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## Chapter

## [22]

# Hydrobiological characteristics of Ganga River at Barrage Bijnor, Uttar Pradesh, India

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**Abstract**

Biodiversity is the variety of life on the Earth, it includes all organism's species, and populations. The present study reports hydrobiology and occurrences of organochlorine pesticides (OCPs) in the Ganga river barrage at Bijnor Uttar Pradesh. Samples were monitored for 5 major OCPs, including hexa-chlorocyclohexanes (HCHs), Aldrin group, and DDTs. The hydrochemical characterization evaluates the quality of water for irrigation purpose. The outcomes analyze the pH of water, Total Dissolve Solids (TDS) values extending from 115 to 676 mg/L, averaging 271 mg/L. Anion and cation concentration (mg/L) were $HCO_3^- > SO_4^{2-} > Cl^- > CO_3^{2-}$ anions and $Ca^{2+} > Na^+ > Mg^{2+} > K^+$ cations. Maximum hydro chemicals were in the form of bicarbonates $Ca–HCO_3$ type. The characterization was different from upper and downstream of the main stream. Analysis shows variations at different sites and seasons thus affecting the habitat, growth, reproduction and migration of aquatic flora and fauna. The quality of water is suitable at a particular season for bathing and irrigation purposes at Ganga Barrage, Bijnor Uttar Pradesh. Bijnor Ganga Barrage fauna is facing the threats of categories like variation in nutrient enrichment, hydro-logical modifications, chemo geodiversity, habitat loss, degradation, and pollution, dominancy of invasive species, extreme flood and draught.

**Keywords** Chemo-geo-diversity, Ganga, Hydrobiology, Organochlorine pesticides

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## Introduction

Himalaya is the birth place of many large rivers *i.e.,* Ganga, Yamuna and Ram Ganga etc. Surface water resources assume a significant job in the worldwide carbon cycle by putting away, moving, or changing inorganic and natural (natural) carbon segments along the hydrologic continuum connecting the land and seas (Kempe *et al*., 1984; Cole *et al*., 2007; Battin *et al*., 2009). Late blends have given more prominent appraisals to the riverine transport of decomposed organic carbon and particulate natural carbon and the ex-change of $CO_2$ between the climate and surface water (Raymond *et al.,* 2013; Wehrli *et al.,* 2013; Ward *et al.,* 2017). Analysis is meager for some stream frameworks in India, leaving many vulnerable sides in worldwide combinations of riverine carbon transport and discharge. Albeit Asian waterways have been assessed to represent up to 40–50 % of the worldwide inorganic and natural carbon transitions from the land to the seas (Degens *et al.,* 1991; Schlunz *et al.,* 2000), the absence of right information and poor spatial spread monitoring have compelled our capacity to appraise the commitments of Asian stream frameworks to the worldwide riverine carbon motions in $CO_2$ emission specifically (Li and Bush, 2015). For example, getting $CO_2$ information estimated in Indian streams was recommended as a top need to diminish the huge vulnerability in assessing the worldwide riverine $CO_2$ out-gassing (Lauerwald *et al.,* 2015).

The hydrochemical structure of a watershed is demonstrative of nature of the zone it moves through. An examination of the hydrochemical water can decide the geochemical wellspring of the waterway solute and related data, including enduring and atmosphere of the watershed (An *et al.,* 2015). There are numerous sources of contamination in surface water, for example, enduring of earthly shakes, barometrical precipitation, and anthropogenic sources (Moon *et al.,* 2007). The hydrochemical qualities of streams starting from the Himalaya resion are changing with environmental change and expanding human exercises (Zhang *et. al.,* 2015 and Zhang *et al*., 2019). In any case, numerous past hydrochemical concentrates on the headwaters of streams starting from the Gadgetry have been fundamentally focused on Ganga waterways, and hydrochemical concentrates (Wu *et al.,* 2008; Jiang *et al.,* 2015 and Wu *et al.,* 2005). An exhaustive analysis of the hydrochemistry of the source area of the Ganga River has not yet been performed. In this manner, so as to explain the attributes of the riverine water science in the River bowl, more examinations ought to be done. The Ganga River and its tributaries are significant hotspots for irrigation and are significant wellsprings of drinking, and house hold water for individuals living in the stream bowl. Right now, broad investigation dependent on water tests was done to portray the hydrochemistry of the standard of the Ganga River and its tributaries, and an evaluation of water quality for bathing and irrigation.

