International Journal of Zoology Studies
www.zoologyjournals.com
ISSN: 2455-7269
Received: 22-11-2025, Accepted: 23-12-2025, Published: 05-01-2026
Volume 11, Issue 1, 2026, Page No. 1-3

Biotic components of pond ecosystems of Ropar, Punjab, India

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Abstract
This study presents a comprehensive assessment of biotic components consisting of fish species diversity and plankton diversity of water in the six ponds, situated in Ropar, Punjab, India. The present study revealed that out of six ponds, a total of 41 planktons has been identified comprising of 22 phytoplanktons and 19 zooplanktons each. Phytoplankton population were composed and identified under four classes namely Bacillariophyceae, Cyanophyceae, Chlorophyceae and Euglenophyceae. In this investigation it was observed that the dominant group of phytoplankton was Bacillariophyceae followed by Cyanophyceae, Chlorophyceae and Eugelnophyceae. During the period of investigation 11 genera belonging to Bacillariophyceae were identified from ponds. Zooplanktons recorded in the present investigation were Rotifera, Crustacea, Insecta, Protozoans. Zooplanktons particularly rotifers occupied major portion of all six ponds. A total of six fish species have been observed in different ponds of Ropar belonging to order Cypriniformes and Perciformes. Cypriniformes has been found to be dominant with 5 genera all belonging to a single family Cyprinidae.

Keywords: Pond, fish, diversity, plankton, Ropar

Introduction
Aquatic ecosystems are essential natural resources that support a variety of living organisms, including phtoplanktons, zooplanktons, fish, insects and various microorganisms. Biotic components such as fish species and planktons serve as bio-indicators that are vulnerable to significant habitat changes. The changes in fish and plankton diversity indicate water quality and habitat degradation (Dudgeon, 2019) [8]. Plankton, being primary producers and food source play an essential role in aquatic food web and also support fish populations influencing fisheries productivity. Biotic component assessment is important for understanding the ecosystem health and for making informed decisions on environmental management. Fisheries contribute to local economies and food security and also serve as bio-indicator reflecting overall quality and habitat conditions. Understanding species composition helps in making conservation strategies (Siligato and Bohmer 2001) [17].
The present study focused on studying biotic components comprising fish diversity and plankton diversity from six different ponds of Ropar, Punjab, India. This study helps in understanding Ropar aquatic biodiversity and guide sustainable management of these habitats.

Study Area
The research area was focused on Ropar. Ropar is officialy known as Rupnagar and is located in eastern part of Punjab. It is bordered by Himachal pradesh the north and different other districts of Punjab. It lies between Latitudes 30 degree 32' and 31 degree 24' and longitudes 76 degree 18' and 76 degree55'. It is characterised by dry climatewith hot summers and cold winters and this region experience monsoon from June to September. Six ponds P1, P2, P3, P4, P5 and P6 have been selected for study.

Methodology
For the collection of planktons, ring-type terracotta net with a mesh size of 24 meshes/mm² was utilized. The net fitted with a wide-mouthed plastic bottle, and 50 L water samples were filtered through it to obtain the plankton sample. For identification purposes, standard references from Pennek (1953) [15], Kudo (1986) [12], and Ward and Whipple (1992) [19] were consulted. A qualitative assessment of the plankton sample was conducted. Fish sampling was done randomly during the different months of study i.e (March to Dec 2025) from six ponds of different villages. Identification of fishes was done with the help of standard literature by from Day (1875-1878) [7], Johal and Tandon (1979, 1980) [10,11], Talwar and Jhingran (1991) [18], and Jayaram (2010) [9].

Results and Discussion
The present study revealed that out of six ponds, a total of 41 planktons has been identified comprising of 22 phytoplanktons and 19 zooplanktons each. Phytoplankton population were composed and identified under four classes namely Bacillariophyceae, Cyanophyceae, Chlorophyceae and Euglenophyceae. In this investigation it was observed that the dominant group of phytoplankton was Bacillariophyceae followed by Cyanophyceae, Chlorophyceae and Eugelnophyceae. During the period of investigation 11 genera belonging to Bacillariophyceae were identified from ponds but it was more dominant in P1 pond.
This was followed by dominant groups Cyanophyceae which includes 8 genera like *Gloeocapsa* sp., *Microcystis* sp, *Merismopaedia* sp., *Spirulina* sp., *Anabaena* sp., *Oscillatoria* sp., *Chlorochoccous* sp. abundantly occurred in all six ponds. Chlorophyceae consist mainly of *Chlorella* sp. and *Rhizoclonium* sp. and Eugelnophyceae dominated by *Euglena* sp. only. Our results are in conformity with the researchers who reported dominance of Bacillariophyceae. Similar results have been observed by Akhter and Brraich (2020) [1].

