

Beetle Parents Choose to Limit Offspring When Food is Scarce

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Researchers have long known that many primates make decisions about the number of children they have based on the availability of resources such as food. Now new research from the New Hampshire Agricultural Experiment Station at the University of New Hampshire finds that some insects – specifically burying beetles – also choose to limit offspring when food is scarce.

By understanding the behavior of burying beetles related to their reproduction and parental care, scientists can better understand the genetic and physiological mechanisms that modify parental care behaviors of insects in variable environments.

“As humans, we have a pocketbook with a certain amount of

currency available to pay for food, housing, and clothing. This pocketbook is limited and informs what we can afford to purchase and support. The beetles are much like this. If resources are limited, then the number of offspring they can successfully raise also is constrained,” said NH Agricultural Experiment Station researcher Daniel Howard, assistant professor of biological sciences.

The research was conducted by Howard, experiment station researcher Carrie Hall, assistant professor of biological sciences, and doctoral student Brooke Woelber. It is presented in the January 2018 issue of the *Journal of Ethology* in [Environmental cues influence parental brood structure decisions in the burying beetle *Nicrophorus marginatus*](#).



Doctoral student Brooke Woelber

“Burying beetles are unique because they’re one of the few insects where both the male and female parent provide care to their developing young – much like what we observe in some birds. They find a food source such as a mouse carcass, bury it, then consume and regurgitate it directly to their developing young,” Woelber said.

In this experiment, researchers manipulated the environmental conditions of beetles by altering the density of beetles, which

increased competition for food. They also changed the availability of food. This was done to see if the breeding pair made decisions about the number and size of the offspring they chose to rear in these conditions.

Researchers found that the burying beetle will make different decisions about the number of offspring they rear in different situations. Specifically, when the beetles face a lot of competition for food by increasing the density of beetles, they rear fewer offspring that are significantly bigger in size. In contrast, beetles that didn't face competition for food from other beetles will rear significantly more offspring that are small in contrast. These results occurred only when the beetles were well-fed (e.g. when food was not limited).

However, when beetles were starved, the decisions parents made regarding the number of offspring to rear and their resulting size differed. Specifically, when food is limited, the beetles rear fewer young overall. However, in low-competition and food-limited environments, these offspring are larger. In contrast, high-competition and limited-food environments, parents have fewer and smaller offspring.

This suggests that parents may be constrained on the type of adjustments they make on their offspring when they themselves are deprived of food following high competition, and may choose to invest more of the food toward their own survival.

“What we see here, is that not only do these beetles provide parental care, but they can make decisions about the number of offspring they should have in certain environments. In a matter of speaking, they are evaluating the environmental conditions and deciding the likelihood their offspring will survive and succeed in the world – which informs the number of offspring they choose to rear,” Woelber said.

Going forward, researchers will evaluate how the burying beetle's reproductive behavior alters the soil environment that they reproduce in, in this case New Hampshire's mixed hardwood forests. Specifically, they are interested in how nutrients and microbial biomass (number of bacteria and fungi) change in the soil where they reproduce. Burying beetles are considered beneficial insects important to soil nutrient cycling, but few studies have actually measured their impacts.

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Founded in 1887, the [NH Agricultural Experiment Station](#) at the [UNH College of Life Sciences and Agriculture](#) is UNH's original research center and an elemental component of New Hampshire's land-grant university heritage and mission. We steward federal and state funding, including support from the [USDA National Institute of Food and Agriculture](#), to provide unbiased and objective research concerning diverse aspects of sustainable agriculture and foods, aquaculture, forest management, and related wildlife, natural resources and rural community topics. We maintain the Woodman and Kingman agronomy and horticultural research farms, the Macfarlane Research Greenhouses, the Fairchild Dairy Teaching and Research Center, and the Organic Dairy Research Farm. Additional properties also provide forage, forests and woodlands in direct support to research, teaching, and outreach.

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