Biodiversity is the variety of life on Earth, it includes all organisms, species, and populations; the genetic variation among these; and their complex assemblages of communities and ecosystems. Aquatic biodiversity can be defined as the variety of life and the ecosystems that make up the freshwater and tidal regions of the world and their interactions. Aquatic biodiversity is greatest in tropical latitudes. About 22000 species of fishes have been recorded in the world; of which, about 11% are found in Indian waters. Out of the 2200 species so far listed, 73 (3.32%) belong to the cold freshwater regime, 544 (24.73%) to the warm fresh water's domain, 143 (6.50%) to the brackish waters and 1440 (65.45%) to the marine ecosystem (Kellerman *et al.*, 2014). India has great diversity in its Geo-climatic conditions. Biodiversity is the varied and differences among living organisms of terrestrial, marine and other aquatic ecosystems and the ecological complexes associated with them. India has great diversity in its geo-climatic conditions. Thus, there is great diversity in India's forest, wetlands, mangroves wildlife and marine areas. The richness in fauna and flora makes it as one of the 12 mega-biodiversity countries of the world (Conserving Biodiversity, 1992). Fresh-water habitats are threatened by many factors, including pollution from industry, increased acidification, and agricultural runoff containing residues of fertilizers or pesticides. In addition, the building of dams destroys many river ecosystems. Development can harm aquatic habitats or remove them altogether, as when marshy areas are filled. In the 20th century, the basis of intensive studies on the different families and groups of freshwater fishes was done (Joshi *et al*., 2017). Aquatic ecosystems also are particularly fragile because the disturbance of a watershed can affect multiple components downstream, including rivers, lakes, estuaries, and oceans. Perhaps the largest threat to ocean biodiversity is overfishing. In addition to depleting commercial species of fish, bivalves, and crustaceans, many fishing methods cause the needless deaths of non-commercial fish species as well as numerous reptiles, birds and marine mammals. The diversity in terrain, topography, climate and soils are able to sustain diverse forms of life. Thus, there is great diversity in India's forest, wetlands, mangrove wildlife and marine areas. The richness in fauna and flora makes it as one of the 12 mega-biodiversity countries of the world (Wang *et al*., 2019).

## Study area

The Origin of Ganga is Gangotri glacier present in Western Himalayan region in Uttarakhand, India. The river Ganga or Ganges is 2,525 km long and flows to the south- east through the Gangetic Plain of the North India into the Bangladesh where it merges into the Bay of Bengal. The altitude of river Ganga ranges from 8848 m in the high Himalayas to the sea level in coastal deltas of India and Bangladesh. The Ganga basin is the home to more than 450 million people and as a result, river Ganga is in strong demand for the domestic and irrigation uses. Fishing along the river yields economy and serves nutritional needs. Ganga waterway and its significant tributaries at Uttarakhand, Uttar Pradesh and Bihar states speak to the investigation region. After passing the Uttarakhand holy river Ganga enters in Uttar Pradesh and Ganga Barrage, Bijnor is the first famous public spot where Hindus take a holy dip in Ganga. Ganga Barrage, Bijnor was testing and sampling site as shown in Figure 1.

## Water sampling and analysis

Water sample was collected from sites Ganga Barage, Bijnor (Uttar Pradesh, Figure 1) between the December 2017 to August 2019. Two samples were taken from the site during each sampling campaign.

Figure 1. Sampling location of the river Ganga.

