THE STING APPARATUS AND PHYLOGENY OF THE ANTS

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In the last 36 years there have been essentially two hypotheses of the internal phylogeny of the Formicidae; that of Brown [1] and Wilson et al. [2], and that of Taylor [3]. Both agree on the following: 1) early in ant evolution the ancestors to the Ponerinae (including Cerapachyini), Dorylini, and Myrmicinae separated from the ancestors to Nothomyrmecia, Aneuretinae, Dolichoderinae, and Formicidae, 2) the Dorylinae (including Ecitonini, Cheliomyrmecini, and Aenictini) are derived from primitive Ponerinae, 3) the Myrmicinae are derived from the Ponerinae, 4) the Pseudomyrmecinae share common ancestors with Myrmecia, 5) the Dolichoderinae evolved from the Aneuretinae, 6) the Aneuretinae shared a common ancestor with Nothomyrmecia, and 7) the Formicinae are more closely related to Nothomyrmecia than to Myrmecia. However, Wilson et al. suggested that the Formicinae evolved directly from Nothomyrmecia-like ancestry, whereas Taylor said that first the Aneuretinae and Nothomyrmecia separated, then the formicines arose from the aneuretines. Taylor also proposed that Myrmecia and the Pseudomyrmecinae, instead of arising from Nothomyrmecia as previously thought, evolved from ponerine ancestors, and thus from the opposite side of the deep split described in 1).

Though stinging ability varies widely in ants, neither phylogeny used sting characteristics. Kugler [4] showed that the sting apparatus has potential taxonomic value in the Formicidae. It is a complex of eight scletites derived from three abdominal segments, and is a rich source of characters that may vary at the species or genus level. In this study I extend these investigations to look for characters that may help us differentiate ant subfamilies and reconstruct their histories.

The sting apparatus is compared in representatives of nine proposed subfamilies of ants: Nothomyrmecinae, Myrmecinae, Cerapachyinae (1 genus), Ponerinae (7 genera), Myrmicinae (72 genera), Ecitoninae (3 genera), Dorylinae (1 genus), Dolichoderinae (3 genera), and Formicinae (5 genera). An hypothesis of the phylogenetic relationships of the subfamilies based on this complex character system is presented and compared with hypotheses based on external anatomy. Preliminary analysis tends to support many traditional views of evolutionary relationships, but provides no particular support for a separating Nothomyrmecia from the Myrmecinae.

REFERENCES

1. Brown, W. L., 1954. Insectes Sociaux, 1 (1) : 21-31.

2. Wilson, E. O., Carpenter, F. M. and Brown, W. L., 1967. Psyche, 74 (1) : 1-19.

3. Taylor, R. W., 1978. Science, 201 : 979-985.

4. Kugler, C., 1978. Studia Entomologica, 20 (1-4) : 413-548.