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**Jagbir Singh Kirti**  
Department of Zoology &  
Environmental Sciences,  
Punjabi University,  
Patiala-147002

**Navneet Kaur**  
Department of Zoology &  
Environmental Sciences,  
Punjabi University, Patiala-  
147002, Punjab, India.

**Simarjit Kaur**  
Department of Zoology &  
Environmental Sciences,  
Punjabi University, Patiala-  
147002, Punjab, India.

**Correspondence:**  
**Simarjit Kaur**  
Department of Zoology &  
Environmental Sciences,  
Punjabi University, Patiala-  
147002, Punjab, India.

## Study on cibarial armature and sense organs of *Armigeres subalbatus* (Coquillett) with scanning electron microscope (Diptera: Culicidae)

Jagbir Singh Kirti, Navneet Kaur, Simarjit Kaur

### Abstract

A detailed description of cibarium of *Armigeres (Armigeres) subalbatus* (Coquillett) has been illustrated for the first time with the aid of Scanning Electron Microscope. The description of cibarial armature is based on structure of cibarial bar, width & characteristic of lateral flanges and number of cibarial sense organs or papillae viz. palatal papillae, larger dorsal papillae, and smaller dorsal papillae. Ventral papillae are found to be absent in this species.

**Keywords:** Diptera, Cibarium, *Armigeres subalbatus* and SEM.

### 1. Introduction

The genus *Armigeres* Theobald, 1901 is entirely based on an oriental group of mosquitoes. The species *Armigeres subalbatus* (Coquillett) as a part Indian mosquito fauna and is well known vector of *Wuchereria bancrofti* to spread the disease filariasis. This mosquito species is very common in India and is sometimes seems to be doubtful in morphological identification partially with other allied species of the same genus. More often there is atleast one species *Armigeres kuchingensis* Edwards which is variable and closely resembles with the present species.

To get rid of this problem, investigations on the internal structures like cibarium have been done for the first time with the aid of Scanning Electron Microscope. However the use of cibarium as morphological identification feature is not new in mosquito taxonomy. Previously a lot of work has been done by many workers like Sinton and Covell (1927)<sup>[11]</sup>; Barraud and Covell (1928)<sup>[1]</sup>; Barraud (1934)<sup>[2]</sup>; Michener (1944)<sup>[9]</sup>; Chen (1972)<sup>[3]</sup>; Sirivanakarn (1976, 1978)<sup>[12, 13]</sup>; Forattini and Sallum (1992)<sup>[5]</sup>; Kirti *et al.* (2015)<sup>[6, 7]</sup>. Cibarium is an integral part of the alimentary canal which lies within the head of mosquitoes. Cibarium is dorsoventrally flattened structure situated under the clypeus at the proximal end of proboscis. It is located at the base of pharyngeal pump (Lee and Craig 1983)<sup>[8]</sup>. Cibarium is composed of two parts i.e. cibarial armature and cibarial sense organs, the latter are furnished with palatal papillae, larger dorsal papillae, smaller dorsal papillae and ventral papillae. The complete description of cibarium is discussed ahead.

### 2. Materials and Methods

For mosquito collection, several collection-cum-survey tours were conducted at regular intervals in gardens, human dwellings, cattle sheds and paddy fields throughout the state of Punjab at dawn and dusk time (between 6:00 A.M. to 10:00 A.M. and 7:00 P.M. to 10:00 P.M.). Specimens were then brought to the laboratory for proper preservation in collection boxes. Morphological identification was done by following keys of Barraud (1934)<sup>[2]</sup> and Reuben *et al.* (1994)<sup>[10]</sup> upto family and genus level. However, the species were further authentically identified by following the keys of Darsie and Pradhan (1990)<sup>[4]</sup>.

