

**The evolutionary trends of Fulgoromorpha antennal sensory plaque organs
(Homoptera:Auchenorrhyncha)**

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This paper reports our extensive and comprehensive study, using scanning electron microscopy, on the antennal sensory plaque organs of 19 families (Hypochthonellidae and Gengidae unavailable and Caliscelinae of Issidae accepted as a valid family, Yang and O'Brien, personal communication)¹⁰ and 710 species of Fulgoroidea. The data obtained reveal considerable variations of antennal plaque organs and provide useful information for phylogenetic analysis in Fulgoroidea.

Among the 19 families, the plaque organs of Tettigometridae, which are basically flat plate structures, represent the simplest form. Most species of this family possess a cuticular ring without denticle and a porous plate without plaque. The simplest one is found in *Brachyiceps laeta* (Tettigometridae) with the organ having an unelevated cuticular ring, plain surface and margin of porous plate expanding outward and fused with the surface of the cuticular ring. Here, these sensory plaque organs of Tettigometridae are considered as outgroup (Fang and Yang, personal communication)⁷. The evolutionary line of sensory plaque organs in other Fulgoroidea then branches into two directions, and the transformation of character states are described below. (Fig.1)

Step A1: The sensory plaque organs of *Ahomocnemileea chivensis* (Caliscelidae, Caliscelinae) have cuticular ring invisible, plate plan and convex submarginally.

Step A2 : The sensory plaque organs of most species of Caliscelinae have irregular plaques.

Step A3 : The sensory plaque organs of Caliscelinae, Augilini have digitated plaques, and their origin is unclear.

Step B1: The sensory plaque organs of *Dalapax postica* (Flatidae, Nephesini) have shapes nearly the same as in Step 0 with the whole organ lowered.

Step B2: The sensory plaque organs of most Flatidae, Lophopidae, Ricaniidae, Nogodinidae, Issidae, Acanaloniidae, Hypochthonellidae and some species of Tropiduchidae have cuticular ring with denticles and plate with clover leaf-like plaque.

Step B3: The sensory plaque organs of some species of Tropiduchidae have digitated plaques, with unclear origin.

Step B4: The sensory plaque organs of Dictyopharidae and Fulgoridae have elongate oval, stripe, stripe sinuated, Y-shaped, H-shaped or irregularly angulate plaques. In some plaque organs of Dictyopharidae the edge of the plate is infolded as clover leaf-like shape with the plate surface thrown up into ridges (in *Haumavarga fedtschenkoi* and *Dorysarthrus mobiliconis* Puton). Therefore, the plaque organs of the two families could be derived from clover leaf-like type.

Step C1: The sensory plaque organs of *Eursa ribauti* (Delphacidae, Delphacini) have cuticular ring without denticle and plate surface with distinctly granulated ridges.

Step C2: The sensory plaque organs of Derbidae, Achilidae, Meenoplidae, Kinarridae and Cixiidae have cuticular ring with denticles and plate with digitated plaques.

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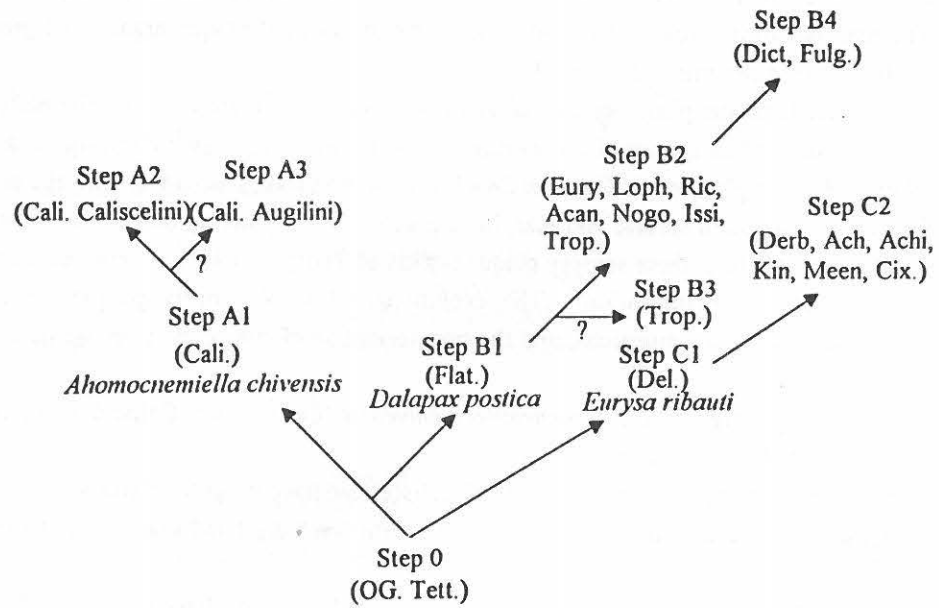


Fig. 1. The complex branching sensory plaque organ tree of Fulgoroidea.

OG: Outgroup, Tett: Tettigometridae, Cali: Caliscelidae, Flat: Flatidae, Eury: Eurybranchidae, Loph: Lophopidae, Ric: Ricaniidae, Acan: Acanalonidae, Nogo: Nogodinidae, Issi: Issidae, Trop: Tropiduchidae, Dict: Dictyopharidae, Fulg: Fulgoridae, Del: Delphacidae, Derb: Derbidae, Ach: Achilidae, Achi: Achilixiidae, Meen: Meenoplidae, Kin: Kinarridae, Cix: Cixiidae.

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