Ultrastructure of the Larval Eye of the Hanging Fly, *Bittacus leavipes* Navás (Mecoptera, Bittacidae)

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It is known that the larvae of scorpionflies, *Panorpa* (Panorpidae, Mecoptera) have ommatidial eyes (Bierbrodt, 1942; Ando and Suzuki, 1977; Paulus, 1979), though holometabolan larvae have stemmata in general. As the Panorpidae belongs to the most derivative or specialized group among the mecopteran families (Willmann, 1987), here we investigated more primitive mecopteran groups in order to find the intrinsic characters of the mecopteran larval eyes. We studied the eyes of the first instar larvae of *Bittacus laevipes* of Bittacidae, regarded as a most primitive group, no less than the Nannochoristidae, among the extant Mecoptera (Willmann, 1987). We describe light and electron microscope work.

The cornea was slightly convex, *ca.* 20 μm in diameter and *ca.* 5 μm thick at its maximum. The number of the ommatidia of *B. laevipes* was seven (*cf.* about 30 in *Panorpa*), all ommatidia were similar in their structure, and the structural characters were as follows. The ommatidium, *ca.* 30 μm long, had an eucone crystalline cone, consisting of four Semper cells, and had eight retinular cells, being arranged in two layers (Figs. 1,2). There observed many endoplasmic reticula, and Golgi bodies were scarcely found on the contrary (Figs. 2,3). Pigment granules, containing some developing ones, chiefly distributed around a rhabdom (Fig. 3), and mitochondria mainly located peripherally in the retinular cells. The distal part of the rhabdom consisting of four rhabdomeres that were formed by the four distal retinular cells, and arranged as the cross section being lozenge-shaped (Fig. 3). It seemed that all the retinular cells participated to the formation of the proximal part of the rhabdom, different from *Panorpa* that only four proximal retinular cells participate in its formation (Paulus, 1979). Each ommatidium had two primary pigment cells(Fig. 1), in which we failed to

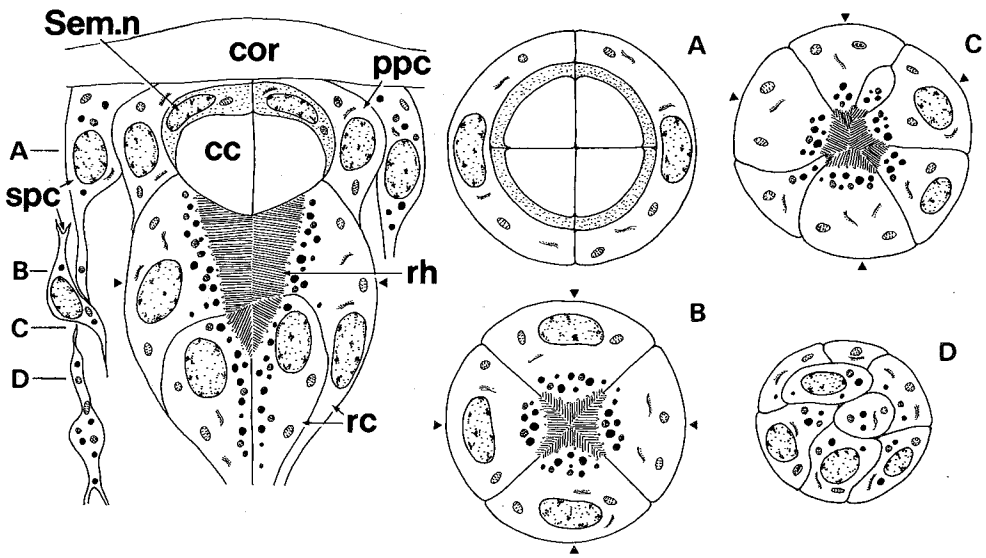

Fig. 1 A semidiagrammatic drawing of an ommatidium of *Bittacus laevipes* in longitudinal and transverse sections at levels indicated by A,B,C, and D. cc: crystalline cone, cor: cornea, ppc: primary pigment cell, rc: retinular cell, rh: rhabdom, Sem.n: nucleus of Semper cell, spc: secondary pigment cell, ▶ : distal retinular cells.

find any pigment granules, and the cells were similar in organelle to epidermal cells. Secondary pigment cells were elongated and loose (Fig. 1), and contained many microtubules. The Semper cell, retinular cell and secondary pigment cell had considerably undergone cell differentiation even just after hatching.

According to the characters mentioned above, the larval eyes of *Bittacus* were very similar to those of *Panorpa*, and also to the hemimetabolan larval eyes. On the other hand, as shown by Paulus(1797), the modified mecopteran larval eyes where *a* Semper cell is transformed into *a* primary pigment cell and *a* retinular cell is lost indicate their relationship to the trichopteran and lepidopteran larval eyes. Those pieces of evidence we offered here support the phylogenic primitiveness of the Mecoptera among the holometabolan insects.

