

# Comparative morphology of cephalic exocrine glands among castes of the black ant *Lasius niger*

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## Abstract

The glandular system is crucially involved in main aspects of ant social life. The function of glands has been primarily studied in the workers (the non-reproductive individuals in a colony). In contrast, little information is available on queens (the reproductive females in a colony) or males in spite of the obvious functional differences between these castes. Here we report a comparison of the general morphology of the mandibular, propharyngeal and postpharyngeal glands between the three castes of the black ant *Lasius niger*. The analysis clearly shows that all these cephalic glands differ in relative size between castes and suggests a link between gland structure and its behavioral role in queens, workers and males. In particular, males present a hypertrophied mandibular gland. This is consistent with the fact that these glands might be the source of the sex pheromone in this caste. By contrast, queens exhibited the most developed postpharyngeal glands. This is consistent with the production of particular cues by queens for workers to help them to distinguish between reproductive and non-reproductive females. Finally, the propharyngeal glands were most developed in the worker caste and of similar relative size in males and queens. Their function is still enigmatic.

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## 1. Introduction

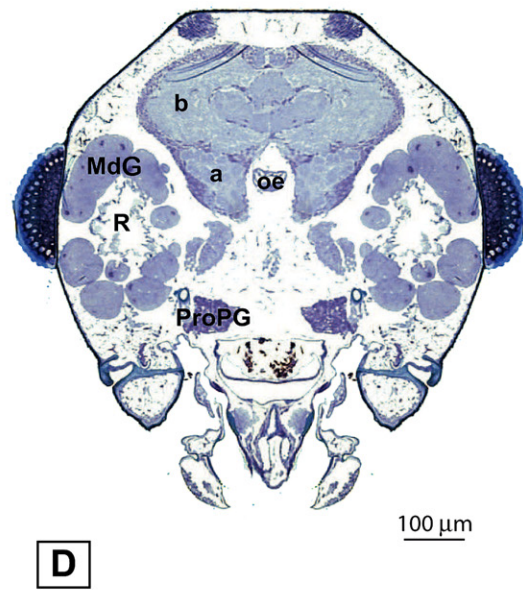
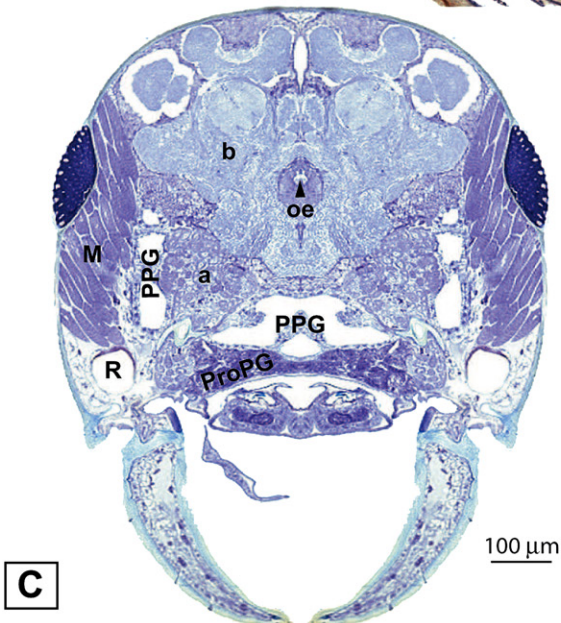
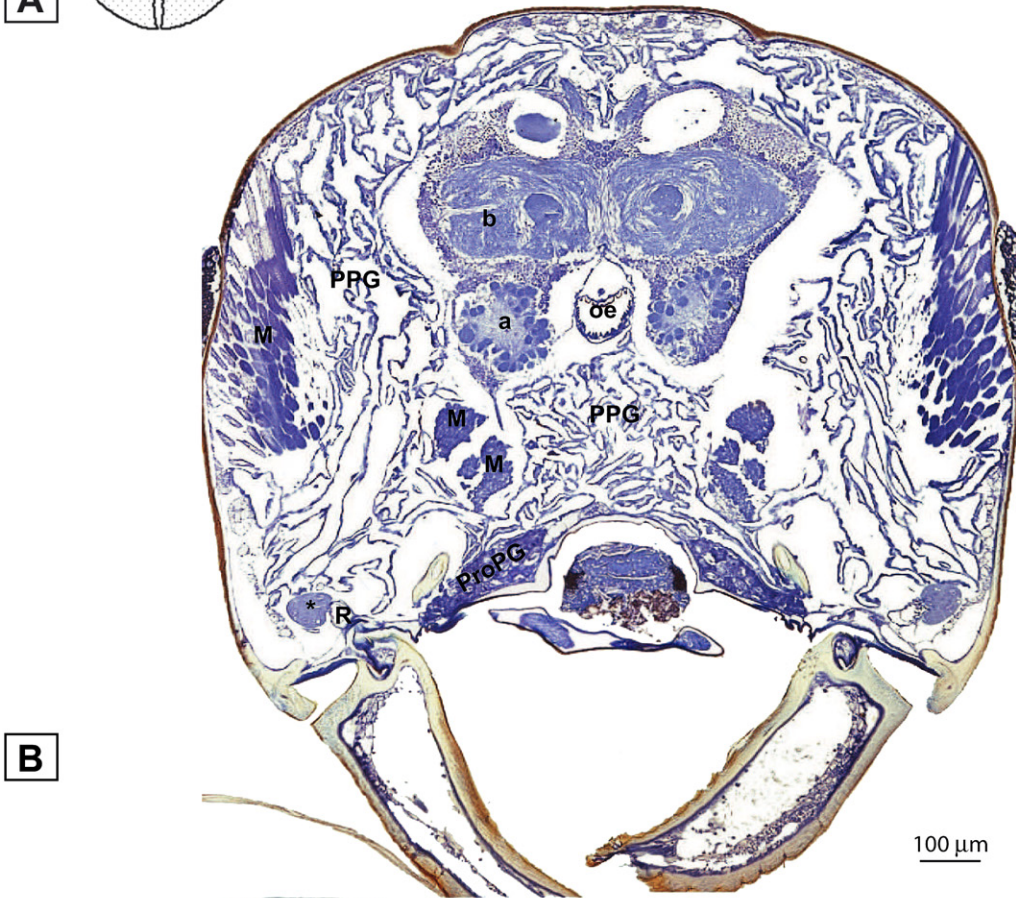
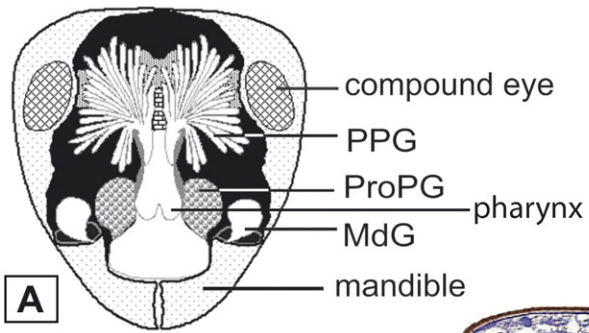
