

# A RECORD OF AQUATIC HEMIPTERA OF GHARANA WETLAND, JAMMU

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## KEY WORDS

Gharana wetland  
Hemiptera  
*Sphaerodema*  
*annulatum*

## Received on :

26.07.2011

## Accepted on :

27.10.2011

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## ABSTRACT

The present study was aimed to record the commonly occurring aquatic Hemiptera of Gharana wetland. Specimens were collected from September, 2008 to August, 2009. A total of 14 species of order Hemiptera belonging to nine families viz. Corixidae, Belostomatidae, Nepidae, Notonectidae, Hydrometridae, Pleidae, Mesovelidae, Vellidae and Gerridae have been recorded in the present investigation. Families Nepidae and Corixidae represent the highest number of species (three species). *Sphaerodema annulatum* (Belostomatidae) was reported for the first time from Jammu.

## INTRODUCTION

Aquatic insects are important members of aquatic ecosystems. They play an important role in nutrient cycling of the ecosystem and also serve as reliable indicators of ecological characteristics of water. They are most frequently used in biomonitoring studies because the responses of macroinvertebrates to organic and inorganic pollution have been extensively documented (Thorne and Williams, 1997). Only a few insects (3-5%) have adapted successfully to the aquatic environment (Daly *et al.*, 1997). Aquatic insects belonging to order Hemiptera are important as fish food, bioindicators, predators and biocontrol agents. They are important food for many organisms including fish, amphibians, waterfowl and other animals (Clark, 1992). Certain families of the bugs may be utilised in the biological control of mosquito larvae (Saha *et al.*, 2007). Hemiptera, commonly known as bugs are characterised by the presence of a piercing and sucking beak like structure formed by the modification of the mouth parts, leathery anterior pair of wings at the base and membranous at apical region and completely membranous second pair. In recent years, there have been a number of limnological investigations on the various wet lands of Jammu which includes the work of Malhotra *et al.* (1990); Salaria (1992); Sharma *et al.* (1996); Thakur (2003); Ayri (2007) but little work has been done on the aquatic insects of Gharana Wetland, Jammu. So the study carried out with the objective to identify the commonly occurring aquatic bugs present in this important wetland with some ecological and biological notes.

## MATERIALS AND METHODS

## Study area

The study site is one of the important wetlands of Jammu region. It is situated at Indo- Pak international border in Ranbir Singh Pura Sector, Jammu and is about 35 km South of Jammu city. The wetland is located at 70°7" N L and 32°34" S L. The wetland is a naturally maintained swamp surrounded by various macrophytes like *Eicchornia* sp., *Hydrilla* sp. and is rain fed. The bottom surface comprises loamy clay with decaying vegetation.

During the course of study extending from September, 2008 to August, 2009 swimming insects were collected at monthly interval with the help of a circular net with a long handle of the area 314 cm<sup>2</sup> and with a mesh size of 1mm and by kitchen sieve of area 1256 cm<sup>2</sup> with a mesh size of 1mm from the littoral zone of the studied habitat. Insects thus collected were sorted and preserved in 70% alcohol and in case of dry preservation, after washing, specimens were stretched, pinned and dried in oven at 30°C. Smaller specimens were glued on the paper points on an entomological pin. The preserved specimens in the collection were later get identified at Entomology Laboratory, IARI, New Delhi.

## RESULTS

A total of 14 species of aquatic bugs belonging to families Corixidae, Belostomatidae, Nepidae, Notonectidae, Hydrometridae, Pleidae, Mesovelidae, Vellidae and Gerridae. have been recorded in the present investigation are listed as under in Table 1.

## Systematic account

**Family: Corixidae****Biological and ecological notes**

Members of family Corixidae commonly called water boatman usually inhabit shallow waters. They seem to prefer undisturbed water and seldom occur in streams and if they do, they usually remain confined to the calm back waters. They are reported by various workers, to be found in a wide range of habitats, occurring in ponds of all sizes, the edges of tanks, rock pools, in river beds, water falls, marshes and paddy fields.

