"Personality" variation seen as vital to ants' success

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Courtesy of Gutenberg University Mainz
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They attack other colonies, plunder and rob, kill other colonies' inhabitants or keep them as slaves. Ants, often seen as prototypes of social beings prepared to sacrifice their lives for their community, can also be cruelly aggressive toward other ant groups.

But now, biologists have found that ant colonies are more successful at multiplying when the workers vary strongly in aggressiveness. This variation may be part of their division of labor, researchers say, a system considered the key to social insect societies' success.

A *T. longispinosus* worker attacks in aggression experiment (photo: Andreas Modlmeier)

"There are no fully aggressive [ant] colonies. It seems that this is not beneficial in the natural world and could rather be a disadvantage," said Andreas Modlmeier, who is studying ant "personalities" for a doctoral thesis at Johannes Gutenberg University Mainz in Germany.

Someone, in other words, needs to hang back and look after the babies.

The concept of animal personality has gained popularity among researchers in recent years. Biologists are now starting go beyond just documenting the existence of such individual variations in behavioral tendencies, into studying their role in the success or failure of populations.

"Ants have a colony character, but that there are also many individual personality characteristics within an ant colony," said Susanne Foitzik, a professor at the university and head of a work group that includes Modlmeier. One such characteristic is aggression, she added; aggressive colonies, for example, flee much less often than others do.

There are more than 15,000 ant species worldwide, according to Foitzik's group. About a third of the 150 Central European species are parasitic, living at the expense of other ant species. These

include "slave-making ants," which Foitzik's group is studying with interest. But another species under study is *Temnothorax longispinosus*, a victim of slave makers. Enslaved *T. longispinosus* workers search for food and care for the brood of the slavemaker.

***T. longispinosus* lives in mixed oak forests in the northeastern U.S., where it builds nests in acorns, hickory nuts, and little twigs. They form colonies averaging 35 workers and feed mainly on dead insects. The workers are just two to three millimeters long.**

"*Temnothorax* is particularly suitable for our experiments, as their colonies are easy to keep in the laboratory, and this makes it possible to use large sample sizes," said Modlmeier. In experiments, he brought individual ants together with a dead worker of another colony and watched how often aggressive interactions took place. He noted actions such as opening of the jaws (a threat display), biting, pulling, and stinging. Ten worker ants were selected from each of 39 different colonies to be classified by their size, level of aggression, and exploratory behavior. Researchers found that the reproductive success of ant colonies increased with the variation in the level of aggression within the colony.

"Colonies might be more productive when tasks such as nest defense and brood care are distributed between specialized workers with different aggression levels," Modlmeier said. Animals with high aggression levels could participate in competition and fights with other colonies, while less aggressive social workers care for the offspring, he added. The findings are published in the June 28 issue of the research journal *Behavioral Ecology*.