations, which evolves association within biota and other abiotic features. Thus, the present work deals with qualitative and quantitative studies on zooplankton and zoobenthos in relation to some physico-chemicals and fish diversity in a high altitude river, Ramganga (W).

MATERIALS AND METHODS

The present study was conducted for two years (2001-02) in a stretch of 45 km in the river Ramganga west. The river originates in the southern slopes of Dudhatoli (3050 amsl) which expands from Gairsen (1659 amsl) to Kalagarh dam- Nainital plains. The selected sites were situated at various altitudes, Gairsen (1650msl), Chaukhutia (1090 amsl) and Masi (1060 amsl). Seasonal samples were taken with the help of Nansen bottle from surface and bottom water and mixed together. The samples were taken on the basis of fortnightly at mid day (between 10.30 to 1400 hr) from three collecting spots in different altitudes (Gairsen-1650 amsl: Chaukhutia-1090 amsl and Masi-1060 amsl). The physico-chemicals were done in the field and laboratories by using methods described by APHA, (1976), Das,(1989) and Trivedi, and Goyal,(1986). The zooplankton collection was made by hauling of water by plankton net (0.1mm mesh size). The plankton count was made by Sedgewick rafter and zoobenthos by 1X 1 m area in the shallow bottom region in the river. The pH by Elico pH meter, conductivity by Elico conductivity meter and turbidity/transparency were determined by Secchi disc. The identification of zooplankton and zoobenthos was made with the help of Ward and Whipple (1959) and Battish (1997).

RESULTS AND DISCUSSION

The qualitative and quantitative studies of zoolpankton, zoobenthos and physico-chemicals have been attempted for two years (2001 and 2002) in the river Ramganga west as follows-

Quality of zooplankton: A total number of 17 taxas of zooplankton were recorded in the river Ramganga west during the study (Table 1).The spot no. 1 harboured 10 genera whereas 14 at spot no. 2 and all 17 taxas were identified with fluctuations in different months in first year, 2001. The protozoans were represented by 3 genera (*Volvox, Diffugia* and *Centropyxis)* at spot no. 1 and 2 while 5 genera (*Volvox, Centropyxis, Diffugia, Arcella* and *Vorticella)* at spot no. 3 (Masi) in the river. There were 3, 5 and 6 genera of rotifers at spot no 1, 2 and 3, respectively in the water (Table 1). The

group crustacea was represented by 4 and 6 genera at spot no. 1 and 2-3 respectively in the river. The study indicated that the zooplankters diversity is more at spot no. 2, Masi than in other two spots in the river, Ramganga west. It is interesting to note that the trend of qualitative analysis is almost same in the second year, 2002 as in first year i.e. 2001 in the river (Table 1).

Table 1. Qualitative and quantitative composition of zooplankton in the river west Ramganga.

Group/Genera	2001			2002		
	Gairsen	Chaukhutia	Masi	Gairsen	Chaukhutia	Masi
Protozoa						
Volvox	+	+	+	+	+	+
Diffugia	+	++	++	+	++	++
Arcella	-	-	++	-	-	++
Vorticella	-	-	++	-	-	++
Centropyxis	+	+	+	-	+	+
Rotifera						
Philodina	-	+	++	-	+	+
Trichocera	-	+	+	-	+	+
Asplanchna	++	+++	+++	++	+++	+++
Pompholix	+	+	+	+	+	+++
Polyarthra	-	-	+	-	-	+
Brachionus	++	+++	+++	++	+++	+++
Crustacea						
Daphnia	+	+	++	+	+	++
Cyclops	++	+++	++	+	++	++
Bosmina	-	+	+	-	+	+
Nauplius Stages	+	++	++	+	++	++
Ceriodaphnia	-	++	++	+	++	++
Helobdella	+	+	+	+	+	+

* -, absent; +, rare; ++, common; +++, abundant.

