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Fred Miller

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FREDERICK H. MILLER, JR.

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Scanning Electron Microscopy of Antennal Structures of *Polyplax serrata* (Burmeister) (Anoplura: Hoplopleuridae)

FREDERICK H. MILLER, JR.
PARASITOLOGY SECTION, DIVISION OF MICROBIOLOGY, DEPARTMENT OF PATHOLOGY AND LABORATORIES, MEADOWBROOK HOSPITAL, EAST MEADOW, NEW YORK 11554

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Abstract: The high magnification of the scanning microscope reveals that the first two antennal segments each have a sensillum placodeum, while the fourth and the fifth, the last two, each have a sensillum coelonicum. These latter sensilla are partially covered by protective plates, and from the floor of each a peg organ arises. On the apex of the peg there is a ring of eleven rudimentary hairs, and the wall of the atrium is reticulate. The third segment of the male has a distal, preaxial angled extension which bears a tooth.

The scanning electron microscope is rapidly becoming a popular tool in entomology. The resolving power and depth of focus is of such high detail that the image has a three dimensional effect. This clarity of surface structures at higher magnifications than is possible with the light microscope, enables previously overlooked or unknown to be studied. An example of this is the pore organs on the antennae of *Pediculus humanus* Linn. and *Phthirus pubis* (Linn.) as described by Miller (1969). An additional advantage of this microscope is that its fine scanning beam makes it possible to see into crevices and openings. For example, the sculpturing and reticular patterns of the spiracular atria may now be studied without having to dissect and section the organisms. When these organs are seen in their entirety, this may lead to a better understanding of the organ and the physiology of the organism, as well as to increase the use of these structures as taxonomic criteria.

The antennae of the genus *Polyplax* is described by Ferris (1923) as being five segmented, and those of the males are slightly sexually dimorphic in the third segment with a distal-preaxial angled extension terminating in a recurved spine or seta. The present study shows this spine or seta to be a tooth. The ring sensoria on the antennae referred to by Ferris (1951) are here described as sensilla coeloconica and in such clarity that the peg organ and reticulated wall of the atrium are reported in detail. Other antennal structures of *Polyplax serrata* (Burmeister) are also described.

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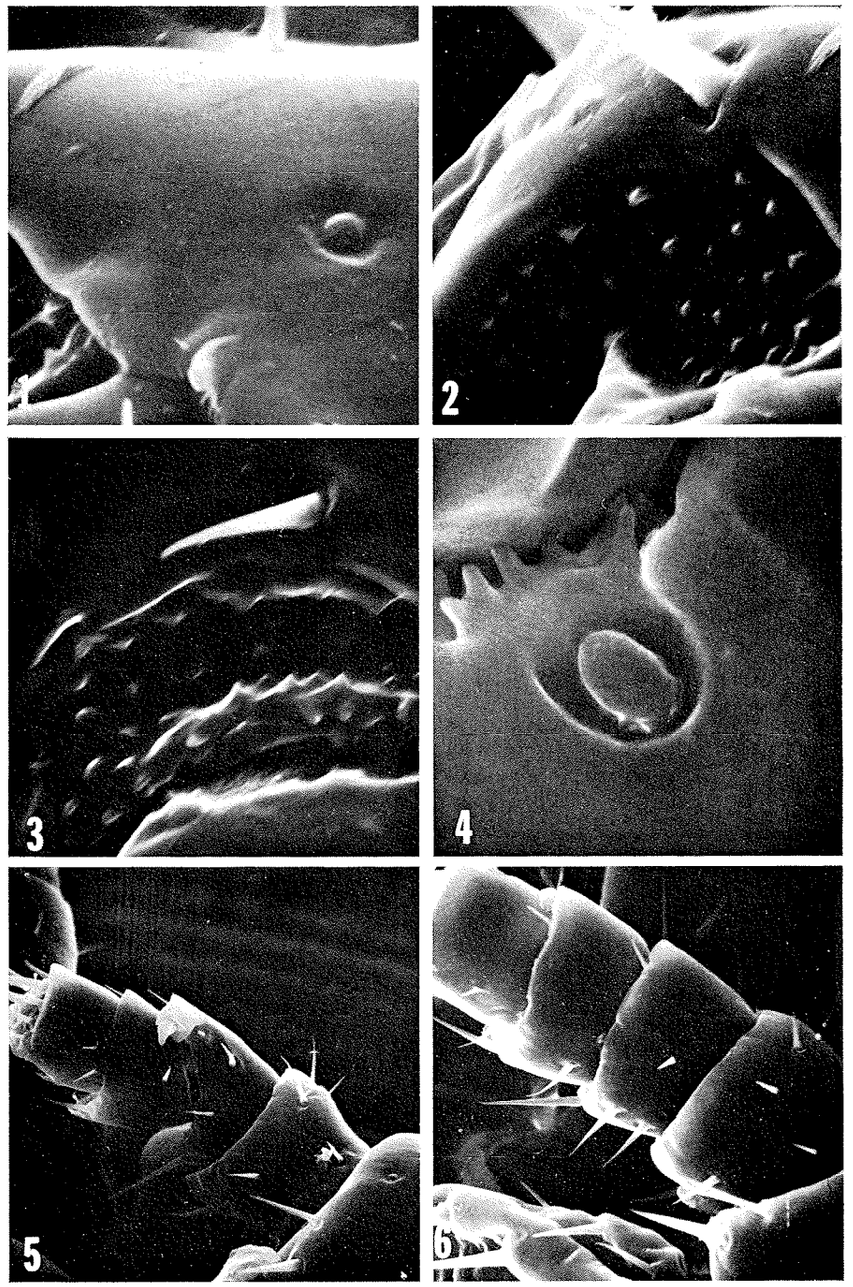
MATERIALS AND METHODS