The complex social system of ants and other social insects is based on a complex system of communication that occurs almost exclusively by pheromones (Hölldobler and Wilson, 1990). Accordingly, social insects possess a massive and very complex system of exocrine glands producing a great variety of pheromones. While several glands such as the mandibular glands occur in all insects, others are specific to particular families, subfamilies, genera or even species (Billen, 1990). For example, the postpharyngeal glands are found in no other family than the Formicidae. The function of many glands varies greatly between species and also between the queen, worker and male castes. For example, the mandibular glands of workers of some species are involved in defence systems

and alarm communication (Billen et al., 1998; Buschinger and Maschwitz, 1984; Hölldobler and Wilson, 1990). In some other species, the mandibular glands of workers are involved in nestmate recognition (Hernandez et al., 2002) and fungal growth inhibition (Marsaro Junior et al., 2001). In males and queens these glands have a very different function, serving as a source of sex pheromones (Ayasse et al., 2001; Topoff and Greenberg, 1988).

The comparison of gland size between queens, workers and males can reveal caste specific gland functions and is thus useful to understand patterns of communication in ants. To date, only very few such studies have been performed for the three cephalic glands (the mandibular, postpharyngeal and propharyngeal gland) in males, queens and workers (*Formica rufa*, Bausenwein, 1960; *Solenopsis invicta*, Phillips and Vinson, 1980). The aim of the present work is to conduct, in the ant *Lasius niger*, a comparative study between virgin queens, males and workers of the mandibular, propharyngeal and postpharyngeal glands to see if there are differences in the

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