What's bugging locusts?

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Since ancient times, locust plagues have been viewed as one of the most spectacular events in nature. In seemingly spontaneous fashion, as many as 10 billion critters can suddenly swarm the air and carpet the ground, blazing destructive paths that bring starvation and economic ruin. What makes them do it?

A team of scientists led by Iain Couzin of Princeton University and including colleagues at the University of Oxford and the University of Sydney believes it may finally have an answer to this enduring mystery.

"Cannibalism," said Couzin, an assistant professor of ecology and evolutionary biology at Princeton.

Writing in the May 8 online edition of *Current Biology*, Couzin and colleagues say that the collective motion of locusts is driven by "cannibalistic interactions."

"Cannibalism is rife within marching bands of locusts," said Couzin. Desert locusts usually feed on vegetation, but individual locusts have been observed to feed on other live locusts or cadavers. This behavior and its effect upon the group, however, have not previously been studied.

"No one knew until now that cannibalistic interactions are directly responsible for the collective motion exhibited by these bands," added Couzin, whose graduate student, Sepideh Bazazi, is the lead author on the paper.

In zoology, cannibalism is defined as occurring when any species consumes members of its own kind.

Young locusts are pressed to eat others when the food supply necessary for supporting the population starts to dwindle. Starved for essential nutrients such as protein and salt, young locust "nymphs" will nip at each other. Those under siege react by running from the aggressors. Others get jittery and simply seek to put space between them and any locust approaching from behind. That's how one aggressive interaction can lead to another and collectively start a vast migration, Couzin said.

And the activity intensifies, as the biting and ominous approach of others increases both the propensity to move and the forward momentum of individual locusts.

The researchers reached their conclusion by studying immature, flightless locusts. They developed computerized motion analysis to automatically track the insects marching in an enclosed arena.

In nature, Couzin said, these locust nymphs can gather in large mobile groups called bands. They can stretch over tens of miles, devouring vegetation as they march. They inevitably precede the flying swarms of adult locusts.

"Once they take flight, locust control is extremely expensive and ineffective," Couzin said. "So understanding when, where and why the bands of juvenile locusts form is crucial for controlling locust populations."

Through history, locusts have invaded up to one-fifth of the Earth's surface, he said. They have contributed to major humanitarian crises in areas such as Darfur and Niger.

Besides having practical applications, understanding the movement of locusts also is part of a growing inquiry by scientists into an area known as group dynamics. With locusts, researchers have been seeking to understand how the group seems to move with the synchronized perfection of the Rockettes when there is no centralized leader and individuals can barely see beyond a few neighbors on either side.

Animal groups such as flocks of birds, schools of fish and swarms of insects frequently exhibit such complex and coordinated collective motion and present a great opportunity to understand how local interactions can lead to vast collective behavior, the scientists said.

Source: Princeton University