

Morphological studies of pleids (hemiptera: pleidae) using sem

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ABSTRACT: Family Pleidae includes the truly aquatic bugs called pleids, commonly known as pigmy backswimmers. Taxonomic studies traditionally used morphological features in identification of a species and development of key or the world catalogue. This resulted in ambiguity and incompleteness in the taxa of various families. The present study deals with utility of scanning electron microscope as a tool in identification of the species of the family Pleidae in freshwater bodies of Chennai City – *Paraplea frontalis*. Various body parts (Rostrum, antennae, legs, ventral region of the body) of the bug were scanned to observe additional morphological features hitherto not reported. SEM is a common tool used for insect study. In the present study, Sem is used in the taxonomical study of pleids.

Keywords: Water bugs; Hemiptera; Pleidae; Morphology; Body parts; Legs.

INTRODUCTION

Aquatic bugs are often used as a model group of true bugs for various kinds of ecological, physiological and morphological studies. Special attention has been paid to study the morphology of the ventrolateral thoracic region and the base of abdomen in water bugs (Papáček, 1999). The results of the study on these body regions were summarized by Papáček (1987) and Papáček *et al* (1990). The reason for attention, that is paid particularly to these body regions, is that they are functionally important for respiration and their architecture reflects some life strategies too (Andersen, 1982).

Schuh and Slater (1995) concentrated on searching for the main characters in the formation of the lateral pterothoracic and thoracic-abdominal body regions in families of aquatic bugs, which are accepted as phylogenetically closely related. Mahner (1993) used some specific character of this body region for his study on phylogenetic relationship in nepomorphan bugs. Papáček (1999) stated that thoracic sclerites presented useful information regarding phylogenetic relationships among the basal stems of Diptera.

The impact of a variety of parameters (eg. predation, reproductive behaviour and strategies, temperature, photoperiod, nutrition) on morphology and / or reproduction in *Microvelia pulchella* was studied by Taylor and McPherson (1979). Studies on morphological variation in members of family Gerridae was given by Row *et al* (1994) and Wilcox (1995). The architecture of the body region studied was uniform in all the examined species of Pleidae (Papáček, 1999).

Morphological and physiological studies are totally lacking for representatives of Pleidae in India. Hence, the present investigation aims at studying the morphology of *Paraplea frontalis* using Scanning Electron Microscope (SEM).

1. MATERIALS AND METHODS

Experimental Animal

The Pigmy backwimmer, *Paraplea frontalis* is a small aquatic bug inhabiting standing water. These bugs were collected from ponds located at Manali, Chennai, India. They were maintained in a small aquaria with aquatic plants and fed with culicine larvae.

Sample Treatment

For Scanning Electron Microscopy (SEM), whole specimens were fixed in 2.5% glutaraldehyde fixative for 16 - 18 h at 40°C. The specimens were then washed for 15 minutes in Phosphate (PO₄⁻) buffer (pH 7.0) thrice. They were then dehydrated in alcohol series of 30%, 50%, 70%, 90% and 100% for 1 hour. The specimens were treated twice in 90% alcohol and left overnight in 100% alcohol. The specimens were then air dried in a desiccator and coated with gold and examined with a Hitachi S 500 SEM operating at 25 KV.

2. RESULT

2.1 Scutellar Development

In the III nymphal stage, formation of the scutellum was noted (Fig.1A). In the enlarged view, the scutellum was observed as a projection on the dorsal side of the III nymphal stage (Fig.1B).

2.2 Adult

The dorsal region in adult is pitted. The pitted region shows the presence of slender, long hairs (Fig.2A). In the enlarged view of the dorsal side, notched depressions are noted (Fig.2B). The body in adults is slightly oval, broadened anteriorly but diverging posteriorly (Fig.2C). The antennae lie concealed beneath the antennal groove (Fig.2D). The antenna is 3 segmented with varied hair like structures in each segment. The basal segment is a bulb like structure, the middle segment is tubular while the distal segment is cone shaped (Fig.2E).

2.3 Head

On the dorsal region of the head, the median stripe is situated between the eyes (Fig.3A). In the enlarged view, the median stripe shows the presence of round granule like structures (Fig.3B). Head is pitted except on median stripe with eyes, rostrum and antennae exhibiting a distinct facial pattern (Fig.3C). Above the rostrum, the clypeus is seen as a group of flattened filamentous structures (Fig.3D). In the enlarged view, the eye shows the presence of many ommatidia. In dorsal view, the eye width is greater than the length. Below the eye, antennal groove with concealed antenna is noted (Fig.3E).

2.4 Rostrum

The rostrum arises from the base of the clypeus (Fig.4A). Anterior to the rostrum are two leaf like projections located on either side of the clypeus. The entire rostrum is made up of 4 bilobed segments with numerous hairs (Fig. 4B, 4C).