***Micronecta proba* Kirk. (Fig. 5)**

**Distribution:** Andra Pradesh (Deepa and Rao, 2007), Himachal Pradesh, Bihar, Orissa (Hafiz and Pradhan, 1947), Delhi, Karnataka, West Bengal (Jana *et al.*, 2009), Assam (Hazarika and Goswami, 2010), Rajasthan (Baid, 1968).

**Adult Description:** Total body length 3mm. Head pale yellow slightly broader than pronotum. Eyes prominent, brownish black covering most part of the head. Antennae small, three segmented not visible dorsally. Hemelytra well developed, irregularly dotted, covering entire abdomen. Legs pale yellow. Forelegs shorter than middle and hind legs, covered with hair and spines and ended in claws. Hind legs longer than both the fore and middle legs covered by dense hairs and spines and ending into claws. Abdomen pale yellow hidden below the hemelytra.

***Micronecta striata* Kirk. (Fig. 4)**

**Distribution:** Andra Pradesh (Deepa and Rao, 2007), J&K (Ayri, 2007). West Bengal (Jana *et al.*; 2009), Assam (Das and Gupta, 2010).

**Adult Description:** Total body length = 1.9mm. Head pale yellow, little broader than pronotum, anteriorly moderately produced. Eyes brownish black, large, prominent, touching the anterior border of pronotum. Antennae small, not visible dorsally, three segmented. Thorax much broader than long, Scutellum short, triangular, sharply pointed at apex. Hemelytra well developed, with black longitudinal lines, elongated, covering entire abdomen. Legs uniformly pale yellow. Fore legs very short, middle legs long with tibia shorter than femur. Tarsi three segmented, covered with rows of long thin hairs, terminating in a pair of short claws. Hind legs with femur and tibia almost equal in length. Tarsi covered with thin hair and claws short. Abdomen short, covered with hemelytra dorsally.

***Corixa hieroglyphica* Duf. (Fig. 11)**

**Distribution:** Andra Pradesh (Ramakrishna, 2000), Maharashtra (Paiva, 1918), Bihar (Hafiz and Ribeiro, 1939), J&K (Thakur, 2003), Orissa (Hafiz and Pradhan, 1947), Uttar Pradesh (Das and Bisht, 1979; Julka, 1977), West Bengal (Nandi *et al.*, 1993), Madhya Pradesh (Kaushik *et al.*, 1990).

**Adult Description:** Total body length = 5.4 mm. Head pale yellow, little broader than pronotum. Eyes black, large, triangular dorsally. Antennae very short, not visible dorsally, four segmented. Thorax short, with transverse black lines. Scutellum less exposed. Hemelytra well developed, elongated covering entire abdomen. Legs entirely pale, natatorial. Fore legs short, middle and hind long; middle femur long, slender; tarsi small; claws well developed. Hind femur thick short, tarsi

long, covered with rows of thin hair. Abdomen covered with hemelytra dorsally.

**Family: Belostomatidae****Biological and ecological notes**

Members of family Belostomatidae, commonly called giant water bugs, known particularly in America as electric light bugs because they frequently fly to electric lights and as they are fish devouring hence also called fish killers. Some are more than 4 inches long and largest of all the insects. These bugs feed upon a large variety of aquatic animals such as insects, snails, fish, tadpole, frogs, toads and any that they overcome. They are strong swimmers and nocturnal fliers and are a nuisance in light houses, aboard ships, residences etc. In genera *Belostoma* and *Diplonychus*, the female glues her eggs on the back of the males (Essig, 1941).

***Sphaerodema molestrum* Duf. (Fig. 1)**

**Distribution:** Andra Pradesh (Deepa and Rao, 2007), Assam (Hazarika and Goswami, 2010), Orissa (Hafiz and Pradhan, 1947), Madhya Pradesh (Kaushik *et al.*, 1990), Kerala (Latha and Thanga, 2010), Rajasthan (Baid, 1968), Jammu and Kashmir (Ayri, 2007), West Bengal (Jana *et al.*, 2009).

