New technique could help solve mystery of vanishing bees

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Ecologists have developed a better way of rearing bee larvae in the laboratory that could help discover why honey bee populations worldwide are declining. The technique, together with details of how statistics adapted from other areas of ecology can aid bee research, is published this week in the British Ecological Society's journal *Methods in Ecology and Evolution*.

Human food security depends on bees because they pollinate so many of our crop plants. As a result, worldwide declines in both honey bee colonies and solitary bees are causing widespread concern. But faced with declines that seem due to the combination of several factors, including diseases, agricultural chemicals and loss of habitat, researchers urgently need better ways of studying bees in the laboratory.

Now, a team of ecologists from the University of Würzburg, Germany has devised a better way of rearing honey bee larvae in the laboratory that should make it easier to study the causes of their decline.

The current method of rearing bees in the laboratory has major drawbacks. It involves a process known as "grafting", where the tiny first instar bee larvae around 1mm long are collected using feathers, brushes or needles. As well as being time consuming and demanding considerable skill, the mechanical stress involved in handling causes mortality among the tiny larvae.

To avoid handling the larvae, the researchers allowed honey bee queens

to lay eggs directly into an artificial plastic honeycomb about the size of a cigar box. The plastic honeycomb is widely used by professional honey bee queen breeders, and by using in the laboratory the team found rearing bee larvae much easier and more successful.

According to lead author and keen bee-keeper Harmen Hendriksma: "The artificial comb has a hexagonal pattern with 110 holes the size of wax cells. The queen lays her eggs directly into these small plastic cells. Because the back of each cell has a small plastic cup, we can collect the larvae without handling them."

Before starting his PhD in 2008, Hendriksma spent four years working with a new Dutch company producing honey for medical uses. Seeing it used by queen breeders, he decided to try out the plastic honeycomb in the laboratory.

"Like many people I am a bit lazy and wanted to find a quicker, easier way of rearing honey bees in the laboratory. When I tried using the plastic honeycomb system I found it was just perfect," he says.

Hendriksma and his colleagues found that when using the plastic honeycomb, almost all (97%) larvae survived. And because it is straightforward and simple to use, researchers were able to collect more than 1,000 larvae in 90 minutes.

By introducing a robust, standardised way of rearing larvae the technique should also help improve the quality of bee research because the results of experiments conducted in different laboratories will be more directly comparable.

The study also shows that applying statistical approaches used in other areas of ecological science can help bee researchers to better analyse their results.

Says Hendriksma: "Bee research is like an arms race, where researchers try and keep up with monitoring emerging new risks to bees. Because so many factors – such as environmental pollution, new agricultural pesticides, bee diseases, changing habitats and bees' genes – may be playing a part in the loss of our bees we need better ways of analysing our results."

More information: Harmen Pieter Hendriksma, Stephan Härtel and Ingolf Steffan-Dewenter (2011), 'Honey bee risk assessment: New approaches for in vitro larvae rearing and data analyses', doi: 10.1111/j.2041-210X.2011.00099.x , is published in *Methods in Ecology and Evolution* on Tuesday 22 March 2011.

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