Quantitative study of zooplankton: The zooplankton population increases from winter season (41.2,45.0 and 45.1%) and reached maximum in summer (47.7, 44.8 and 45.8%) at 1, 2 and 3 stations respectively in the water. The minimum population has been estimated in monsoon season (11.2, 9.9 and 9.1% at station 1, 2 and 3) during first year, 2001. Similar pattern of seasonal fluctuations have been recorded in the second year, 2002 (Fig. 2).The zooplankton population dominated by crustacea (51.5, 50.5 and 52.3% in first year and 51.8, 57.4 and 52.8% in second year respectively in 1-3 stations).

The rotifers are moderate in population in the river (28.8, 32.7 and 33% in first year and 22.2, 27.2 and 34.1% in the second year at 1-3 stations, respectively). It was observed that the abundance and population increases towards down stream in the water. There was a monthly variations of zooplankton in the selected sites in the river (Fig 1 and 2). The peak was in April-May and November in first year while it was February-March and October in second year with variation of values in the selected stations and low values in rainy season with minimum values in August in the study. Thus, the quality and quantity of zooplankton have fluctuated monthly, seasonally and altitudinally in the river Ramganga besides many physico-chemical factors in the river.

Table 2. Qualitative and quantitative composition of zoobenthos in the river west Ramganga

Group/Genera	2001			2002		
	Gairsen	Chaukhu.	Masi	Gairsen	Chaukhu.	Masi
Ephemeroptera						
Ephemera	+++	+++	+++	+++	+++	+++
Baetis	+++	+++	+++	+++	+++	+++
Caenis	++	++	+++	++	++	+++
Leptophlebia	++	+++	+++	++	+++	+++
Iron	+	++	++	+	++	++
Cynigima	-	-	+	-	-	+
Ameleus	-	-	+	-	-	+
Diptera						
Dixa	+++	+++	+++	+++	+++	+++
Chironomus	++	++	++	++	++	++
Simulium	-	+	+	-	+	+
Antoch	-	-	+	+	-	+
Coleoptera						
Strenolophus	+	++	++	+	++	++
Potamonectes	++	+++	+++	++	+++	+++
Laccobius	+	++	++	+	++	++
Paedurus	++	++	++	++	++	++
Hydraticus	+	+	+	+	+	+
Trichoptera						
Limenephilus	+	-	+	+	-	+
Stenopsyche	++	++	-	++	++	-
Hydropsyche	++	-	-	++	-	-
Glossoma	-	+	+	-	+	+
Hemiptera						
Ptelomera	+	++	++	+	++	++
Micronecta	+++	+++	+++	++	++	+++
Heleoceris	+	++	++	++	++	+++
Gerris	+	+	++	+	++	++
Ranatra	-	-	+	-	+	+
Laccotrephes	+	+	-	+	+	-
Plecoptera						
Perla	+++	+++	+++	+++	+++	+++
Isoperla	+++	+++	+++	+++	+++	+++
Kamimuria	++	+	+	++	+	+
Capnia	+	++	+	+	++	+
Odonata						
Corixa	+++	+++	+++	+++	+++	+++
Agrion	+	++	++	+	++	++
Rhinocypha	+	+	+	+	+	+
Matrona	-	-	+	-	-	+
Mollusca						
Lymnaea			+		+	

* - = Absent; += Rare; ++= Common; +++= Abundant.