**Adult Description:** Total body length 17mm. Body pale, dull brownish medially. Head triangular, compressed; broadest at base, produced in front to form rostrum which is 3 segmented. Eyes prominent, present postero laterally. Antennae minute, 3 segmented, not visible dorsally. Pronotum broader than long, scutellum triangular, broader at base, pointed at apex. Hemelytra longer than broad, with oval shining spot beyond the middle of length at inner margin. Legs pale with dull spots; spines brownish. Forelegs shorter in length to middle and hind legs and are of raptorial type used in predation. Middle legs slender, longer in length; hairy and spiny clawed. Hind legs longer than middle one; claws two, curved but long and well developed. Abdomen gradually tapering towards apex.

***Sphaerodema annulatum* Fabr. (Fig. 2)**

**Distribution:** Tamilnadu (Rao, 1976); Assam (Das and Gupta, 2010); Andra Pradesh (Deepa and Rao, 2007); Bihar (Hafiz and Ribeiro, 1939); Orissa (Hafiz and Pradhan, 1947); Kerala (Latha and Thanga, 2010); Madhya Pradesh (Kaushik *et al.*, 1990).

**Adult Description:** Total body length 21mm. Body pale. Head triangular produced in front to form rostrum. Eyes prominent; present postero laterally. Antennae 3 segmented; not visible dorsally. Pronotum broader than long, scutellum triangular. Hemelytra pale yellow; longer than broad with shining spots all over. Legs pale with brownish spot and brownish spines on tibia and tarsus. Forelegs shorter than middle and hindlegs and of raptorial type. Middle legs slender; longer than forelegs; hairy with tibial and tarsal spines. Hindlegs longer than middle and forelegs; hairy and spiny with two curved claws. Abdomen tapering towards apex and covered all over by hairs.

**Family Nepidae****Biological and ecological notes**

Members of family Nepidae are carnivorous and are air breathers. Though most of the time they live in water but sometimes emerge out of water on the ground or under stones

in damp beds of recently dried streams. All legs are employed in swimming but they are not good swimmers. Fore legs are moved up and down and middle is used for kicking motion, each pair operates simultaneously as a unit. In crawling on objects under water, normal alterations of legs occur. Abdominal appendages thrust up to the surface as the insect crawls or move slowly. They feed on various types of small aquatic animals after capturing them with front raptorial legs. Water scorpions inflict painful bite when handled. Though they have well developed wings but they seldom fly. Eggs of genus *Laccotrephes* carry seven filaments at one end, whereas genus *Ranatra* has two. Eggs are usually attached by the female to various objects or inserted into crevices of various kinds of rotten wood or debris lying at the bottom of the water body. Sometimes the eggs may even be inserted into the tissue of aquatic plants. Some members of this family are known to stridulate by jerking back the forelegs, which results into the friction of coxae against the coxal cavities, a squeaking type of sound is produced by them (Essig, 1941).

#### ***Laccotrephes maculatus* Fabr. (Fig. 9)**

**Distribution:** Andra Pradesh (Deepa and Rao, 2007), Assam (Hazarika and Goswami, 2010), Orissa (Hafiz and Pradhan, 1947), Uttar Pradesh (Bisht and Das, 1985) Madhya Pradesh (Kaushik *et al.*, 1990), Tamiladu (Rao, 1976), Jammu and Kashmir (Ayri, 2007), West Bengal (Jana *et al.*, 2009).

**Adult description:** Total body length between 15-20 mm. Head small, triangular, broadest in the middle, produced in front forming rostrum. Eyes oval, prominent antero laterally present in the middle of head. Antennae not visible dorsally, placed ventrally near the inner edge of each eye; 3 segmented, lamellate type. Pronotum slightly broader than long; scutellum triangular broader at base, pointed at apex. Hemielytra well developed; veins and membrane distinct. Forelegs raptorial; coxae long and trochanter short, femora flattened dorsoventrally; thick with a strong tooth. Tibia short, slender, dentate at the inner edge, tarsi one segmented, claw single. Middle and hind legs are moderately slender. Row of thin long hairs present on tibial and tarsal segments of middle and hind legs. Tarsi in both legs single segmented but with two sharp pointed claws. Abdominal appendages shorter than the body length. Apically respiratory siphons are present for breathing purpose formed by the cerci.