*Armigeres (Armigeres) subalbatus* Coquillett

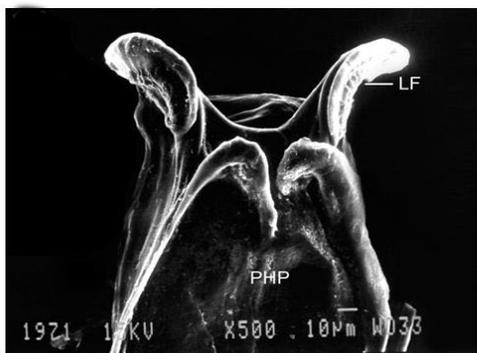


Fig. 1. Cibarial armature

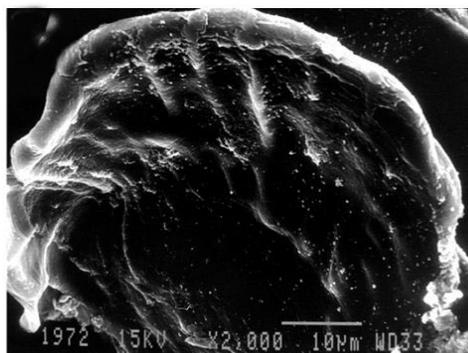


Fig. 2. Lateral flange

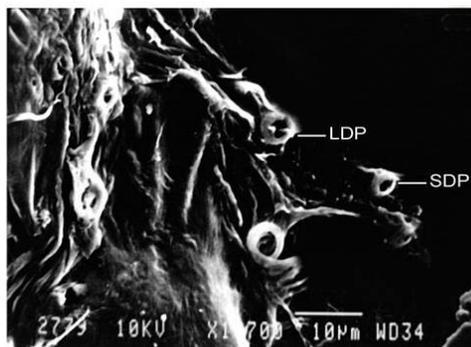
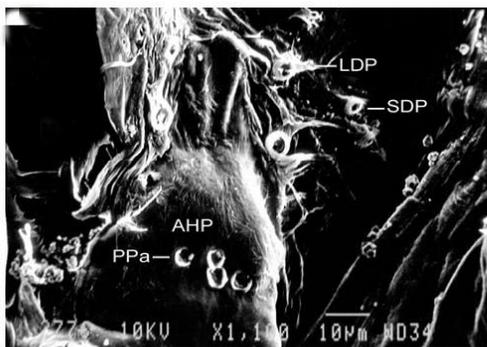


Fig. 3 & 4. Antero-dorsal membrane

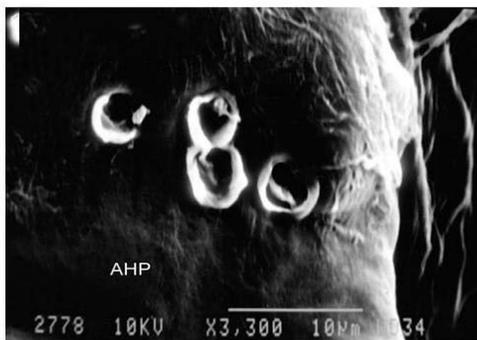


Fig. 5. Palatal papillae

**Abbreviations:** AHP– Anterior Hard Palate, LDP– Lateral Dorsal Papillae, LF– Lateral Flange, PHP– Posterior Hard Palate, PPa– Palatal Papillae, SDP– Smaller Dorsal Papillae

For Scanning Electron Microscopy, the method given by Lee and Craig (1983) [8] was followed with certain changes. Heads of at least five adult female mosquitoes were alienated from their body at a time and boiled in 10% KOH solution till their clearance. These were then washed several times in water. Heads were placed on slide one by one with a drop of water, dissected with the help of dissecting needles, under binocular microscope. Compound eyes were slowly pulled apart in order to expose cibarium which is located immediately behind the clypeus. The specimens were washed in several changes of distilled water and dehydrated by passing through ascending grades of alcohol. The specimens were then put on stubs exposing dorsal position after air drying on filter paper and coated with gold. After that images were observed under JSM-6610LV Scanning Electron Microscope at Indian Institute of Technologies (IIT), Ropar.

**3. Results and Discussion**

**3.1 Cibarium:** Length of cibarium twice its width and anterior hard palate about one third the length of cibarium.

**Cibarial armature:** Lateral flanges stout, upper ends curved outwards; width between posterior ends of two lateral flanges ranges 104.28µm. A horizontal row of cuticular projection found posterior to posterior hard palate, projected downwards in the middle (Figure: 1 & 2).

**3.2 Cibarial sense organs**

**Palatal papillae:** 4 closely packed in one group, near posterior end and kept apart from edges of anterior dorsal hard palate; socket diameter ranges from 2.41 ± 0.46µm (Figure: 3 & 5).

**Larger dorsal papillae:** 4 in number, forming quadrilateral shape, one pair situated at a short distance apart from each other; socket diameter ranges from 1.99 ± 0.64µm (Figure: 3 & 4).

- **Smaller dorsal papillae:** 4 in number, two on each side of anterior hard palate, linearly placed and equally situated on both sides; socket diameter ranges from  $1.45 \pm 0.28\mu\text{m}$  (Figure: 3 & 4).

Earlier research work done by Barraud (1934) [2] and Lee and Craig (1983) [8] mentioned the overview of the structure using only light microscope. This is for the first time the ultrastructure of entire cibarium is described in details using Scanning Electron Microscope. The present study on *Armigeres subalbatus* (Coquillett) has provided many new taxonomic attributes like cibarial sense organs i.e. palatal papillae, larger dorsal papillae and smaller papillae. These new features will be used to update the status of present species.

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