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ORIGINAL ARTICLE

Studies on Bionomics of the Indian Water Boatmen, *Micronecta striata*, Fieb. (Corixidae, Hemiptera: Heteroptera)

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ABSTRACT

The common Indian water boatman belongs to a family of aquatic insects. In the present study an effort is made to explore bionomics of Micronecta striata Fieb. to introduce its habitat, habit, food, feeding and morphology. It is very common in ponds of rural area of India. Sound observations were made to ensure the validity of study. These insects are harmless, so that no special management to control them exists today. They are part of aquatic ecosystem as food for other higher trophic level animals. Keeping all these points in view, the present study is undertaken to evaluate bionomics of common Indian water boatman Micronecta striata Fieb (Corixidae, Hemiptera: Hetroptera).

Key words: *Bionomics, Micronecta striata, Hemiptera*

INTRODUCTION

Water boatmen are somewhat flattened and elongate in shape. They have the hind two pairs of legs fitted with hairs and the tarsi of the hind legs is scoop or oar-shaped which allows them to swim. Adults range in length from 3/16 to 3/8 inch (3 to 11 mm) long and are usually dull colored and often mottled. Water boatmen are the largest group of aquatic true bugs. They are sometimes confused with backswimmers (Hemiptera: Notonectidae) because they have the same general shape. However, backswimmers swim upside down in the water and are colored with the wings lighter than the leg area. Adults are relatively small and soft bodied so they do not preserve well on insect pins. Immatures are similar to the adult and share the habitat. Their sucking mouthparts are modified to allow some chewing. Water boatmen often swim in open water. They can be seen in groups or clusters swimming through a pond. They feed on plant material, including algae. Water boatmen can be collected with aquatic nets. May occasionally be a problem when numerous in ponds. They are beneficial because they are an important part of the diet of fish; medically harmless. Management is none, these are considered beneficial insects

MATERIAL AND METHODS

The water boatmen *Micronecta striata* (Fieb.) for the morphological investigation were collected during the months of July to November from the various ponds and the river Yamuna at Mathura. They were found upon the surface of the water. They are usually found in groups. These bugs were killed by chloroform vapours and fixed in different fixatives. Small punctures by microneedles were made in the abdomen before putting them into the fixative in order to ensure proper fixation. The fixative used was Bouin's fluid, alcoholic bouin's fluid, Zenker's fluid. After keeping in fixatives for about 24 hours they were washed thoroughly through several changes of 70% alcohol with a few drops of glycerine.

For the study of external anatomy, the specimens were kept in 5% KOH for about one month or sometimes boiled in the solution for about 20 minutes for the partial removal of muscles and bleaching of the highly pigmented integument. After treating the material with KOH solution, the alkaline effect was neutralized by keeping the specimens in glacial acetic acid for an hour or so. These specimens were later on washed, upgrade and preserved in glycerine and mounted in Canada balsam. Dissections of the specimens in a small dish under high power of the binocular dissecting microscope with microscaples, forceps and microneedles were helpful for the skeletal studies. Adults for initial culture were collected from a pond near B.S.A. College, Mathura (Uttar Pradesh) by using an ordinary pond net. Several pairs were allowed to lay eggs in circular glass throughs of 30 cm diameter and 15cm and the containing the water of the same pond with

submerged shoots of plants. Nymphs were prevented from escaping by using cheese cloth the mouth of the trough. Notearation was provided but the water troughs was regularly changed approximately after every ten day to explore any possibility of formation of scum over the surface of the water to avoid the infection in the normal breathing of the developing instars. The developing instars and adults were regularly provided with files as the main food and uneaten alongwith their bites were removed every day. Cultures were examined regularly for the presence of eggs or exuviae. The exuviae were preserved in the average temperature of the laboratory was 24hrs. The eggs are developing instars were also collected from the natural habitat. All the drawing was made using a camera lucida on Leitz microscope. The colour patterns were drawn from the entire measurements of antennal and leg segments as well as length and width of egg, developing instars and adults have been recorded in milimieters. The aid of an ocular micrometer and each measurement represents the average for ten individuals.