Zoobenthos: Some 34 taxa of different zoobenthos were recorded in the river Ramganga at Gairsen, Chakhutia and Masi (Table 2). Amongst 34 genera of different zoobenthos, 27 genera recorded at Gairsen and Chaukhutia, where as 32 genera at Masi. A group wise distribution shows that the ephemeroptera represented by 5 taxa (*Ephemera, Baetis*, *Caenis, Leptophebea* and *Iron*) at Gairsen and Chaukhutia and by 8 taxa (*Ephemera*, *Baetis, Caenis, Leptophlebia, Iron, Cynigma, Ameletus* ,*Lymnea*) at Masi . Diptera has 2 genera (*Dixa, Chironomus*) at spot no 1; 3 taxa (*Dixa, Chironomus, Simulus*) and 4 genera (*Dixa*, *Chironomus, Simulus, Antocha*) at spot no 3 (Masi). The coleopterans have 5 genera at all the 3 spots in the water (Table 2). The trichopterans represented by 3 genera at spot no. 1 and 2 genera at spot no 2 and 3.The hemiptera represented by 5 genera at spot no. 1 and and 5 different genera at Masi in the river. Similarly plecopterans are also represented by different numbers of genera at different spots in the river Ramganga west.The mollusc is represented by *Lymnaea* sp with variation in year wise at Masi in the river. Thus, the zoobenthos show monthly, seasonally and yearly variations with seasonal rhythms as in the case of zooplankton in the water. A high percentage of zoobenthos in summer and followed by winter season while low quantity of zoobenthos in rainy season has been recorded may be due to high velocity of water and other factors in the river.

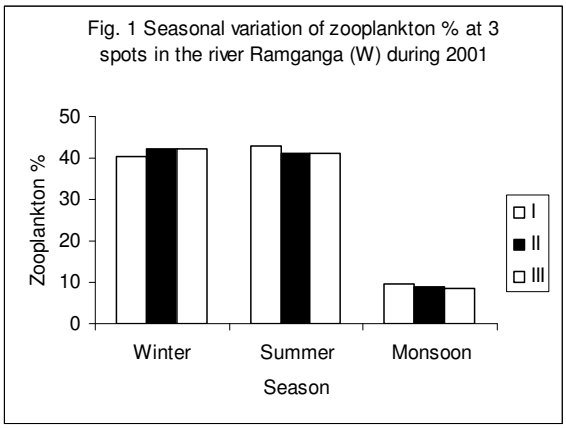

Fig. 1 Seasonal variation of zooplankton % at 3 spots in the river Ramganga (W) during 2001

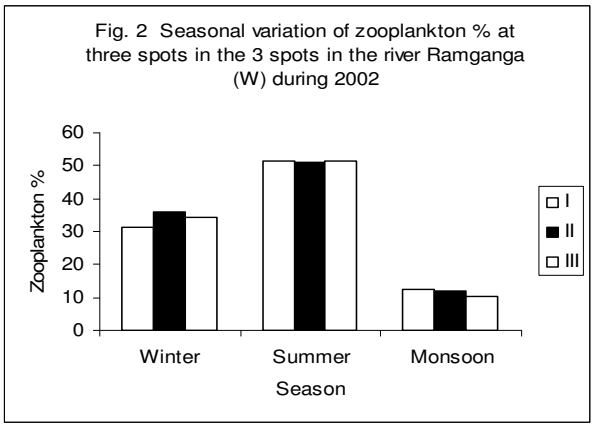

Fig. 2 Seasonal variation of zooplankton % at three spots in the 3 spots in the river Ramganga (W) during 2002

Fluvial dynamics: The velocity of water, depth and width of river Ramganga west inter related with each other (Table 4). These values were fluctuated monthly, seasonally and station-wise (altitudinally) in the river. The high velocity is responsible for low population and diversity of zooplankton and zoobenthos in the river. Similarly the high values of depth and width of the river during rainy season have been observed in the study. The depth and width may also influence the low population of biota during rainy season. These data may also be related to the precipitation in the catchment area of the river basin which are not available in the present paper. Thus, the fluvial dynamics may be limiting factor in the high altitude river of the Himalayas.

Physico-chemicals: The ambient temperature has been studied for two years in the river at three stations. It ranged from13 to 28 in the first year and from 15 to 32^0 C in the second year at Gairsen; it ranged from 14 to 35^0 C during first year and from 18 to 37^0 C during second year at Chaukhutia while it ranged from 18 to 31^0 C in the first year and from 15 to 32^0 C in the second year at Masi in the catchment area in the river. It is recorded that the ambient temperature varied monthly, seasonally, yearly and altitudinally in the study (Fig.3&4). It is also observed that the maximum value of the temperature was in June in first year while it was May and July in the second year.

