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DIVERSITY OF WATER BUGS IN GUJRWANWALA DISTRICT, PUNJAB, PAKISTAN

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ABSTRACT

Water bugs fall under the order Hemiptera, suborder Heteroptera, which is further divided into two types, i.e., semi-aquatic (Gerromorpha) and true water bugs (Nepomorpha). They play a vital role as biological control agents and also a source of food for fishes, birds and other aquatic organisms. The present work was carried out to ascertain aquatic Hemiptera in different lentic and lotic water bodies of various sizes in Gujranwala district, Pakistan. A total of 10 species belonging to five families were identified. Species include *Nepa ruber* Linnaeus, *Laccotrephes elongatus* Montandon, *Ranatra filiformis* Fabricius (Nepidae), *Corixa substriata* Uhler, *Micronecta proba* Distant, *Micronecta thyesta* Distant (Corixidae), *Lethocerus indicus* Lepeletier, *Diplonychus rusticus* Fabricius (Belostomatidae), *Ambrysus* sp. (Naucoridae) and *Anisops sardea* Herrich-Schaffer (Notonectidae). A key at genera and species level was developed to help the future researchers.

Keywords: Aquatic insect, diversity, lentic, lotic, water bodies

INTRODUCTION

Aquatic insects are a rich and diverse group of Class Insecta in the world and dwell in a variety of water ecosystems during greater part of their life period (Zborowski and Storey, 1995). They play a significant role in the ecosystem having different status in their respective trophic levels as herbivores, predators, scavengers, parasitoids, pollinators and biological control mediary against disease-carrying mosquitoes (Mohanraj et al., 2012; Irshad and Stephen, 2014; Irshad, 2015). Hemipterans are extremely significant as food source for many wild and cultivable fishes, amphibians, waterfowls and other aquatic organisms (Clark, 1992; Yen and Butcher, 1997; Blaustein, 1998; Fernández and López, 2006; Ohba and Nakasuji, 2006;

Lekprayoon et al., 2007; Saha et al., 2007; Choudhury and Susmita, 2015). Some species of Hemipteran are used as food source in China, Colombia and Thailand (Hanboonsong et al., 2000). They are also used as a bio-indicator to determine the variations in the quality of water due to toxins because of their capability to react rapidly to such variations (Papacek and Zettel, 2000; Andersen and Weir, 2004; Arimoro and Ikomi, 2009; Trisal, et al., 2009; Das and Gupta, 2010; LiLi et al., 2010; Das and Gupta, 2011).

Heteroptera is a diverse group of insects that has a wide range of habitats like terrestrial, aquatic and semi aquatic. Aquatic Heteroptera can be found from marine and intertidal to arctic and high alpine with an altitudinal range of 0–4,700m across the world excluding Antarctica (Vianna and de

Melo, 2003). They are extremely abundant in the tropic regions. Species richness is greatest in the Oriental (1289 species) and Neotropical regions (1103 species), whereas lowest in the Afro-tropical (799 species), Australasian (654 species), Palearctic (496 species), Nearctic (424 species) and Pacific (37 species) regions (Polhemus and Polhemus, 2008).

Heteroptera is further divided into three aquatic infraorders, i.e., Nepomorpha, Gerromorpha and Leptopodomorpha. Presently, these three infraorders comprise of 23 families, 343 genera and 4,810 species. Among them, 20 families, 326 genera and 4,656 species are freshwater inhabitants (Polhemus and Polhemus, 2008). Nepomorpha, are true water bugs with dwellings predominantly underneath the water surface whereas Gerromorpha are semiaquatic and predominantly dwell on water surface (Chen et al., 2006).

The main families of Heteroptera include Corixidae (boatman), Notonectidae (back swimmers) and Nepidae (water scorpions), Belostomatidae (giant electric light bugs), Gelastocoridae (toad bug), Saldidae (shore bugs), various surface walkers and a few others. The bugs are hemi-metabolus insects consisting of egg, larvae or nymph and adult stages (Andersen and Weir, 2004.) The members of order Hemiptera have forewings which are hemelytra1 and membranous (Devi, 2013).

Limited work has been done on identification of aquatic Hemiptera of Gujranwala district, Punjab, Pakistan. This study was conducted to increase knowledge on the taxonomy of water bugs in different lentic and lotic water bodies of various sizes in Gujranwala district.