RESULTS AND DISCUSSION

The Hemiptera are minute to large, oval or elongate frequently flattened heterogenous, phytophagous and predacious terrestrial and aquatic insects with simple metamorphosis and piercing and sucking mouth parts, head free, usually prognathous or rarely hypognathus, antennae two to ten or rarely 25 segmented, eyes large, ocelli present or absent, labium modified not a short and long curved or straight, simple or segmented rostrum, beak or proboscis, palpi atrophied, wings present ot absent, log or short. Hemylaptera or fore pair of wings, usually thickened basally and membranous apically in Heteroptera and usually wholly membranous in Homoptera, legs for walking, running, jumping, swimming and grasping the prey, cylindrical or flattened with 1-3 segmented tarsi, 1 or 2 claws and with or without arolia or empodia, abdomen with few segments, the first segment greatly reduced or apparently wanting, cerei absent, the members of this order are commonly referred as bugs. The order Hemiptera is divided into two sub orders, the Heteroptera and Homoptera. The water boatmen *Micronecta striata* Fieb 1808 belongs to the suborder Heteroptera which is characterized by base of rostrum usually not touching anterior coxae, gular region usually well developed, long pronotum large, fore wings usually thickened basally and membranous apically, hind wings membranous, both pairs folded flat over the back with apices overlapping, tarsi normally three segmented.

The common Indian water boatmen, *Micronecta striata*, Fieb belongs to the family Corixidae. The literature on the bionomics of water boatmens is very unsatisfactory. The life history studies in Corixidae have mainly been carried out on Corixa hieroglyphica, Duf by Ekblom in 1956 and by Qadri in 1950, on Sigara geoftroyi, Leech by Sprague in 1956 and by Rastogi in 1962; Sigara haliploide, Horv by Patel in 1971. The bionomics of other Heteropteran bugs viz on *Metrocoris tenuicomis* Esaki by Cheng in 1966; on Trepobates Knighti Kittle in 1985 and on Limnometra fluviorum Fabricius by Tonapi in 1959 and Tonapi in 1961, however, have been attempted. The only contribution on the life history studies of the water boatmen from India is that of Tonapi and Krandikar (1961) and that too lacks in a number of desired informations. No attempt has ever been made to study the bionomics of any Micronecta species which are widely distributed on the sluggish waters of ponds, lakes, rivers and streams in India. The present chapter deals with the developments and bionomics of the common Indian water boatmen, *Micronecta striata*, Fieb.

Distribution:

Micronecta striata, Fieb is the most common water boatmen of India which is found skating over the surface of sluggish waters of ponds, lakes, rivers and streams. It is very widely distributed in India and during the present studies; its distribution was recorded from Himachal Pradesh, Uttar Pradesh, Bihar, West Bengal, Assam, Orissa, Kerala, Rajasthan and Madhya Pradesh besides India it is also distributed in Burma, Ceylon, China, Malaya and Thailand.

Habit and Habitats:

The *Micronecta striata*, Fieb, is the most commonly distributed Indian boatmen, in India. It is found in large numbers upon the surface of slowly and quiet waters of ponds, tanks, rivers and lakes. They are found near the edges and prefer open water. They mostly live in groups some times have also been observed individually. It is very difficult to net them because of their quick striding

activities. They do not swim under the water even persuasion. At times they have been observed to jump several inches.

Food and Feeding:
This water skater is very voracious and feeds more actively during observation right than the day. They feed upon various aquatic insects that fall into the Hemiptera. It was observed that when the fallen insect is too large for one strider, several striders collectivity capture and feed. They will their prey by piercing with their rostrum. The fore legs are modified for holding the prey. They sometimes jump several inches from the surface of the water into the air for catching the small insects. In the laboratory during the study the adults and their developing instars were upon the files, leaf hoppers and the larvae of mosquitoes.

Predation:
The *Micronecta striata*, Fieb, is found infested by mites which attack all the stages of the development. The mites are ectoparasitic and kill this in large numbers. They also attack its various developing instars and the eggs.

