

STUDY OF MORPHOLOGICAL CHARACTERISTICS OF TAXONOMICALLY SIGNIFICANT AQUATIC AND SEMIAQUATIC FAMILIES IN HETEROPTERA***MAMTA KUMARI AND SUSHIL KUMAR¹**Department of Zoology,
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Received : 25.02.17.; Accepted : 23.04.17**ABSTRACT**

The heteroptera is an important suborder of order hemiptera and includes a large number of aquatic and semiaquatic forms, which are of a taxonomic importance. The study recorded 14 families namely Nepidae, Notonectidae, Pleidae, Belostomatidae, Naucoridae, Corixidae, Gelastocoreidae, Ochteridae, Hydrometridae, Veliidae, Mesoveliidae, Gerridae, Saldidae and Herbridae. Aquatic and semiaquatic heteropteran insects are of variable sizes from 1.5 mm. to 110 mm long living mainly in lentic and lotic fresh water. Some even live in brackish water, only a few species are marine. These are different in morphology and feeding habits from their terrestrial forms. Some are truly aquatic, provided with effective swimming respiratory structure along with modification of body shape and size. Besides the genitalia and copulatory complex of all the species studied has been dealt. The other morphological features of taxonomic significance were also studied. This study finds various morphological features in the members of different aquatic and semiaquatic families of heteroptera.

Figures : 07

References : 10

Table : 00

KEY WORDS : Aquatic, Hemiptera, Heteroptera, Semiaquatic

Introduction

Heteroptera a important suborder of order hemiptera. It includes a large number of aquatic and semiaquatic bugs which are found below or upon the surface of the water^{1,2,4-6}. There are 14 families of the suborder heteroptera Nepidae, Notonectidae, Pleidae, Belostomatidae, Naucoridae, Corixidae, Gelastocoreidae, Ochteridae, Hydrometridae Veliidae, Mesoveliidae, Gerridae, Saldidae and Herbridae, Former 8 families belong to the series cryptocerata and the later 6 to the series Gymnocerata. Heteroptera order are easily recognised from the other suborder Homoptera due to kept base of rostrum is usually not touching anterior of coxae region.

Heteropteran insects are small to large size, slender, rounded oval or flat insects. Head is usually prognathous but hypognathous in some heteropteran bugs. Compound eyes are large and prominent. Ocelli usually present while rarely absent. Mouth parts are modified for piercing and sucking. Antennae usually well developed and are rarely absent. Thorax compact and closely fused. Prothorax variable in size, usually well developed long pronotum Meso and meta thorax complex with many sclerite. Scutellum often very large and may even cover the abdomen. Metanotum is reduced or well developed. Legs are adapted for crawling, walking, jumping, grasping prey and swimming. Wing usually thickened basally and apically membranous. Hemelytra with basal portion

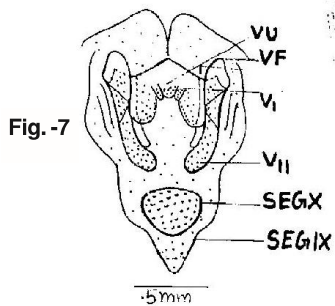
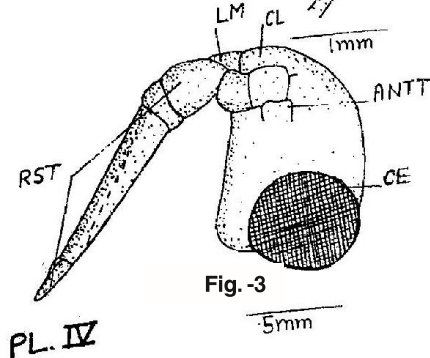
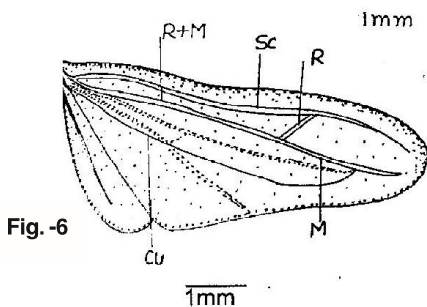
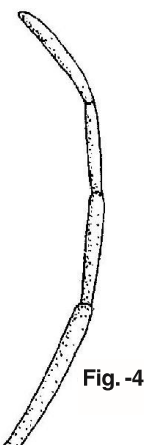
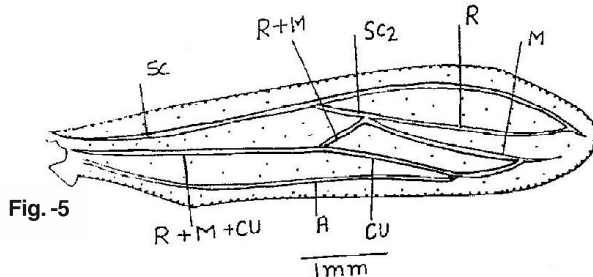
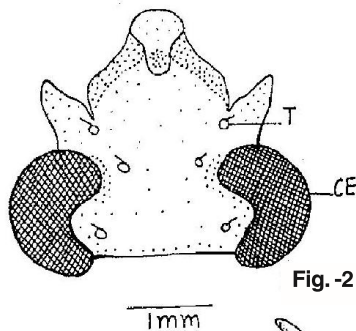
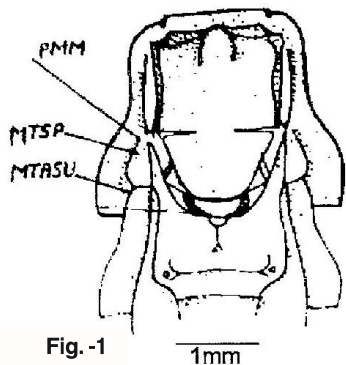


