



Science

STUDY ON DIVERSITY OF AQUATIC INSECTS IN RAMAUA RESERVOIR OF GWALIOR DISTRICT (M. P.)

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Abstract

Aquatic insects are those which live a part of their life cycle in water. In addition to their significant ecosystem function aquatic insects are also a primary source of food for fishes and amphibians. Inland wetlands of India serve as the habitat for more than 500 species of aquatic insects which are mainly from Ephemeroptera, Odonta and Trichoptera. The study was conducted during early hours of the day from August, 2019 to November 2019. Three sites were selected for the study i.e. vegetation site, agricultural site and disturbed vegetation site. The checklist of recorded aquatic insects is shown with their taxa, order, family and scientific name and common name. Total 24 species of aquatic insects were found in three different sites. The study of population of insects in different sites revealed the fact that the population of aquatic insects was governed by abiotic and biotic factors.

Keywords: Diversity; Aquatic Insects; Environment; Habitat; Ramaua Reservoir.

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1. Introduction

Insects are the most diverse group of organisms in freshwater. Aquatic insects are those which live a part of their life cycle in water. There are about 45000 species of insects, known to inhabit diverse freshwater ecosystems. Less than 3% of all species of insects have aquatic stages in some freshwater biotopes, insects may comprise over 95% of the total individual or species of macro invertebrates. They play important ecological roles in keeping freshwater ecosystems functioning properly (Choudhary and Janak, 2015).

Different functional feeding groups of aquatic insects such as shredders, scrapers, filter feeders and predators are important links in nutrient recycling. Aquatic insects primarily process wood and leaf litter reaching the wetland from the surrounding landscape. Nutrients processed by aquatic insects are further degraded into absorbable form by fungal and bacterial action. Plants in the riparian zone absorb this nutrient soup transported through the wetlands. In addition to this

significant ecosystem function, aquatic insects are also a primary source of food for fishes and amphibians (Tachet et al., 2003).

The origin of aquatic insects has been controversial and doubts still exist as to whether or not insects are primarily or secondarily adopted to aquatic environment. Widely accepted view is that the ancestor of Myriapod-insect group (millipedes, centipedes and insects) lived in leaf litter areas along margins of pond like environment Primitive insects of this moist environment were ancestors of aquatic insects. Their fossil record extends to Devonian in the Paleozoic era. Among extend aquatic insects, dragonflies (Odonata) and mayflies (Ephemeroptera) are the most primitive and only insects with aquatic juveniles. The understanding of aquatic insect evolution and phylogeny has been hampered by poor fossil record of freshwater animals. Aquatic insects are capable of withstanding a harsh and severe environment and can live in any climatic conditions (Polhemus, 1979). Through their feeding strategies, aquatic insects enhance the nutrient cycling of the river and also support communities of higher organisms like fish, frog and others (Kumar, 2014).

India is rich in biodiversity and possesses about 108276 species of insects. Indian subcontinent is one of the mega biodiversity countries of the world occupying ninth position in terms of freshwater mega biodiversity (Mittermeier et al., 1997). Inland wetlands of India serve as the habitat for more than 500 species of aquatic insects which are represented predominantly by Ephemeroptera (mayflies), Odonata (dragonflies) and Trichoptera (caddisflies), (Subramanian and Sivaramakrishnan, 2007). In the present study on aquatic insect diversity in Gwalior has been assessed.

2. Study Area

Ramaua Dam is situated in the Eastern side of Gwalior city of the state Madhya Pradesh, India. Located along the geological coordinates $78^{\circ} 10' 58.1916''$ E and $26^{\circ} 13' 5.8332''$ N near the Ramaua village .The dam is surrounded by hilly area .The river attached with it is the Morar river .The area of this dam is about 3177 hectare , from which 4400 hectare is used for the cultivation of kharif crops, while remaining is used for the cultivation of rabi crops .the low reservoir level (214.88 M) and the full reservoir level is (225.55 M) .the difference between the two 10.06 M and the maximum water level capacity is about 226.77 M and the dead store water capacity is 0.141 cubic meter (Figure 1).

