Puzzle of ants' suicide mission to protect the nest

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(PhysOrg.com) -- Scientists studying social insect behaviour have discovered a remarkable example of self-sacrifice in a species of ant found in Brazil.

The Brazilian ant Forelius pusillus routinely seals the entrance to its nest each night. The entrance is first closed from the inside. One or a few ants remain outside and continue closing the entrance, carrying and kicking sand and soil into the hole in the ground.

Those ants that stay outside to complete the task are therefore unable to return to the nest and die before the nest is re-opened from the inside each morning. Social insects such as bees, ants and wasps are known for giving their lives to defend their hive or nest (ie a honey bee worker dies after stinging).

This is the first observed example, however, of defensive self-sacrifice in which the sacrifice is pre-emptive rather than directed at a current threat such as a predator already at the nest.

The researchers who made the discovery are now left puzzling what the reason might be behind the evolution of such self-sacrificing behaviour on a nightly basis, with no apparent threat in sight.

The findings are published in the November issue of The American Naturalist journal. The project was carried out by an international team led by Dr. Adam Tofilski of the Agricultural University of Krakow,

Poland, and Professor Francis Ratnieks of the University of Sussex, UK.

The ants left outside spend at least 15 minutes carrying and kicking sand into the hole until it is invisible. This showed that they were involved in deliberate entrance-closing activities, not merely trying to find a way in.

Showing that the ants left outside died was challenging. It was not possible to find the dead bodies, as the ants were practically invisible, being 2mm long and sand-coloured. Two lines of evidence showed that many or all of the ants left outside died. First, when the colonies re-opened their nest entrances in mid-morning there were never any ants waiting to be let in. Second, the researchers set up nest entrances in plastic bowls so that they could find the ants the next morning, alive or dead.

The ants left outside probably die due to the extreme heat at the soil surface, which they could not survive for long.

Professor Ratnieks, who is Professor of Apiculture at the University of Sussex, where he also heads the new laboratory of social insects, says: "A few workers sacrificed per day would be a small cost for a large colony to pay for improved nest defence."

But one big puzzle remains. What they are defending against by closing the entrance? Professor Ratnieks says: "It may be ants of the same species, parasites or predators. Or it may be to prevent water from the sudden heavy rainstorms from flooding the nest."

Studying the kind of behaviour exhibited by the Brazilian ants, and the possible reasons behind it, could help scientists to understand the evolutionary importance of altruistic behaviour.

Citation: 'Pre-emptive defensive self-sacrifice by ant workers' The

American Naturalist, by Adam Tofilski (Agricultural University, Krakow), Margaret J. Couvillon (University of Arizona), Sophie E. F. Evison (University of Sheffield), Heikki Helanterä (Helsinki University and University of Sussex), Elva J. H. Robinson (University of Bristol), and Francis L. W. Ratnieks (University of Sussex), November 2008. See American Naturalist.

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