

# A novel exocrine gland in the antennal scape of the army ant *Eciton burchelli*

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Ants are often regarded as miniaturized walking glandular factories because of their extremely well developed exocrine system (1). More than 60 different glands can be distinguished in this hymenopteran family, with for a majority of the glands a clear function in the social organization and communication system of the ant colony (2). Most glands are situated in the head, thorax and abdomen, but also the legs have recently been found to contain several glands, such as metatibial glands (3,4) and glands in the various tarsal segments (5-8). Other remarkable locations where glands have been found are inside the mandibles (9), inside the sting (10), and inside the gemmae of *Diacamma*, which represent vestigial wing buds (11).

The antennae of ants, however, have generally been overlooked as a possible location for exocrine glands. JANET already in 1894 reported on the existence of 'antennal glands' in *Myrmica rubra* Linnaeus, 1758, but these occur near the antennal base within the head capsule (12), and therefore cannot be considered as real intra-antennal glands. In dacetone ants, mention was made very recently of a gland in the antennal scape, although its description, without histological observations, was restricted to "a circular, oval or more elongated patch of pale tissue on the ventral surface of the scape, close to its apex but proximal of the articulation with the first funicular segment" (BOLTON, 1999: p.1665) (13). When observ-

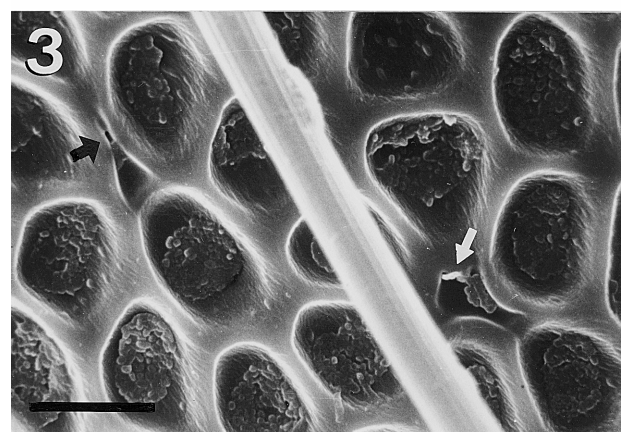
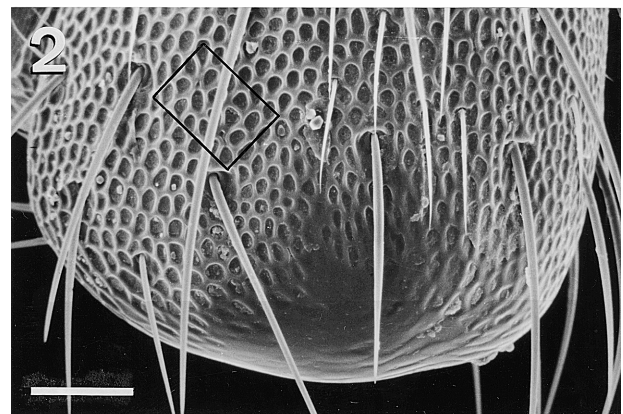
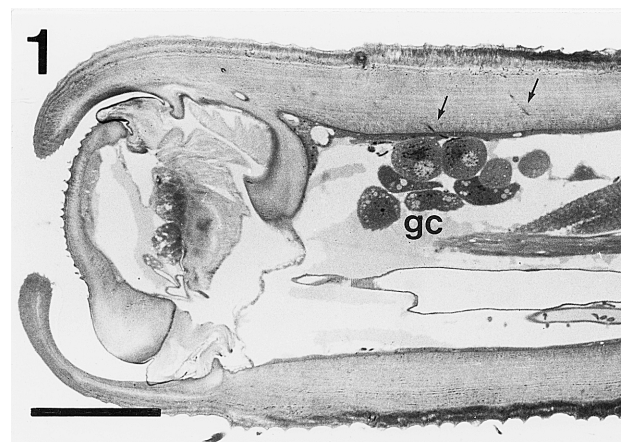


Fig. 1. – Semithin section through distal part of antennal scape of a worker of *Eciton burchelli*, showing cluster of glandular cells (gc). Note narrow ducts penetrating tegumental cuticle (arrows). Scale bar 100  $\mu$ m.

Fig. 2. – Scanning micrograph of dorsodistal portion of antennal scape. Framed part, under slightly different angle, is shown in Fig. 3 (scale bar 50  $\mu$ m).

Fig. 3. – Detail of dorsodistal surface of antennal scape, showing two duct openings (arrows). Note whitish secretory material oozing out of pore at right side (white arrow). Scale bar 10  $\mu$ m.

ing semithin sections of the antennae of the army ant *Eciton burchelli* (Westwood, 1842), I found a novel antennal scape gland. While the present manuscript was in preparation, an independent study bringing a detailed first description of exocrine glands in the distal antennomeres in fire ants was equally in press (14).

Material for the present study was obtained from foraging workers of *Eciton burchelli* that were collected from a natural raiding column in Manaus, Brasil. Their antennae were cut off near the scape base and fixed in 2% glutaraldehyde in Na-cacodylate buffer. After postfixation in 2% osmium tetroxide and dehydration in a graded acetone series, the antennae were embedded in Araldite. Semithin 1 µm sections were stained with methylene blue and thionin. Air dried material for scanning microscopy was examined in a Philips XL30 ESEM microscope.

The distal part of the antennal scape of *Eciton burchelli* workers contains, in its dorsal region, a cluster of approx. 10 rounded glandular cells (diameter around 25 µm, Fig. 1). Each glandular cell is associated with a corresponding duct cell. The ducts penetrate the scape's tegumental lining under an oblique angle and open on its external surface as very small pores with a diameter of approx. 0.3 µm. Whereas the outer cuticle of the scape shows a more or less regular reticular sculpturing, it displays local changes in the region of pore openings, which occur in between two more parallel cuticular ridges (Figs 2-3). Occasionally, a secretory substance can be seen oozing out of a pore like toothpaste (Fig. 3).

The antennal scape gland is a novel exocrine gland in ants. It is not homologous to the possibly glandular structure, reported for Dacetini (13), that occurs in a ventral position and the external appearance of which does not correspond with the gland we found in *Eciton*. The dacetine structure that is visible as a pale area may correspond with an underlying glandular epithelium in analogy to the metatibial gland (3,4), whereas the *Eciton* gland is formed by bicellular units (2,15). The function of the antennal scape gland remains unknown at present. It probably does not serve as a source of lubricants, as for such function an association and opening through the articulation membrane would be expected. The paste-like nature of the secretion may be indicative for the production of substances that need to be distributed by smearing or rubbing. In an independent study, ISIDORO et al. (14) described an exocrine gland in the 9th and 10th antennomeres of the fire ant *Solenopsis invicta* Buren, 1972. This gland is equally formed by bicellular units, of which the duct cell openings appear as small pores that occur as a ring circling the proximal part of the antennomere. The function of these antennomere glands is also still unknown. Similar antennomere glands in parasitoid Hymenoptera were reported to be involved in the production of sex recognition substances in males or spatial information cues in females (14, and references therein). Whether the antennal scape gland as described here also exists in other ants is not yet known and needs further examination.

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