

D4P: Social Behavior Educator Discussion Guide

On Ants and Sociality

How does social hunting evolve in ants?

Colony expansions underlie the evolution of army ant mass raiding. Vikram Chandra, Asaf Gal, Daniel J. C. Kronauer. Proceedings of the National Academy of Science of the United States of America, 25 May 2021. · [PDF LINK](#) · <https://doi.org/10.1073/pnas.2026534118>

Link to slides: [📄 How did ants evolve to become social hunters?](#)

SUMMARY OF PAPER AND RESEARCH QUESTIONS

Whether human or insect, societies with many individuals need lots of food. Ants have been living in colonies for many millions of years and have developed clever ways of ensuring there is enough food to feed every mouth. The most impressive of these are the army ants, who hunt by leaving the nest in large numbers to form a “raiding column”, and then fanning out along the edges to collect all available food (mass raiding). Conversely, the close relatives of the army ants live in small colonies and send single individual scouts to look for food, who then recruit nestmates to retrieve it (group raiding). Army ants cannot be studied in the lab, but a species of group raiding ants called *clonal raider ants* are good laboratory animals.

In this paper from Daniel Kronauer’s lab, the researchers investigate **how group raiding works and how group raiding behavior relates to mass raiding behavior.**

1. They begin by asking the question, **what happens during a group raid?** They record videos of clonal raider ants performing group raids and use computers to track the location of each ant in the colony. They find that group raids consist of several predictable behavioral phases as single scouts find food, lay a pheromone trail back to the nest, recruit nestmates to the food using a second pheromone, wait by the food for some amount of time, and eventually carry it home.
2. Next, they ask **how mass raiding ants and group raiding ants are related.** They examine the position of army ants on the evolutionary tree and confirm that army ants are closely linked to mass raiding behaviors and large colony sizes, and that army ants most likely evolved from group raiding ants with small colony sizes. They hypothesize that changing colony size might explain some of the differences between group raids and mass raids.

D4P: Social Behavior Educator Discussion Guide

On Ants and Sociality

3. Finally, they ask **how increasing the population size of clonal raider ant colonies affects their raiding behavior**. They repeat the group raiding experiment using colonies with different population sizes, and find that larger colonies have more ants leaving the nest in groups, and very large colonies start to perform raids that look similar to army ant mass raids. This provides evidence that ants can switch between behaviors that are more like group raids or more like mass raids by increasing population size.

The researchers conclude that group raiding is a more ancient form of social hunting in ants, before some species evolved to have larger colony sizes. Their experiments showed that changing group size can have unexpected effects on the way that social groups work together. This represents a way that evolutionary changes in social group size can automatically lead to changes at the level of the social group, without changing the way individuals behave on their own.

Questions for learners	Discussion points for educators
1. Why use social hunting at all (vs every individual collecting their own food)?	<ul style="list-style-type: none">- Social hunting pros: more efficient, division of labor, sharing food source information- Solitary hunting pros: self-sufficient, don't depend on others, no concerns about sharing- Where are possible sources of conflict from social life? How might groups resolve/prevent conflict? (In eusocial insects like ants, colonies are family groups and high relatedness reduces conflict, but there are many other reasons as well)
2. Why might one species use group raids and another use mass raids?	<ul style="list-style-type: none">- Tradeoffs for sending out one scout at a time vs many at once- Costs and benefits of having most ants stay at home until food is found- This discussion focused on hunting raids,

D4P: Social Behavior Educator Discussion Guide

On Ants and Sociality

	<p>but what about other ways of getting food? Why use raids vs. farming fungus, tending aphids for honeydew, scavenging, or eating plant material? Also consider discussion on food sources in relation to humans</p>
<p>3. Group raids have a long phase in the middle called 'preretrieval phase' where ants mostly sit on food before bringing it home. Why might the ants do this?</p>	<ul style="list-style-type: none">- This is completely unknown! Here are a few possibilities:- Making sure prey doesn't fight back- Deciding if food is good quality- Checking for the presence of more food nearby- Design an experiment to test one of these ideas, or ideas from the students