Some Indian jumping ant workers can transition to a queen-like state

August 20 2020, by Bob Yirka

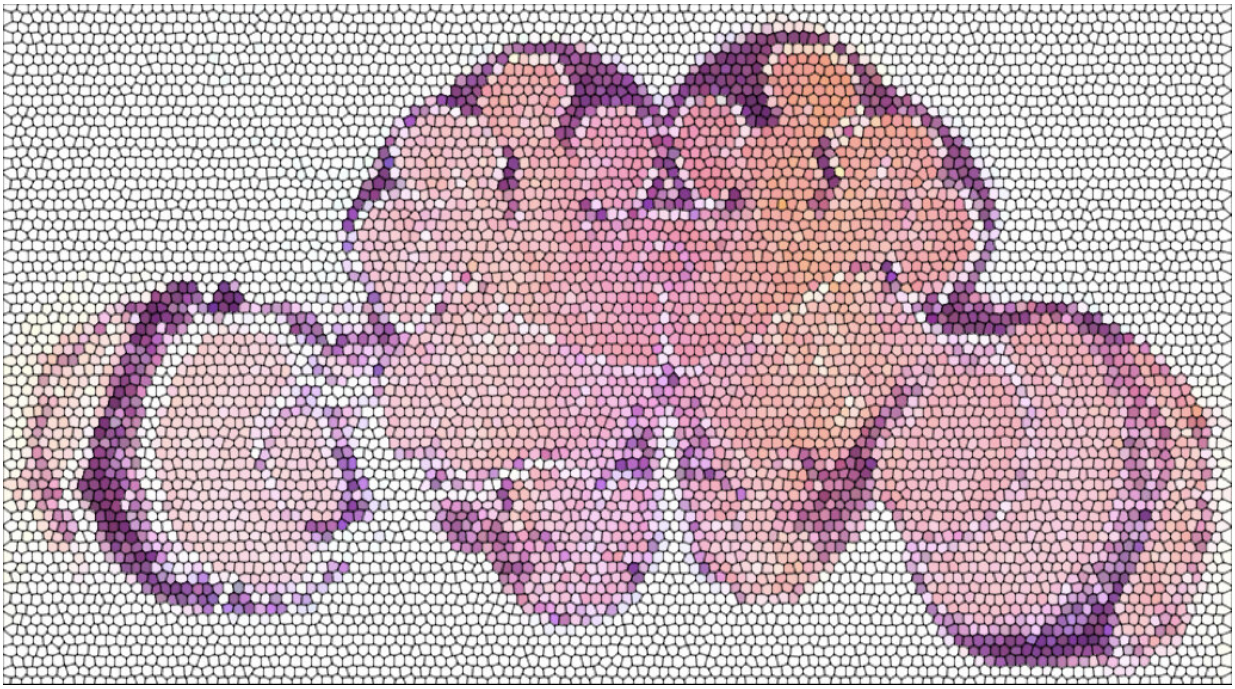
An Harpegnathos dominance tournament showing two dueling pairs (bottom). Credit: Lihong Sheng

A team of researchers at the University of Pennsylvania has found that some Indian jumping ant workers can transition to a queen-like state if their queen dies. In their paper published in the journal *Science Advances*, the group describes their study of Harpegnathos saltator ants, and what they learned about them.

Most ants live in colonies in which individuals have clearly delineated roles. Worker ants, for example, build nests and keep them clean. Each colony has a queen that lays eggs to keep the population thriving. New colonies are formed when new queens are born and fly off with a group of worker ants. In this new effort, the researchers have found that one species of ant, H. saltator, does things a little differently. By closely studying the behavior of the ants in their nest, they discovered that when the queen dies, instead of waiting for another queen ant to be born, one or more of the worker ants transitions into a queen-like ant—called a gamergate—and begins laying eggs.