The water temperature also variable with altitude and season-wise with a high positive correlation (r = 0.931 and 0.943) with the surface water temperature. The water temperature ranged from 12 to 28^0 C with monthly and site-wise variation in the study.

Turbidity: Mostly the water is clear and the bottom could be seen through naked eyes throughout the year except in rainy season when the turbidity ranged from 2.5 to 3.6 m in the water. The zooplankton and zoobenthos are very few during the rainy season in the water.

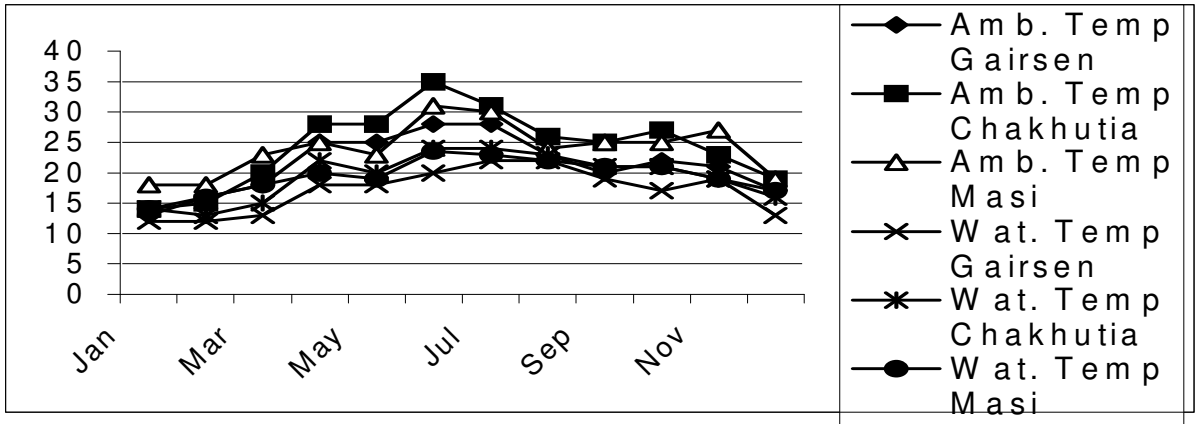

Fig 3. Showing relation between ambient and water temp. in Ramganga during 2001.

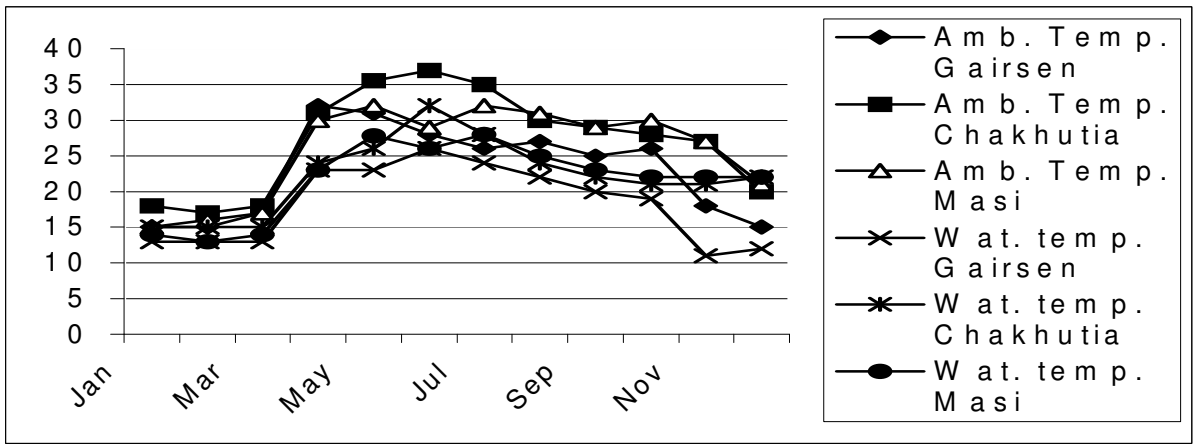

Fig 4. Showing relation between ambient and water temperature during 2002 in Ramganga.

