



ORIGINAL ARTICLE

Brief Description of *Notonecta glauca* Linn, The Indian Back Swimmer with Emphasis on Salivary Glands

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ABSTRACT

Notonecta glauca Linnaeus is known as Indian Back Swimmer. These are most interesting and fascinating of all aquatic hemiptera of tropics and subtropics and are commonly known as back-swimmers as they swim on their backs with long oar like hind legs. These are medium sized, about 14 to 17 mm. long aquatic insects and are at once distinguished from the all other water bugs. It is meagre to study its general structure with emphasis on its salivary glands which is important part of digestive tract.

Key words: *Notonecta glauca* Linn, The Indian Back Swimmer, Salivary Glands

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INTRODUCTION

Notonecta glauca Linnaeus is the most commonly distributed insects of family Notonectidae Leach (1815) in India. The Notonectidae is an important family of aquatic bugs of order Hemiptera.

In insect world Hemiptera is the largest and most important order of exopterygote insects. These are small to medium sized insects called "bugs" with piercing and sucking type of mouth parts, atrophied palpi, labium in the form of a dorsally grooved sheath receiving to pairs of bristle like stylet, and two pairs of wings of which four wings are often harder than hind wings. The aquatic bugs are included the suborder Heteroptera. Besides Notonectidae, there are thirteen more families of aquatic bugs that are included in the suborder Heteroptera. The Notonectids are truly aquatic in habitat and are commonly known as back swimmer. The back swimmer, *Notonecta glauca* Linnaeus for the morphological and bioecological investigations were collected during, the months of July to November from various ponds, ditches, and canals of Mathura and its near by areas. These bugs were easily recognised due to their oblong, convex body; large eye; short four jointed antennae; four jointed rostrum; large triangular scutellum; anterior legs inserted at the posterior margin of the pronotum; moderate long pronotum; last joint of antennae being much shorter than the penultimate one and posterior tarsi being without unguiculi.

These insects are commonly known as water boatman and back swimmer as they swim on their backs with the help of their long oar like hind legs. They are extremely predaceous and are very common around the edges of fresh water reservoirs such as ponds, lakes and streams throughout India and may be easily taken with a net. In the present study, a detailed description of digestive tract of the aforesaid insect has been noted.

MATERIALS AND METHODS

These bugs were killed by chloroform vapours, and fixed in different fixatives. Small punctures were made by micro needles to the abdominal before putting them into fixative in order to ensure proper fixation. The fixatives used were (1) Bouin's fluid, (2) Alcoholic Bouin's and (3) Zenker's fluid. After keeping in fixative for about 24 hours, they were washed thoroughly through several changes of 70% alcohol mixed with a few drops of glycerine. The specimens were later washed, upgraded and preserved in glycerine and mounted in Canada Balsam. Dissections of the specimens were made in a small dish with the help of micro scalpels, forceps and microneedles under high power of binocular microscope.

The studies on the musculature were made in the insects fixed in alcoholic Bouin's solution. The fresh specimens dissected for the musculature did not yield satisfactory results because the muscles of freshly killed specimens were extremely soft. The insects were embedded in wax and dissected from different angles for the study of various muscles. Some sections were also cut by a sharp razor blade to study the musculature of the Labium, antennae, the legs and the genitalia. Few dissections were stained by one or two drops of Mann's Methyl blue, Eosin or Borex carmine. The organs of support and locomotion of the back swimmer, *Notonecta glauca* Linnaeus were thus studied. The study of the digestive system was made by dissecting the freshly killed and Bouin's fixed material.

The dissections of freshly killed specimens yielded good results. The diagrams of gross anatomy were snatched directly from the dissections. For the histological studies of the alimentary canal, the different regions were immediately fixed after the dissections in the alcoholic, Bouin's solution. Later the material was washed, dehydrated in usual manner, cleared and embedded in paraffin wax for microtomy. The sections of 6 to 8 μ thickness were cut, stained with Hematoxyline, Eosin, Mann's Methyl blue Eosin and Malory's triple. A triple embedding technique was found most satisfactory for the purpose.

