

Skeletomuscular Modifications Associated with the Formation of an Additional Petiole on the Anterior Abdominal Segments in Aculeate Hymenoptera

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Abstract The skeletomusculature of the anterior abdominal segments in Aculeata was examined to discuss the relationships among Formicidae, Vespidae (s.l.) and Scoliidae, and phylogeny among Formicidae. On the basis of ground plan for Aculeata hypothesized, the present study indicated 3 types of apomorphic states associated with the formation of an additional petiole. The abdominal characters showed that Vespidae is more closely related to Formicidae than to Scoliidae. The tiphiid-like abdominal appearance of Amblyoponini may be secondary modification for increasing the length of tergal muscles. A close relationship between the ponerine tribe Ectatommini and Myrmicinae was proposed in the present study, because among the aculeates these formicid groups alone had a lobe for attachment of tergal muscles developed on the pretergum of the third segment.

Key word: Formicidae, phylogeny, petiole, skeletomusculature, Amblyoponini.

Introduction

In 1975, BROTHERS published an idea on the phylogeny of the aculeate Hymenoptera, which has stimulated later investigations of the relationships among aculeates (RASNITSYN, 1988; KÖNIGSMANN, 1978; WALTHER, 1979; CARPENTER, 1981; GIBSON, 1985; SCHÖNITZER & LAWITZKY, 1987; JOHNSON, 1988; DAY, 1988; GAULD & BOLTON, 1988; KIMSEY, 1991). Most recently, BROTHERS & CARPENTER (1993) reevaluated these studies, and proposed cladograms for the superfamilies of Aculeata. However, the relationships among Formicidae, Scoliidae and Vespidae (s.l. = Masaridae + Eumenidae + Vespidae s.s.) are still doubtful. To have more accurate understanding of the relationships among these groups, and also of aculeate phylogeny, new information based on additional morphological characters is required.

Like other apocrita Hymenoptera, aculeates are characterized by having a constriction and articulation between the first and the second abdominal segments (i.e., petiole). Furthermore, in some aculeates the flexibility of the abdomen is augmented by an additional constriction between the second and third abdominal segments, and even the third and fourth segments. In Scoliidae,