This study is based on 48 specimens of *Polyplax serrata* (Burmeister) representing two populations. One was supplied by Dr. Austin Frishman of the State University of New York at Farmingdale, and the other from a laboratory colony maintained on mice at the Meadowbrook Hospital Laboratory. Males, females and nymphal stages were fixed in 70% alcohol. Intact lice were mounted on metal specimen holders as previously described by Miller (1969). They were studied under the scanning electron microscope, a Cambridge Steroscann Mark II, at 20kv. The general structures and characteristics of the entire organisms were scanned prior to the more detailed study of the antennae.

RESULTS AND DISCUSSION

Scanning electron microscopy of the antennae of adult male, female, and nymphal stages of *P. serrata* reveals the following. The first antennal segment of the male appears slightly dilated when compared to this segment in the female. The first segment of the male, female, and nymphal stages each has approximately seven setae of different sizes scattered over the segment. On the dorsal side, near the distal end of the first antennal segment there is a dome-like structure (Fig. 1) which measures approximately 1.6 microns in diameter. This dome, or plate, may well be a surface view of a sensillum placodeum as described by Snodgrass (1935). There are numerous short spines on the intersegmental membrane and surrounding the base of the second segment (Fig. 2). Studies of entire lice reveal similar spines between all the joints of the legs (Fig. 3). Their positions suggest that they may be the organs for recording the position of the appendages.

The second antennal segments of the males, females, and nymphal stages are morphologically similar to each other; seven setae are usually scattered on this segment. On the dorso-lateral distal end of this segment, there is a dome similar



