Insectes Sociaux
https://doi.org/10.1007/s00040-017-0596-1

Insectes Sociaux

RESEARCH ARTICLE

Individual and colony level choice during relocation to unequal target nests in an Indian queenless ant *Diacamma indicum*

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Received: 30 June 2017 / Revised: 16 October 2017 / Accepted: 13 December 2017

Abstract
Most organisms need to make temporal and spatial choices pertaining to a wide range of activities like mating, feeding and resting. Arriving at a consensus on facing a choice could be even more challenging in social insects as inputs from multiple individuals need to be consolidated. Colony relocation is one such event that showcases the interplay between individual inputs and colony level choices. *Diacamma indicum* is a ponerine ant that uses tandem running for colony relocation. A small subset of the colony become transporters by either transporting brood or males in their mandibles or by becoming tandem leaders and leading all adult females via tandem running to the new nest. Previous studies show the importance of these individuals in the relocation process and document the presence of leader following leader events, which may be a means for information exchange among leaders. The present set of experiments evaluate colony relocation dynamics in the context of two unequal, but equidistant target nests by following 1135 uniquely marked ants. When faced with a light and dark nest, indecision was minimal and all ten colonies relocated to the dark nest. Knowledge of both targets was not crucial for choice of the better option as less than 10% of transporters had visited both targets before initiating transports. A transporter's latency to start transportation was not influenced by the number of individuals present at the target nest or by the mode of discovery; independent exploration or through leader following leader event. Further the contribution of dependent transporters was found to be significantly lower than independent transporters. Examining decision making by individual transporter and how they influence colony level choice across this simple scenario will enable in understanding the versatility of tandem running recruitment.

Keywords Tandem running · Decision making · Nest choice · Transport-latency · Colony cohesion

Introduction

Nests are central for rearing their young as well as storing colony resources in eusocial insects like ants and bees (Wilson 1971; Andersson 1984). Hence, relocation from one nest to another would be an important process in these species. Ant colonies move from their old nest to a new one for various reasons that impact survival and reproduction directly or indirectly (Visscher 2007; McGlynn 2012). In bee and wasp colonies the immature young (eggs, larvae, and pupae) are not transported from the old nest to the new nest while in ant colonies they are carried to the new nest. This is an important part of the colony's investment and their transportation would complicate the relocation process (Hölldobler and Wilson 1990; Visscher 2007). Further as ants lack the dance language that enables honeybees to share information with their nest-mates regarding various nesting sites in their environment (Seeley 2010), maintaining colony cohesion and choosing an optimal nest is expected to be more complicated. Ant colonies generally rely upon pheromone trails to recruit individuals to a target (Wilson 1971). Studies of ant colony recruitment to food sources suggest that varying levels of these chemical signals are used based on the quality of the target (Beckers et al. 1993; Jackson and Châline 2007), however, such trails could be subject to runaway positive feedback (Sumpter and Beekman 2003) and the amplification of initial choices could lead to selection of sub-optimal

Electronic supplementary material The online version of this article (https://doi.org/10.1007/s00040-017-0596-1) contains supplementary material, which is available to authorized users.

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Published online: 19 December 2017