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Research Paper

Evolution of Reproductive Dominance in Animal Societies – Lessons From a Social Wasp

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Most insect societies can be classified as either primitively or highly eusocial. Primitively eusocial insect societies are usually led by queens who are morphologically indistinguishable from the workers and use aggression to control the workers, thereby typically holding top positions in the colony's dominance hierarchy. Highly eusocial species have morphologically large queens who regulate worker reproduction through pheromones and achieve larger colony sizes than their primitively eusocial counterparts. However, it is not clear whether this switch from aggression to pheromone took place in a single step in which a population as a whole evolved chemical regulation, or in two steps in which a queen used physical regulation when the colony size was small and switched to chemical regulation when the colony became larger. *Ropalidia marginata* is a primitively eusocial wasp, which also has some characteristics that are typically seen in highly eusocial species. The queens in this species do not usually lead the colony's dominance hierarchy and use pheromones to signal their presence to workers. Since new colonies are founded by one or a few individuals and grow through time, young colonies are small enough to permit suppression of worker reproduction through aggression. Queens in small colonies indeed sometimes occupy the top position in the colony's dominance hierarchy, thus providing a unique opportunity to test the above-mentioned hypotheses. We analysed data from 100 colonies of *R. marginata* to test these two competing hypotheses and found support for the former. Our findings are consistent with the hypothesis that the evolution of highly eusocial societies from primitively eusocial ones involved a one-step transition from physical control to chemical regulation of worker reproduction.

Keywords: Social Insects; Dominance Behaviour; Pheromones; Colony Size; Worker Control; Statistical Artefacts

Introduction

The formation of groups or communities often helps to achieve efficiency in performing complex tasks, and the performance of such groups largely depends on the efficient administration of individual tasks by group members. Group living is ubiquitous in the animal kingdom across taxa as diverse as insects, fishes, birds and mammals (Wilson 1975); and diverse control mechanisms can be recognized in social organizations

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