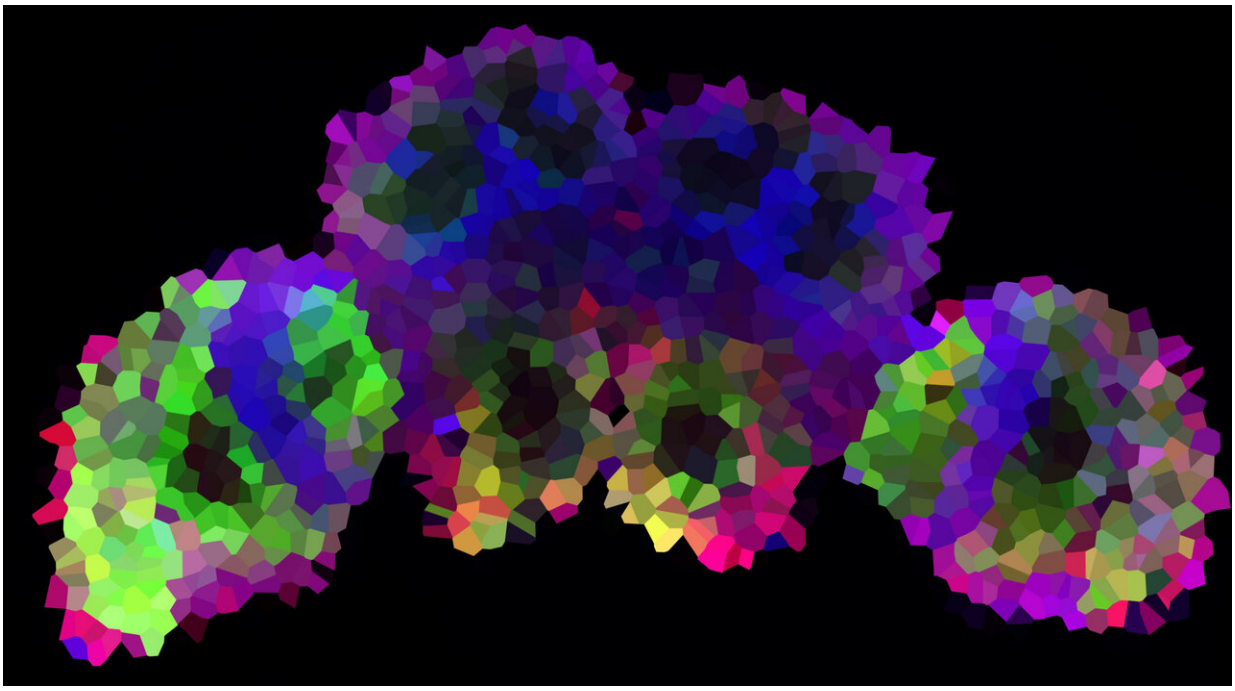
Intrigued by the transition, the researchers undertook a closer study of gamergates hoping to learn how such a transition could take place. They found that the ants underwent another transition, as well: their lifespan increased dramatically, from approximately seven months to approximately three years. Further intrigued, they studied the brains of the gamergates. They used single-cell RNA sequencing to compare the distribution of neuronal and glial populations (types of brain cells) before and after their transition. In so doing, they found that as the ants transitioned from worker ants to gamergates, they underwent an expansion of neuroprotective ensheathing glia—a change that appeared to apply to their personality, as well. The gamergates began acting like

queen ants.



An artistic rendition of an Harpegnathos ant brain section. Credit: Roberto Bonasio

The researchers next wondered if the same change was also responsible for the longer life span. To find out, they injured the brains of several of the ants by poking them with a tiny pin and then tested them to see what happened. They found that due to the injury, the brains of the gamergates began activating the Mmp1 gene to a greater degree than was the case for regular worker ants—a sign that they could repair brain injuries, and thus live longer. The researchers also found cellular changes in the gamergate brains that were associated with aging in ants.



An artistic rendition of an Harpegnathos ant brain section. Credit: Lihong Sheng

Two Harpegnathos workers capturing a cricket. Credit: Brigitte Baella

More information: Lihong Sheng et al. Social reprogramming in ants induces longevity-associated glia remodeling, *Science Advances* (2020). DOI: 10.1126/sciadv.aba9869