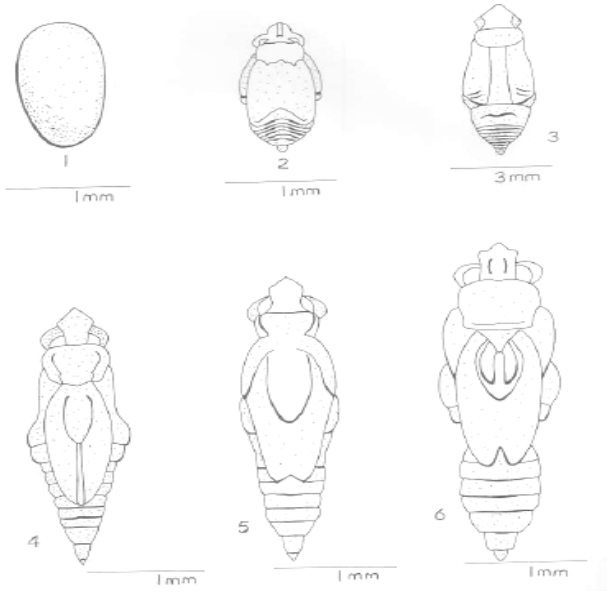
Locomotion:
These water boatmen are long leged insects and walk, skip, glide or skate over the surface of the water. The fore legs are relatively short and used in capturing the food. The mid and hind legs are considerably long and used in locomotion. The mid and hind legs are provided with powerful retractor muscles inserted into the trochenters. The powerful muscles of the mid legs are most of the thrust. The backward movement of the legs builds up a flow which causes forward thrust to the insect. During protraction, the tibiae are trailed backwards to minimise resistance for forward movement by mid legs are lifted off the surface and swim forwards while the insect is moving by fore and hind legs. Steering is achieved by the unequal contraction of muscles of the two sides and the fast turning is produced by movement of the legs of one side towards which the insect is turning while the other side remains still. The surface tension counter acts the gravity the skating on the surface of the water. In these water boatmen the wings are reduced or fully developed. Their developed winged forms fly at night which accounts for their wide and long to small and large bodies of water. The reduced winged, which forms are incapable of flight.

Suitable for Life on the Surface of the Water:
The water boatmen, *Micronecta striata*, Fieb is highly specialized on the surface of the water. The body is light in weight, slender and with an absolutely water proof coat of find hairs which enables them about in perfect safety. The pubescence entangles the air necessary. Fore legs are modified for capturing the prey and the other legs are used in walking or skating over the surface of the water. The tarsi are so arranged that they give buoyancy and traction on the surface of the water. The tarsi are clothed with fine hairs and difficult to wet. If the tarsi are wet, the insect no longer stays on the surface film and is drawn into the water unless craw is up some dry surface to dry its tarsi to function again.

Aestivation:
There are plenty of water boatmen from April to October and then decreases. During the winter i.e. in December, January and February it is difficult to find them as they remain well out of the site hibernating by legs and other debris around the margin of the water in the adult. The over wintering adults are generally seen in ponds at the end of March. In Indian regions they aestivate under similar objects about the dried ponds waiting for the return of wet season.

Generations:
These bugs are unisexual. The males differ from the females in size smaller in size and in the structure of external genitalia. Mating occurs both during the day and night but more commonly and is in afternoon. The mating periods seem to be short and frequent a mating is disturbed by the interference of a third individual. The male jumps over of the female without any apparent premating display and remains in for about 20-25 minutes. The female hardly pays any attention to the and continues her feeding, cleaning and other activities in normal way. The egg laying takes place at night. The eggs were found attached side of the grass blades and other floating objectives.

The eggs are length wise on the object upon which they are laid in the laboratory; they were also laid on the sides of the glass trough just below the water line. The eggs were attached by translucent gelation like holdfast substance. A female generally lays about fifteen eggs at a time. There are several instars in generations.



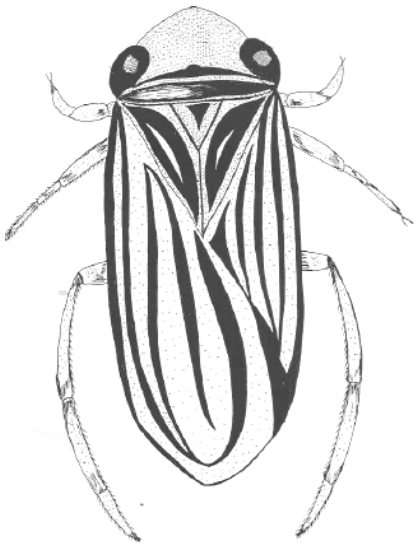


Plate1: Different stages in life cycle of *Micronecta striata* Fieb. **Plate 2:** Adult of *Micronecta striata* Fieb.

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