

PHYLOGENETIC ASPECTS OF EXOCRINE GLAND DEVELOPMENT IN THE FORMICIDAE

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All of the approximately 10,000 known ant species are eusocial, and together form the cosmopolitan family Formicidae. According to the author, they are classified in nine [1], ten [2] or eleven [3] extant subfamilies. This simple numerical difference mostly deals with the respective estimation towards the attribution of the subfamily status to a particular phylogenetic group, while the classifications presented generally consider two complexes, albeit with some characteristic differences. The resulting phylogenetic trees are mainly based on morphological criteria, although the most recent cladistic analysis diagram by Baroni Urbani [2] includes behavioural aspects as well. Also other approach methods have recently been found to furnish useful evolutionary information in insects, as is e.g. the case with chemotaxonomy and the analysis of mitochondrial DNA. In our examination on the occurrence and development of the exocrine glands in the Formicidae, we found it too provides additional evolutionary information [4 to 8].

The high number of exocrine glands in social insects is mainly due to their crucial role in the elaboration of pheromonal substances. Although the general appearance of the exocrine system and the development of the ubiquitous major glands is relatively similar in all ant species, there are a number of other glands that are only found in one or a few groups, for which they may form a valuable diagnostic character. The Formicidae as a family are thus characterized by the presence of postpharyngeal and metapleural glands. At the subfamily level, the Dolichoderinae and Aneuretinae share the exclusive occurrence of the Pavan gland and the very much enlarged pygidial gland, which therefore support the generally accepted relationship between both groups. The Formicinae, on the other hand, are unmistakable by their peculiar venom gland, that shows a dorsal, cap-like convoluted gland portion. The venom gland is also used as a subfamily character with regard to the appearance of its two secretory filaments : in the Dolichoderinae, these are lobate, whereas they are long and slender

in the other subfamilies. The opposite situation, however, does also exist, as we could ascertain from recent observations in Australian *Leptomyrmex* (a dolichoderine with long filaments) and *Meranoplus* (a myrmicine with lobate filaments), and therefore warrants for cautious use of venom gland morphology in a phylogenetic context.

The Dufour gland, although anatomically probably the most simple of all glands, exhibits different ultrastructural epithelial types in most of the subfamilies [4,5]. These different types support the existence of subfamily groups as such, but do not readily allow to trace a developmental pattern to explain their evolution. It does, however, reveal a similar fine structure in *Myrmecia* and *Nothomyrmecia*, which is not found as such in ants from other subfamilies. This apparent relationship between both Australian subfamilies is further supported by their similar gland chemistry, and particularly by their exclusive sharing of a sting bulb gland, which we very recently discovered inside their sting [8]. For these reasons, we believe that Myrmeciinae and Nothomyrmeciinae are more closely related [1] than is reflected by their actual and rather distant position [2,3].

References

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