MATERIALS AND METHODS

A study survey was conducted in different lentic and lotic water bodies at Gujranwala district (32°9'N, 74°11'E),

Punjab, Pakistan. The insects were collected by using long-handled water net of 1 mm mesh size and preserved in plastic bottles containing 70% ethanol for further laboratory identification. The specimens were also mounted on small pieces of paper and kept in the museum. The insects were identified up to the species level with the aid of keys of Distant (1903, 1906 and 1911), Metacalf and Flint (1939) and Richards and Davies (1988).

RESULTS AND DISCUSSION

A total of 10 species belonging to 8 genera and 5 families from the suborder Heteroptera were recorded in the present study. Family Nepidae and Corixidae represented three species each, followed by two species of Belostomatidae, while Naucoridae and Notonectidae contained one species each (Table 1). The standard work, the fauna of British India series on bugs by Distant (1902, 1903, 1906, 1907, 1911, 1916, 1918) has become antique. In Pakistan, some efforts were made to study the aquatic Hemiptera and Coleoptera during the past 50 years by various researchers like Khatoon and Ali (1975, 1976, 1977, 1978), Tomaszewska (1999), Rafi et al. (2010) and Fazal et al. (2012). The information gathered from their studies is scant. Most of the researchers could identify few species, leaving a number of species as undetermined. This study considerably contributed in the taxonomy of water bugs in Gujranwala district but further detailed studies are required to carry out continuous censuses to monitor the Hemiptera in all water bodies of the district. The details of specimens are given below;

A. Family Corixidae

a. Genus *Corixa* Geoffr.

i. *Corixa substriata* Uhler

Table 1: List of Aquatic Insects recorded from Lentic and Lotic water bodies of district Gujranwala.

Family	Genus	Species
Nepidae Latreille, 1802	<i>Nepa</i> Linnaeus	<i>Nepa ruber</i> Linnaeus
	<i>Laccotrephes</i> Montandon, 1907	<i>Laccotrephes elongatus</i> Montandon
	<i>Ranatra</i> Fabricius 1790	<i>Ranatra filiformis</i> Fabricius
Corixidae Leach, 1815	<i>Corixa</i> Geoffroy, 1762	<i>Corixa substriata</i> Uhler
	<i>Micronecta</i> Kirkaldy, 1897	<i>Micronecta proba</i> Distant
		<i>Micronecta thyesta</i> Distant
Naucoridae Leach, 1815	<i>Ambrysus</i> Stal, 1862	<i>Ambrysus</i> sp.
Notonectidae Latreille, 1802	<i>Anisops</i> Spinola, 1837	<i>Anisops sardeus</i> Herrich-Shaffer
Belostomatidae Leach, 1815	<i>Lethocerus</i> Mayr, 1853	<i>Lethocerus indicus</i> Lepeletier & Serville
	<i>Diplonychus</i> Laporte, 1833	<i>Diplonychus rusticus</i> Fabricius

Diagnostic Characters: Body length was 5.82 mm. Body colour was brown, clear brownish on head and beneath, head was moderately blunt, face was moderately convex with hair below. Pronotum was dark brown, moderately short and triangularly rounded behind. Pronotum crossed by seven somewhat curved slender lines. Embolium was terminated by an aggregation of blackish marks, legs pale with a testaceous fringe of posterior tarsi.

Habitat: It was found inhabiting stagnant areas of rivers and streams, also found in ponds and pools.

Locality: It was collected from small water bodies of flood area of river Chenab and paddy fields.

b. Genus *Micronecta* Kirk.

i. *Micronecta proba* Distant

Diagnostic Characters: Body length was 4 mm, head was brownish-yellow while pronotum, scutellum and elytra were dark olivaceous-brown. Anterior margins of clavus, posterior margins of the pronotum and lateral margins of elytra were brownish-yellow. Head was almost twice as broad at between eyes as medial length, shorter than pronotum with a more or less distinct central longitudinal ridge. The elytra had four

obscure darker longitudinal fasciated lines and a longitudinal broken piceous line near the middle. The posterior tarsi were streaked with piceous.

Habitat: It was found in ponds and stagnant water bodies of rivers, streams and channels.

Locality: Ponds in Gujranwala city and Qadirabad Head Works and small water bodies in the floor Plain of Chenab River.

ii. *Micronecta thyesta* Distant

Diagnostic Characters: Body length was 2.88 mm. Elytra with a more or less distinctly continuous piceous line.

Habitat: It was found in stagnant areas of rivers, streams and also found in ponds.

Locality: Ponds in Ali Pur Chattha and Qadirabad areas.

B. Family Naucoridae

a. Genus *Ambrysus* Stal.

i. *Ambrysus* sp.

