Ginger is key ingredient in recipe for conserving stag beetles

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This is a male stag beetle. Credit: Copyright Deborah Harvey

The humble ginger root could be the key to conserving the UK's largest and most spectacular terrestrial beetle – the stag beetle. Ecologists from Royal Holloway, University of London and the University of York have developed a series of new methods to monitor stag beetle numbers – including ginger lures to trap adult beetles and tiny microphones to detect sounds made by the larvae in their underground nests. Conservation efforts have been hampered until now because ecologists lacked a reliable way of monitoring stag beetle numbers.

The new research, published in the Royal Entomological Society's journal *Insect Conservation and Diversity*, found that a combination of ginger-baited aerial traps to catch adult stag beetles, plus tiny

microphones to record the underground larvae's sounds and samplers to detect the chemicals they emit, give an accurate picture of the species' abundance.

According to Dr Deborah Harvey, one of the study's authors: "Our new methods offer genuine promise for monitoring the population of this elusive and rare insect, one that we think is declining across much of its European range. We need to know where the stag beetle lives – and in what numbers – to be able to conserve it effectively."

Harvey and her colleagues discovered ginger was irresistible to adult stag beetles only after testing the attractiveness of many other fruit and vegetables – including banana, strawberry, tomato and cherry – as well as wine and beer. Ginger works because it contains large amounts of alpha copaene, a chemical known to attract other insects that live in dead and decaying wood.

By using ginger, and designing the trap using heavy duty plastic, Harvey was able to produce a very cost-effective trap, which is vital because most insect monitoring in the UK is done by a small army of dedicated but unfunded amateur recorders.

This is a male stag beetle. Credit: Copyright Deborah Harvey

Using other methods of trapping insects, such as light traps or traps baited with food, do not work with adult stag beetles because they are not reliably attracted to light and the species does not eat during the adult phase of its life cycle.

As well as finding a method of monitoring adult numbers, Harvey also needed a way to detect larvae, which live underground. Hand searching is likely to destroy their habitats, so instead the team used tiny microphones to pick up the sounds – known as stridulation – the larvae make, together with so-called diffusive samplers to detect a chemical (longifolene) they emit.

Harvey says: "Sampling subterranean insects without destroying the larval habitat is notoriously difficult. These diffusive samplers are widely used to monitor environmental pollution, but this is the first time they have been used for insect detection. Because longifolene can be produced by plants, we used it together with sound recording to come up with a more accurate method of finding stag beetle larvae."

The team found that stridulation patterns produced by stag beetle larvae are very different from other species likely to live nearby, such as the rose chafer (*Cetonia aurata*) and the lesser stag beetle (*Dorcus parallelipipedus*). "Stridulation is likely to be a form of communication between larvae; it increases if larvae are handled or placed in solitary confinement," Harvey says.

These are the first ever sound recordings of lesser stag beetle and rose chafer larvae. The latter sound like squeaky shoes.

The new methods could help conserve other rare species. According to Harvey: "Acoustic detection of insects as a sampling method is very

underused, but we believe it could have great potential in detecting larvae in the field."

More information: Alan Gange, Deborah Harvey, Colin Hawes, Paul Finch, David Chesmore and Ian Farr. Development of non-invasive monitoring methods for larvae and adults of the stag beetle, Lucanus cervus, *Insect Conservation and Diversity*, doi:10.1111/j.1752-4598.2009.00072.x , is published online on Monday 10 January 2011.

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