One sample was collected for Ogranochlorine pesticide analysis, while the second sample was collected for Hydrochemical Analysis, Anion and cation concentration (mg/L) were $HCO_3^- > SO_4^{2-} > Cl^- > CO_3^{2-}$ anions and $Ca^{2+} > Na^+ > Mg^{2+} > K^+$ cations. Sampling bottles were rinsed with river water and were carefully filled to overflowing, without trapping air bubbles in sealed bottles. The samples were transported in cool-box with ice packs and subsequently stored in a refrigerator at 4°C until further analysis. All the samples were transported on ice and kept under refrigeration until performance of laboratory analysis. The pH, water temperature, electrical conductivity (EC), and total dissolved solids (TDS) were measured in situ using a Horiba U50 (HORIBA Ltd., Kyoto). $Ca^{2+}$, $Mg^{2+}$, $K^+$, $Na^+$, $HCO_3^-$, $CO_3^{2-}$, $SO_4^{2-}$, and $Cl^-$ were measured at the. Concentrations of $HCO_3^-$ and $CO_3^{2-}$ were measured by titration using 50-mL acid burettes (DZ/T0064.49-93, 1993). The concentration of $Cl^-$ was determined by titration using 50 mL brown acid burettes (DZ/T0064.50-93, 1993). The concentration of $SO_4^{2-}$ was determined by UV/VIS spectrophotometer (DZ/T0064.65-93, 2015). Concentrations of $Ca^{2+}$, $Mg^{2+}$, $K^+$, and $Na^+$ were analyzed by inductive coupled plasma atomic emission spectrometry (HJ776-2015)

All chemicals used during the study were analytical grade procured by Merck. Reagents and calibration standards for physico-chemical analysis were prepared using double glass distilled water. The glass-wares were washed with dilute nitric acid followed by distilled water. Standard was procured from Sigma Aldrich. The working standards of pesticides were prepared in n-Hexane and were stored at -20 °C.

### Physico-chemical parameters

Alkalinity, chloride and hardness were measured by titration method in the laboratory. Nitrate and ammonia were measured by selective ion electrode (Thermo and HACH, respectively), while TOC was analyzed on TOC analyzer (Shimadzu). EC, pH, DO and total dissolved solids (TDS) were measured onsite using portable meters. pH, electrical conductivity (EC), alkalinity, chloride hardness, dissolved oxygen (DO), total organic carbon (TOC), nitrate, and ammonia as per APHA (1998).

### Extraction

Before GC analysis all samples were filtered using 0.45μm glass fiber filter to remove suspended impurity and were extracted without any pH adjustment. A liquid extraction (LLE) method, using n-hexane as solvent, was used for extraction of pesticide residues (APHA-1998). Sample beaker was shaken and filtered sample was transferred to a separating funnel (1000 mL cap.). It was mixed with 20 g of sodium chloride and 40 ml of n-hexane. The sample was shacked properly for 60 min and the hexane layer was separated with the help of separating funnel. One more extraction was done with 25 ml n-hexane and the combined hexane extract was treated with 8 g anhydrous $Na_2SO_4$ to remove traces of moisture. The moisture free (dehydrated) n-hexane was rotary vacuum evaporated to a small volume and transferred to an airtight test tube followed by evaporation of solvent under a mild stream of nitrogen to 1.0 ml. The concentrated samples were ready to gas chromatograph (GC) analysis.

### Organochlorine pesticide OCPs analysis

The contamination of OCPs was analyzed by Thermo Trace GC Ultra gas chromatograph equipped with 63-Ni micro-electron capture detector (GC-ECD) and an auto sampler. The column specifications and operating conditions are Column DB-5, fused silica capillary with 30 m × 0.25 mm ID, thickness 0.25 μm, carrier gas Helium with 1.0 ml/ min makeup with 30 ml/min N, oven programming 90-150°C rising rate 15°C/min, 150-220°C rising rate 3°C/min and 220-270°C rising rate 5°C. Injection volume 2.0 μl, Injector temperature 250°C, Detector temperature 280°C.