3. FIGURES

FIGURE 1
SCUTELLAR DEVELOPMENT IN *PARAPLEA FRONTALIS*

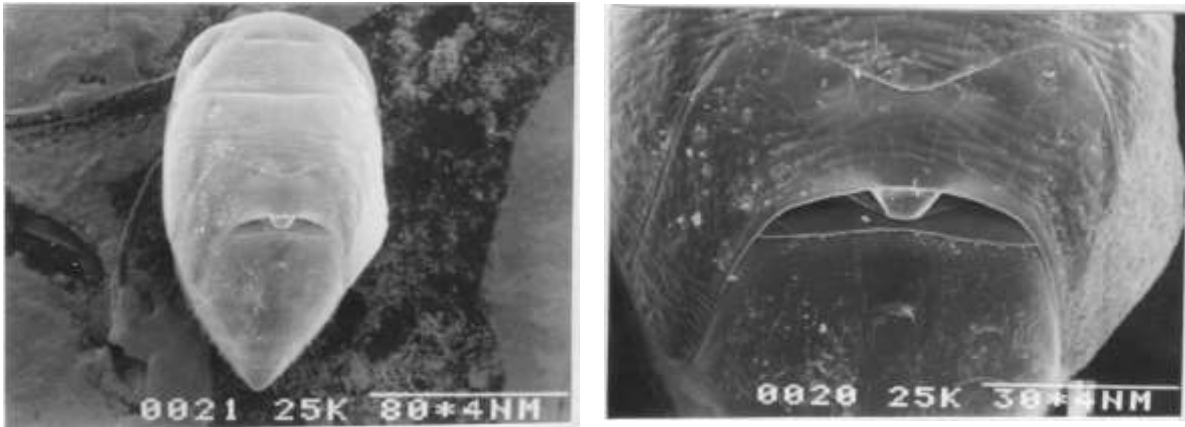


Figure 1 A. Formation of Scutellum in III nymphal stage Figure 1B. Enlarged view of Scutellum

FIGURE 2
***PARAPLEA FRONTALIS* – ADULT**



Figure 2 A. Dorsal side - Depressions with hair like structure Figure 2B. Enlarged view - Depressions with hair like structure

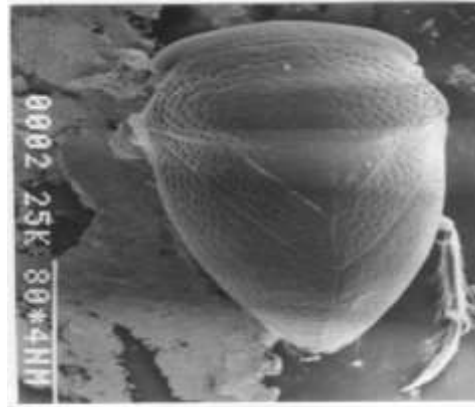


Figure 2C. Dorsal view

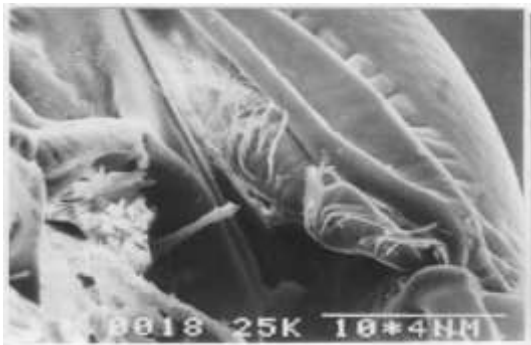


Figure 2 D. Concealed view of Antennae with antennae groove



Figure 2 E. Antennae – Entire structure

FIGURE 3
STRUCTURE OF HEAD IN *PARAPLEA FRONTALIS*

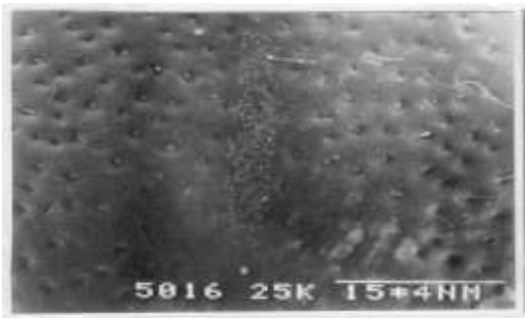


Figure 3 A. Median Stripe



Figure 3 B. Enlarged view – Median Stripe



Figure 3 C. Head – Entire structure

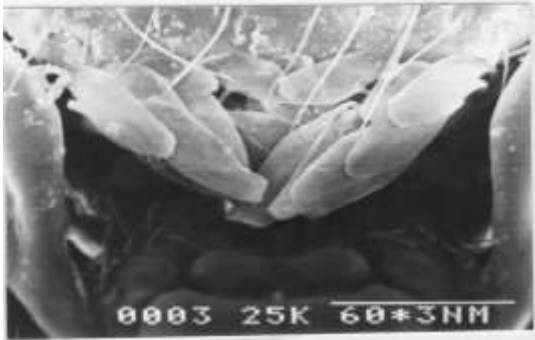


Figure 3 D. Clypeus



Figure 3 E. Eye – Entire structure with antennae groove

FIGURE 4
ROSTRUM OF *PARAPLEA FRONTALIS*



A. Clypeus with anterior portion of Rostrum



B. Enlarged view – Rostrum



C. Rostrum with concealed antennae and Foreleg coxa

4. DISCUSSION

The electron microscopic study on *Paraplea frontalis* revealed differences in the varied body parts. The scutellar development was noted in the third nymphal stage. This feature is reported for the first time. The entire dorsal region on the head is pitted. This sculpturing on the dorsal surface is also noted in *Neoplea striola* (Gittelman, 1974). The rostrum or beak is adapted for piercing and sucking. Most of the bugs are predaceous, feeding upon the predigested body contents of other insects. The beak is generally elongate and four segmented although the proximal segment may be quite short or concealed and so easily missed. The clypeus or the anterior part of the face is noted above the mouth parts (Nieser, 1991).

Some characteristics of the adult specimens are noteworthy, with reference to distinctive evidence of species identity. Lundblad (1934) synonymised a number of insect species, recognising the occurrence of intra-specific variation in facial pattern. The facial pattern of the head region reported in the present study is the first of its kind in *Paraplea frontalis*. This facial pattern is similar to that noted in *Plea frontalis* (Benzie, 1989). The structure of the antennae and rostrum is similar to related pleids.

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