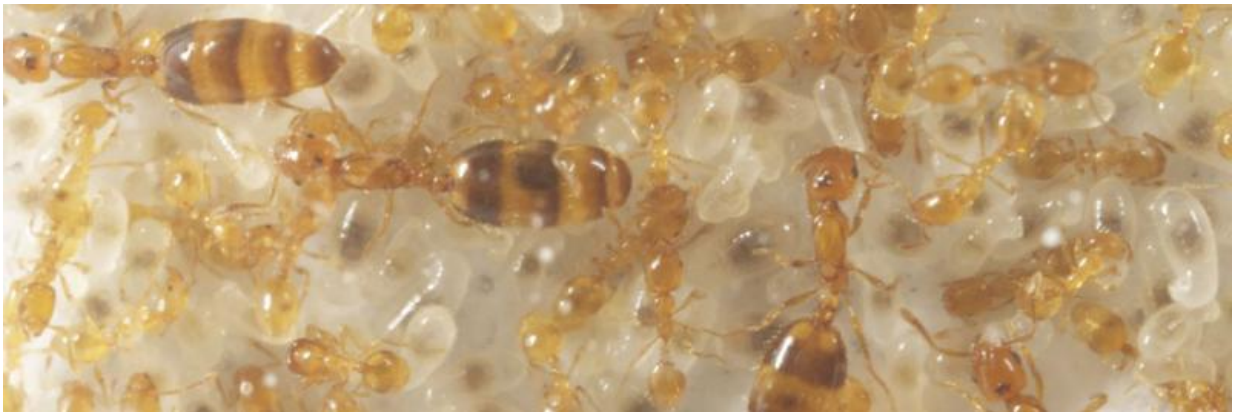


Uncovering the evolution of queen-worker ant differences

April 12 2016

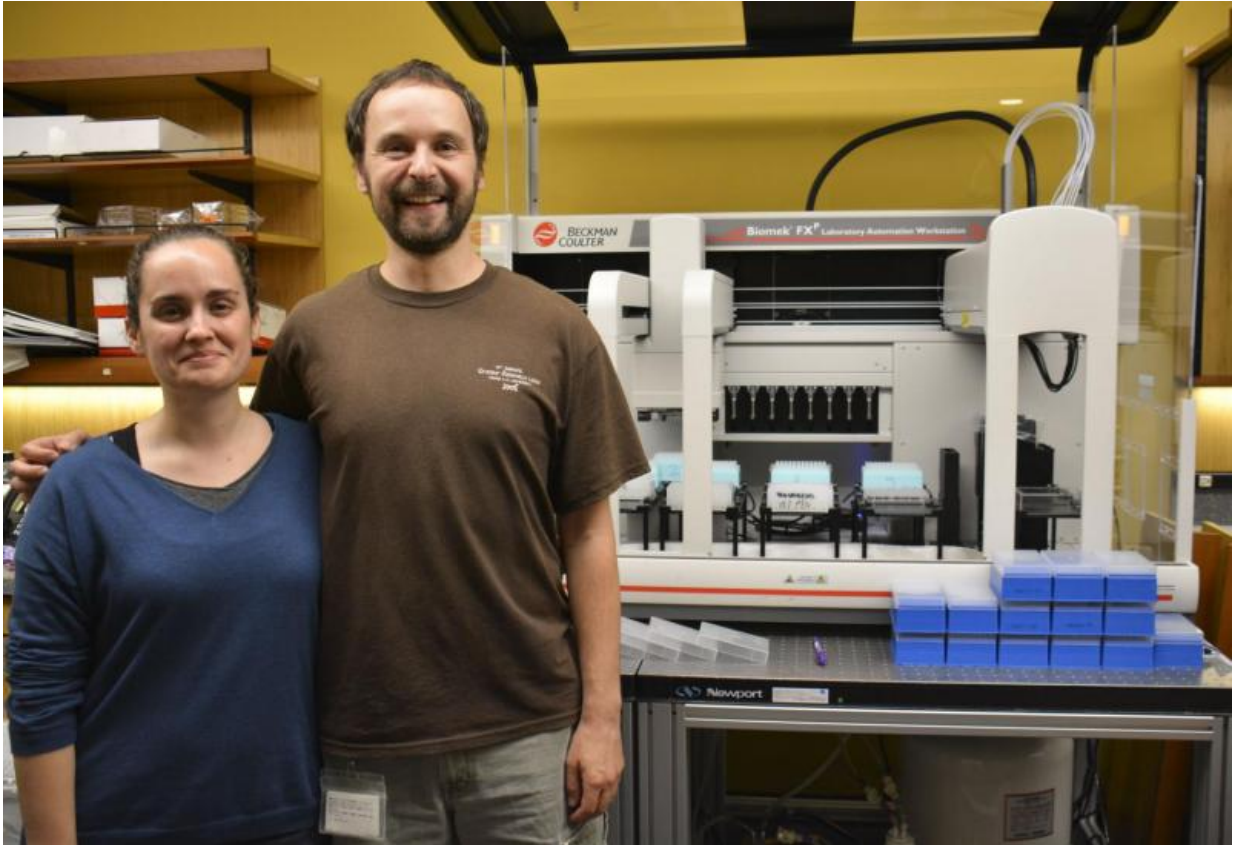


Queen and Worker Ants

Queen and worker ants develop from the same sets of genes, but perform completely different ecological roles. How the same genes result in two types of individuals is an ongoing mystery. In the past, scientists have only studied a small number of ant species at a time to try to understand the nature of queen-worker differences. However, a team from the Okinawa Institute of Science and Technology Graduate University (OIST) in tandem with the University of Helsinki and other collaborators from around the world, recently looked at a large data set with 16 species that provides insight into the differences between queen and worker ants.

Rather than listing specific [genes](#) that manifest themselves differently, or are differentially expressed, between queens and workers, the team looked for genes with similar expression patterns across samples that may be involved in maintaining the structural, behavioural and functional differences observed between queens and workers. The results were recently published in *Genome Biology*.

The team, headed by OIST's Prof. Alexander Mikheyev of the *Ecology and Evolution* Unit and Dr. Claire Morandin, post-doctoral scholar at the University of Helsinki, collected queens and workers and sequenced the transcriptome – the full range of messenger RNA molecules expressed by an organism – of 16 species of ants to create a co-expression network of 36 sets of genes, that represent groups of similarly expressed genes. This is the biggest dataset so far for the study of [gene expression](#) in social insects and it provides insight into the [evolution](#) of gene expression across [ant species](#). This is because ants have many different features that are repeatedly evolving.



Dr. Claire Morandin of the University of Helsinki and OIST Prof. Alexander Mikheyev

"Ants originated more than 100 million years ago," Mikheyev said. "They are remarkable for their diversity of traits and adaptations, many of them evolving in parallel in different species."

