Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

J E Z S Journal of Entomology and Zoology Studies

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2018; 6(3): 1010-1014

Received: 19-03-2018
Accepted: 20-04-2018

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A preliminary list of aquatic and semi-aquatic hemiptera (Arthropoda: Insecta) of Chittagong University Campus, Bangladesh

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Abstract
A list of Aquatic and Semi-aquatic hemiptera has been studied from some selected ponds and lakes of Chittagong University Campus during December'08 to August'09 in the present study. Insects were collected from the edge as well as deep water of the ponds by nets and hand pickup. Collected specimens were preserved in 70% alcohol and Identification up to family level was carried out following different available keys and up to generic and species level by using the keys of Distant. A total of 17 species of Hemiptera were recorded which belongs to 12 genera and 9 families. Numbers of species identified in each family reached 3 in Corixidae, 2 in Pleidae, 2 in Notonectidae, 3 in Belostomatidae, 3 in Nepidae, and 1 species to each family of Gerridae, Hydrometridae, Veliidae and Mesoveliidae. The finding shows no significant change in number of genera and families in the study region due to ecological change for decades. At the same time no new insects has been identified in the present study.

Keywords: Aquatic, semi-aquatic, hemiptera, Chittagong University, Bangladesh

1. Introduction
Taxonomy is the basic and essential step of all fields of scientific endeavor. It encroach either directly or indirectly on many other areas of science including fields as diverse as agriculture, horticulture, medicine, pharmacology, anthropology, archeology and petrology as well as traditional areas of botany, zoology and microbiology. It provides names for organisms so that others can identify what they encounter and classifications which facilitate data retrieval of fundamental importance for their areas of biological science. Many of our living species have become extinct and quite a good number of them are following suit. Scientists 'fear that in the next thirty years one quarter of all species could be lost forever. Many may be die out even before we know of their existence. They serve as the main reference sources of material for the future workers of taxonomy, biology, phylogeny and other fields. Under these circumstances it is an urgent need to collect as many of the world species as possible.

Of all the creatures in animal kingdom, insects are the most numerous in number and as a group highly successful. While less than 0.1% is regarded as pests, most of the insects are regarded to be beneficial or have an indirect influence to our live and environment. Despite their small size, the sheer numbers or biomass of insects means that they have a significant impact on the environment and therefore upon our lives. Their species richness or diversity surpasses any other group of organisms.

Although the great majority of insects are terrestrial, a number of them are aquatic occurring almost entirely in fresh water. Aquatic and semi aquatic faunal list is of utmost importance to future workers for further study on their biology, ecology and diversity. Hemipterans play an important role in fresh water ecosystems and therefore the knowledge of this group, the primary predators as nymphs and adults, is essential for the study of fish biology and for the proper management of hatcheries. Furthermore, certain families of the bugs may be utilized in the biological control, feeding on mosquito larvae, chironomid larvae, tadpoles, mites, gnats.

About seven hundred semi aquatic and five hundred aquatic species have so far been described by Richards and Davies [1], and have been classified by Hungerford [2] by aquatic and semi aquatic for the submerged and surface dwellers respectively. Very little research work has previously been made on aquatic and semi aquatic Hemiptera in Bangladesh. The earliest published report of Fauna of British India by Distant [3-6] included Bangladesh as part of a much bigger survey area.

After Distant no comprehensive taxonomic work were done on aquatic and semi aquatic Hemiptera. Insects are vulnerable to climate change. The mean temperature of Bangladesh has been increased by 2.1 ºC over 100 years [7]. Unfortunately we do not know yet how many species of aquatic and semi aquatic Hemiptera are found and how many have been extinct due to ecological change for decades in Bangladesh. Therefore, it was an urgent need to have a baseline data. Chittagong University Campus area is encompassed by medium sized hills, having moderate temperature and heavy rainfall which enriches this area with spectacular flora and fauna. The present study was undertaken to make a checklist of the aquatic and semi aquatic Hemiptera from different location of the Campus through the intensive collection, preservation and identification.

2. Materials and Method

Aquatic and semi aquatic Hemiptera were collected from some selected ponds and lakes of the Chittagong University Campus area usually once a week during the study period (December, 2008 to August, 2009). Submerged insects were collected by dredge net and in case of surface dwellers sweep insect net was used although hands picking was common. Collections were made along the edge and sometimes in the dipper parts of the water bodies. Plankton net was also used to sample the small sized floating insects of open water. Collected specimens were preserved in 70% alcohol. Identification up to family level was done following different available keys and up to generic and species level by using the keys of Distant, Ameen and Nessa [8], Alam *et al.* [9].

