

# Ants turn unwelcome lodgers into a useful standing army

September 9 2013

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Mercenary soldiers are notoriously unreliable because their loyalty is as thin as the banknotes they get paid, and they may turn against their employers before moving on to the next dirty job. Not so in fungus-farming ants, where a new study reports that permanent parasites that are normally a chronic social burden protect their hosts against a greater evil.

Ants are unusually free of [infectious diseases](#) but their societies are often invaded by social parasites; insects that exploit the resources of [ant colonies](#) for their own benefit. Many such social parasites escape detection by the social immune system of their hosts by producing barcode like chemical recognition labels similar to the host's own. Others use brute force or obnoxious chemicals to infiltrate or usurp host colonies. One particularly devious ant genus, *Megalomyrmex*, produces alkaloid-based venoms to repel and poison their host's and adversaries.

This week in *PNAS*, researchers from the Centre for Social Evolution at the Department of Biology, University of Copenhagen report a surprising story of ant warfare between three parties, reminiscent of dramas in human history and literature: The victims are peaceful fungus-farming ants that by a remarkable strike of evolutionary misfortune have two other ants as [natural enemies](#).

One is an agile raider whose scouts are always on the lookout for new farmer-colonies and recruit their nestmate warriors for swift strikes. They kill or chase away the defenders and pillage and plunder brood and the farmers' crop to move on after some days in search of a new colony

to usurp - not unlike the hordes of Ghengis Khan that laid waste to Asian and European settlements in the middle ages.

However, the fungus-farming ants have powerful protectors. Paradoxically, these are the second natural ant enemy of the farmers, a highly specialized *Megalomyrmex* species that uses its alkaloid poison to permanently move in with a farming host colony to exploit its fungus farm at relative leisure. Lodging of these unwelcome guest ants is a lifelong burden for the farmers, but they do survive and realize some reproductive success. However, having a colony of guest ant lodgers turns out to be a life-saving asset when mobile raiders threaten them, as the guest ants rise to the defense of their hosts.

Interaction Figure: Negative fitness impact among three interacting ant species – a fungus-growing host ant (blue), a permanently associated parasitic guest ant (orange), and a raiding agro-predator ant (brown). Although fundamentally a parasite, the guest ant functions as soldier caste to protect the host from the more lethal raiding ants. Drawings by Rozlyn E. Haley, reprinted with permission.

Using laboratory experiments, the authors show that the guest ant defenses are so effective that they not only kill raiders, but their mere presence greatly decreases the probability of a raid.

## **Scouts can detect**

Our experiments show that the scouts can detect whether or not a host colony has a cohabiting guest ant colony before deciding to initiate a raid so the guest ants serve as an effective front line defense, explains Dr. Rachelle Adams, the lead author of the study.

The scientists directly observed how mass recruitment behavior by the guest ants works and captured it on video

(<http://www.megalomyrmex.com/Videos.html>).

When a *Megalomyrmex* worker discovered an invading raider, she quickly returned to the cavity to excite her sister workers, and one by one they came out, soon overpowering the invaders, so a raid was prevented, says Dr. Adams.

The results of the study help explain why the guest ant parasite is common in the Panamanian sites where the colonies were collected, a very unusual situation as socially parasitic ants are normally very rare.

The study illustrates how sophisticated and subtle co-evolutionary processes driven by natural selection can be. The results not only show that the idea that "the enemy of my enemy is my friend" can work in the world of [ants](#), but also that natural selection can maintain lesser evils when that helps prevent greater harm, similar to the well-known example of sickle-cell anemia being maintained in areas where potentially deadly malaria is endemic, but not elsewhere.

These kinds of interaction, where being a foe or friend depends on the presence of a third party, are probably far more common than we realize, and may be fundamental for the coevolution of interacting species, adds Dr. David R. Nash, the senior corresponding author of the study.

**More information:** Chemically armed mercenary ants protect fungus-farming societies, [www.pnas.org/cgi/doi/10.1073/pnas.1311654110](http://www.pnas.org/cgi/doi/10.1073/pnas.1311654110)

Provided by University of Copenhagen

Citation: Ants turn unwelcome lodgers into a useful standing army (2013, September 9) retrieved

27 April 2024 from <https://phys.org/news/2013-09-ants-unwelcome-lodgers-army.html>

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