RESULTS AND DISCUSSION

Economically the back swimmer, *Notonecta glauca* Linnaeus are of a great importance as they predate upon the eggs, larvae and adults of Anopheles Culex and Aedes mosquitoes and thus may possibly be employed as a means of their biological control. They come to the surface for air and at times even emerge on the ground out of the water or may be found under stones in dam beds of recently dry streams. They fly by night. They are also found in depth in certain condition when distributed or captured. They lay their eggs and insert into the stems of aquatic plants. The young nymphs at once begin their life in water. *Notonecta glauca* Linnaeus is the Indian form of back swimmer. These insects have also been known as 'Water Boatman'. Economically the back swimmer, *Notonecta glauca* Linnaeus are of a great importance as they predate upon the eggs, larvae and adults of Anopheles Culex and Aedes mosquitoes and thus may possibly be employed for their biological control.

The back swimmer, *Notonecta glauca* Linnaeus is commonly found in fresh water reservoirs such as lakes, ponds, stream and ditches etc. India being a vast land of ponds, ditches and shallow water reservoirs possess these insects in white abundance but unfortunately nothing significant is on the record as to their habits morphohistology, bionomics and ecology. As these back swimmers predate upon a large number of aquatic insects pests, they may be employed as the tool for the biological control of a large number of insect pests. The present investigation provides an account of bioecology of common Indian back swimmer, *Notonecta glauca* Linnaeus (Hemiptera: Heteroptera, Notonectidae). The morphology of these bugs has also been investigated alongwith.

BEHAVIOUR OF NEWLY HATCHED NYMPHS

The newly hatched remained motionless for a few minutes under the water. The mid legs first exhibited slow movement the nymphs begin to swim below the surface of water. The movements were very slow and jerky for about two to three hours but become swift and quite normal afterwards. The newly hatched nymphs were pale yellow in colour but with quite weak, soft and transparent appendages. After about six to eight hours the appendages began still and the normal colour pattern was obtained. The nymphs had no interest for food for about eighteen hours but after twenty two to twenty four hours they were observed feeding upon flies and larvae of mosquitoes etc.

Table 1: Duration of different instars of back swimmer, *Notonecta glauca* Linnaeus

Duration of first instars in days	Duration of second instars in days	Duration of third instars in days	Duration of fourth instars in days	Duration of fifth instars in days
6	8	11	13	11
7	7	12	11	12
8	8	13	12	13
6	8	12	14	11
8	7	12	13	12
7	7	13	14	11
7	8	13	14	12
6	7	14	14	13
8	8	13	14	11
8	8	14	13	12
Average 7.1	7.6	12.7	12.2	11.6

SALIVARY APPARATUS

The Salivary apparatus of back swimmer, *Notonecta glauca* Linnaeus is situated below the hypopharynx in between the hypopharyngeal wings. It consists of a piston, piston roll, afferent duct, efferent duct and a two layered salivary pump. The salivary pump is a cylindrical vesicle like structure, consisting of an outer and inner. The outer layer folded on its inner side and forms the piston with which is attached a short piston rod. A pair of muscles arises from the hypopharyngeal wing and become inserted on the piston. A pair of afferent ducts, extending one on each salivary duct opens into the cavity of salivary pump. The alternate contraction and relaxation of the piston brings about the action of the salivary syringe. The pressure inside the pump decreases due to the withdrawal of the piston. It results in the collapse of the membranous roof of the efferent duct due to which the flow of the saliva in the backward direction is prevented. The salivary secretion is drawn into the pump through the afferent opening due to the lowering of the pressure at this time.

MAIN SALIVARY GLAND:

The main salivary gland (MSG) consists of a pair of a long glandular mulberry like elongated structure, found one on each side of the fore gut in the region of the thorax and the first two abdominal segments. It is bounded by numerous highly branched tracheas with the anterior region of the alimentary canal. Each gland consists of a large number of a small rounded lobes or acini (AC) which are arranged around a central axis. The acini are smaller towards the proximal and distal ends but larger in the middle giving a mulberry fruit like appearance to the gland. Each acini is a hollow flask shaped structure that opens into the central canal of the gland by a short duct.

