A cheaper, lighter moth trap may make citizen science projects more affordable

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Credit: Photo by Mike Boone [CC BY-SA 2.5], via Wikimedia Commons.

Researchers from Michigan State University believe they have invented a better—or at least a cheaper—version of the proverbial mouse trap. Except instead of a mouse trap, it's a moth trap. The new device is described in the *Journal of Insect Science*.

Traditional light traps used by entomologists for sampling, known as mercury vapor black light traps (MVTs), can be expensive and difficult to use in remote areas. Powered by car batteries, they can be heavy and

hard to carry, and each one could set a researcher back anywhere from $200 to $500 dollars per unit.

The researchers thought that there had to be a better way.

"What prompted our original question was trying to walk 500+ yards through thick woods with the MVT traps," said Katharine Glover, an undergraduate researcher at MSU, who co-authored the paper with Assistant Professor Peter White and fellow undergraduates Amanda Rice and Joel Stewart. "I would carry 40 pounds in motorcycle batteries, Amanda Rice would carry four of the actual traps, and Joel would carry four or more wooden stands over his shoulder. On an average day, we would set up 20 traps, and it was physically exhausting. Thus, we wanted to find a new way to obtain similar results without the physical demands of the MVT trap."

In addition to the physical toll of MVT traps, the researchers also wanted to create a cheaper trap.

"One of the most important reasons for performing this study was to devise a moth trap that didn't cost $400," said Stewart. "Not only did the full assembly cost four hundred dollars, but the individual parts that would sometimes break in the field did not come cheap."

Using LED light strips, rechargeable nine-volt batteries, a Tupperware-style container, a soda bottle, poster board, tape, glue, Velcro, and twine, the team created a light trap that was easy to assemble using everyday materials.

And the cost? Just $28.50 per unit.

Given that most sampling efforts require multiple traps in different locations, using the LED traps could easily save researchers thousands of

dollars.

While the design of the new LED trap is unique, using LED lights to attract insects is not new.

"LEDs have been used as insect attractants in the past, but as far as we know, they have not been embedded into a simple standard light trap before," said Dr. White. "A key component to our design is its simplicity. Other designs we have come across that use LEDs have typically involved complex blueprints and have required advanced skills with electronics."

Twelve-volt mercury vapor black light traps like the one on the left are heavy and cost between 200-500 dollars apiece. The new LED funnel trap (right) is lightweight and costs about $28.50. Credit: Entomological Society of America

However, while the new trap is lighter and cheaper than an MVT trap, the real question is: Is it is as good?

In short, the answer is no. In tests, the MVT caught more insects and a more diverse array of species. However, on a cost-per-moth-captured and a per-moth-species captured-basis, the LED came out on top by a large margin.

"Undeniably, the MVT is superior to the LED trap as we have constructed it," the authors wrote. "If money and transportability are not limiting to research, the traditional MVT trap will yield a more abundant and speciose Lepidoptera assemblage. However, when cost and transportability are taken into account, the LED trap provides an effective alternative for surveying the night-flying Lepidoptera assemblage."

In addition to helping researchers who need a cheaper, lighter alternative to the MVT trap, the new LED trap also has implications for educational and citizen science. The simple design, using everyday items, means classrooms or members of the public can create traps and collect insects.

"Scientific literacy in the public is increasingly important as we continue to learn how to manage natural areas for the preservation of biodiversity and how to deal with the impacts of climate change and human-induced habitat modification," said White. "While someone might not want to spend hundreds of dollars on a standard black light trap, they now can make their own for fairly cheap. In fact, we are starting a pilot project at Michigan State University through an internal grant opportunity to put some of these traps into the hands of sixth graders so they can investigate the drivers of insect biodiversity in their neighborhoods."

Stewart has a similar vision for the new, cheaper trap.

"This trap could allow more volunteers to contribute data because they are able to construct their own trap while not breaking the bank," he said. "Citizen science initiatives could rely more on novice entomologist volunteers rather than professional entomologists. For example, high school students could be tasked with constructing traps, deploying their traps, and reporting the data to an online database. This would accomplish two things: collecting data of a target species, and teaching students the process and importance of collaborative science."

More information: Peter J. T. White et al. The Technical and Performance Characteristics of a Low-Cost, Simply Constructed, Black Light Moth Trap, *Journal of Insect Science* (2016). DOI: 10.1093/jisesa/iew011

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