Ants share decision-making, lessen vulnerability to 'information overload'

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Temnothorax rugatulus. Credit: Arizona State University

Scientists at Arizona State University have discovered that ants utilize a strategy to handle "information overload." *Temnothorax rugatulus* ants, commonly found living in rock crevices in the Southwest, place the burden of making complicated decisions on the backs of the entire colony, rather than on an individual ant.

In a study published in the early, online version of scientific journal Current Biology, Stephen Pratt, an associate professor in ASU's School of Life Sciences in the College of Liberal Arts and Sciences, and Takao Sasaki, a graduate student in Pratt's lab, suggest that the key to preventing cognitive overload is found in collective decision-making,

rather than in multi-tasking.

"I think the reason people are interested in this is because as humans, we can become overloaded with information—and that can possibly be detrimental both to our health and to how effectively we make decisions," Pratt said. "There's a sense that as a society, we are being more and more overwhelmed by information."

Previous research has shown that ant colonies have the ability to compare the quality of two potential nest sites—even if no single ant visits both sites. Pratt and Sasaki hypothesized that a colony could choose a high-quality nest from many more options more effectively than individual ants, because each member of the colony assesses only a small part of portion of available sites, and then shares the information with the entire colony.

"People usually think of ants as sort of stupid, that they can't really compare options, or that they don't have good cognition," said Sasaki. "But actually, individual ants can compare options, and that's why they too experience cognitive overload—a well-documented phenomenon in human beings."

The pair designed experiments with artificial nest sites to evaluate the ants' decision-making abilities. Both colonies and individual ants were given two levels of tasks. Ants had to choose between two nests, or they had to choose among eight nests. In both experiments, half the nests were unsuitable. Nests are frequently chosen based on entrance and cavity size, as well as darkness and other features.

Researchers discovered that individual ants made much worse decisions when faced with eight options rather than two, meaning that they experienced cognitive overload. Colonies, on the other hand, did equally well with either two or eight options, showing that they could handle the

harder problem as a collective.

The study shows what Pratt believes to be the answer to two questions: What do you get out of being a collective intelligence? And secondly, why and how is a group smarter than an individual?

"Living in a group is costly in many ways, so ants must get some benefit from doing it," said Pratt. "By sharing the burden of decision-making, colonies avoid the mistakes that a solitary animal makes when taking on too much information. What's great about these ants is that we can see exactly how they do this, by making sure that no ant has to process more information than it is able to."

Pratt added that this is one problem ants can solve, but that there are other problems ants face that we might be able to learn from.

"What we really want is a more complete understanding as to how this society works as a kind of distributed brain," Pratt said. He believes their research may provide insight into how to handle information excess in society and will have applications in collective robotics.

Provided by Arizona State University

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