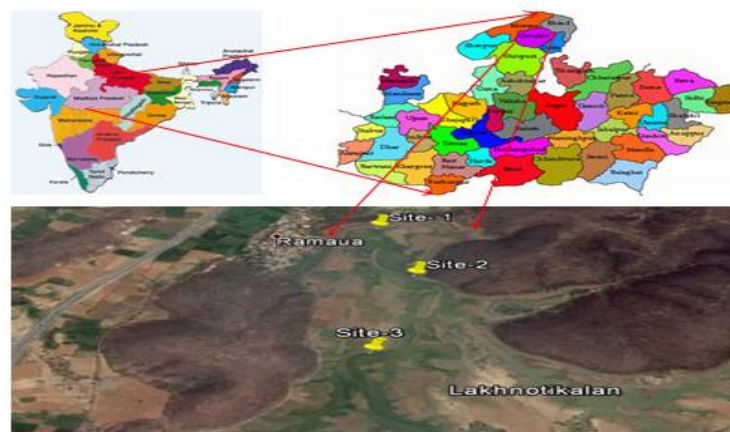


Figure 1: Showing the Location sites in Ramaua Dam at Gwalior

3. Methodology

The study was conducted during the early hours of the day from September, 2019 to November, 2019. Three sites were selected for the study i.e. vegetation site, agricultural site and disturbed vegetation site. A length of 100m reach was considered as a unit and the aquatic entamofauna were sampled using kick net which are of 500µm mesh size. The dip net was placed in between every site for collection. One meter above stream bottom substrates was kicked to dislodge invertebrates clinging to debris and stones into the kick net. The contents were emptied into the tray and invertebrates were collected. The kick net was employed to trap specimens clinging to vegetation, root mats etc., along the boundary (Merit and Cummins, 1988). The collected specimens were preserved in jars containing formalin. They were identified with the help of experts at the department.

4. Result and Discussion

The Checklist of recorded aquatic insects is shown with their taxa, order, family and scientific name and common name given in table 1. During the present study a total of 24 species of aquatic insects belonging to 6 orders and 18 families have been recorded from the three sampling sites of the study area. The majority of the aquatic insect species (17 in number) were recorded from the site 1 of the water body where there was the presence of majority of macrophytes. From the sites 2 and 3 a total of 11 and 15 species were recorded respectively (Table 2). Occurrence of diverse insect species in relation to luxuriant aquatic vegetation on account of shelter, breeding sites and food which has also been recorded at site 1.

During the study period it is find out that at site 1 highest total no of species individual 105 were recorded while at site 2 and 3 total number of individual 64 and 68 recorded respectively. Hydrophilidae beetles inhabit the shallower regions of water bodies with abundant macrophytes and feed usually on detritus, algae and decaying vegetative matter (Khan and Ghosh, 2001). Choudhary and Janakahi (2015) reported 12 species of aquatic insects from Lakhabanjara Lake, Sagar. Sharma et al., (2010) reported 12 species of aquatic insects from Kishanpura Lake, Indore. Similar observations have been reported by (Venkateswarju, 1969) from Moosi River Hyderabad. The sites 2 and 3 were disturbed by anthropogenic activities due to which the diversity of insects was low at these sites. Hepp et al., (2013) reported that destruction of habitat and water chemistry can lead to the reduced diversity of aquatic macro invertebrates.

Family wise recorded species from study area given in table 4, and family wise percentage of species recorded shown in fig. 1. Coenagrionidaes family is show the highest percentage with three species rest of family show the lowest percentage respectively. Overall species diversity revealed that the insects from the order Hemiptera were the most dominant and that of Lepidoptera were the least dominant in the water body. The percentage of insect species from various families reported. Aquatic insect taxa from orders Lepidoptera and Ephemeoptera were very low in diversity contributing only 5 and 9 %, however the taxa from orders Hemiptera and Diptera were found dominant throughout the study period with a percentage composition of 38 % and 24 % respectively.

