Research Tracks Shrinking Beetle Populations

An at-risk insect population could spell problems for U.S. agriculture, and scientists are racing to learn more. "Dung beetles recycle livestock feces and incorporate those nutrients back into the soil," says Wyatt Hoback, Professor of Entomology at Oklahoma State University. "The beetles not only improve pastures by allowing grass to grow, but they also reduce pest flies (face flies, horn flies) and internal parasite worms found in dung."

A clean field is critical, as cattle rarely feed within five to 10 ft. of their dung. A dung beetle can spread 20 times its body weight in cow feces in one night. Multiply that by a colony, and they can quickly clear an entire pasture, allowing the cattle to return to grazing.

Standard livestock practices are shrinking dung beetle populations. "The beetles are impacted by pesticide use," Hoback says. When dung beetles use the affected dung, they experience a reduced ability to reproduce, and fewer larvae survive to adulthood. "We've known about the negative impacts of Ivermectin (used for controlling internal parasites) for a long time and are now interested in the effects of pesticides used to manage flies."

This requires field research using baited traps in the dung beetle's preferred habitat. Hoback's team collects, sorts and counts beetles to better track the effects on different species. "We're assessing dung beetle communities at the Tallgrass Prairie (bison and limited pesticides) and comparing them with various ranching practices," Hoback says. "We've shown differences in the community abundance and the rates of dung breakdown when there are lower numbers of beetles. Now we're continuing to generate information about the non-target effects of pesticides—dung beetles accidentally being killed—and on practices that increase their numbers."

"Dung beetles contribute over $380 million per year to U.S. livestock producers. Beef is the top agricultural commodity for Oklahoma," says Hoback.

Generally, the best way to increase dung beetle populations is to minimize insecticide use. "Dung beetles contribute over $380 million annually to U.S. livestock producers. Beef is the top agricultural commodity for Oklahoma," says Hoback. "We want to keep dung beetles around and make sure they're healthy to improve ranching profit and sustainability."

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Beekeeping Kits Offer Homegrown Honey

A beekeeping kit provides a helpful starting point for those interested in producing honey at home but unsure of the first steps.

"Keeping bees can be a very calming experience. They offer many benefits beyond honey," says Jenna Prososki, Director of Sales & Marketing for Mann Lake. "Though, in my opinion, there's no better honey than what you get from your own hives. Still, bees serve as excellent pollinators in vegetable and flower gardens, helping you increase yields."

Beehive starter kits typically include three categories of items: the hive body, bee-keeping tools and protective gear.

Beehive starter kits typically include three item categories: the hive body, bee-keeping tools and protective gear. The hive body comprises the bees' home and is generally made of wood. It offers a roomy, well-ventilated space for bees to make and store honey. Most include a hive stand, bottom board, hive bodies, frames, top cover and inner cover. Tools help with hive maintenance. Standard options include bee brushes, a hive tool for prying parts of the hives and frames, and a smoker for calming the hive before inspections. Protective gear, aimed at keeping the beekeeper safe from stings, typically includes suits, veils and gloves.

Mann Lake sells a variety of beekeeping kits for both beginners and serious hobbyists. "The Mann Lake Premium Starter Kit comes with all the necessary hive components, tools and feed to get started as a beekeeper," Prososki says. "It's not sold with protective clothing, which gives beekeepers the flexibility to get the size and material type best suited to them." Priced at $429, the kit comes with ten fully assembled frames, a notched inner cover, a 9 5/8-in. deep hive kit, a smoke cloud smoker with shield (and 1/2 lb. of smoker fuel), a premium bee brush, a metal queen excluder, 1 gal. of pro sweet liquid feed, and a variety of other accessories.

It's a hobby she believes almost everyone can benefit from. "Many programs across the country partner beekeepers with veterans and first responders to help them benefit from the calming experience that beekeeping can provide," she says. Still, Prososki is quick to point out that supplies are only part of the equation for keeping bees. "Do your research first. Read books, watch videos, take a class, or find a mentor. The more information you can get ahead of time, the more likely you are to be successful as a beekeeper."