3. Results

List of Aquatic and semi-Aquatic Hemiptera

Order: Hemiptera

3.1 Family: Corixidae

3.1.1 Species *Corixa connexa* (Lundblad)

3.1.1.1 Diagnosis: Oval flat body; length 4.2-5.2 mm; head, body beneath and legs are more or less pale ochraceous, posteriorly eyes are continuous with the anterior margin of pronotum; rostrum indistinctly segmented, pronotum with 6 prominent continuous transverse black lines, posterior margin distinctly convex; hemelytra brownish ochraceous mottled with castaneous black markings, embolial end of hemelytra with a large dark spot; scutellum covered; forelegs very short, fore tarsi one segmented; mid and hind legs double the length of fore leg; hind tibia and tarsi have double rows of long hairs and with spines, no tarsal claw.

3.1.1.2 Remarks: This species commonly known as Water Boatman. They are found slightly below the water surface, common in ponds, also found in birdbaths. The long hind leg row with powerful sweeping strokes. They are strongly attracted to light. They take minute aquatic organisms and algae as food. Alam *et al.* reported the distribution of this species in Chittagong (Bangladesh) and Distant reported several species of the genus *Corixa* in The Fauna of British India series.

3.1.2. Species *Micronecta scutellaris* Stal

3.1.2.1 Diagnosis: Body oval; length 3.5-4 mm; pronotum with three transverse black facia forming three equal margins; antennae 3-jointed; corium with three longitudinal facia, head, ventral part of the body and legs are ochraceous; eyes broader than long; rostrum indistinctly segmented with labral hairs; hind leg is longer; legs without claws; some long hairs on palae of foreleg.

3.1.2.2 Remarks: This species remain gripped with the bottom of water bodies for maximum time but make frequent excursion upwards for air renewal, which it reserves below the hemelytra. They move with the rowing movement of the legs. Alam *et al.* reported this species from Chittagong (Bangladesh). Distant reported a species *Micronecta proba* from Calcutta, Burma, Malay and Rajshahi (Bangladesh) which closely resembles the species studied.

3.1.3 Species *Micronecta merope* Distant

3.1.3.1 Diagnosis: Body oval; size 3 mm; head ochraceous; eyes black, inter ocular space longer than head; pronotum castaneous brown with a transverse black line; scutellum dark brownish; infolding condition hemelytra make a yellowish band surrounding scutellum; hemelytra olivaceous brown with many small scattered black spots; body beneath and legs pale ochraceous; hemelytra with the lateral margins moderately convexly rounded.

3.1.3.2 Remarks: Very common in shallow water of the pond, dighi and swamp. Ameen and Nessa reported this species from Dhaka city (Bangladesh). Distant identified the specimen as a new species and named as *Micronecta merope.*

3.2 Family: Pleidae

3.2.1. Species *Plea* sp.

3.2.1.1 Diagnosis: Size 1.5-2 mm; eyes red; head yellowish without any maculate markings on vertex or frons; pronotum with 5 large, prominent black spots, two at the base of mid-pronotum, two at the lateral angle and a similar one in the apical portion of pronotum; punctures of corium with small dots in basal portion, hemelytra with very few spots.

3.2.1.2. Remarks**:** They are found in the still waters of ponds and lakes among aquatic vegetation. *Plea* sp resembles *Plea liturata* Fieb. Distant described this species. Ameen and Nessa reported *Plea* sp from Dhaka City. However, it is not known whether these two are synonymous.

3.2.2 Species *Plea pallescens* Distant

3.2.2.1 Diagnosis: Body size is 1.5-1.4 mm. Above pale stramineous, the central posterior disk of pronotum apparently discoloured; no spots on vertex, a broad longitudinal line on frons; pronotum with a few spots on basal and apical portion; body beneath piceous; legs pale stramineous; hemelytra with 2 oblique fasciae.

3.2.2.2 Remarks: Commonly known as Pygmy Backswimmers. They live in aquatic vegetation in the still waters of ponds and lakes. They swim on the back and propel themselves by the posterior legs. This species was first collected more than 100 years ago by Annandale from Rajshahi and Distant identified this species as a new to science. Ameen and Nessa reported this species from Dhaka city.

