Intercontinental dispersal of giant thermophilic ants across the Arctic during early Eocene hyperthermals

S. Bruce Archibald[1], Kirk R. Johnson[2], Rolf W. Mathewes[1], David R. Greenwood[3]

[1] Dept. of Biological Sciences, Simon Fraser University, Burnaby, British Columbia, Canada;
[2] Denver Museum of Nature & Science, Denver, Colorado, USA;
[3] Dept. of Biology, Brandon University, Brandon, Manitoba, Canada.

Early Eocene land bridges allowed numerous plant and animal species to cross between Europe and North America via the Arctic. While many that were suited to prevailing cool Arctic climates would have been able to cross throughout much of this period, others would have found dispersal opportunities only during limited intervals when their requirements for higher temperatures were met. Here we present a new giant (> 5cm long) formiciine ant from the early Eocene (~49.5 Ma) Green River Formation of Wyoming, USA. We show that the extinct ant subfamily Formiciinae is only known from localities with estimated mean annual temperature of about 20°C or greater, consistent with the tropical ranges of almost all of the largest living ant species. This is the first known formiciine of gigantic size in the Western Hemisphere and the first reported case of cross-Arctic dispersal by a thermophilic insect group. This implies dispersal across the Arctic during brief high temperature episodes (hyperthermals), representing brief, episodic openings of a climate-controlled physiological gate during the interval between the late Paleocene establishment of intercontinental land bridge connections and the presence of giant formiciines in Europe and North America by the early middle Eocene.