Researchers develop new approach to identify possible ecological effects of releasing genetically engineered insects

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University of Minnesota researchers have developed a new approach for identifying potential environmental effects of deliberate releases of genetically engineered (GE) insects.

The researchers outline their approach in a paper in the journal *Ecology and Evolution*. The authors include professor of entomology David Andow and Aaron David, Joe Kaser, Amy Morey and Alex Roth – four graduate students who received NSF Integrative Graduate Education and Research Traineeships (IGERT) – the National Science Foundation's flagship interdisciplinary training program educating U.S. Ph.D. scientists and engineers.

GE insects hold great promise for significantly changing pest management and fighting insect borne human diseases throughout the world. Before releasing GE insects, scientists, governments and industry must examine the possible ecological effects GE insects could have by doing ecological risk assessments (ERA). University researchers' new approach provides improved guidance for such assessments.

"When new technology is developed, you want to make sure it's safe," says Morey, who is a doctoral student in the Department of Entomology. "You want to know what could happen when you release these novel organisms into the environment."

Because GE insects are such a new technology, there really isn't a standard way of evaluating that yet, she says.

"Our project is trying to get it a little bit further into a standardization—a framework for how do you go about systematically evaluating a new technology so you're looking at all the sorts of different interactions that could possibly happen," Morey says.

In the paper, the researchers focus on all potential ecological effects whether an effect is adverse or beneficial, says Kaser, who is a doctoral student in the Department of Entomology. They apply their own approach to the *Anopheles gambiae* mosquito – a malaria vector being engineered to suppress the wild mosquito population, says David, who is a doctoral student in the Department of Ecology, Evolution, and Behavior. They explore possible ecological effects during the transitory phase in the short term and steady state phases of the GE mosquito in the long term, David says.

"The population isn't the same the whole time. You do have these transitory phases where the potential effects could be quite different than the effects during the steady state phase," Kaser says.

Many risk assessments only look at the end result. "Our framework really tries to evaluate the entire range of potential effects," he says.

That more comprehensive look is what sets their approach apart from others.

"We think this is a novel and important contribution because many past risk assessments that were just looking at the final population state were missing a lot of really important effects," says Roth, a doctoral student in the Department of Forest Resources. "And that's where we think our framework can really add to identifying effects that could be important throughout this whole process."

As they worked, the researchers not only developed an approach for identifying potential ecological effects of GE insects, and they also found significant knowledge gaps in mosquito ecology.

"While there's an amazing and impressive amount of research that's been done on mosquitoes, there wasn't a whole lot of information about how they might be important ecologically," Kaser says.

In the paper, they had to broaden their scope of ecological research to infer what could happen.

"The idea is that there isn't much info on what happens when you release a GE organism so we drew upon other literature to get at the answer of what happens when you peturb populations," David says.

As GE insects become more common, the researchers say they hope their framework provides guidance that will improve future risk assessments and ensure the safety of these technologies.

Provided by University of Minnesota

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