Conductivity: The conductivity showed a range of 50.2 to 59.2 µ Scm-l at Gairsen, 54.3 to 65.8 µ Scm-l at Chaukhutia and 54.2 to 79.8 µ Scm-l at Masi in first year in the river. The conductivity showed a range of 50.1 to 60.1 µ Scm-l at spot no- 1,51.8 to 68.9 µ Scm-l at no- 2 and 50.4 to 78.3 µ Scm-l at spot no- 3 during second year in the water. It was also observed that the conductivity increases from upstream to downstream (54.3, 59.8 and 62.5 µ Scm-l in first year and 53.6, 58.5 and 61.9 µ Scm-l in second year) in the study. It was also observed that the high conductivity during rains in the river.

pH: The pH of the water was mostly alkaline throughout the course of the study.

The pH values fluctuated from 7.5- 9.01 at spot -1, 7.01 - 9.02 and 7.02 - 8.5 at spot -3 in first year and 7.02 - 11.04 at spot -1, 7.03 - 10.02 at spot - 2 and 7.01 to 10.05 at spot - 3 in the river Ramganga (w). It is a general view that the high values of pH in winter season while low in summer and monsoon season in the water.

Alkalinity: The lowest and the highest values of alkalinity recorded from 16.0 - 96.0 mgll at spot - 1, from 10.0 - 103.0 mg/l at spot 2 and from 11.0 - 115.0 mg/l in the first year while the minimum values were observed in January (25.0, 10.0 and 15.0 mg/l at spot-1, 2 and 3) and the maximum

values were recorded in April (95.0, 120.0 and 139.0 mg/l at spot -1, 2 and 3) in the water during second year. The annual mean value was higher in downward than the upward stream (50.9, 54.5 and 60.2 in Ist year; 50.5, 59.4 and 63.9 ppm in second year).

Hardness: The hardness values fluctuated from 25.0 to 88.0 mg/l in 2001 and from 28.0 to 100.0 mg/l in 2002 with spot wise, season wise and month wise in the river Ramganga west. The hardness has an inverse co-relation with conductivity in the water.

Calcium: Generally the high values of calcium at Gairsen, Chaukhutia and Masi in winter with a range from 8.5 to 26.4 mg/l during 2001 and 6.41 to 30.4 mg/l in the study. The values increases from upstream to downstream in the river (13.79, 1996 and 18.10 in first year and 14.52, 18.74 and 19.36 mg|l in second year). The values of calcium are directly co-related to the hardness in the study.

Magnesium: The values of magnesium shows monthly and spot- wise fluctuation with a range from 0.13 to 9.58 mg/l in first year and 0.01 to 11.70 mg/l in second year in the water. It was observed that the high annual mean value (4.91 and 4.27 mg/l) was recorded at Chaukhutia and low value at Gairsen (3.19 and 2.84 mg/l) in both the years in the water.

Chloride: The chloride contents was low or normal in the river with a slight pollution in some months of the year. The values ranged from 2.31 to 5.60 mg/l in first year and 3.10 to 9.94 mg/l in second year with monthly and station wise variation in the river.

The mean values were 3.46, 4.53 and 4.89 mg/l in first year while 4.81, 6.58 and 6.77 mg/l in second year at Gairsen, Chaukhutia and Masi, respectively in the river. It is noted that the chloride values increased down ward (altitudinal variation) in the river.

Sulphate: The sulphate values are marginally high in monsoon while low in winter season with variation in months of both the years. The altitudinal variation was also obtained in the river (The annual values were 1.78, 2.98 and 3.65 mg/l in first year and 1.45, 3.65 and 4.28 mg/l in second year at station no. 1, 2 and 3, respectively in the water).

