The "Wisdom" of the Ancient Insects

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Neuroptera (lacewings) is an ancient order of Insecta, extending back to the Early Permian. The Middle Jurassic neuropterans have various types of wing markings. This study is to address two issues: (1) How many and what types of wing markings for neuropterans in the Middle Jurassic of northeastern China? (2) What are the corresponding living strategies by lacewings with different types of markings? In this study, 3040 fossil neuropteran specimens from the Middle Jurassic of Daohugou, China were classified into Families, and then into different types of wing markings. Four types of wing markings, i.e. spots, bands, eyespots and leaf-like were found in nine Families. Wing markings account for 51.1 % of all specimens. Among those, 58.0 % with spots, 41.0 % with bands, 0.7 % with eyespots, and 0.3 % with leaf-like markings. The study highlighted the irregularly arranged spots disrupted the wing shapes, resulting in less visibility and notice by lacewings' natural predators. Band and leaf-like markings mimicked some of the contemporary plants, like cycad, so that these lacewings may hide themselves among these plants. Eyespots imitated eyes of the contemporary animals to scare off lacewings' natural enemies. The diverse wing markings and possible living strategies suggest that the ecosystems in the Middle Jurassic of China was complicated and lacewings have well-evolved to take advantage of the environmental factors. This is the first documented study showing the statistical data of wing markings and proposing their associations with ecosystems in improving their probabilities of survival and propagation.