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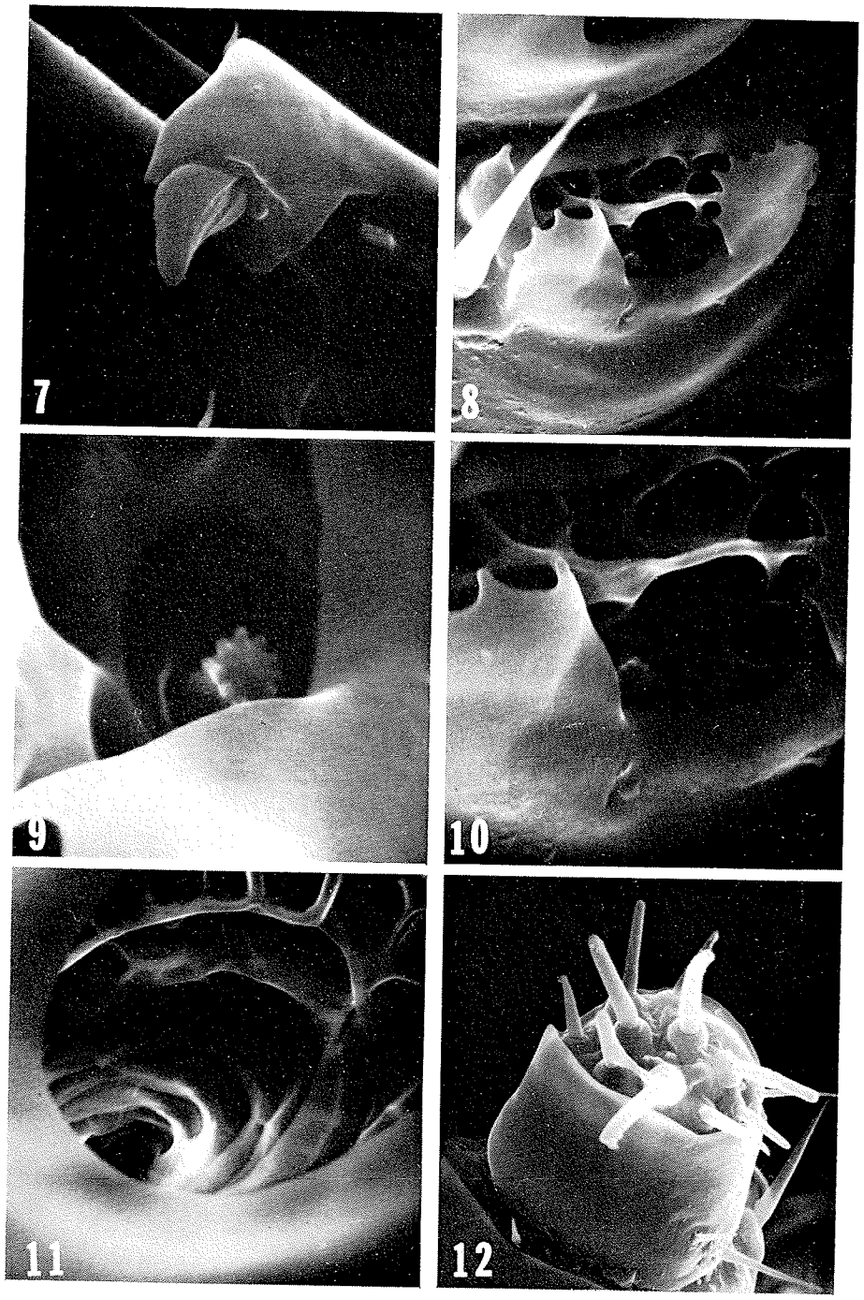
FIGS. 1–12. All the photomicrographs are of the louse, *Polyplax serrata*. 1. Dome-like structure on the first antennal segment. 2,800×. 2. Spines in intersegmental membrane between the first and second antennal segments. 1,000×. 3. Spines surrounding the joint between the coxae and the trochanter of the first leg. 3,000×. 4. Dome-like structure seen on second antennal segment. 6,000×. 5. Antennal segments of the male showing sexual dimorphism of the third segment. 500×. 6. Antennal segments of the female. Note the absence of the tooth on the third segment. 600×. 7. Tooth on the third segment of the male antenna. 3,000×. 8. Protective plates around the opening on the fourth antennal segment. 3,000×. 9. Peg organ seen in base of sensillum coeloconicum. 12,000×. 10. Atrial wall of sensillum coeloconicum of fourth antennal segment showing the sculptured reticulated pattern. 7,000×. 11. Wall of respiratory atrium of the third abdominal segment showing sculptured reticulated pattern. 3,000×. 12. Terminal end of fifth antennal segment showing the cluster of setae-like structures. 1,000×.



to that seen on the first segment, but the surrounding groove is usually narrower and the sides of the dome are often irregular (Fig. 4).

The third antennal segment is the sexually dimorphic one (Figs. 5 and 6). The male segment has a distal, preaxial-angled extension which bears a tooth (Figs. 5 and 7). This tooth measures 40 to 50 microns in length by 20 to 30 microns at its base, and it tapers to a subacute point. There is a groove on the side of the tooth extending from the base to the apex. The tooth is referred to as a "spine or stout seta" by Ferris (1923), but it is obviously morphologically different from other setae seen on this species. There are usually seven setae of different sizes scattered over this segment of both males and females.

The fourth antennal segment usually has 4 or 5 setae. There is an opening on the distal, lateral aspect of this segment. This structure is similar to the sensillum coeloconicum described by Comstock (1940). A similar opening is found on the fifth, or terminal segment. The only mention Ferris (1951) makes of these structures is that they are "ring-like structures" that may be regarded as sensoria. These openings appear to be protected or partially covered by two scalloped, leaf-like plates (Fig. 8). I propose that these plates be referred to as protective plates. Within this opening a peg organ can be seen (Fig. 9) which projects from the base of the atrium. The stalk of this peg arises from a slight elevation of the floor and it is crowned by a ring of 11 rudimentary hairs. The length of the hairs are approximately equal to their width and all are the same size. The wall of the atrium is heavily sculptured and reticulate (Fig. 10). Studies of entire lice reveal similar reticulations in the respiratory atria of the spiraculae of the thorax and abdomen (Fig. 11). Studies are continuing to determine the function of the sensilla coeloconica.

The fifth or terminal segment has 3 or 4 setae scattered on its lateral walls. The opening of the sensillum on this segment is more centrally located than the one on the fourth segment. At the apex of the segment there are 11 setae-like structures of different sizes and shapes (Fig. 12). Seven are larger and blunt or obtuse at their apices, and the four centrally located ones are larger than the other three. The remaining 4 setae are located peripherally, and they are pointed. Do these differences in size and shape indicate differences in sensory functions?

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