Silicates: The silicates values have shown high in monsoon, moderate in summer and low in winter season with monthly and altitudinal variations in the water. The annual mean values were 1.71, 2.81 and 2.86 in first year while 2.25, 4.18 and 5.18 mg ||l in second year at station 1, 2 and 3, respectively in the water.

Orthophosphate: The level of this nutrient was significantly low and show a seasonal pulse with high in summer and low in winter and moderate to high in monsoon in the water. Due to low orthophosphate values it shows low primary productivity in the river (0.012gm C/m^2 0.253 gm C/ m^2/day during the study). The annual mean values have been recorded as 0.112, 0.225 and 0.227; and 0.067, 0.162 and 0.206 mg ||l in first and second year at station 1,2 and 3, respectively in the river.

Nitrate - nitrogen: The nitrate-nitrogen value was low and ranged from 0.001 to 0.024 mg/||l in first year while 0.001 to 0.020 mg/||l in second year with monthly and altitudinally variation in the river Ramganga (west). The increasing trend of nitrate-nitrogen values was in autumn season with slight variation at different spots in the water.

Total dissolved solids: There was a seasonal rhythms of dissolved solids with a peak in early summer and another in rains. The lowest values of TDS in winter season in the river. It has a range between 10.0 to 95.0 mg/l in first and second year with monthly and altitudinally variable data in the water. The annual mean values were increasing down ward in the river (27.5, 57.1 and 63.6 mg/l in first year and 22.9, 51.7 and 47.1 mg/l in second year, respectively).

D O: The low values of dissolved oxygen (DO) in summer and moderate values in monsoon and high values in winter months have been observed. It has an inverse co-relationship with water temperature in the river. The DO values ranged from 8.0 to 15.0 with annual mean values as 10.5 at Gairsen, 9.8 at Chakhutia and 9.4 mg/l at Masi in first year while it was 10.0 at Gairsen, 8.9 at Chakhutia and 8.8

mg/l at Masi in second year. It was also indicating that the higher value at high altitude than the low altitude in the water with a inverse co-relationship to the zooplankton population in the river.

Free Carbon di oxide: - The free carbon dioxide is not only low in quantity but also absent in some months in the year. The concentration of free CO_2 increase from upstream to downstream in the river (0.93, 2.37 and 3.12 mg/l) in first year and second year (1.43, 3.02 and 4.15 mg/l), respectively. The free CO_2 show a positive correlation with BOD in both the years ($r = 0.709$ and $r = 0.824$) in the water.

Biological Oxygen Demand (BOD): The BOD values have been fluctuated from 0.1 to 1.5 mg | l in the water during both the years. The BOD values are higher in down stream than up stream (0.28, 0.40 and 0.41 mg/l in first year; and 0.51, 0.64 and 0.66 mg/l in second year). The pollution is higher in down ward than up stream in the water. It is also indicated that the BOD values increase with increase of temperature in the study.

Chemical Oxygen Demand (COD): The COD values fluctuated from 0.56 to 2.52 mg/l in two years with monthly and station wise variation. It is noted that the values are higher in summer and monsoon and low in winter in the study.

Dissolved organic matter (DOM): Like other physico-chemicals of water DOM also showed seasonal, year-wise and altitudinal variation in the river. It ranged from 0.01 to 0.53 mg/l with annual mean values 0.013, 0.021, 0.031 in first year and 0.012, 0.021 and 0.023 mg/l in the second year at different stations, respectively in the study.