3.3 Family: Notonectidae

3.3.1 Species *Anisops breddini* Kirkaldy

3.3.1.1 Diagnosis: Body slender, ovate, ventral surface flat, dorsal surface convex, roof like; body yellowish with some grey and golden reflections; the ventral posterior abdominal part black; eyes large and contiguous posteriorly, cover most part of the head; last joint of antennae much longer than penultimate; head without any cephalic projection; pronotum trapeziform; hemelytra hyaline; fore coxae and femur with a black spot; fore and mid legs are double clawed, hind legs without claw.

3.3.1.2 Remarks: Commonly known as Back Swimmers, swims back side down. They were found slightly below the surface of shallow ponds, and swamp waters. Most of the air for breathing is stored in two grooves on the ventral surface, the resultant buoyancy holds the animal upside down position and makes it lighter than water. Ameen and Nessa reported this species from Dhaka City, Alam *et al.* reported this species from Chittagong and Distant from Calcutta, Dhappa and Port Canning of West Bengal.

3.3.2 Species *Anisops sardea* Herrich-Schaffer

3.3.2.1 Diagnosis: Body ovate, ventral surface flat, dorsally convex; pale stramineous; eyes black; hemelytra sordid grey; male with a long, triangular, obtuse, apically pointed cephalic projection; interocular space very narrow without sub parallel margins; in both sexes there is a distinct foveate impression near each basal angle of the scutellum; two long labral hairs are present only in male.

3.3.2.2 Remarks: Found in muddy ponds, dighi and shallow beel waters. Attracted to light. Ameen and Nessa reported this species from Dhaka city, Distant reported this species from Bombay, Burma: Minhla.

3.4 Family: Belostomatidae

3.4.1 Species *Lethocerus indicus* Lepeletier & Serville

3.4.1.1 Diagnosis: Body ovate; grayish dorsally and ventrally light brown; head, pronotum and scutellum dark brownish ochraceous dorsally, ventrally paler; eyes longer than width; rostrum stout and 3-segmented; pronotum with longitudinal band like structure on posterior and lateral margins; scutellum paler basally with a narrow central line; hemelytra ochraceous; elongate membrane with longitudinal veins forming s-shaped cells; fore leg with one claw and mid and hind leg with two claws.

3.4.1.2 Remarks: Commonly known as Giant Water Bugs, Toe-biters, Fish killers or electric-light bugs. They live in deeper water with or without aquatic vegetation, clinging to some support, with the tip of the abdomen in contact with the surface films. In habit they are very rapacious, feeding upon small fish, tadpoles, young frogs and insects. They can fly rapidly and often attracted to light. Their bite is considered one of the most painful that can be inflicted by any insect. Ameen and Nessa reported this species from Dhaka city.

3.4.2 Species *Sphaerodema annulatum* Fabricius

3.4.2.1 Diagnosis: Medium sized, oval; body ochraceous or ochraceous brown; lateral margins of the pronotum and the embolium of the hemelytra always paler in hue; head with scattered fuscous spots; eyes elongated and oblique, interocular space as long as head; rostrum slender, 3-jointed; hemelytra broad, clavus smooth, without veins, corium thickly and very finely punctuate and with faint network of veins, membrane without veins; foreleg prehensile, fore tarsi 2-segmented with single claw, mid and hind tarsi 2-jointed, claws double.

3.4.2.2 Remarks: Mostly found in shallow waters, ponds and swamps with or without aquatic vegetation. Male of this species carry eggs on their back. The species was recorded more than 100 years ago by Distant in the Sylhet district, Bangladesh (Indian subcontinent) and Calcutta. Ameen and Nessa reported this species from Dhaka city. Alam *et al*. reported the species from Chittagong.

3.4.3. Species *Sphaerodema rusticum* Fabricius

3.4.3.1 Diagnosis: Body colour ochraceous or ochraceous brown dorsally, the lateral and basal margins of pronotum and the embolium always paler; body dorsoventrally depressed; head shorter than breadth; eyes obliquely converging, interocular space very long, longer than head; rostrum short, 3-jointed; pronotum, scutellum and corium very thickly and finely punctuate; legs natatorial, anterior coxae inserted between the anterior area of prosternum; tarsi 2-jointed;claws short, fore tarsi with 2 claws.

3.4.3.2 Remarks: This species prefers shallow water ponds, swamp or beels with or without aquatic vegetation. Sometimes they are found attached with the floating aquatic weeds. They are voracious feeders on fish fry. They are also known to feed on a wide variety of aquatic organisms including mosquito larvae. Ameen and Nessa reported this species from Dhaka city. Distant reported the species from Bombay, Ceylon, Malay Peninsula, Sumatra, Philippines, China.

