

Panamanian termite goes ballistic: Fastest mandible strike in the world

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Marc Seid, postdoctoral fellow in the new neurobiology laboratory at the Smithsonian Tropical Research Institute in Panama. Credit: Marcos Guerra, STRI

A single hit on the head by the termite *Termes panamensis* (Snyder), which possesses the fastest mandible strike ever recorded, is sufficient to kill a would-be nest invader, report Marc Seid and Jeremy Niven, post-doctoral fellows at the Smithsonian Tropical Research Institute and Rudolf Scheffrahn from the University of Florida.

Niven and Seid conducted the study at the Smithsonian's new neurobiology laboratory in Panama, established by a donation from the Frank Levinson Family Foundation. The laboratory was built to use Panama's abundant insect biodiversity to understand the evolution of brain miniaturization.

"Ultimately, we're interested in the evolution of termite soldiers' brains and how they employ different types of defensive weaponry," says Seid. Footage of the soldier termite's jaws as they strike an invader at almost 70 meters per second was captured on a high speed video camera in the laboratory at 40,000 frames per second. "Many insects move much faster than a human eye can see so we knew that we needed high speed cameras to capture their behavior, but we weren't expecting anything this fast. If you don't know about the behavior, you can't hope to understand the brain," Seid adds.

Why are the termites so fast? When insects become small they have difficulty generating forces that inflict damage. "To create a large impact force with a light object you need to reach very high velocities before impact," Niven explains.

The Panamanian termite's strike is the fastest mandible strike recorded, albeit over a very short distance. Because a termite soldier faces down its foe inside a narrow tunnel and has little room to parry and little time to waste, this death blow proves to be incredibly efficient.

The force for the blow is stored by deforming the jaws, which are held pressed against one another until the strike is triggered. This strategy of storing up energy from the muscles to produce fast movements is employed by locusts, trap-jaw ants and froghoppers. "The termites need to store energy to generate enough destructive force. They appear to store the energy in their mandibles but we still don't know how they do this—that's the next question," says Niven.

A full report of the study appears in the Nov. 25, 2008 issue of the journal *Current Biology*.

Source: Smithsonian Tropical Research Institute

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