In this study, the parallels between the species were established because almost all of the sets of genes the team identified were associated with either queen or worker traits. The researchers' results suggest that structural and functional differences between queens and workers result from the differential expression of evolutionary conserved sets of genes, or genes that are basically expressed in the same manner throughout

evolution among all ant species. In other words, they saw that instead of one specific gene, the relationships between sets of genes may help to explain the structural and functional disparities between queen and [worker ants](#).

"Our findings further highlight the importance of gene expression for the evolution of traits," Mikheyev said. "In particular, one should consider not just the individual genes involved, but what other genes they interact with."

Surprisingly, these conserved gene sets were also associated with several other biological traits, which evolved multiple times in ants, such as number of queens in a colony, whether an ant species is invasive or not, and the degree of worker sterility. This suggests that conserved genetic modules may be involved in the development, or parallel evolution, of ant traits.

This information is not only important because it can now help scientists try to understand how the differences between queen and worker may arise through interactions among genes, but also for the evolution of ants, and in the evolution of gene expression more generally.

"With this study we also demonstrate what kind of non-traditional genomic approach can be applied in ecology and evolution" Morandin said. "This technique will be useful for other studies interested in characterising the link between gene expression and physical, external traits."

More information: Comparative transcriptomics reveals the conserved building blocks involved in parallel evolution of diverse phenotypic traits in ants, *Genome Biology* 201617:43, 7 March 2016

Provided by Okinawa Institute of Science and Technology

Citation: Uncovering the evolution of queen-worker ant differences (2016, April 12) retrieved 9 August 2024 from <https://phys.org/news/2016-04-uncovering-evolution-queen-worker-ant-differences.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.