3.5 Family: Nepidae

3.5.1 Species *Laccotrephes ruber* Linnaeus

3.5.1.1 Diagnosis: Body elongately ovate; dull black dorsally, pale ochraceous ventrally; head as long as broad; interocular breadth longer than anteocular length; pronotum little shorter than broad; hemelytra sub parallel, membrane with complex reticulate veins; abdominal appendages a little longer than the body length, with long hairs; tarsi 2-jointed with double claws.

3.5.1.2 Remarks: This species mostly found in shallow margin of water with bottom mud and debris. Alam *et al.* reported this species from Chittagong. Distant reported several species of *Laccotrephes* from Indian subcontinent.

3.5.2 Species *Ranatra filiformis* Fabricius

3.5.2.1 Diagnosis: Dull obscure brownish ochraceous; head and anterior area of pronotum pale castaneous; posterior area of sternum, legs and abdominal appendages pale ochraceous; legs with transverse striations; head including the eyes broader than the anterior margin of pronotum; pronotum elongate, posterior area widened and elevated, its base profoundly sinuate; antennae long, stout spines; rostrum 3-jointed;abdominal respiratory tube 17-21 mm; fore femora with a pair of teeth in the middle; body length 21-25 mm.

3.5.2.2 Remarks: Mostly found in shallow ponds and swamp waters. It occurs among vegetation fringing the shallower parts of water bodies and is scarce in deeper areas. Ameen and Nessa (1985) reported this species from Dhaka city. Alam *et al.* reported this species from Chittagong, Distant from Karachi, Bihar, Bombay and Philippines.

3.5.3 Species *Ranatra elongata* Fabricius

3.5.3.1 Diagnosis: Anterior area of the pronotum and head very pale castaneous; abdomen fuscous above, laterally pale ochraceous; head slightly raised between eyes, eyes prominent, blackish with a reddish tinge; rostrum 3-jointed; pronotum elongated, wide, elevated posteriorly; abdominal appendages longer than the body; length excluding abdominal appendages about 41-45 mm; length of abdominal respiratory appendages about 47 mm; fore femur with two teeth, one medial and other distal.

3.5.3.2 Remarks: Mostly found in deeper parts of ponds and swamps, sometimes also found with aquatic vegetations in different depth of pond water. Ameen and Nessa reported this species from Dhaka city, Alam *et al.* from Chittagong and Distant from Kashmir, Calcutta and Bombay.

3.6 Family: Gerridae

3.6.1 Species *Gerris nitida* Mayr

3.6.1.1 Diagnosis: Body dorsally shinning black; abdomen silvery white, abdominal spiracles black; head with a central longitudinal and two lateral yellowish lines, surrounding eyes; rostrum 4 jointed, apex of rostrum black; antennae four segmented. Pronotum shield shaped, conically protruded posteriorly with tubercles, anteriorly with 2 small longitudinal ochraceous spots; hemelytra piceous, the veins black; legs are ochraceous.

3.6.1.2 Remarks: Commonly known as Water Striders; live on the surface of ponds, slow streams, marshes and other quiet waters and can stand effortlessly on water due to their non-wetting legs; they hunt for insects and other small invertebrates on top of or directly below surface using their strong forelegs which end with claws. Ameen and Nessa reported this species from Dhaka city (Bangladesh), Distant from Darjeeling, Orissa, Balighai (Puri).

3.7 Family: Hydrometridae

3.7.1 Species *Hydrometra vittata* Stal

3.7.1.1 Diagnosis: Size 10-12 mm, body slender and elongated, dark brown dorsally, ventrally paler; head with black dots; hemelytra and apices of femora piceous; a slender longitudinal central line extending behind the eyes up to pronotum. Distance between the tip of head and pronotum twice that between eye and pronotum; antennae 4-jointed; hemelytra extends up to 5th abdominal segment.

3.7.1.2 Remarks: Commonly known as water measurers, mostly found on or near the edge of ponds, dighi and swamp or on floating or emergent vegetation. Walk slowly over the water on all six legs. Ameen and Nessa reported this species from Dhaka city, Alam *et al.* from Chittagong and Distant from Burma; Ceylon; Philippines and Japan.

3.8 Family: Veliidae

3.8.1 Species *Microvelia doughlashi* Scott

3.8.1.1 Diagnosis: Small, ovate shaped, body length 1.2-1.5 mm; head, pronotum piceous black; body length dull black with grayish pubescence; pronotum with reddish ochraceous spots; hemelytra with numerous grayish white spots throughout, of which larger one occupies the greater part of clavus, antennae 4-jointed; legs similar, pubescent, fore tarsi 1-jointed, mid and hind tarsi 2-jointed; legs are gradually elongated, third leg is double the length of first leg.

