Young queens of leafcutter ants change roles if they cannot reproduce

September 14 2012

Credit: Albert-Ludwigs-Universität Freiburg

Biologists from the universities of Freiburg and Copenhagen, Denmark, have discovered that queens of the ant genus Acromyrmex are flexible in the event that they cannot found their own colony. The queens of other species die as soon as they can no longer fulfill their life's task. The unsuccessful Acromyrmex queens, on the other hand, change their entire repertoire of behavior and help defend and tend to their mother colony,

as the scientists report in the current online issue of the journal *Current Biology*.

The critical moment in the life of the queens is their nuptial flight, in which they mate with male ants. They then lose their wings and found their own colony. Queens are existentially important for the continued existence of a colony because only they can reproduce. They hide in their nest and avoid all risks. They are defended by the much smaller and sterile female workers or, in some species, soldiers. "We were very surprised to find Acromyrmex queens that defended their nest during our studies in Panama", says the Freiburg behavioral ecologist Dr. Volker Nehring, who conducted the study.

It was previously assumed that ant queens who lose their wings before their nuptial flight and remain unfertilized simply die. Some of them are also eaten by their sisters, allowing the energy stored in their bodies to be made useful for the colony. However, leafcutter ants feed on a fungus that they grow in their colonies and that provides them with plant nutrients. "We suspect that they have lost the ability to digest meat and recycle their queens," says Nehring. "There is thus an evolutionary advantage to keeping the sterile queens alive and making them useful for the colony in another way." They hardly have to feed at all, because they live from reserves and digest their own wing muscles like the fertilized queens.

Upon their return from Panama, where they had conducted field studies supported in part by the Smithsonian Tropical Research Institute, the scientists succeeded in reproducing their observations in the laboratory and studying them more closely. They prevented young queens from reproducing by removing their wings, as often also happens in nature. The wingless queens exhibited a greatly increased level of aggressiveness when exposed to scents from foreign colonies. Unlike their winged sisters they helped take care of the mother's offspring and engaged in

nest building. "It seems as if these princesses knew that they would never be able to mate and found their own colony without wings," says Nehring. "So the only thing left for them to do was to help their uninjured sisters and defend the nest against invaders like the legendary Amazons."

More information: V Nehring, JJ Boomsma, P d'Ettorre. Wingless virgin queens assume helper roles in Acromyrmex leaf-cutting ants. *Current Biology*, 11 September 2012. www.cell.com/current-biology/fulltext/S0960-9822%2812%2900714-2

Provided by Albert-Ludwigs-Universität Freiburg