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The Insect Eavesdropper is being tested at more than 20 academic labs on a wide variety of pests. It's also being evaluated at multiple crop input companies.

Spy Technology 'Listens' For Insects

University of Wisconsin researcher Emily Bick can hear bugs chomping on crops with her Insect Eavesdropper. Its sensitive microphone records minute sounds, and the integrated computer differentiates and identifies the insect making them. While she's continuing to refine the device, it has the potential to revolutionize crop scouting and pest control.

"It's currently a research project; however, we're starting licensing agreements and will be incorporating a start-up company in September," says Bick. "We'll be taking requests to see where it works the best, but commercial production is still two years out."

Bick first got the idea when she learned about spy agencies attaching microphones to walls to pick up vibrations, which they then translated into speech. In 2023, she attached microphones to plants in the lab infested with Colorado potato beetles and tobacco hornworms.

"They're large and noisy, and we were able to detect both insects based on feeding sounds," says Bick.

Her research team achieved similar results, detecting tiny second instar European corn borers as they fed on corn leaves before boring into the stems. The same technique captured the sounds of northern corn rootworm beetles in the soil as they fed on roots. Differentiating and identifying the species from the sound files was just as important as detection.

In only two short years, the technology has been refined to identify pests in seconds. The contact sensors can be attached to any plant part to locate pests above and below ground.

"Our lab at the University of Wisconsin is working on corn pests, Japanese beetles in soybeans, and potato leafhoppers in alfalfa," says Bick. "We're also working with researchers on issues like coconut hispid beetles in the Maldives, three-cornered alfalfa hoppers in California, soybean aphids in Minnesota, and apple pests in New York state."

What she's already learned about corn rootworms is amazing. Sounds recorded include the larvae banging and crunching on the corn root tissue. The banging reveals if there's enough sugar to continue eating or if there are toxins to avoid.

The Insect Eavesdropper is being tested on a wide variety of pests at more than 20 other academic labs and evaluated at multiple crop input companies.

"Resistance to Bt traits in commercial seed is expanding, and it would be extremely helpful to know if and when the trait is failing," says Bick. "Agrichemical companies are interested in using the technology to screen products they're working on."

Crop producers may see benefits even sooner. Instead of paying for seed traits that may or may not work, or spraying insecticides based on predicted damaging infestations, they'll know the pests are present. Soon, they may know how many are present and what damage is being done.

"This summer we'll try to find out if we can relate sounds to insect density or feeding damage," says Bick. "Finding thresholds for farmers to use before applying synthetic or organic controls is top of mind to make the Insect Eavesdropper as useful as possible."

Bick notes that entomologists' use of microphones is nothing new, stretching back to the early 1900s. "Before this, while sounds could be picked up, they were unidentifiable," says Bick. "Our algorithms added structure to the data to make sense of the sound files. In our initial research, we achieved upwards of 96% accuracy."

The availability of Piezo contact microphones that pick up vibrations, combined with very low-cost Raspberry Pi computers and machine learning, has made the Insect Eavesdropper economically viable.

"The Raspberry Pi costs $45," says Bick. "The four contact microphones per device cost $3 each, and we 3D printed the box that contains everything."

Bick's current version of the Insect Eavesdropper costs about $120. She expects to see that eventually fall to around $15.

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Weber built his trailer from scrap on hand, including bicycle tires.

Low-Cost, Simple Trailer

David Weber built a simple trailer to tow behind his lawn tractor and ATV.

"I used four wheels from same-sized bicycles and welded angle iron to the frame. I made the bed from scrap metal and used a ball hitch from scrap I had on hand," Weber says.

The trailer is useful for various farm projects and was inexpensive to build. One advantage of bicycle tires is the high clearance they provide.

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