#### ***Ranatra filiformis* Fabr. (Fig. 14)**

**Distribution:** Andra Pradesh (Deepa and Rao, 2007), Bihar (Hafiz and Ribeiro, 1939), Orissa (Hafiz and Pradhan, 1947), Kerala (Latha and Thanga, 2010), Assam (Das and Gupta, 2010; Hazarika and Goswami, 2010), Madhya Pradesh (Kaushik *et al.*, 1990), Uttar Pradesh (Bisht and Das, 1985), Madras (Rao, 1976), Jammu and Kashmir (Salaria, 1992), West Bengal (Jana *et al.*, 2009).

**Adult Description:** Total Body length 25mm. Head triangular, large, broad at base, produced in front to form rostrum. Eyes prominent; globular. Antennae 3 segmented ventrally visible. Pronotum elongated; scutellum small, triangular. Hemielytra membranous with irregular veins forming reticulate pattern. Legs long and slender. Forelegs raptorial modified for predation; fore femora with two teeth. Abdomen narrow, long and caudally tapered. Respiratory siphons are present at the tip of abdomen.

#### ***Ranatra elongata* Fabr. (Fig. 10)**

**Distribution:** Andra Pradesh (Deepa and Rao, 2007), Delhi, Kerala (Latha and Thanga, 2010), Assam (Das and Gupta, 2010; Hazarika and Goswami, 2010), Madhya Pradesh (Kaushik *et al.*, 1990), Uttar Pradesh (Bisht and Das, 1985), Madras (Rao, 1976), Jammu and Kashmir (Salaria, 1992), West Bengal (Jana *et al.*, 2009), Bihar (Hafiz and Ribeiro, 1939), Orissa (Hafiz and Pradhan, 1947).

**Adult Description:** Total body length = 42 mm. Length of abdominal appendages = 52mm. Head yellowish brown, triangular, produced forming rostrum. Head including eyes broader than anterior margin of pronotum. Eyes blackish brown, prominent. Antennae short, three segmented. Thorax elongate, divided by a transverse suture into anterior and posterior lobes; anterior lobe yellow, longer than posterior lobe which is blackish. Scutellum twice as long as broad, basally smooth and shining. Hemielytra brownish yellow with brownish black reticulate venation. Legs pale, slender and long. Fore legs raptorial, femur with one large tooth. Middle and hind femora of same length. Middle and hind tibia slightly longer than femora with two rows of long hair on ventral surface. Tarsi with well developed claws. Abdomen pale with paired respiratory siphons present at the tip of abdomen, longer than body.

#### **Family Pleidae**

##### **Biological and ecological notes**

Members of family Pleidae are found among the vegetation in still waters. They usually feed on small water fleas and cyclops. The oval eggs are laid singly in the tissues of water plants (Mellanby, 1963).

#### ***Plea buenoi* Kirk (Fig. 12)**

**Distribution:** Andra Pradesh (Ramakrishna, 2000), Bihar (Hafiz and Ribeiro, 1939), Jammu and Kashmir (Salaria, 1992), Orissa (Hafiz and Pradhan, 1947), Maharashtra (Tonapi, 1959), Uttar Pradesh (Das and Bisht, 1979; Julka, 1977; Bisht and Das, 1985), Madhya Pradesh (Kaushik *et al.*, 1990).

**Adult Description:** Total body length = 1.9 mm. Head pale, with a short elongated dark spot medially, broader than long, produced in front to form rostrum. Antennae three segmented, minute, not visible dorsally present near the inner border of eyes ventrally. Eyes small, but prominent, oblong. Thorax wider than long, punctate. Scutellum small, triangular, broader than long, apex pointed shining. Forewings cover the abdomen completely, shining, with black punctures towards broad apex. Legs pale, small, with minute spines. Abdomen blackish with thin hairs, small, covered with wings dorsally.

