

## Workers of the primitively eusocial wasp *Ropalidia marginata* do not perceive their queen across a wire mesh partition

A. Sumana · Sujata A. Deshpande · Anindita Bhadra · Raghavendra Gadagkar

Received: 18 October 2006 / Accepted: 14 April 2007 / Published online: 7 June 2007  
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**Abstract** Queens of primitively eusocial wasps generally have active and behaviourally dominant queens who use physical aggression to suppress worker reproduction. Although a *Ropalidia marginata* queen is strikingly docile and behaviourally non-dominant, she is completely successful in maintaining reproductive monopoly. *R. marginata* queens must achieve such reproductive monopoly by some means other than overt physical aggression. Upon loss or removal of the queen, one of the workers (referred to as the potential queen) becomes extremely aggressive and will eventually go on to become the next queen of the colony, if the original queen is not returned. The fact that potential queens are not discernible in the presence of the queen but become obvious within minutes after removal of the queen raises the question of how workers in general and the potential queens in particular, perceive the presence or absence of their queens. Here, we have conducted experiments in which we separate half of the workers from their queen by a wire mesh screen and study their behavioural response to such separation. We demonstrate that the presence of the queen is not perceived across the wire mesh screen, which suggests that if the queen uses a pheromone to signal her presence, then that pheromone is not very volatile.

**Keywords** *Ropalidia marginata* · Primitively eusocial wasp · Potential queen · Dominance behaviour · Non-volatile pheromone

### Introduction

Primitively eusocial wasps are characterized by relatively small colonies (<100 individuals) and absence of morphological divergence between queens and workers. By these criteria *Ropalidia marginata* may be classified as primitively eusocial. But, unlike other primitively eusocial wasps which have active, behaviourally dominant queens who use physical aggression to suppress worker reproduction (West-Eberhard 1969, 1977; Chandrashekara and Gadagkar 1991; Fletcher and Ross 1985; Reeve 1991), an *R. marginata* queen is strikingly docile and behaviourally non-dominant (Premnath et al. 1996; Kardile and Gadagkar 2002; Sumana and Gadagkar 2003). It must be emphasized however that the behaviourally inactive and non-dominant, docile queens of *R. marginata* are completely successful in suppressing reproduction of their workers and maintaining their reproductive monopoly (Gadagkar 2001). It seems clear therefore that *R. marginata* queens must achieve such reproductive monopoly by some means other than overt physical aggression in the form of dominance behaviour (Premnath et al. 1996; Gadagkar 2001; Sumana and Gadagkar 2001).

Upon loss or removal of the queen, one of the workers will become extremely aggressive and will eventually go on to become the next (docile) queen of the colony, if the original queen does not return. We therefore label this individual as the potential queen (Premnath et al. 1996; Deshpande et al. 2006). The fact that potential queens are not discernible in the presence of the queen but become

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A. Sumana · S. A. Deshpande · A. Bhadra · R. Gadagkar (✉)  
Centre for Ecological Sciences, Indian Institute of Science, Bangalore 560012, India  
e-mail: ragh@ces.iisc.ernet.in

R. Gadagkar  
Evolutionary and Organismal Biology Unit,  
Jawaharlal Nehru Centre for Advanced Scientific Research,  
Jakkur, Bangalore 560064, India