Ants self-organize the traffic on their trails to accommodate greater numbers and speeds

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Acacia ants (Pseudomyrmex ferruginea). Credit: Ryan Somma/Wikipedia.

Rather than slowing down, ants speed up in response to a higher density of traffic on their trails, according to new research published in Springer's journal *The Science of Nature – Naturwissenschaften*. When the researchers increased the supply of food by leaving food next to the

trail, ants accelerated their speed by 50 percent. This was despite more than double the density of traffic.

When food increases in supply, more forager ants are sent out to carry it back to the nest. With this increase in ant density, the number of encounters between outbound and incoming individuals increases. Researchers at the University of Halle-Wittenberg in Germany suggest that the encounters provide an opportunity for ants to swap information and to change their behavior according to conditions.

The researchers also identified rules of ant etiquette. For example, workers returning to the colony more often moved to the left than to the right to avoid colliding with an oncoming ant. Rather than segregating strictly into lanes like human traffic, the ants used only a degree of segregation, with inbound ants more frequently using the left side of the trail.

The observations were made in the black-meadow ant, *Formica pratensis*, a species that lives mainly in open grassland and forages on aphid honeydew as its carbohydrate source. The colonies are situated near favored foraging sites where the ants protect and cultivate aphid populations. Repeated journeys are made more efficient by the use of well-worn trails that can persist for over a decade.

A total of 1,865 individual ants were filmed on a 15 centimeter (ca. 6 inch) section of trail. The video was stopped every 50 frames and the number of ants on each lane was counted. At low and medium densities, ants preferred the central lanes. Of the total number, 496 ants were studied for their speed.

Encounters between ants included touching antennae or exchanging fluids. The number of encounters increased with density but this did not reduce the traffic flow.

"Even under the highest densities we could achieve, we did not observe any traffic jams," says Christiane Hönicke, co-author of the study. "The ants increased their pace and were driven off the central lanes of the trail, resulting in a self-organized optimization of the traffic."

More information: Effect of density on traffic and velocity on trunk trails of Formica pratensis. *Science of Nature - Naturwissenschaften* DOI: 10.1007/s00114-015-1267-6

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