Swarming locusts need larger brains

May 25 2010

Locust schistocera gregaria. Credit: Gabriel Miller

One of the most devastating events in the insect world - the locust swarm - has extraordinary effects on the insect's brains, scientists in Cambridge have discovered.

Although desert locusts are infamous for their swarming behaviour - when they migrate en masse and consume everything in their path - they usually occur in a solitary form, living alone and actively avoiding fellow locusts.

Working with colonies of swarming (gregarious) locusts, Dr Swidbert Ott and Dr Stephen Rogers of the University of Cambridge, converted

some of them into the solitary phase by keeping them in isolation for three generations.

When they then compared the size and shape of the locusts' brains, they found that extraordinary changes had taken place.

Despite being smaller than solitary locusts, swarming locusts developed brains that were 30% larger. Not only that, regions of the brain that are dedicated to different tasks had very different proportions in the two phases.

In the solitary locust the parts of the brain that deal with vision and smell are proportionately larger, possibly helping them to detect faint or distant stimuli, whereas in the swarming locust huge increases in size occur in the parts of the brain associated with learning and processing complex information.

Swarming locusts need these larger brains to cope with the challenges of a life on the move that can take them across continents in a milling mass of other locusts, and to deal with the intense competition that dominates their existence, Dr Ott believes.

"Their bigger and profoundly different brains may help swarming locusts to survive in the cut-throat environment of a locust swarm. Who gets to the food first wins and if they don't watch out, they themselves become food for other locusts. In a nutshell, you need to be brainier if you want to make it in the mayhem that is a locust swarm," he says.

He adds: "As swarming locusts move through the landscape, they face much more of a challenge in finding and assessing potential foods, which may be something new that they have never encountered before."

The challenges of living in large groups and of finding varied and

unpredictable food sources are also believed to be key factors in explaining why some vertebrates have evolved particularly large brains.

Because desert locusts can transform between a solitary and a swarming phase, which look and behave very differently, they provide ideal opportunities for studying the relationship between an animal's lifestyle, its behaviour and its brain structure.

The results are published today in *Proceedings of the Royal Society B*.

Provided by University of Cambridge