

Caterpillars calling

School student Eric Topham spent four weeks of his summer holidays researching how caterpillars communicate with ants. His project won him a prestigious prize.

The Large Blue butterfly (*Maculinea*) is an endangered species both here in the UK and in continental Europe, with a very special parasitological relationship with red ants (*Myrmica*). Understanding this relationship was and is essential for the conservation and reintroduction of the species. The caterpillars of the Large Alcon Blue spend the first three stages of their lives on the marsh gentian plant. They then fall to the ground where they are found by red ant foragers which carry any caterpillar they come across back to the nest. The ants feed and protect the caterpillar for up to two years through the final stage of its life (the pupa) before it becomes a butterfly. The ants are fooled into believing that the caterpillar is one of their own young.

How does the caterpillar do this? First, the surface of the caterpillar is covered in chemicals very similar to those on the ant larvae (chemical mimicry). A second possible method involves the caterpillars producing sounds similar to those of the ant (acoustic mimicry). Previous studies show that the caterpillars produce similar but not identical sounds to the ants.

The main aim of my research was to see for the first time if the ants would respond to the caterpillar sounds when no physical or chemical cues were present, and if so how they would behave. We recorded the caterpillars using sensitive recording equipment which was also lent to the BBC for recordings presented in the *Life in the Undergrowth* series. Much to our surprise, we found that the ants did investigate the source of recorded caterpillar or ant sounds. They would tap on or near the headphone with their antennae, where they seemed to be searching for further cues. However there was no significant result for the ants actually resting on the headphone or walking over it. The results suggest that the caterpillars were calling for attention. This was a fantastic result for such a short project and the first time that this had

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been shown for parasitic caterpillars. However, we were unable successfully to record sounds from other members of the ant colony or the 'ant loving' hoverfly larvae *Microdon mutabilis*. Nevertheless, this was a highly successful Nuffield Science Bursary project which scientists at the Centre for Ecology & Hydrology are keen to build upon.

The project was also a wonderful opportunity for me to discover exactly what scientific research was all about, and to work with real scientists. It gave me a taste of post-educational scientific work and what a career in science might be like. It was also a chance to study an area of biology that I had never come across in school. And the project was invaluable in

helping me to decide which university courses to choose, as well as a great topic of conversation for the interviews that followed.

The major challenge was rapidly to learn all of the new terminology, the methods used in behavioural studies, and most importantly to catch up on as much prior knowledge as possible. Learning to handle ants in a quick and efficient manner without harming them was also harder than it looked. This was not helped during the first week by a persistent itchy feeling whenever ants were present! Despite this, the whole of the project was a fantastic experience and four weeks of my summer holiday flew by in no time at all.

Want to know more?

Eric's project is described at www.ceh.ac.uk/scisoc/Nuffield2005Topham.html and is part of the EU fifth framework project MacMan: www.macman-project.de

Nuffield project successes

The Nuffield science bursary scheme gives sixth-form students bursaries for summer research placements at scientific institutions for four to six weeks. The Centre for Ecology & Hydrology has benefited from more than 50 Nuffield projects and has taken part in all of the ten years of the scheme's existence. In 2005 CEH Dorset, Edinburgh and Oxford sites hosted five students.

Project summaries on the CEH website are an inspiration to sixth formers wishing to carry out similar projects for A level studies. Project successes have led to prizes for students and their teachers, including participation in the BA Crest and European Science Fairs, the London International Youth Forum conference, and a visit to the Coto Doñana nature reserve. Students have been named as authors and received acknowledgements in published papers, and have contributed to their supervisors' success in grant and studentship applications. Many of the students have gone on to study science at top universities.

In 2005 three Dorset students took part. Nic Phillips from the Purbeck School chose a project which fitted his A2 study requirements and said, 'It was the best job I have had!' Alex Aquilina from Canford School won the CREST Gold Award for the South-west. Eric Topham's prize-winning project is described here. Details of all three projects are at www.ceh.ac.uk/scisoc/NuffieldListing.html



- 1 Adult Alcon Blue laying eggs.
- 2 Ants with larvae in the nest.
- 3 Eric at work in the field.

Eric Topham, from Thomas Hardy School, Dorchester, won the AstraZeneca Young Innovator's Award at the BA Crest Fair held in February at the Royal Society. As a prize he visited an AstraZeneca site in Sweden and the Gothenburg International Science Festival in May 2006 while revising for those important A levels which he needs for a place to read Natural Sciences at Cambridge. His research was published in a CEH paper for an academic conference.