Diagnostic Characters: Body length was 21.3 mm. Abdomen was triangular, body was spindle-shaped and yellowish-brown in colour, fore legs modified for grasping; middle and hind tarsi bearing swimming hair with two distinct claws. Middle and hind tibiae had spines. Rostrum 3 segmented;

fertilization internal, produce relatively few offspring but parental protection enhances the survival of the off springs. Female glues her eggs to the back of the male who carries them for days, frequently fanning water over them, which helps keep the eggs moist, aerated and free of parasites.

Habitat: It was found inhabiting weed beds in still water and in stagnant water bodies of rivers and streams.

Locality: Lower Chenab canal near Ali Pur Chattha and Dhrindian.

C. Family Nepidae

a. Genus *Nepa* Linn.

i. *Nepa ruber* Linn

Diagnostic Characters: Body length was 52.33 mm; excluding the abdominal appendages, the body length was 25.7 mm. Body colour was brown. The abdomen was reddish from above and ochraceous, apical appendages of abdomen were slightly longer than the body. Usually, the abdomen has a central longitudinal fuliginous fascia, the apex is brownish-ochraceous and hemelytra were sub-parallel.

Habitat: It was found in vegetation in still water and slow running water.

Locality: Small distributary of Lower Chenab Canal near Manchar Chattha, and from Palkhoo Nala near Wazirabad.

b. *Laccotrephes* Montandon

i. *Laccotrephes elongates* Montandon

Diagnostic Characters: Body length was 28.1 mm with appendages. Body colour was brown. The head had a longitudinal carina. Somewhat projecting small eyes with much enlarged inter-ocular space. Pronotum as long as it was broad, scutellum was longer than broad at base. Apical appendages of abdomen were shorter than the body. Intermediate tibiae were much shorter than their femora.

Habitat: It is usually found among the vegetation in still, slow running water and also in stagnant water.

Locality: Ali Pur Chattha, Rasul Nagar ponds and small distributary of Lower Chenab Canal near Ali Pur Chattha.

c. Genus *Ranatra* Fabr.

i. *Ranatra filiformis* Fabr.

Diagnostic Characters: Body length was 42.2 mm, excluding abdominal appendages the size was 22.1 mm. Head and anterior area of pronotum was pale castaneous; posterior area of sternum, legs and abdominal appendages were pale ochraceous with a central longitudinal fuscous linear fascia; eyes very prominent; intermediate and posterior legs obscurely annulate.

Habitat: It was found inhabiting bottom of ponds, tanks and in slow running water.

Locality: Qadirabad Barrage and Palkhoo Nala near Wazirabad bypass.

D. Family Notonectidae

a. Genus *Anisops* Spin.

i. *Anisops sardeus* Herr.

Diagnostic Characters: Body length was 6.3 mm, colour was white, eyes were black, and hemelytra was greyish white. Males had a long triangular, obtuse apically-pointed cephalic projection, which was absent in females. A distinct foveate impression near each basal angle of the scutellum in both sexes, the inter-ocular space was very narrow at base.

Habitat: It was found inhabiting still water.

Locality: Ponds in Gujranwala near bypass, Dhrindian and Qadirabad Head Works.

E. Family Belostomatidae

a. Genus *Lethocerus*

i. *Lethocerus indicus*

Diagnostic Characters: Body length was 25-80 mm. Large and flattened bugs with large raptorial frontal legs; antennae tiny and

buried beneath the head; flattened mid and hind legs with fringed swimming hair; two to three segmented tarsi and tip of abdomen with a couple of flat, retractile respiratory setup.

Habitat: They are found in both lentic and slow flowing water and stick to the plants near to the water.

Locality: In fish farms near Qadirabad Barrage.

b. Genus *Diplonychus*

i. *Diplonychus rusticus*

Diagnostic Characters: Smaller in size, body was oval in shape and length was 20-21 mm, appearing more rounded, lateral sides of hemelytra were externally arcuate; inner borders of eyes were anteriorly convergent. Body colour was moderately brown with lateral boundaries of pronotum and hemelytra divergent paler brown. Frontal tarsal claws were very small; narrow line of ventro- lateral hair on the abdomen. The female glues eggs on the back of male that remain there till hatching.

Habitat: They were found in lentic water bodies.

Locality: In fish farms near Qadirabad Barrage and Ali Pur Chattha.

CONCLUSION

In this study, the researchers presented biodiversity of the aquatic Hemiptera (10 species of five families) in different lentic and lotic water bodies of Gujranwala district, Pakistan. The present study offers baseline information for functioning of food chain in an aquatic ecosystem.

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