The study of abiotic features indicates that the magnitude of various parameters is partially or wholly associated with the level of river discharge and season in the present study. The low atmospheric temperature was always recorded during winter, the higher during summer and monsoon than the winter season at all the stations. Similar observations also recorded by Bhatt and Pathak (1992), Pathani (1995) and Mahar (2002) in the other lotics of Kumaun Himalya. The co-relation and co-efficient ($r = 0.931$ and $r = 0.943$) between ambient and water temperature so that the water temperature directly related to the air temperature. Water temperature found to be related to elevation and a decline in it at higher elevation may be corroborated with lower ambient temperature. The pH value high in winter and low in summer and monsoon may be due to photosynthetic activity as also recorded by Nautiyal (1984) and Singh et.al.(1994) in other rivers of the Himalaya. The free carbon dioxide is either absent or present in different months, which reflects less load of organic matter in the water. Ganpati (1957) attributed that the changes in the values of bicarbonates are related with the rate of photosynthetic activity. There is a progressive increase in the total hardness in winter and summer and decrease in monsoon. A wide variation in hardness indicates that water of this channel may not be characterized as permanently hard as also reported by others (Dubey et.al.,1986). The rivers of Indian subcontinent including those draining the Himalaya show seasonal variations (Trivedy, 1988; Gautam, 1990; Singh, 1990). The high concentration of sulphate from upstream to downstream also supported the fact that the human activities in basin increase the sulphate content in the river as also reported by Crosser (1989), Raina *et al.* (1984) and Gautam (1990). The silicate showed its high concentration during monsoon, moderate in winter and low in summer in the study, as also reported by Boon (1999). A combination of many factors in the fluvial water, such as runoff, erosion, vegetation cover, nitrogenous compounds, fertilizers and domestic wastes including organic matter responsible for variation of the nitrates and phosphates in the river (Johnson *et al.*, 1976, Probst, 1985 and Ahmad, 1989). The high concentration of nitrate nitrogen and phosphate from upstream to downstream due to increased pollution level in the river. The maximum amount of solids was recorded during monsoon which indicates poor quality of water in the season (Pathani, 1995 and Mahar, 2002). An increase in temperature of water results in decrease of DO and an increase in sediment concentration hampers the photosynthesis and reduces DO level (Ellis, 1973). Torrential nature of river and its gradient resulted in variation of DO from upstream to downstream in the water.

An inverse relationship between DO and free carbon di oxide in fresh water bodies reported by Joshi (1993) and Joshi *et al.* (1993). The values of BOD and COD shows variation in months, season and altitude in the water (Tewari *et al.* 1986, Sunder 1998, Pathani 1995, Singh *et al.* 1998 and Pathani and Mahar, 2006).

The seasonal, monthly and altitudinal variation of plankton is related with temperature and dissolved oxygen because the summer peak of phytoplankton followed by zooplankton in the water. The moderate second peak of plankton in early winter when moderate water temperature and high DO may be related to the photosynthesis and low turbidity (almost transparent water) and low solids in the river. But the plankton volume and population was low in monsoon due to high temperature, high turbidity, high solids, high conductivity and low DO. Similar results were obtained by Pathani and Mahar (2006) and Joshi *et al.* (1996) in some lotic waters of Uttaranchal Himalayas. The velocity of water, width and depth of water in different spot were studied and it was found that the number and quality of zooplankton and zoobenthos were higher in low altitude then the high altitude (Gairsen). Other hand the velocity of water was very high in monsoon when there were very few zooplankton and aquatic insects in the study as also reported by Pathani (1995) and Mahar (2002) in Sarju and Suyal river of Kumaun Himalayas.

Table 3. Ichthyo-diversity in the river west Ramganga (2001-2002)

Family /Genus/ Species	Station		
	Gairsen	Chaukhutia	Masi
Cyprinidae			
Barilius bendelisis	+	++	++
Barilius vagra	+	++	++
Barbus conchonius	+	+	+
Barbus ticto	+	+	+
Garra gotyla	++	+	+
Garra lampta	+	++	+
Labeo dero	+	+	+
Schizothorax plagiostomus	+	++	++
Schizothorax richardsonii	+	+	+
Tor putitora	+	++	++
Tor tor	+	++	++
Botinae			
Botia almorhae	++	++	+
Nemachelius botia	++	+	+
Nemachelius montanus	++	+	+
Sisoridae			
Glyptothorax pectinoptrus	++	+	+
Luguvia sp.	-	+	-
Pseudoecheneis sulcatus	++	+	+
Mastacembellidae			
Mastacembelus armatus	+	+	+

