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Antennal ultrastructures in Flatidae (Hemiptera: Fulgoromorpha) – a preliminary report

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The Flatidae constitute one of the largest families within planthoppers (Fulgoromorpha, Hemiptera), distributed worldwide, with 1420 species and 297 genera. These phytophagous insects are highly diverse in terms of their colour and size (from 4.5 up to 32 mm), and are found on all continents, but are especially common in the tropics. They are divided into two subfamilies – Flatinae and Flatoidinae, and in most cases, can be easily distinguished from each other by the shape of the body – Flatinae hold their wings vertically, in contrast to Flatoidinae which place their wings horizontally. Flatinae are further divided into 13 tribes. About 20 species of Flatidae are regarded as serious pests of economically important crops such as coffee, tea, cacao, mango, citrus, apple and cherry. In Europe the only recognized pest is a native Nearctic species *Metcalfa pruinosa* (Say, 1830), firstly recorded in France in 1970.

The ultrastructure of Flatidae is only poorly known. The first paper was published by Bugnion & Popoff (1907) who studied the wax pores of *Flatida marginella* Olivier, 1791. A further contribution was made by Lucchi and collaborators who described the ultrastructures of wax pores, male and female genitalia, nymphs, eggs and egg-burster of *M. pruinosa*.

With respect to the ultrastructure of antennae, there are works referring to such families of Fulgoromorpha as Fulgoridae (Lewis & Marshall 1970), Tettigometridae (Bourgoin 1985), Meenoplidae and Kinnaridae (Bourgoin & Deiss 1994), Ricaniidae (Stroiński et al. 2011) and Tropicuchidae (Wang et al. 2012).

Our previous studies together with new data referring to almost all tribal representatives reveal a rich set of antennal characters, which might be useful in the establishment of a modern classification of Flatidae, including species, generic and tribal levels. Thus, the following characters have a potential value in taxonomic and phylogenetic analyses of Flatidae and Fulgoromorpha in general: placement of the antenna in respect to the compound eye; length ratio and the shape of the first and second antennal segments; types, structure and location of the sensillae and plate organs on the pedicel. The scanning electron microscopy (SEM) applied here is an advanced tool which enables a deeper understanding of the comparative morphology and ultrastructure of the family.