References

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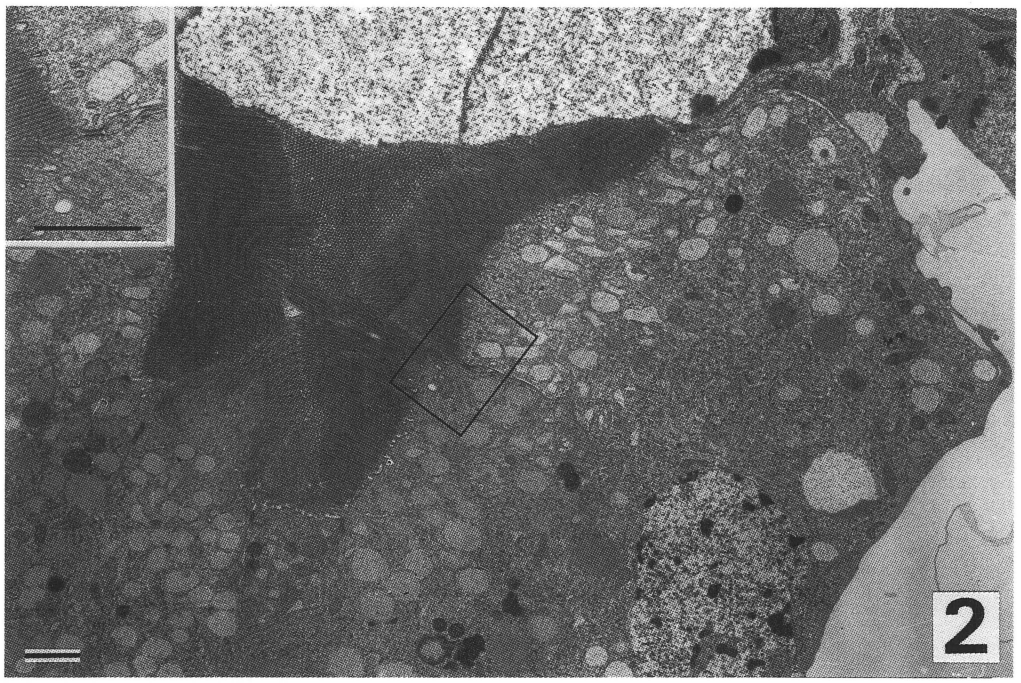

Fig. 2 An electron micrograph of an ommatidium of *Bittacus laevipes* in longitudinal section. Inset: enlargement of a boxed part. Scale = 1 μm.

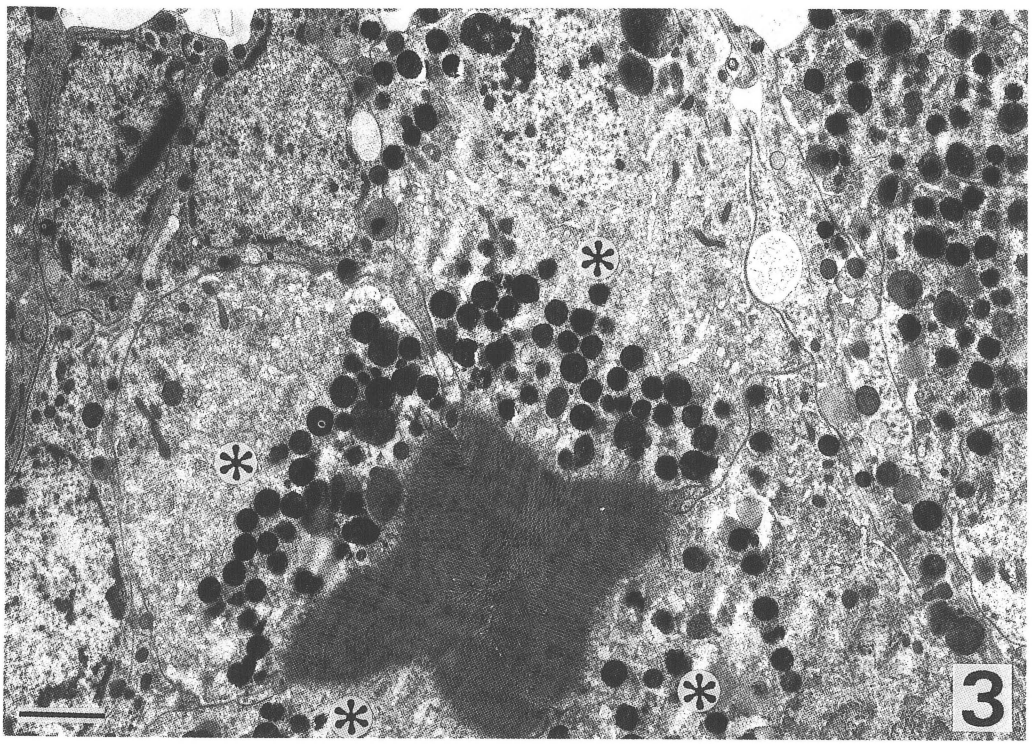

Fig. 3 An electron micrograph of a transverse section of the distal part of an ommatidium of *Bittacus laevipes*. Asterisks: distal retinular cells. Scale=2 μm.