Why are workers lazy?

M. Breed

Published online: 8 January 2015
© International Union for the Study of Social Insects (IUSSI) 2015

Does the highly touted efficiency of social insect colonies stem from a dedicated work force? Are all animals in the society engaged at the highest possible level in their work? Intuition and fairy tales, such as Aesop's fable of the ant and the grasshopper, tell us this is exactly the case. But even casual observation of a social insect colony reveals the puzzling truth: many workers are inactive at any given moment and rarely, if ever, does the entire colony stir into concerted action. This observation of lazy workers or helpers extends to vertebrate societies including the eusocial naked mole rat [6]. An animal society, including a social insect colony, can appear to be the exact opposite of the paragon of efficiency.

A number of hypotheses attempt to explain this observation. The first invokes workers held in reserve for rare but essential tasks [4]. This has also been expressed as the concept that workers or helpers may be in a holding pattern waiting to fill in as needed [1]. Second, worker ineffectiveness is possible due to genetic variation in worker response thresholds not matching the distribution of tasks at hand [2]. Third, Mattila et al. [5] put forward the intriguing idea that workers in colonies monogamous queens focus more on reproductive competition and less on work than workers in polygynous colonies, meaning that workers' activities in monogamous colonies are more biased to reproduction rather than labor.

In an interesting article in this issue, Charbonneau and colleagues [3] note that most of the observations of lazy

workers in eusocial insect colonies have been obtained from laboratory colonies. This brings into question the validity of the lazy worker concept as differences in the demand for work in the laboratory, as compared to field settings, may create behavioral artifacts in division of labor among workers. Charbonneau and colleagues compare the behavior of workers in laboratory and field colonies of *Temnothorax rugulatus*, a species of ant commonly used for laboratory studies.

Their key finding is that division of labor in the laboratory colonies closely matches that of field colonies. While this could seem like a simple confirmation of the soundness of previously published laboratory studies, the significance of this work has far reaching implications for our understanding of division of labor. Even rate of foraging behavior, for which labor demands could be quite different between laboratory and field colonies, showed no significant differences in time budget between the two settings.

The reason for the presence of lazy workers remains to be discovered. Of particular interest will be the determination of whether a single underlying explanation covers all cases. If so, this could reflect fundamental algorithms that govern division of labor. On the other hand, the widespread presence of lazy workers may reflect convergence on a behavioral phenotype with many possible roots. The reserve force/holding pattern explanation seems most generally plausible based on the slender evidence available. Future studies on how task performance is replaced when workers are removed should help to sort this out. In the meantime, we can be sure that social insect workers are not governed by the moral drive to work asserted in Aesop's fable.

M. Breed (✉)
Department of Ecology and Evolutionary Biology,
University of Colorado, Boulder, CO 80309-0334, USA
e-mail: michael.breed@colorado.edu

Michael Breed
Editor-in-Chief

References

1. Baglione V., Canestrari D., Chiarati, E., Vera R. and Marcos J. M. 2010. Lazy group members are substitute helpers in carrion crows. *Proc. Roy. Soc. B-Biol. Sci.* **277**: 3275–3282.
2. Bonabeau E., Theraulaz G. and Deneubourg J.-L. 1998. Fixed Response thresholds and the regulation of division of labor in insect societies. *Bull. Mathemat. Biol.* **60**: 753–807.
3. Charbonneau D, Hillis N, Dornhaus A. ‘Lazy’ in nature: ant colony time budgets show high ‘inactivity’ in the field as well as in the lab. *Insectes Sociaux* **62**. doi: [10.1007/s00040-014-0370-6](https://doi.org/10.1007/s00040-014-0370-6)
4. Jandt J. M., Robins N. S., Moore R. E. and Dornhaus A. 2012. Individual bumblebees vary in response to disturbance: a test of the defensive reserve hypothesis. *Insect. Soc.* **59**: 313–321.
5. Mattila H. R., Reeve H. K. and Smith M. L. 2012. Promiscuous honey bee queens increase colony productivity by suppressing worker selfishness. *Curr. Biol.* **22**: 2027–2031.
6. Reeve H. K. 1992 Queen activation of lazy workers in colonies of the eusocial naked mole-rat. *Nature* **358**: 147–149.