ACCESSORY SALIVARY GLAND:

The accessory salivary gland (ASG) closely resembles the main salivary gland (MSG) in its shape and structure except for the relatively smaller size. Like the main salivary gland

(MSG) it also bears a large number of similar lobes or acini (AC). A few of the anterior acini open directly into the central duct. The duct of the accessory salivary gland (DASG) joins with the central canal of the main salivary gland (DMSG) in between the two salivary vesicle (SV). The Accessory salivary is relatively much smaller in size than the main glands (MSG) and bears similar type of acini or lobes around the central axis. The acini give off very minute cuticular canals which open into the lumen of the central duct. The acini of the accessory salivary glands possess a thick layer of syncytial epithelium (AP) with a few oval nuclei and granular cytoplasm. The epithelium forming the inner lining of the duct of the accessory salivary gland is produced into numerous distinct longitudinal folds.

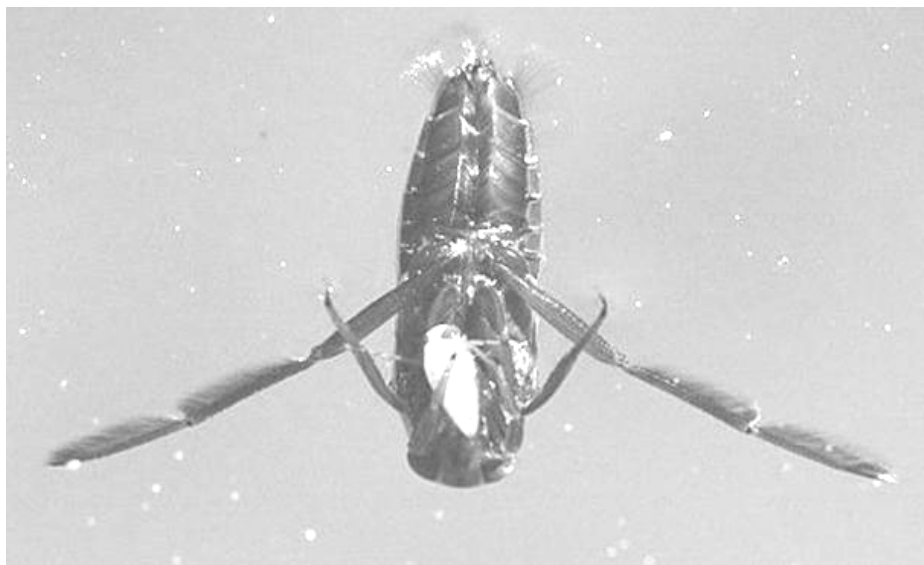


Fig. 1: Photograph of back swimmer in water

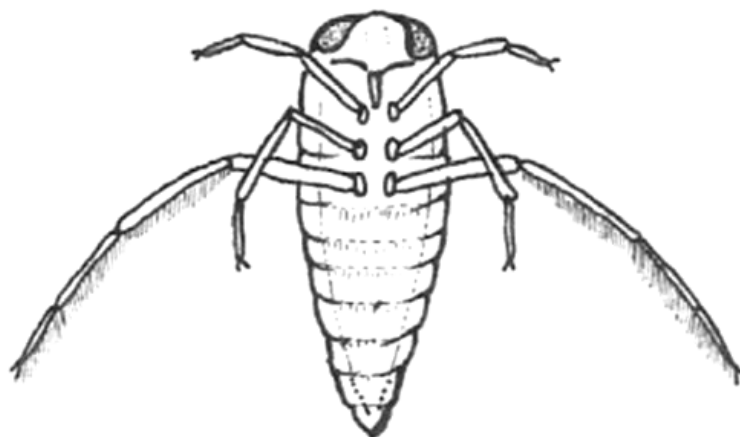


Fig. 2: Diagram showing ventral segmentation of back swimmer

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