## Status of physico-chemical parameters

Water quality in mountainous stretch Ganga is very good, with high DO levels Avg. 8.17∓0.4, low EC, TDS and TOC, indicating no significant contamination pollution. When Ganga enters in Uttar Pradesh the first station is Bijnor before this many small rivers and the sub-basins are merge in Ganga. The STPs reduce 61–93 % organic loadings and half of trace contaminants present in the sewage (CPCB-2009). Domestic sewage is the major contributor of pollution in this stretch. The water quality in the stretch is affected from the Rishikesh (Uttarakhand) by domestic, industrial organic and inorganic west and agricultural runoff. The Dissolve Oxygen (DO) levels in all the samples were in the range of 4.9-7.9 mg/ L ($DO_{avg}$ (mg/L) = 5.6∓1.2), however this zone has some of the worst polluted stretches, but due to high monsoonal flow, the river water quality appeared good from the water quality data obtained during this sampling campaign (Table 1).

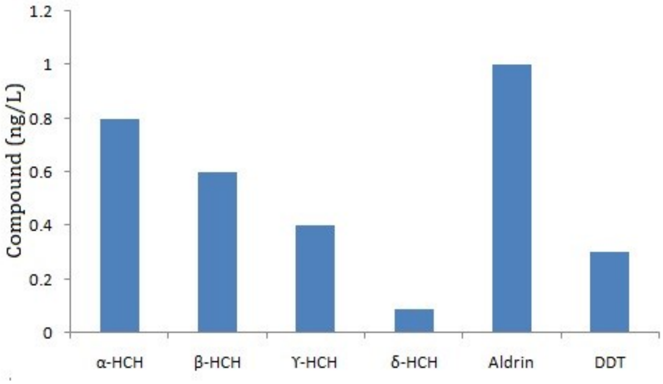

Figure 2. Comparison of reported organochloride pesticides (OCPs) levels in the Ganga barrage Bijnor.

### Organochlorine pesticides

Different types of organochlorine pesticides are widely used in agricultural sector all over the Ganga basin (Rehana *et al.,* 1995; Nayak *et al.,* 1995; Malik *et al.,* 2009). Beside the runoff from agricultural fields, the agricultural practices in the dry bed of the rivers, which are common in India (Hans *et al.,* 1999), also, add pesticides to the river during monsoon. The OCPs levels in Bijnor UP, Ganga garage are shown in Figure 2. In this stretch concentration of all the targeted OCPs varies from 0.2 to 1.00 ng/ L.

### Major elements

In terms of variation, the pH of the middle of the main stream of the Ganga was the highest in the whole catchment every year (2017-2019). The pH of all analyzing sample was slightly alkaline range between from 7.89 - 8.42 with an average of 7.2. The water temperature measured in situ was 9.42-29.07 °C in 2017, 9.42-28.82 °C in 2018, and 8.87-30 °C in 2019. Total dissolve solid (TDS) of Ganga water sample 85 mg/L to 453 mg/L, with an average of 250 mg/L. TDS of the Ganga water of the main stream of the Ganga River was the highest in the whole catchment in 2017, 2018, and 2019. Electrical conductivity (EC) varied from 125 µS/cm to 425 µS/cm, averaging 282 µS/cm. Increasing order may have caused this phenomenon. In addition, the EC of the main stream of the Ganga was the highest in the whole catchment in 2017, 2018, and 2019. pH, TDS and electrical conductivity of the main stream of the Ganga River shown in Table 1.

### Fresh water biodiversity

Freshwater ecosystems are a subset of Earth's aquatic ecosystems. They include lakes, ponds, rivers, streams, springs, bogs, and wetlands. Limnology is a branch of freshwater biology and a part of hydrobiology. Freshwater habitats can be classified by different factors, including temperature, light penetration, nutrients, and vegetation (Wetzel *et al.,* 2001). Temperature in fresh water habitats does not show much range of variation, due to several unique thermal properties of water. Turbidity of water

Table 1. Summary statistics of hydrochemical compositions from the Ganga barrage Bijnor.