#### **Family Notonectidae**

##### **Biological and ecological notes**

The members of family Notonectidae are found very commonly around the edges of fresh water can be easily taken with a net. They rest and swim close beneath the water surface. On various parts of their body and also beneath the wings, a layer of air is held. The greatest store of air lies on the ventral surface in two channels formed of four dense rows of hydrofuge air on their faces. This is the reason that these bugs lie usually in upside down position. The back swimmers are excellent fliers.

They swarm occasionally in large numbers especially in autumn when they disperse into other water bodies, where they over winter. Their bite is painful, hence the name water bees. Certain species are able to produce clearly audible sounds, which they produce by rubbing their fore legs over ridges on the proboscis.

#### ***Anisops sardea* Kirk. (Fig. 6)**

**Distribution:** Assam (Das and Gupta, 2010), Madhya Pradesh (Kaushik *et al.*, 1990), Madras (Rao, 1976), Rajasthan (Baid, 1968), Jammu and Kashmir (Ayri, 2007), Bihar (Hafiz and Ribeiro, 1939).

**Adult Description:** Total body length 6-7.5 mm. Head pale, narrow at base and wider towards apex. Eyes black, large covering most part of the head touching anterior border of pronotum. Antennae pale, concealed and three segmented. Pronotum pale with three black spots, comparatively long, a bit elevated in the middle anteriorly. Scutellum triangular, broader at base, narrow pointed at apex. Hemelytra sordid grey and membranous. Body ventrally shining brown. Legs pale. Forelegs shorter than middle and hind legs. Coxae and trochanter short, femur with thick row of spines present at the inner margin. Tibia slender, longer than femur, row of spines present at inner margin; tarsi five segmented with claws. Middle legs slender and tarsi five segmented with claws. Hind legs long natatorial; femur long slender; tibia thin. Thick row of hairs present on inner margin of tibia and tarsal claw single and well developed. Abdomen five segmented; covered by hemelytra dorsally; visible ventrally with thin sheath of hair.

#### **Family Hydrometridae**

##### **Biological and ecological notes**

Members of family Hydrometridae lie on the surface of shallow waters, close to the shore, amongst all sorts of stranded plant parts. They make sudden movements by means of which they skate on the water surface, hence called as 'skaters'. Under side of insects is covered with a dense pile hydrofuge hair preventing the body on the surface from being wetted. They walk slowly about on the surface without apparently ever entering into water and feed on small insects such as flies and crustaceans like water fleas (Mellanby, 1963).

#### ***Hydrometra vittata* Stal. (Fig. 3)**

**Distribution:** Assam (Hazarika and Goswami, 2010; Das and Gupta, 2010), Rajasthan (Baid, 1968), West Bengal (Jana *et al.*, 2009), Orissa (Hafiz and Pradhan, 1947), Bombay, Jammu and Kashmir (Salaria, 1992; Ayri, 2007).

**Adult Description:** Total body length 11mm and body colour grey. Head much elongated than pronotum with a central line extending throughout the length of head and pronotum. Eyes well developed present at one-third distance from anterior end of head. Antennae four segmented; long, slender and inserted near apex of head. Pronotum twice longer than broad. Scutellum short, triangular. Wings shorter than abdomen, broadest at apex with round margin. Appendages ventrally pale. Forelegs long, modified for walking. Coxae and trochanter short. Femur cylindrical, shorter than tibia. Tibia long with thin fine spines. Tarsi three segmented with two claws. Middle legs longer than forelegs. Coxae long, trochanter short, femur shorter than tibia. Tarsi three segmented. Hind

legs longer than middle ones. Tibia again longer than femur. Tarsi three segmented; claws well developed. Abdomen long, tapering towards apex, ventrally median line running throughout its length.

