

Ultrastructure and Histology of Antennae of *Anoplophora glabripennis*

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Abstract

Anoplophora glabripennis (Motschulsky) (Coleoptera: Cerambycidae), known in the U.S. as Asian longhorned beetle (ALB), is a recently introduced pest of considerable economic importance and eradication efforts are under way in New York and Illinois. Identification of specific chemical attractants for ALB would facilitate survey and detection efforts in the U.S., but little is known about this insect's response to olfactory cues. In this study, antennae of male and female ALB were examined using light microscopy and scanning and transmission electron microscopy to provide information on the location, number, and description of cuticular sensilla that might function in olfaction.

Beetles emerged within the U.S. Department of Agriculture Forest Service Quarantine Laboratory, Ansonia, CT, from infested logs harvested in Chicago, IL, and Bayside, Queens, NY. For light and transmission electron microscopy, antennal segments were fixed, dehydrated, embedded in Spurr's resin, and sectioned. For scanning electron microscopy, specimens were fixed and either air-dried or critical point dried.

This study focused on the antennal flagellum (segments 3-11). The flagellum is densely covered with socketed hairs arranged in alternating black and white bands. The surface of these hairs is uniformly sculptured with fine ridges running along the axis of the hairs. Two other broad categories of socketed hairs are found on ALB antennae. Chetiform-1 sensilla are long hairs located at the junctions of segments and on the ventral surface of segment 11, at a special flex point on this segment. The proximity of these hairs to areas of antennal articulation indicates that they are likely to be mechanoreceptive. Even longer sensilla with articulatory sockets are found midway along the segments. These chetiform-1a type sensilla also are likely to serve in mechanoreception. Smaller socketed chetiform-2 type sensilla are dispersed among the larger sculptured hairs on all of the segments of the flagellum. These sensilla are articulated at a broadly acute angle to the axis of the segment on which they occur. As articulated hairs, they likely respond to physical stimulation; it is not known if they could be olfactory as well.

The sensilla that are most likely to have an olfactory function fall into two morphological classes – basiconic pegs and trichoid sensilla. Basiconic pegs occur primarily on segment 11, and nearly all are located at the distal end of that segment. Their number and location suggest that they could function in contact chemoreception. Trichoid sensilla occur in abundance on the distal segments and in gradually decreasing numbers on the more proximal segments of the flagellum. Many pores perforate the thick cuticular walls of the trichoid sensilla and pore tubules extend to the shaft lumen where there are numerous distal dendritic branches. The abundance and distribution of trichoid sensilla on the antennal segments and their histology and ultrastructure suggest an olfactory function.

There appear to be few differences in the number, type, or location of cuticular sensilla on male and female ALB antennae. Although the basiconic sensilla could be contact chemoreceptors and the trichoid sensilla are likely to be olfactory receptors, neither of these receptor types necessarily function in communications between the sexes. They could serve in host plant selection or other ecological roles.