Fig.1.: Dorsal View of thorax, *Gerris adelaidis* Dohrn.
 Fig.2.: Dorsal View of head, *Gerris adelaidis* Dohrn.
 Fig.3.: Lateral View of head, *Gerris adelaidis* Dohrn.
 Fig.4.: Lateral View of antenna, *Gerris adelaidis* Dohrn.
 Fig.5.: The fore wing, *Gerris adelaidis* Dohrn.
 Fig.6.: The hind wing, *Gerris adelaidis* Dohrn.
 Fig.7.: Female genitalia, *Gerris adelaidis* Dohrn.

PMM- primary inter segmental suture between mesonotum and metanotum.
 MTASU- metacelabular suture, MLAS- Metanotal longitudinal sulcus.
 SCU- Scutum., CE- Compound eye RST- Rostrum, LM- Labrum, CL- Clypeus,
 ANTT- Antenniferous tubercle
 VU- Vulva, VF- Valvifer, V1- Valvula1, V11- Valvula11.

PL. IV

thickened or coriaceous and divided into two areas: the clavus and corium. Hind wing fully membranous. Abdomen long slender composed of usually 11 segments. Ovipositor well developed in aquatic forms.

Material and Method

The aquatic and semi-aquatic heteropteran insects were collected with the help of pond net from ponds, lakes, rivers, streams and under the rocks of different parts of India. After determination most of the specimens were preserved in 70% alcohol and remaining specimens pinned in entomological box. The genitalia was taken out with the help of forceps. The genitalia were then mounted in D.P.X. after processing as usual. In order to study the structural details of the male genitalia, dried specimens were softened, macerated in a hot 10% Kolt solution, dissected and placed in lactic and glycerine. The genitalia were stored in a drop of glycerine kept in a micro-vial. Figures were drawn with the help of camera lucida. All the measurements in mm unless otherwise stated.

Diagnostic Characters :

Gerris adelaidis is selected as the standard gerrid for the study of morphological characters of taxonomic importance of the gerridae because of its relative abundance, convenient size for dissection and relative primitiveness in structure. Other species were also studied to facilitate the interpretation of structure in this family. Unless otherwise stated *Gerris adelaidis*.

Description

1. Head :

It is forwardly directed apically. The antennae are four segmented. The four segmented rostrum is always placed on the ventral surface of the head. The first segment is thick, usually as long as wide, the second is shortest, the third one is longest with a small special lobe suppressed on the dorsal basal region of the fourth segment. The rostrum is labial in origin. The labrum is short and sub triangular. It is basally separated from the apical margin of the clypeus. The mandibular plate is externally separable from the maxillary plate by the transverse structure which ventrally reaches inside the antennal cavity. The clypeus is well defined. The compound eyes are large and prominent.

2. Thorax :

The thorax of the Gerridae was studied¹⁰ in

Gerris species. The pterothoracic structure of representative species of Gerridae and discussed their taxonomic significance⁸.

A. Prothorax :

The pronotum is prolonged in all the winged forms and in most of the wingless forms. It is divisible into two areas which can be separated by an obscure transverse suture. The suture demarcates the point of origin of prolongation. It represents the posterior margin of the pronotum in those wingless form in which the pronotum is not prolonged. The pronotum more or less widened and elevated above the point of the wing base in all the winged forms. This point is called the humerus. The humerus is absent in the wingless forms. The area of pronotum anterior to numari is called anterior lobe and the area posterior the humeri is the posterior lobe in winged form. But it is highly inconvenient in wingless form. The prosternum is indistinguishable from the propleural region. It is comparatively narrow than meso and metasternum.

B. Mesothorax :

The antecostal suture marks the anterior margin of mesonotum. A pair of sutures extend posteriorly from the anterior margin of mesonotum, called parapsidal sutures. The prescutum is the anterior area of the mesonotum or metanotum between the antecostal suture the prescutal suture when the later is present. The true prescutum was observed only in ptilomera in the Gerridae. The area bounded between the parapsidal sutures is the scutum. The scutoscutellar suture is not present. The posterior region of the mesonotum which is continuous with the scutal region is the scutellum. A narrow sclerite of unelucidated morphological significance is present along the scutellar region behind the tergal. It was termed Gelenkkop the posterior margin of the postnotum is greatly produced in metrocoris but straight in ptilomera. The basalar and sabalar sclerite are not found. The longitudinal lateral membranous suture separates, the mesonotum from mesopleuron is usually absent. The mesosternum is often inseparable, fused with the mesopleural region but the suture demarcates the mesosternum from the mesopleuron. The mesothoracic spiracle is hidden beneath the pronotum.