#### **Family Mesovelidae**

##### **Biological and ecological notes**

Members of the family Mesovelidae are less known type of pond skaters. They are usually found singly among the vegetation of slow rivers, ponds and lakes. Being mostly greenish or blackish in colour and it is difficult to see them against the background of floating pond weeds. Exceedingly agile (Mellanby, 1963).

#### ***Mesovelia mulsanti* (Buch.) (Fig. 7)**

**Distribution:** Bihar (Hafiz and Ribeiro, 1939), Orissa (Hafiz and Pradhan, 1947), Assam (Das and Gupta, 2010), Jammu and Kashmir (Salaria, 1992), West Bengal (Khan, 2002; Nandi *et al.*, 1993), Kerala (Thirumalai and Radhakrishnan, 1999) Karnataka, Maharashtra, Tamilnadu (Thirumalai and Krishnan, 2000).

**Adult Description:** Total body length = 2-3 mm. Head triangular, eyes prominent almost touching anterior margin of pronotum. Antennae four segmented. Thorax with lateral angles somewhat tuberculously subprominent. Scutellum large, its apex somewhat broadly truncate. Hemelytra not fully developed but with prominent veins. Hind wings membranous. Legs long and slender. Forelegs shortest and hindlegs longest of the three pairs. Coxae large, trochanter short, femora thick and tibia slender. Middle and fore tibial segment shorter than its corresponding femora. Hind tibia longer than hind femur, covered over by rows of short prominent spines. Tarsi three segmented, with a pair of moderately developed claws at the apex of the three legs. Abdomen slender, elongate, six segments seen dorsally at apex.

#### **Family Veliidae**

##### **Biological and ecological notes**

Members of family Veliidae, commonly called water crickets are very common in still and running water where numerous specimens are found living together. In running water, they are found near banks on floating pond weeds or wet sphagnum moss. These bugs walk on water with alternating movements of their legs, which are short and strongly flexed. They feed on insects or any small animals which lie on or near the surface of water. The female lays masses of long cylindrical eggs on floating vegetation (Mellanby, 1963).

#### ***Microvelia singalensis* Kirk. (Fig. 8)**

**Distribution:** Andhra Pradesh (Ramakrishna, 2000), Bihar (Hafiz and Ribeiro, 1939), Jammu and Kashmir (Salaria, 1992), Orissa (Hafiz and Pradhan, 1947), Tamilnadu, West Bengal, Meghalaya, Bihar, Delhi, Maharashtra, Orissa, Karnataka (Thirumalai and Krishnan, 2000), Kerala (Thirumalai and Radhakrishnan, 1999), Uttar Pradesh ( Bisht and Das, 1985).

**Adult Description:** Total body length = 1.5-2 mm Head greyish, small, triangular with eyes touching the anterior margin of pronotum. Antennae four segmented. Thorax silvery grey with longitudinal central carina. Hemelytra greyish, well developed,



Fig. 1.

*S. molestrum*

Fig. 2.

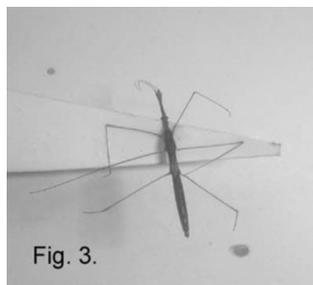
*S. annulatum*

Fig. 3.

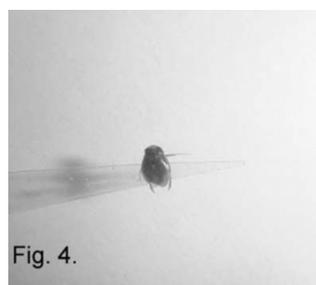
*H. vittata*

Fig. 4.

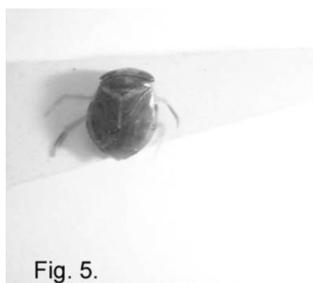
*M. striata*

Fig. 5.

