Tropical ants in Europe

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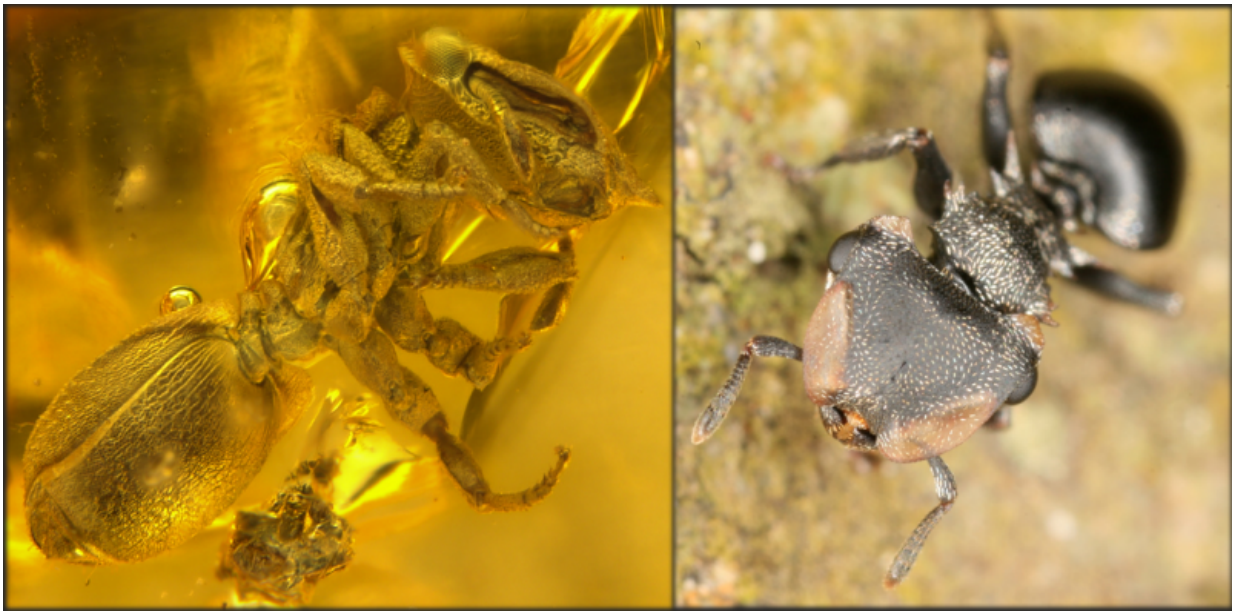

An ant preserved in amber and its modern counterpart

"Imagine I could send an ecologist to Europe back tens of millions of years ago. Then, ask them to look at the ants and to tell me where they think they have landed… They would say Southeast Asia", explains Prof. Evan Economo of the Okinawa Institute of Science and Technology Graduate University (OIST). His team compared a database of modern ants with a database of fossil ants. The analysis has shown in which locations fossilized ants are more related to the ants now living in the same area of the world. Interestingly, ants which lived in Europe 45 to 10 million years ago were more similar to modern ants now living in

South East Asia than their European counterparts. The study has been published in the *Journal of Biogeography*.

The team, including Economo's former post-doc and now assistant professor at the University of Hong Kong Benoit Guénard and associate professor Vincent Perrichot of the Université de Rennes, is studying why we encounter certain groups of ants, in specific regions on Earth, and how their distribution has changed over time. Understanding the worldwide distribution of biodiversity is one of the biggest challenges for biogeographers and ecologists. "Many biologists tend to perceive biodiversity as a fixed image while in fact it is a very long movie and we don't understand the full story yet. Getting more snapshots of this movie will help us to reconstruct the teaser trailer of life" Guénard said.

Today's biodiversity evolved over millions of years and although invertebrates count for two thirds of Earth life, large scale analyses are still scarce. "To understand the present we need to consider history," suggests Prof Economo. The three biologists combined a fossil ant database with a modern ant database including 1,060 publications, over 4,000 worldwide sites and several fossil deposits to compare the geographical distribution of modern ants with their ancestors. "Until recently scientists were able to talk about the characteristics of ants fossils, but it is only thanks to new informatics tools that we are able to combine and quantify a huge amount of data" continues Economo.

The integration of these two databases shows interesting differences and similarities between the geographical distribution of ancient and modern ants. For example, fossil ants which once lived in Europe were more comparable with modern South East Asian, Indian or even Australian ants, rather than with the ants currently populating Europe or Africa. During most of the Cenozoic era and especially at its earliest period, around 60 to 5 million years ago, the Earth was much warmer. Tropical forests covered most of the globe, including Europe, and even Antarctica

was covered with vegetation. In those days Europe was a tropical rainforest with a completely different ecosystem from the one we see today. Then, climate shifts, continent re-arrangements, and ecological variations caused large scale extinctions in some parts of the world. Ants adapted to warm climate were not able to survive in cooler temperatures. The data also showed evidence of continent-wide extinctions. For example, ants that were once globally widespread are now restricted only to Sri Lanka.

These results help scientists to go a step closer into the interpretation of the "tree of life", that is the network of the relationships between living and extinct organisms across the globe. "If we can get a better understanding of the climate in the past, of the consequences of climate change and of how it shaped communities, then we might be able to interpret the future of biodiversity under the current climate change scenario," says Guénard.

More information: Benoit Guénard et al. "Integration of global fossil and modern biodiversity data reveals dynamism and stasis in ant macroecological patterns," *Journal of Biogeography* (2015). DOI: 10.1111/jbi.12614

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