

tending from the oblong plate (2nd valvifer) to the sting (fused 2nd valvulae) has sensory pegs (SP) extending toward the closely associated 1st rami (RA 1). These sensory pegs extend from depressions in the ramal integument. We have never found sensory structures on the 1st rami. They appear to be unidirectional, their direction of bending being away from the 1st rami. The 1st rami have serrate surface extensions (TH) that rub on the mechanoreceptor pegs of the 2nd rami.

During the stinging act the lancets move alternately back and forth within the sting shaft. Hence, the 2 rami move on each other. The system of pegs and adjacent serrations appear to function at that time.

Oblong Plate.—Fig. 8.—About 15 sensory setae in the form of hair plates are found on each oblong plate (OP) in the region where it articulates with the triangular plate. The setae converge distally. Similar hair plates have been found in the joints of limbs in some insects (Pringle 1938). Pringle stated that the setae of hair plates are mechanical sense organs with a slow rate of adaptation and he suggested that they are "position" sense organs. There is considerable movement between the oblong plate and triangular plate during the act of stinging. These setae, therefore, appear also to have a vibratory or positional function during the alternating movements of the lancets.

Seventh Sternum.—Fig. 9 and 10.—The 7th sternum (7ST) of *P. clavata* has a number of trichoid structures extending both laterad and posteriad (Hermann and Blum 1966). The most obvious structures are large, nonmoveable spines (SS) that extend laterad for most of the length of the sternite. Distally they have an open end and consequently qualify as

chemoreceptors. Just how they function is not known.

Except for their size, these structures most closely resemble the thick-walled but hollow basiconic sensory pegs commonly found on insect antennae (Slifer et al. 1957, 1959).

Anal Pad.—Fig. 11.—The anal pad (AP), originating from the 10th abdominal segment, hangs over the anal opening. Distally it has 18–20 sensilla trichodea. The function of these setae is not known. However, upon examining the anal pads and associated sensory structures in doryline queens, we feel that these pads may sometimes be important in mating or egg-laying activities.

CONCLUSION

Other sensory areas associated with the ovipositor and venom apparatus, as well as those in the present report, are being investigated by us in widely divergent species of the order Hymenoptera. As a preliminary hypothesis we suspect significant differences among the major groups of the Symphyta, Parasitica and Aculeata and even greater differences in the Formicidae.

LIST OF ABBREVIATIONS USED IN FIGURES

AP: Anal pad	PS: Pore structure
BB: Barb of lancet	RA: Second ramus
DR: Distal gonostylar lobe	RA 1: First ramus
FA: Fulcral arm	SP: Sensory peg
LN: Lancet	SS: Sensory spine
OP: Oblong plate	ST: Sting
PO: Plate organ	TH: Tooth on first ramus
PR: Proximal gonostylar region	TS: Trichoid sensilla
	7 ST: Seventh sternum

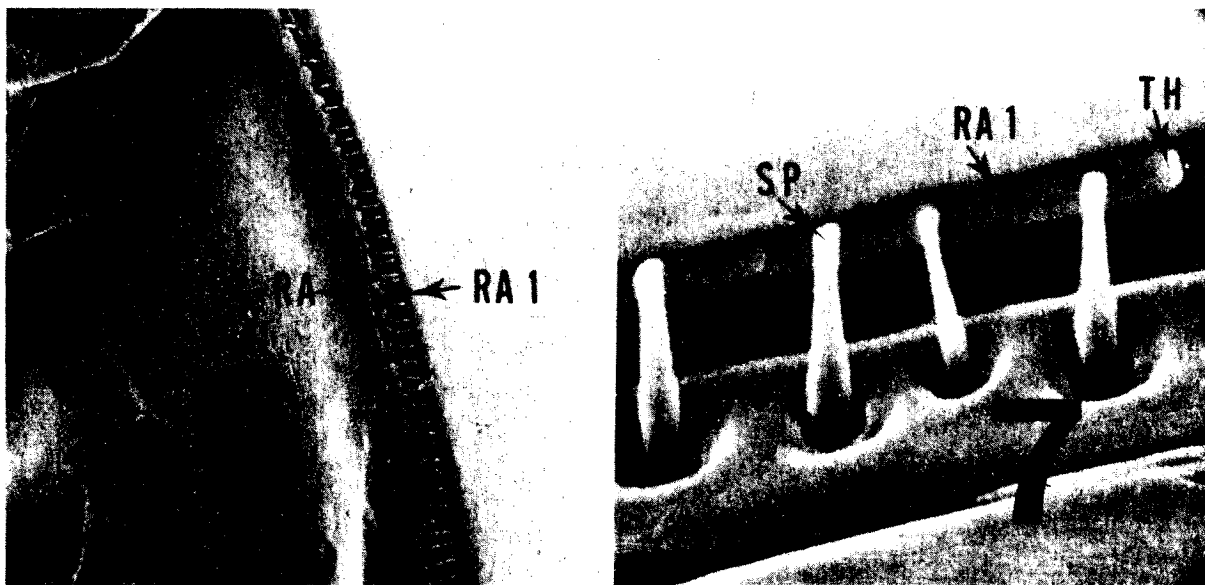


FIG. 6 and 7.—Scanning electron micrographs of the rami from the 1st and 2nd valvifers. 6. Entire rami, showing row of sensory pegs on 2nd ramus (RA) (200X). 7. Enlargement of rami, showing the unidirectional sensory pegs (SP) on the 2nd ramus (RA) and the serrate edge of the 1st ramus (RA 1) (2000X). Note: Figures reduced to 89%.