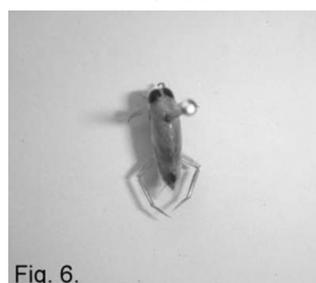
*M. proba*

Fig. 6.

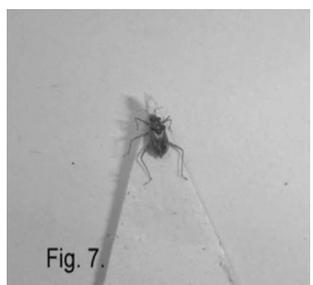
*A. sardea*

Fig. 7.

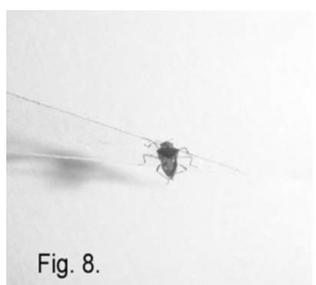
*M. mulsanti*

Fig. 8.

*M. singalensis*

Fig. 9.

*L. maculatus*

Fig. 10.

*R. elongata*

widest at the middle tapering towards apex, covering abdomen completely, with prominent thickened veins. Legs long and slender. Coxae large, trochanter short, femora thick and tibia

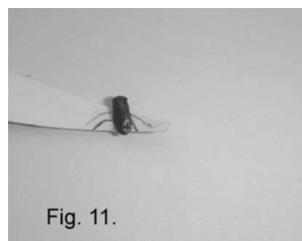


Fig. 11.

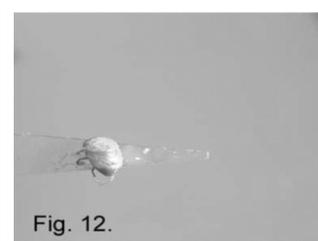
*C. hieroglyphica*

Fig. 12.

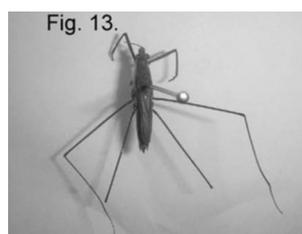
*P. buenoi*

Fig. 13.

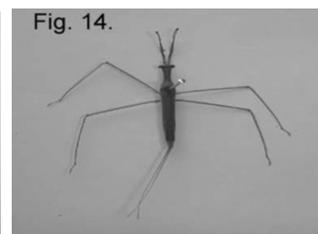
*Gerris sp.*

Fig. 14.

*R. filiformes*

slender. Fore femur longer than fore tibia. Middle and hind femur shorter than their tibial counterparts. Fore tarsi one segmented; middle and hind tarsi two segmented. A pair of moderately developed claws present in each leg preapically. Abdomen slender, six segmented.

#### Family Gerridae

#### Biological and ecological notes

Members of family Gerridae are subaquatic as they skate around on the surface of water and lay their eggs in water. The eggs are inserted inside the plant tissues or are attached to plants and other objects in gelatinous masses. They are predacious in habits and prey upon such small insects, which happen to fall into water or feed or rest upon water plants. These are highly specialized for the life on surface of water. While they generally walk, run or skate on water surface, they can also walk over water plants and other shore margins and when excited, they hop about in an erratic manner falling as often upon their backs as right side up. The arrangement of the tarsi and claws on their legs is such that it provides buoyancy on the surface of water. They glide about on water layer with an ease. The winged species fly at night. The life histories appear to be relatively simple, the young ones hatch from submerged eggs and immediately start their life on the surface. They may have one to several generations in an year.