+ = Present ; ++ = Abundant ; - = Absent

Fish composition and fishery: Some 18 species of fishes belonging to four families such as cyprinidae, botinae, sisoridae and mastacembellidae have been recorded with fluctuation of fish species at different collecting sites (Gairsen, Chaukhutia and Masi) in the river during two years (Table 3). The percentage of species of fish has been obtained as 7.33 - *Tor* spp.; 10.7 - *Schozothorax* spp. ; 13.76 - *Botia almorhae;* 11.92 - *Garra spp*.; 10.10 - *Mastacemballus armatus* ; 5.50 - *Puntius*

spp. ; 1.83 - *Labeo dero* 1..83 ; *Barelius spp*. 19.26; and 19.26 percent of others when total numbers of fishes counted in the water. While it was 31.25 - *Tor spp*.; 21.34 - *Schizothorax spp*.; 8.60 - *Barelius spp*.; 7.19 - *Botia almorhae*; 5.21 - *Garra spp*.; 7.19- *Labeo dero*; 8.60 *Mastacemballus armatus* ; 2.06 - *Puntius spp*. and 9.5 percent of other fishes on the basis of weight in the river.

The catch per unit effort (CPUE) ranges from 201.0 to 550.0 gm|man|hr in the river. The ornmental fishes such as *Botia almorhae*, *Puntius ticto*, *P. conchonius*, *Nemacheilus montainus* may be used as the aquarium fish. The production||anding of fishes during 2001 was 905.0 Kg and 816.0 Kg during second year, 2002 with 205 and 198 days of fishing, respectively in the river west Ramganga. Similar data on fish landing has been recorded in Sarju river by Pathani (1995).

Table 4. Water velocity, depth and width of river Ramganga (west)

Months	Year	Velocity in m / Sec.		Depth in m		Width in m	
		Gairsen (I)	Chaukhutia (II)	Gairsen (I)	Chaukhutia (II)	Gairsen (I)	Chaukhutia (II)
Jan.	2001	0.33	0.19	1.5	1.1	20.0	23.2
	2002	0.31	0.19	1.3	1.3	20.2	24.2
Feb.	2001	0.29	0.19	1.2	1.4	20.5	23.5
	2002	0.25	0.17	1.1	1.2	20.6	24.5
Mar.	2001	0.18	0.22	1.3	1.1	19.2	23.1
	2002	0.19	0.2	1.3	1.5	19.4	23.9
Apr.	2001	0.17	0.19	1.9	2.0	19.1	22.0
	2002	0.18	0.27	1.7	1.4	18.9	23.7
May.	2001	0.18	0.19	1.1	1.5	18.5	24.0
	2002	0.18	0.20	1.2	1.5	19.1	25.3
Jun.	2001	0.20	0.28	1.3	1.2	18.9	32.0
	2002	0.27	0.13	1.4	1.9	20.2	35.0
Jul.	2001	0.27	0.20	2.5	2.8	22.3	35.2
	2002	0.27	0.27	2.1	2.5	22.4	37.3
Aug.	2001	0.59	0.22	3.2	3.7	25.3	38.0
	2002	0.22	0.28	3.0	3.4	25.5	39.2
Sep.	2001	0.47	0.25	3.5	4.9	25.7	39.0
	2002	0.49	0.27	3.4	4.5	25.9	39.5
Oct.	2001	0.47	0.19	2.5	4.1	22.8	31.0
	2002	0.47	0.27	2.1	3.5	22.4	33.1
Nov.	2001	0.29	0.17	1.1	2.0	19.6	28.0
	2002	0.37	0.19	1.3	1.1	18.7	30.2
Dec.	2001	0.28	0.17	1.3	1.5	19.3	25.2
	2002	0.28	0.18	1.1	1.1	18.9	30.2

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