

Why some butterflies sound like ants

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Parasitic butterfly larvae may use acoustic signals to infiltrate ant colonies.
Credit: Marco Gherlenda/University of Turin, Italy

Ant nests can offer a lot to organisms other than just ants. They are well-protected, environmentally-stable and resource-rich spaces—in many ways everything a tiny creature could ask for in a home. So long as you can live with an army of ants of course.

For the thousands of species of insects that squat inside ant nests, survival means finding ways to live with the ants—by foiling the chemical cues ants use to distinguish friend from foe, for instance. Now a team of scientists from the University of Turin in Italy have been

looking at how the would-be nest crashers also use sound as a protective countermeasure—warping ant "words" to suit their own twisted tastes.

At the 168th Meeting of the Acoustical Society of America (ASA), to be held October 27-31, 2014 at the Indianapolis Marriott Downtown Hotel, the researchers will describe the latest research on one such ant-parasite pair—Maculinea butterflies, which infiltrate the nests of *Myrmica* ants and spend most of their lives there as unwanted guests by mimicking the sounds produced by the ants themselves.

"Acoustic signals convey quite complex information, not only between worker ants while outside the colony, for example during foraging, but also within the nest and between castes," said Francesca Barbero, the lead researcher from the University of Turin, Italy. "We aimed at understanding whether some ant social parasites, such as butterfly larvae, could interfere with their host ant communication system."

Over the years, Barbero's team has recorded and analyzed the sound signals emitted by larvae and pupae of Maculinea parasites and by queens and workers of the *Myrmica* host ants. Observing similarities in the patterns between butterfly parasites and ant host's acoustic signals, they have investigated the role of those signals in the ant societies and host-parasite relationships by playing back recorded sounds to ant nests.

In an initial study published in the journal *Science* in 2009, Barbero's team collaborated with scientists from the Center for Ecology and Hydrology and the University of Oxford to show that the sounds queen ants make are distinctive sounds from worker ants inside ant colonies. The new work shows that the parasitic butterflies exploit that difference.

Maculinea species are so-called "obligated parasites," Barbero said, with lives that depend on two other species. Deposited as eggs onto the leaves or buds of one specific plant, they gorge themselves for 10–15 days then

drop to the ground and wait to be found and ferried into a nest by a *Myrmica* worker ant.

Earlier research in the field showed that the butterfly caterpillars can "beg" like baby ants by secreting chemicals similar to those an ant larva would, fooling the workers into feeding the caterpillars as their own. But some of these imposing guests were actually given the royal treatment—fed first and fed most, even in times of scarcity as the real ant larvae went hungry. This type of privilege is normally reserved for the queens of the nest, something that mimicking the begging brood could not account for.

To solve the mystery, Barbero and colleagues used a specially-manufactured microphone to record the noises of the ants and the caterpillars and played back the caterpillars' sounds within [ant nests](#). By comparing the [acoustic signals](#) and analysing the responses of the ants, they found that the caterpillars indeed mimic the sound of their host queen ants and trick the worker ants into cleaning and feeding them in preference to their own offspring.

They also compared two populations of parasitic butterflies—a predatory species that feeds on ant broods, and a cuckoo species that is fed directly by the worker ants. They found that while both species made queen sounds, the voices of the ones that depended on workers to feed them elicited a stronger response in the worker ants.

"This is consistent," Barbero said. "Once inside the host nest, the main difference between the two life strategies is that cuckoos need to be considered as colony members, predatory species need not to be discovered by ants."

The next step, she said, is to extend their research to assess the role of acoustical emissions in other butterfly-ant interactions.

"We hope our findings will boost research on acoustic communication in social parasites of ants," Barbero said, "[and] bring about significant advances in our understanding of the complex mechanisms underlying the origin, evolution and stabilization of host-parasite relationships."

Presentation 3aAB1, "Breaking the acoustical code of ants: The social parasite's pathway," by Francesca Barbero, Luca P. Casacci, Emilio Balletto and Simona Bonelli will take place on Wednesday, October 29, 2014, at 8:30 AM in Lincoln. The abstract can be found by searching for the presentation number here:

<https://asa2014fall.abstractcentral.com/planner.jsp>

There are sound files of queen [ants](#), [worker ants](#), [butterfly larvae](#) and pupa available with this story. Contact: jbardi@aip.org

Provided by Acoustical Society of America

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