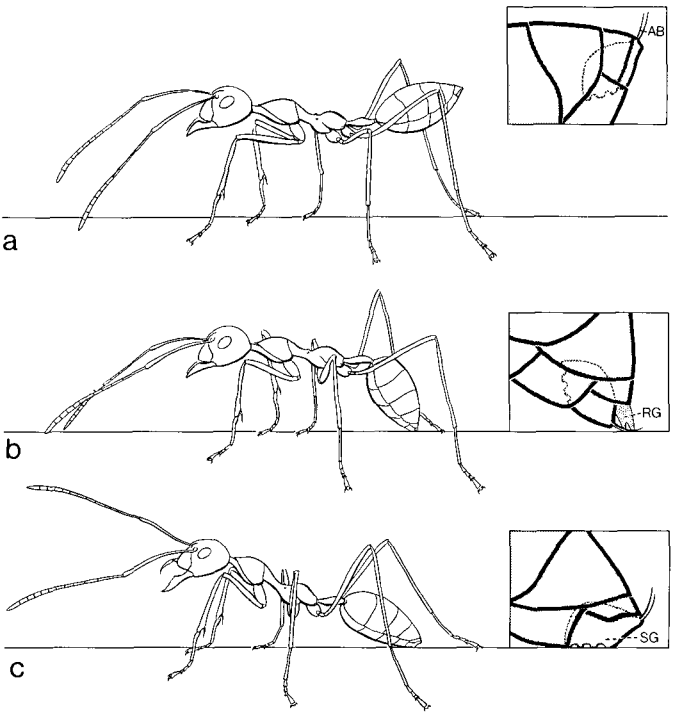

Fig. 7a–c. The modes of application of pheromones from the rectal gland and sternal gland by major workers of *O. longinoda*. **a** Ordinary running posture of a worker; as shown in the inset to the right, the terminal abdominal segment is held so that the sternal gland surface is covered by the penultimate abdominal sternite, and the rectal gland remains retracted within the wall of the rectal vesicle. **b** Worker laying odor trail from the extruded rectal gland, which 'rides' on the bristles of the acidopore, located just beneath the anus; the sternal gland surface remains covered. **c** Worker depositing sternal gland substance onto the substratum; the terminal abdominal segment has been rotated upward to expose the gland openings, while the rectal gland remains retracted

by feeding the ants with honey water dyed red with Azorubin S (Chroma-Gesellschaft, Schmid and Co., 7 Stuttgart-Untertürkheim, Federal Republic of Germany). After several days the hindgut contents were colored intensely red, but we could not detect any trace of the dye in the recruitment trails laid by the ants. We tentatively concluded that no rectal bladder contents are discharged during trail laying. Furthermore, histological investigation revealed two previously unrecognized glandular structures that might be involved in recruitment communication (Hölldobler and Wilson, 1976). One we called the rectal gland, an invagination of the lower rear surface of the rectal sac with a strongly developed glandular epithelium. The other structure was called the sternal gland, because of its location on the last abdominal sternite (Fig. 5). This structure consists of an array of single glandular cells that send short channels into cuticular cups on the outer surface of the sternite (Fig. 6).

Our observations of trail laying ants during food recruitment, together with the analysis of close-up slow-motion pictures of trail laying ants (70 f/s), clearly