Table 1: Abundance of planktons in ponds of Ropar during March to Dec 2025

S.No.	Planktons	P1	P2	P3	P4	P5	P6
	Phytoplanktons						
	Bacillariophyceae						
1.	*Fragilaria sp.*	+	+	++	-	-	+
2.	*Synedra spp.*	++	+	++	-	++	+
3.	*Tabellaria sp.*	++	+	++	-	-	-
4.	*Diatoma spp.*	+	+	++	+	-	++
5.	*Navicula spp.*	+	-	-	+	-	++
6.	*Cymbella spp.*	+++	++	+	+	+	-
7.	*Gomphonema sp.*	+++	++	+	+	-	-
8.	*Eucocconeis sp.*	++	+	-	-	-	-
9.	*Rhopalodia sp.*	++	+	+	+	-	-
10.	*Cyclotella sp.*	+++	++	+	+	+	-
11.	*Cocconeis sp.*	+++	++	+	+	-	-
	Cyanophyceae						
12.	*Gloeocapsa sp.*	++	++	++	+	+	++
13.	*Microcystis sp.*	++	++	++	+	+	++
14.	*Merismopaedia sp.*	++	++	++	+	+	++
15.	*Spirulina sp.*	++	+++	++	+	+	+++
16.	*Nostoc sp.*	++	+++	++	+	+	+++
17.	*Anabaena sp.*	++	+++	++	+	+	+++
18.	*Oscillatoria sp.*	++	+++	++	+	+	+++
19.	*Chlorochoccous sp.*	++	+++	++	+	+	+++
	Chlorophyceae						
20.	*Chlorella sp.*	++	+	+	++	++	-
21.	*Rhizoclonium sp.*	++	++	++	-	-	-
	Euglenophyceae						
22.	*Euglena sp.*	+	++	++	+	-	+
	Zooplanktons						
	Rotifera						
23.	*Asplanchna sp.*	+++	++	+	+	+	-
24.	*Brachionus spp.*	+++	++	+	+	-	-
25.	*Lecane spp.*	+	+	-	-	-	-
26.	*Ascomorphella sp.*	+	+	+	+	-	-
27.	*Euchlanis sp.*	+++	++	+	+	+	-
28.	*Plationus sp.*	+++	++	+	+	-	-
29.	*Filinia sp.*	+	+	+	-	-	-
30.	*Monostyla spp.*	+	-	+	-	-	+
31.	*Keratella spp.*	+	++	++	-	++	+
32.	*Hexartha sp.*	+	++	++	-	-	-
33.	*Polartha sp.*	+	++	++	+	-	++
34.	*Ploesoma spp.*	+	+	+	+	-	-
35.	*Colurella sp.*	+++	++	+	+	+	-
	Crustacea						
36.	*Daphnia spp.*	++	+++	++	-	+	-
37.	*Cypris spp.*	++	++	-	-	+	+
	Insecta						
38.	*Ranatra spp.*	++	+	+++	++	+	-
39.	*Notonecta spp.*	+	++	++	+	+	++
	Protozoans						
40.	*Paramecium spp.*	+	++	++	+	-	+
41.	*Phacus sp.*	+	+	+++	+	-	+

+ - Low dominant; ++ - Moderately dominant; +++- Highly dominant

Zooplanktons recorded in the present investigation were Rotifera, Crustacea, Insecta, Protozoans. Zooplanktons particularly rotifers occupied major portion of all six ponds. In the present work, the rotifers occurred in all six ponds have been found to be *Asplanchna* sp., *Brachionus* spp., *Lecane* spp., *Ascomorphella* sp. *Plationus* sp., *Euchlanis* sp., *Filinia* sp., *Monostyla* spp., *Keratella* spp., *Hexartha* sp., *Polartha* sp., *Ploesoma* spp., *Colurella* sp. followed by Protozoans which includes *Paramecium* spp. and *Phacus* sp. and Crustacea consisting of *Daphnia* spp. and *Cypris* spp. In the Insecta was reported *Ranatra* spp. and *Notonecta* spp. The abundance of species was clearly noticed in Table-1. Our results are in coherence with Ankathi and Piska (2009) [2]; Negi and Negi (2010) [13]; Brraich and Kaur (2015) [4]; Panwar and Malik (2016) [14]; Brraich and Akhter (2019) [5].

Table 2: List of various fish species collected from ponds of Ropar, Punjab (India) during the study period March to Dec 2025

S.No.	Order	Family	Genus/Species
1.	Perciformes	Channidae	*Channa punctatus* (Bloch)
2.	Cypriniformes	Cyprinidae	*Puntius sarana* (Hamilton)
			Puntius sophore (Hamilton)
			Labeo rohita (Hamilton)
			Labeo catla (Hamilton)
			Cyprinus carpio Linnaeus

A total of six fish species have been observed in different ponds of Ropar belonging to order Cypriniformes and Perciformes. Cypriniformes has been found to be dominant with 5 genera all belonging to a single family i.e. Cyprinidae followed by Perciformes represented by only one genus belonging to family Channidae (Table 2). The dominance of Cypriniformes have also observed by Pervez and Pal (2024) [16]; Aske (2025) [3]; Chilke (2025) [6].

Conclusion

Biodiversity contributes both directly and indirectly to human and losses in biodiversity and change in ecosystem service have adversely affected the well-being. The present study is relevant to fish and plankton biodiversity and this study will be helpful in making management strategies and conservation of biodiversity in the future.

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