Researchers sequence genome of primitive termite

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Michael Scharf eyes a group of eastern subterranean termites, destructive pests in Indiana and the Eastern US. Credit: Purdue University / Tom Campbell

North Carolina State University entomologists are part of a research team that has for the first time sequenced the genome of a member of the termite order, the dampwood termite (*Zootermopsis nevadensis*). A paper reports the findings today in *Nature Communications*.

The findings on the genetic blueprint of the dampwood termite, one of the world's most primitive social insects, highlight key differences and similarities with other social insects like ants, wasps and bees, and

provide insight into how social insects evolved. The findings could also help researchers pinpoint specific gene functions to devise measures to control unwanted termites.

Dampwood termites don't get out much; most of their lives are spent inside a tree log. So it stands to reason that termite males have expanded male fertility genes to continually fertilize eggs produced by queens that don't store sperm for very long. In contrast, ant males deliver sperm once in a short-lived and often far-flung existence, forcing ant queens to store sperm for a long time, says Dr. Ed Vargo, professor of entomology and a co-author of the paper.

"Generally, ant males deliver sperm and then die. But sperm production goes on for life in the dampwood termite male," Vargo said.

The study also shows that termites have fewer receptors associated with smell than other social insects. While this makes sense at a basic level – a termite that doesn't leave home may not experience a wide variety of smells and thus has no need for a wide odor palate– the finding is also a bit surprising. Dr. R. Michael Roe, an NC State professor of entomology and co-author of the paper, says that previous studies in ants and bees suggest that a sophisticated chemical communication behavior system needs lots of sensory receptor genes.

"These sensory receptors may not be as important to being social as we previously believed, at least for these more primitive termites," Roe said. "These findings also show that you can't make assumptions about termites by studying ants – it's important to study both as comprehensively as possible."

The study also found some key similarities between dampwood termites and other social insects. Many of the termite genes involved in sex and caste determination appear to be present in ants, for example.

These findings, along with others reported in the paper, could lead to new baits that eliminate the termites eating your home.

"The vast majority of termites are not pests," Vargo said. "They serve important functions in decomposition, for example. But we can use this sequence information to figure out ways of disrupting certain pathways which could have pest control implications for termites causing problems in homes."

More information: "Molecular traces of alternative social organization in a termite genome" Authors: Robert Mitchell, Jiwei Zhu, R. Michael Roe, Edward L. Vargo, North Carolina State University; lead authors are Judith Korb, University of Osnabruck; Guojie Zhang, University of Copenhagen; and Jurgen Liebig, Arizona State University. Published: May 20, 2014, in *Nature Communications*. DOI: 10.1038/nscomms4636

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