

How scent can net bigger reward for ants in hunt for food

July 2 2012, By Maggie Clune



Ants carrying a cockroach

(Phys.org) -- University of Sussex biologists studying Brazilian big-headed ants have discovered how one species uses powerful scent trails to quickly recruit helpers in transporting prized food in a competitive environment over unexpectedly large distances.

The big-headed ant (*Pheidole oxyops*) is highly organised when it comes to directing nest mates to large morsels of food (such as dead insects) so that they can help to carry the food quickly back to the nest.

This behavior trait, which [ants](#) share with humans, is known as cooperative transport, where individuals cooperate in shifting an object much bigger than any individual. In the case of big-headed ants, 80 per cent of all the food is collected in this way.

Pheromone trails play a key role for ants in communicating directions to food for nestmates. For big-headed ants, this pheromone trail is particularly pungent, but also very volatile. When a scout ant locates, for example, a dead insect it lays a pheromone trail back to the nest, resulting in a surge of recruits to the item and its retrieval.

University of Sussex researchers Tomer Czaczkes and Professor Francis Ratnieks studied the big-headed ant pheromone trail and its effects by laying tempting morsels of mozzarella cheese at locations close to and further away from the nest, filmed the resulting ant activity and recorded times and success rates in locating and transporting food back to the nest.



The Brazilian big-headed ant

They found that:

- The trail is very strong when freshly laid, even by just one ant, with nearly 90 per cent of recruits being able to follow the trail even at a junction, demonstrating one of the most accurate examples of trail following ever discovered in ants.

- The trail decayed very quickly, having no effect after six minutes, making the trail easy to follow when fresh and therefore leading the ants quickly to the food source before it is found by competitors. This factor is advantageous to big-headed ants, which lives in areas densely populated with other ant colonies as well as other competitive species.

However, the rapid rate of decay should mean that the trail is effective only up to 4m distance from the nest, allowing for the speed at which ants can travel and the rate of decay

But the team's third discovery reveals how the trail can be used to extend the foraging distances the ants can cover: the [pheromone](#) trail acts as a net, dragging in nest mates who are already outside of the nest, and funnelling them towards the site of the food. Given that the trail evaporates so quickly, this allowed the trail to be effective at recruiting nestmates to more distant food items, at up to about 8m from the nest entrance, than would have been the case if it only recruited ants from the nest itself.

The experiment, the findings for which are published online in the journal *Behavioural Ecology and Sociobiology*, was one of a number of field experiments carried out on a trip to São Paulo state, Brazil.

Tomer Czaczkes, who led the research and filmed the ants in action, says: "When an ant finds something delicious she has to lay a trail really quickly, because competition is fierce. The strong scent is a powerful attractant, ensuring a rapid response from other ants. The fact that it is short-lived means that ants won't be drawn needlessly from the nest, possibly after the food source has already disappeared. For ants, being out of the nest is very risky."

Professor Ratnieks, who heads the Laboratory of Apiculture and Social Insects at the University of Sussex, says: "This is another example of the

sophistication shown by ants in coordinating their activities so that they can get things done, in this case directing nestmates to a newly discovered [food](#) item so they can take it back to the [nest](#) before competitors discover it.”

More information: Czaczkes T, Ratnieks F. 2012. ‘Pheromone trails in the Brazilian ant *Pheidole oxyops*: extreme properties and dual recruitment action’. *Behavioural Ecology and Sociobiology*: [DOI 10.1007/s00265-012-1367-7](https://doi.org/10.1007/s00265-012-1367-7)

Provided by University of Sussex

Citation: How scent can net bigger reward for ants in hunt for food (2012, July 2) retrieved 5 April 2024 from <https://phys.org/news/2012-07-scent-net-bigger-reward-ants.html>

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