Table 1: Checklist of aquatic insect recorded from study area during study period

S. No.	Order	Family	Scientific name	Common name	
1	Coleoptera	Hydrophilidae	<i>Tropisternus lateralis</i>	Hydrophilid beetle	
2		Notoridae	<i>Hydrocanthus sp.</i>	Burrowing water beetle	
3	Hemiptera	Belostomidae	<i>Diplonychus indicus</i>	Water bug	
4			<i>Lethocerus indicus</i>	Giant water bug	
5		Corixidae	<i>Sigara alternata</i>	Water boatman	
6		Nepiidae	<i>Nepa sp.</i>	Water scorpion	
7			<i>Ranatra sp.</i>	Water stick insects	
8		Vellidae	<i>Microvelia sp.</i>	Common pond skater	
9		Naucoridae	<i>Pelocoris sp.</i>	Creeping water bugs	
10		Notonectidae	<i>Notolecta undulate</i>	Grouse winged back swimmer	
11		Diptera	Syrphidae	<i>Eristalis sp.</i>	Rat tailed maggots
12			Chironomidae	<i>Diamesinae sp.</i>	Non-biting midges
13	<i>Chironomus sp.</i>			Blood worm	
14	Ephidridae		<i>Brachydeutera sp.</i>	Shore flies	
15			<i>Ephydra sp.</i>	Brine flies	
16		Psychodidae	<i>Telmatoscopus sp.</i>	Lake flies	
17		Stratiomyidae	<i>Euparyphus sp.</i>	Soldier flies	
18	Odonata	Coenagrionidae	<i>Ischnura sp.</i>	Blue tailed damsel fly	
19			<i>Enallagma</i>	Bluets	
20			<i>Ischnura aurora</i>	Golden dartlet	
21		Petaluridae	<i>Tachopteryx</i>	Damsel flies	
22	Lepidoptera	Pyralidae	<i>Ostrinia sp.</i>	Aquatic moth	
23	Ephemeroptera	Leptophlebiidae	<i>Leptophlebia</i>	Black and blue quills	
24		Siphonuridae	<i>Ameletus</i>	Brown dun	

Table 2: Presence of aquatic insect at different selected sites

S. No.	Common name	Site 1 Rich Vegetation	Site 2 Agricultural	Site 3 Disturbed
1	<i>Tropisternus lateralis</i>	+	-	-
2	<i>Hydrocanthus sp.</i>	+	-	-
3	<i>Diplonychus indicus</i>	-	-	+
4	<i>Lethocerus indicus</i>	+	+	+
5	<i>Sigara alternata</i>	+	-	+
6	<i>Nepa sp.</i>	+	+	+
7	<i>Ranatra sp.</i>	+	+	+
8	<i>Microvelia sp.</i>	+	-	-
9	<i>Pelocoris sp.</i>	-	-	+
10	<i>Notolecta undulate</i>	+	-	-
11	<i>Eristalis sp.</i>	-	+	+
12	<i>Diamesinae sp.</i>	+	+	+

13	<i>Chironomus sp.</i>	+	+	+
14	<i>Brachydeutera sp.</i>	+	-	-
15	<i>Ephydra sp.</i>	+	-	-
16	<i>Telmatoscopus sp.</i>	-	-	+
17	<i>Euparyphus sp.</i>	+	-	+
18	<i>Ischnura sp.</i>	+	-	+
19	<i>Enallagma</i>	-	+	+
20	<i>Ischnuraaurora</i>	+	+	-
21	<i>Tachopteryx</i>	+	+	+
22	<i>Ostrinia sp.</i>	-	+	-
23	<i>Leptophlebia</i>	+	+	-
24	<i>Ameletus</i>	-	-	+
Total		17	11	15

Table 3: Abundance of recorded species at selected sites

S. No.	Common name	Site 1 Vegetation rich	Site 2 Agricultural site	Site 3 Disturbed site
1	<i>Tropisternus lateralis</i>	3	0	0
2	<i>Hydrocanthus sp.</i>	5	0	0
3	<i>Diplonychus indicus</i>	0	0	2
4	<i>Lethocerus indicus</i>	8	6	4
5	<i>Sigara alternata</i>	7	0	2
6	<i>Nepa sp.</i>	5	5	4
7	<i>Ranatra sp.</i>	4	3	4
8	<i>Microvelia sp.</i>	1	0	0
9	<i>Pelocoris sp.</i>	0	0	5
10	<i>Notolecta undulate</i>	3	0	0
11	<i>Eristalis sp.</i>	0	5	5
12	<i>Diamesinae sp.</i>	3	1	2
13	<i>Chironomus sp.</i>	1	3	1
14	<i>Brachydeutera sp.</i>	5	0	0
15	<i>Ephydra sp.</i>	6	0	0
16	<i>Telmatoscopus sp.</i>	0	0	3
17	<i>Euparyphus sp.</i>	5	0	3
18	<i>Ischnura sp.</i>	10	0	5
19	<i>Enallagma</i>	0	7	13
20	<i>Ischnuraaurora</i>	14	0	0
21	<i>Tachopteryx</i>	10	7	10
22	<i>Ostrinia sp.</i>	0	8	0
23	<i>Leptophlebia</i>	15	12	0
24	<i>Ameletus</i>	0	7	5
Total		105	64	68