| **Parameters** | **Mean** | **Standard Deviation** | **Min** | **Max** |
|---|---|---|---|---|
| Temperature ($^{O}$C) | 23 $^{O}$C | 5 $^{O}$C | 9.4 $^{O}$C | 30 $^{O}$C |
| pH | 7.89 | 2.35 | 7.20 | 8.42 |
| EC (µS/cm) | 382 | 165 | 325 | 425 |
| TDS (mg/L) | 368 | 188 | 385 | 453 |
| $K^{+}$(mg/L) | 2.87 | 1.08 | 2.32 | 5.36 |
| $Na^{+}$(mg/L) | 43.45 | 15.88 | 39.12 | 55.32 |
| $Ca^{++}$(mg/L) | 73.54 | 16.52 | 58.48 | 88.02 |
| $Mg^{++}$(mg/L) | 28.85 | 8.42 | 22.33 | 35.05 |
| $Cl^{-}$ (mg/L) | 21.45 | 5.64 | 17.36 | 25.66 |
| $SO_4^{--}$ (mg/L) | 122.62 | 32.88 | 76.05 | 165.69 |
| $HCO_3^{-}$ (mg/L) | 216.13 | 71.69 | 144.13 | 288.07 |
| TOC (mg /L) | 4.4 | 1.2 | 3.1 | 5.8 |
| Nitrate (mg /L) | 2.4 | 0.9 | 1.2 | 3.6 |
| Ammonia (mg /L) | 5.2 | 1.8 | 2.7 | 8.9 |
| Hardness (mg /L) | 158.7 | 16.7 | 148 | 169.2 |
| Alkalinity (mg /L) | 171.2 | 22.3 | 152 | 192.4 |
| DO (mg /L) | 5.6 | 2.6 | 4.9 | 7.8 |

depends upon the kinds and amount of suspended material like silt, clay particle and living organism etc. Turbidity affects the penetration of light and thus is important factor in the distribution of organisms. Large rivers have comparatively more species than small streams. Many relate this pattern to the greater area and volume of larger systems, as well as an increase in habitat diversity. Some systems, however, show a poor fit between system size and species richness. Organisms in fresh water habitats are generally classified in to following manner: on the basis of their major niches, their life habit and sub habitat they are autotrophs (producers), phagotrophs (macroconsumers), saprotrophs (decomposer or microconsumer), benthos (bottom), periphyton (attached to other plants), planktons (floating), nekton (swimming) and neuston (resting or swimming on surface). Freshwater ecosystems can be divided into lentic ecosystems (still water) and lotic ecosystems (flowing water).

**Lentic communities:** Lentic communities are found in three distinct zone i.e., littoral, limnetic and profundal. Producers like, rooted and benthic plants (Nymphaea, Nelumbo), mainly seed plants, rooted hydrophytes (Typha, Scirpus, sagittaria, Eleocharis etc.), floating green plants, the phytoplankton, mainly the algae are distributed in these zones. These algae are diatoms, green algae, including unicellular forms as desmid, filamentous (attached or floating) as species of *Spirogyra, Oedogonium, Cladophora, Chara* etc., and various colonial forms as *Volvox, Hydrodictylon etc;* blue green algae, which are unicellular and colonial. In littoral zone the consumer is animal in which vertical rather than horizontal zonation is more striking. The zooplankton represents a few species but their number is large. Copepods, cladocerans and rotifers are chiefly present. Common forms are other vertebrate taxa inhabit lentic systems as well. These include amphibians (e.g., salamanders and frogs), reptiles (e.g., snakes, turtles, and alligators), and a large number of waterfowl species (Moss *et al.,* 1998). Most of these vertebrates spend their time in terrestrial habitats and thus are not directly affected by abiotic factors in the lake or pond. Many fish species are important as consumers and as prey species to the larger vertebrates mentioned above Fish size, mobility, and sensory capabilities allow them to exploit a broad prey base, covering multiple zonation regions. Like invertebrates, fish feeding habits can be categorized into guilds. In the pelagic zone, herbivores graze on periphyton and macrophytes or pick phytoplankton out of the water column. Carnivores include fishes that feed on zooplankton in the water column (zooplanktivores), insects at the water's surface, on benthic structures, or in the sediment (insectivores), and those that feed on other fish (piscivores). Fish that consume detritus and gain energy by processing its organic material are called detritivores. Omnivores ingest a wide variety of prey, encompassing floral, faunal, and detrital material. Finally, members of the parasitic guild acquire nutrition from a host species, usually another fish or large vertebrate (Le *et al.,* 2006). Fish taxa are flexible in their feeding roles, varying their diets with environmental conditions and prey availability. Many species also undergo a diet shift as they develop. Therefore, it is likely that any single fish occupies multiple feeding guilds within its lifetime (Lytle *et al.,* 1999).