3.8.1.2 Remarks: Commonly known as Broad Shouldered Water striders or Ripple bugs. They hunt by diving under water. Attracted to light and can take flight. Alam *et al.* reported this species from Chittagong, Distant reported a species *Microvelia albomaculata* from Rajshahi (Bangladesh) with which the species studied resembles. It is not known whether they are synonymous.

3.9 Family: Mesoveliidae

3.9.1 Species *Mesovelia vittigera* Horvath

3.9.1.1 Diagnosis: Body small, elongately ovate; body length 24-28 mm; ventrally grayish, pubescence; apices of tarsi and eyes are piceous; anterior pronotal portion brownish, posterior pronotal margin, lateral scutellum margin, veins of corium fuscous, corium with a pale discal cell; membrane and clavus, when present, veinless; head highly broad; anteoculus broader than interoculus; eyes large and situated closer to anterior margin of pronotum; ocelli distant from eyes; antennae 4-jointed, 2nd joint shortest, 3rd and 4th joints are sub equal; pronotum as long as broad, posterior margin little sinuate; fore leg is smaller than mid leg and mid leg is smaller than hind leg; tarsi 3 segmented, claws single.

3.9.1.2 Remarks: Commonly known as Water treaders. Lives on the surface of ponds and other water bodies. Typically, they forage on the floating vegetation and run out over the open water with remarkable agility. Alam *et al.* reported this species from Chittagong (Bangladesh), Distant described a species *Mesovelia mulsanti* from Sumatra and Central America with which the species studied closely resembles. It is not known whether they are synonymous.

4. Discussion

In the present study, 17 species of aquatic and semi-aquatic Hemiptera were identified from some selected ponds and lakes of Chittagong University Campus area. Aquatic and semi aquatic Hemiptera were not significantly dimorphic except some differences in the structure of external genitalia; the male and female are alike. Specimens for study were selected randomly and overlooked their differences. For identification and description emphasis was given on the features of head, pronotum, legs, scutellum and hemelytra and also on colorations. Although total body length is not an identifying character for species but the relative lengths of various body parts specially that of legs had a great significance in identification. The diagnostic features included here are those which are peculiar to a species and by which it can be separated from closely related ones.

The identified species belong to 12 genera and 9 families, viz. Corixidae, Pleidae, Notonectidae, Belostomatidae, Nepidae, Gerridae, Hydrometridae, Veliidae, Mesoveliidae. The first five families belong to the aquatic (live beneath the water surface) where as the last four to the semi-aquatic (strides over the water surface or floating vegetations) Hemiptera. Alam *et al.* described 14 species of aquatic and semi aquatic Heteroptera (belonging to 13 genera and 9 families) from Chittagong University Campus area and Ameen and Nessa recorded 23 species of aquatic Hemiptera (belonging to 11 genera and 7 families) from Dhaka city. In addition, another study has been performed by Ameen and Chowdhury [10] where only 2 species of aquatic Hemiptera were reported from the same city. As both the studies in Chittagong university campus revealed a total of 9 family species, that is more than Amena and Nessa's study, there is no evidence of extinction of any family species due to ecological imbalance in the university campus. However it indicates that the number of genera identified in our study is less than Alam *et al.* study where as greater than Ameena and Nessa's findings. As Dhaka is one of the most polluted cities in the world, with huge amount of chemical wastage poured in its water bodies every day, there might have some short of genera and families in Amena and Nessa's study. The shortage of genera in the Chittagong university campus in our present study could be due to ecological alteration over years. However, it ensures co-existence of most of the species within ecological and climate change. All these study also proves that the species are not homogenously available over regions of Bangladesh. The present study shows there is no new species evolved in the study area.

5. Conclusion

As Hemipterans fauna have been studied in small scale previously, an attempt shoud be taken systematically to collect and identify the aquatic and semi aquatic Hemipterans fauna in Bangladesh. Having those importances in mind, the study, up to lowest taxa, on the ecology and distribution of aquatic and semi aquatic Hemipterans in the undisturbed environment of the campus was conducted. The identified data shows that the study area is still enriched with insects. The brief description of each insect in the study would help future workers in this field.

6. Acknowledgement

The authors would like to express profound gratitude to the Department of Zoology, University of Chittagong for kind support and cooperation to conduct this experiment.

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