Table 4: Family wise recorded species in study area

S. No.	Name of family	Total No. of recorded species
1	Hydrophilidae	1
2	Notoridae	1
3	Belostomidae	2
4	Corixidae	1
5	Nepiidae	2
6	Vellidae	1
7	Naucoridae	1
8	Notonectidae	1
9	Syrphidae	1
10	Chironomidae	2
11	Ephidridae	2
12	Psychodidae	1
13	Stratiomyidae	1
14	Coenagrionidae	3
15	Petaluridae	1
16	Pyralidae	1
17	Leptophlebiidae	1
18	Siphonuridae	1

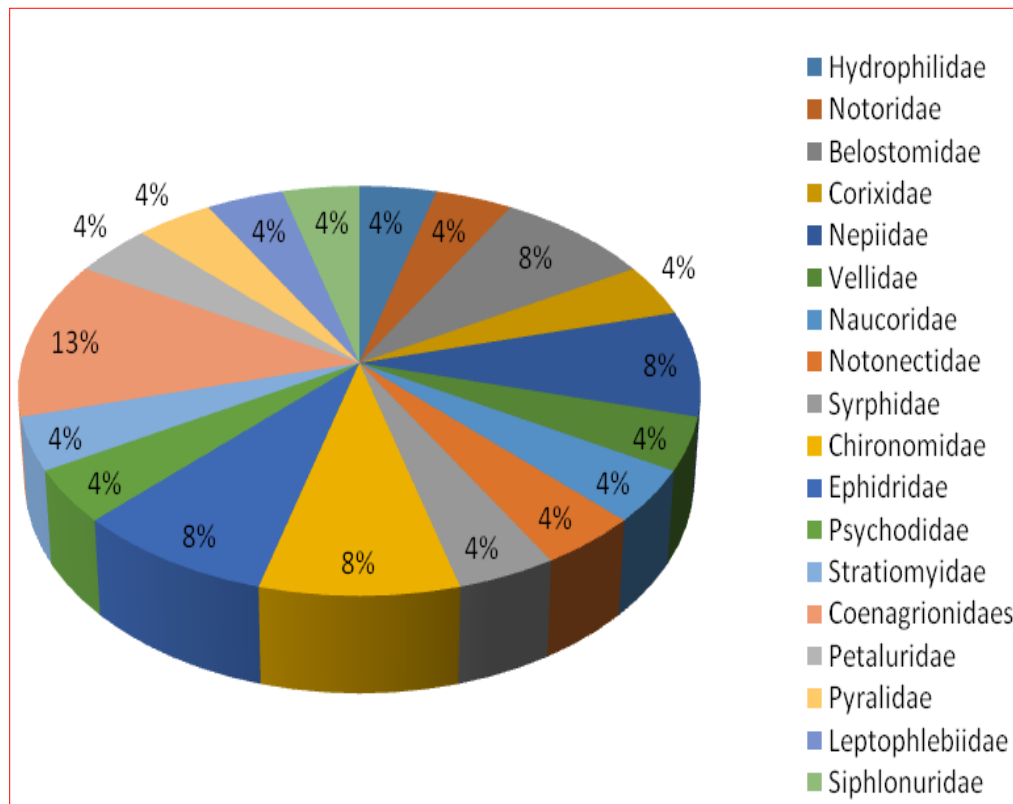


Figure 1: Percentage of species of insect families in Ramaua Reservoir

5. Conclusion

This study documents the composition of aquatic insect communities in different sites studied. It shows the effect of natural and manmade interferences on the diversity of aquatic insects. Aquatic insects are probably best known for their ability to indicate the water quality in a particular environment. If a sample of the aquatic insects in a particular place is analyzed, in terms of sensitive kind versus tolerant kinds one can get a good measure of the environmental health.

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