C. Metathorax :

The metanotum is distinguishable laterally by the longitudinal elevated carina. As it is continuous from the abdominal connexivum hence

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it also contains the part of the first abdominal segment. The continuation of the first abdominal segment into the metanotum is most clearly visible in *Rhagadotarsus*.

The encroachment of the pleurite of the first abdominal segment into the metathoracic region is a very common feature in the Gerridae. In some forms, the anterior margin of the first abdominal tergite is straight and it seems that the metanotum does not contain any part of the I abdominal segment. The metanotal longitudinal sulcus is visible. The third phragma is absent. There are two very important sutures which occur in metaplural region.

- 1- Primary inter segmental suture between the mesonotum and mesonotum. It goes laterally in line with the metathoracic spiracle, and
- 2- The metacetabular suture: It goes dorsally behind the metathoracic spiracle. It is dorsally connected with the posterior margin of the mesonotum in some forms. The suture was termed secondary intersegmental suture⁸.

The metathoracic spiracle is very conspicuous and occupies the inter segmental position between the mesonotum and metanotum laterally.

3. Wing Venation :

The naming of the venation of wings⁷ was worked out. In *Gerris adeladis* the hemelytra with vein R+M+Cu fused basally and are separated into R+M and Cu, beyond the middle of the wing. The vein R+M bifurcates into R and M branches. R is joined with Sc by oblique vein Sc₂. Cu is specially joined by the vein A. A is connected with lower margin of the wing by a short cross vein.

In the hind wing R+M and Cu are clearly separated basally. Cu is specially joined with M, Cu, and A are not joined together apically.

4. Abdomen :

There is a tendency of progressive loss of pleuron of the abdomen during the embryonic development in the hemiptera. The tergite and the sternite become fused. The spiracle, which was originally in the pleural region becomes located in the sternal region.

A. The first abdominal segment :

The first segment dorsally clearly retained in all species of the Gerridae. The first segment to always completely lost ventrally except for the

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rhagadotarsinae. The first abdominal pleurite is distinctly incorporated into the metathoracic region⁹. The median omphalium is absent in rhagadotarsinae. There is no lateral opening of the omphalial groove on the metacetabular region.

B. The second to seventh abdominal segments :

The connexivum is always present in the second to seventh segment. It is always absent in eighth segment. The connexivum is dorsally well defined by the longitudinal suture tergal region. The connexivum ventrally appears to be defined by the longitudinal suture which runs more ventral to abdominal spiracle. The suture is quite distinct and complete in some forms while totally disappears in others. The seventh connexival segment is more or less greatly produced, forming the connexival spine. The ventral apical margin of the seventh segment is mostly concave.

C. The male external genitalia :

The male phallic organs of the Gerridae were studied³ and also summarized the male genitalia in various group of heteroptera. The pygophore is the fusion product of the ninth coxites. It covers ventrolaterally the genitalia chamber and encloses the invaginated phallic organs. The basal plate is attached laterally to the pygophore, subtaining the phallosome within the genital chamber. The parameres arise from the point of connection of the basal plate to the pygophore. The phallosome contains the invaginated endosoma. Endosoma is divided into the proximal and distal membranous segments. The phallosome opens at the distal end, through which the endosoma is extruded. The distal segment is composed of three pairs of sclerotized plates viz.. There are (i) the medium dorsal plate (ii) the ventral plates and (iii) the lateral plates. The ventral plates carry the ejaculatory duct. The shape, size and number of plates vary in Gerridae due to loss and fusion of plates.

D. Female external genitalia :

The gonapophyses (Valvulae) arise from the primary sternum and the valvifer is modified sternum. The shaft of the ovipositor is formed of the first and second valvulae, the first being external and ventral, the second internal and dorsal. The first valvifers have a pleural position below the tergum on the sides of the eighth segment though their posterior angles may be flexibly attached to the ninth tergum. The first valvulae, each have two proximal rami. The outer ramus is flexibly attached

to the ventral angle of the first valvifer : The inner ramus is united with the anterior inner angle of the ninth tergum. The second valvifer has a pleural position on the sides of the ninth segment beneath the lateral margins of the ninth tergum. The second valvulae are attached proximally to the anterior end of the second valvifer and the ramus slides on the concave margin of the inner ramus of the corresponding first valvula. The third valvulae and the second valvifers are often absent in gerridae.

In *Gerris adelaidis* the first valvula is divided into inner short and outer longer lobe being directly connected with the first valvifer. The valva is situated between the inner lobes of first valvulae.

The second valvulae are connected by the intervalvular membrane. The apical end of the ramus is loosely attached to the inner margin of the ramus of the first valvula due to loss of the second valvifer.

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