**Table 1: Aquatic hemiptera collected from Gharana wetland, Jammu**

Family	Name of species
Corixidae	<i>Micronecta proba</i> Kirk. <i>M. striata</i> Kirk.
Belostomatidae	<i>Corixa hieroglyphica</i> Duf. <i>Sphaerodema molestrum</i> Duf. <i>S. annulatum</i> Fabr.
Nepidae	<i>Laccotrephes maculatus</i> Fabr. <i>Ranatra filiformis</i> Fabr. <i>R. elongata</i> Fabr.
Pleidae	<i>Plea buenoi</i> Kirk.
Notonectidae	<i>Anisops sardea</i> Kirk.
Hydrometridae	<i>Hydrometra vittata</i> Stal.
Mesovelidae	<i>Mesovelia mulsanti</i> Buch.
Velidae	<i>Microvelia singalensis</i> Kirk.
Gerridae	<i>Gerris sp.</i>

Adults may hibernate under stones, logs and other debris around the margin of water in colder regions, while in semiarid regions they may aestivate under similar objects around dried ponds, awaiting return of wet season (Essig, 1941).

#### **Gerris sp. (Fig.13)**

**Distribution:** Maharashtra (Tonapi, 1959), West Bengal (Jana *et al.*, 2009; Nandi *et al.*, 1993), Kerala (Thirumalai and Radhakrishnan, 1999), Andra Pradesh (Ramakrishna, 2000), Uttar Pradesh (Bisht and Das, 1985), Tamilnadu (Thirumalai and Raghunathan, 1988).

**Adult Description:** Total body length = 11-16mm. Head small, triangular, broader at base, produced to form rostrum. Eyes large, globular present at posterolateral margin of head. Antennae long, four segmented. Thorax longer than broad with parallel lateral edges. Hemelytra brown, long with distinct venation covering abdomen just prior to apical tip of abdomen. Forelegs raptorial used for catching prey. Coxae long, trochanter small. Femur compressed, thick with stout spine at posterior end. Tibia long, slender thick at apex, covered with fine hair. Tarsi two segmented with two claws. Middle legs longer than hind ones. Hind legs shorter but similar to middle ones. Abdomen cylindrical tapering at apex.

#### **DISCUSSION**

The total number of insects collected from study site amounts to 298. A total of 14 species comprising 11 genera and nine families viz. Corixidae, Belostomatidae, Nepidae, Pleidae, Notonectidae, Hydrometridae, Mesovelidae, Velidae and Gerridae have been recorded in the present investigation. Families Nepidae and Corixidae represent the highest number of species (three species) followed by Belostomatidae (two species). Families such as Pleidae, Notonectidae, Hydrometridae, Mesovelidae, Velidae and Gerridae comprised one species each (Table 1). Similar findings regarding the highest number of species of family Nepidae were carried out by Jana *et al.* (2009) in West Bengal and Hazarika and Goswami (2010) in Guwahati.

The species recorded presently exceed the findings of earlier workers as Thakur (2003) and Ayri (2007). Thakur (2003) recorded five hemipteran species in water bodies around Trikuta Hills, Jammu and Ayri (2007) recorded nine hemipteran species in Mansar Lake, Jammu. The species *Sphaerodema annulatum* is reported for the first time from Jammu. Also the diversity of Hemipteran insects is comparatively high in comparison to some studies in fresh water ecosystems in India. Das and Bisht (1979) recorded eight hemipteran species from Nainital and Bhimtal lakes. Deepa and Rao (2009) recorded eight hemipteran species from Pocharam Lake, Andra Pradesh. Khan (2002) also recorded eight species from two man made lakes of Kolkata and Das and Gupta (2010) recorded twelve hemipteran species from agricultural fields and rain pools in Assam.

#### **ACKNOWLEDGEMENTS**

The authors are greatly indebted to Professor Baldev Sharma former Head, Department of Zoology, University of Jammu for his constant interest and encouragement in the present work.

The authors are also thankful to the Head, Department of Zoology University of Jammu for providing necessary facilities to work. The authors acknowledge the help rendered by Dr. V.V. Ramamurthy, Principal Scientist, Entomology Deptt., IARI, New Delhi for the identification of the insects mentioned in the paper.

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