**Lotic communities:** Lotic systems typically connect to each other, forming a path to the ocean (spring → stream → river → Ocean). Up to 90% of invertebrates in some lotic systems are insects. These species exhibit tremendous diversity and can be found occupying almost every available habitat, including the surfaces of stones, deep below the substratum, and in the surface film. Invertebrates are important as both consumers and prey items in lotic systems. Insects have developed several strategies for living in the diverse flows of lotic systems. Some avoid high current areas, inhabiting the substratum or the sheltered side of rock (Le *et. al.,* 2006). In addition to these behaviors and body shapes, insects have different life history adaptations to cope with the naturally-occurring physical harshness of stream environments (Lytle *et al.,* 2004). The common orders of insects that are found in river ecosystems include Ephemeroptera (also known as a mayfly), Trichoptera (also known as a caddisfly), Plecoptera (also known as a stonefly, Diptera (also known as a true fly), some types of Coleoptera (also known as a beetle), Odonata (the group that includes the dragonfly and the damselfly), and some types of Hemiptera (also known as true bugs). Additional invertebrate taxa common to flowing waters include mollusks such as snails, limpets, clams, mussels, as well as crustaceans like crayfish, amphipoda and crabs. Fish are probably the best-known inhabitants of lotic systems. The ability of a fish species to live in flowing waters depends upon the speed at which it can swim and the duration that its speed can be maintained. Continuous swimming expends a tremendous amount of energy and, therefore, fishes spend only short periods in full current. Instead, individuals remain close to the bottom or the banks, behind obstacles, and sheltered from the current, swimming in the current only to feed or change locations. Some species have adapted to living only on the system bottom, never venturing into the open water flow. These fishes are dorso-ventrally flattened to reduce flow resistance and often have eyes on top of their heads to observe what is happening above them. Some also have sensory barrels positioned under the head to assist in the testing of substratum. Other vertebrate taxa that inhabit lotic systems include amphibians, such as salamanders, reptiles (e.g. snakes, turtles, crocodiles and alligators) various bird species, and mammals (e.g., otters, beavers, hippos, and river dolphins). Other vertebrate taxa that inhabit lotic systems include amphibians, such as salamanders, reptiles (snakes, turtles, crocodiles and alligators) various bird species, and mammals (otters, beavers, hippos, and river dolphins). With the exception of a few species, these vertebrates are not tied to water as fishes are, and spend part of their time in terrestrial habitats (Giller *et al*., 2000). Many fish species are important as consumers and as prey species to the larger vertebrates mentioned above.

**Fish fauna:** Ganga water fish fauna consisted 25 fish families and 149 fish species along the study 58 species are present in mountain region and 122 (Hardwar to Bijnor) species in plane region. Maximum fish species are common to Mountain Region and Upper Gangetic Plane. In present study past, 21 fish species (Carp: Catfish: Other = 18:2:1) were observed from Devprayag to Rishikesh zone, 22 fish species (Carp: Catfish: Other = 13:6:3) at Narora and 27 species at Kachla Ghat (Carp: Catfish: Other = 8:7:14) and 31 fish species at Bithoor (Carp: Catfish: Other = 12:07:12). Earlier, 30 fish species (Carp: Catfish: Other = 20:3:7) were recorded in Rishikesh-Hardwar zone (Giller *et al*., 1998), 6 fish species (Carp: Catfish: Other = 14:4:9) around the Bijnor District (Khanna *et al*., 1994). In Lower zone of the Ganga the 82 fish species (Carp: Catfish: Other = 45:17:20) have been reported between Brijghat to Narora (Sharma *et al*., 1986; Rao *et al*., 2001). A recent information shows 58 fish species (Carp: Catfish: Other = 26:18:14) at Narora (EEF-India, 2004). Fish population richness is evident from Mountain Zone to Upper Gangetic Plane. Stretch of the river from Hardwar to Bijnore (77 km. apart) is of special interest from the viewpoint of fish distribution since it is the junction of two biogeographic regions, the west Himalaya and the Upper Gangetic Plains. 68 species are listed in this zone of which 17 species are common with the Upper Mountain Zone (above Devprayag), 37 species (including 17 from Upper Mountain Zone), that are present in Lower Mountain Zone (Devprayag to Hardwar), 9 species are specific to this junction and 21 species are common to Upper Gangetic Plane. Thus, this zone has a larger share of mountain and Plane. It is notable that some essentially coldwater species i.e. snow trout, *Garra* and *Glyptothorax* extend their range into the Upper Gangetic Plane but are few in junction zone. Distribution and diversity of 149 fish species belongs to 25 families in the mountain (M) and the upper Gangetic plains was studied (Nautiyal *et al*., 2014).

Aquatic ecosystems are critical components of nature. In addition to contributor of biodiversity and ecological productivity, they also provide a variety of services to human population as drinking water, irrigation, recreation, and habitat to aquatic fauna. Increase temperature is changing the distribution, migration and breeding of aquatic species. Change in seasonal patterns, precipitation, and run off affects species composition and ecosystem productivity. Wetlands ecosystems have limited ability to adapt to climate change (Day *et al*., 2002). The effect of increased pollution and temperature adversely affects the physical, chemical and biological characteristics of water and affect ecosystem structure and function. It results into loss of aquatic biodiversity, fisheries, phytoplanktons, zooplanktons. A two-degree increase is associated with 500 ppm of $CO_2$ concentration changes the flora and fauna of wetlands. These impacts will add to the stress already given by anthropogenic activity. A climate change brought about by human activities is threatening to accelerate the loss biodiversity. Climatic changes and anthropogenic activities play a dominant role in maintaining the fish population and diversity (Anttrill and Power, 2002). Surface freshwater is a small fraction of global water. It may cause extinction of aquatic mammals and reptiles at species level which are restricted in their geographical ecology. Biodiversity is very sensitive to even small change in the Earth's climate. There is a need for conservation of diversity through planning and management. Urgent steps and efforts are required to mitigate the losses in biodiversity and implement the long-term measures to preserve the rich treasures of Haidarpur wetland of Bijnor. Biodiversity conversation cannot be brought about by enforcement of laws only, it must come from within because we should love the nature and all living being. Biodiversity is life. It is the nature's insurance policy against disasters (IPCC, 2014).

## Conclusion and future recommendation

Healthy freshwater ecosystem provides vital ecosystem services to human societies including the provision of clean water for drinking, agriculture, fisheries, flora, fauna, wetlands and biodiversity. The present reports hydrobiology characteristics of Ganga river barrage at Bijnor Uttar Pradesh. Water samples were monitored for 5 standards Aldrin group, hexachlorocyclohexanes (HCHs), DDTs and OCPs. The outcomes analyze the pH of water, Total Dissolve Solids (TDS) values extending from 115 to 676 mg/L, averaging 271 mg/L. Cations concentration $Ca^{2+} > Na^{+} > Mg^{2+} > K^{+}$ and anion concentration (mg/L) were $HCO_3^{-} > SO_4^{2-} > Cl^{-} > CO_3^{2-}$. Maximum hydro chemicals were in the form of bicarbonates $Ca–HCO_3$ type. The hydrochemical characterization evaluates the quality of water for irrigation purpose. Water quality analysis shows variations at different sites and seasons thus affecting the habitat, growth, reproduction and migration of aquatic flora and fauna. The quality of water is suitable at a particular season for bathing and irrigation purposes at Ganga Barrage, Bijnor Uttar Pradesh. The hydrochemical characterization was different from upper and downstream of the main stream. Bijnor Ganga Barrage fauna is facing the threats of broad categories like variation in nutrient enrichment, hydrological modifications, chemo geodiversity, habitat loss, degradation, and pollution, dominancy of invasive species, extreme flood and draught. To improve the quality of Ganga water we should farmers should reduce the use of insecticides, pesticides and herbicides in agriculture.

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