Interpretative dance coaxes bees into quick decisions on nest sites

August 19 2014, by Niall Byrne

James Makinson filming a giant Asian honey bee (Apis dorsata) cluster in Chiang Rai province, northern Thailand. Data from this swarm was published in Makinson et al 2014.

Dr James Makinson evicts bees from their homes for a good reason—to figure out how they collectively decide on the next place to live. His research on bee communication and consensus-building has been

published in this month's issue of *Animal Behaviour*.

James and his colleagues at the University of Sydney in partnership with two universities in Thailand have found that not all honeybee species think like the common Western hive bee when it comes to deciding on a place to nest.

Two little-known species—the giant Asian honeybee and the tiny red dwarf honeybee—use a more rapid collective decision-making process that enables them to choose a new home quickly. But they aren't as fussy when it comes to the quality of their new home.

It's work that could help with understanding and managing honeybees for pollination services, ecological health, and pest control.

"We know a fair bit about the nesting behaviour of honeybees through the work already done on the Western hive bee—the common honeybee that produces honey for our morning toast," says James, a Postdoctoral Researcher at the University of Sydney, School of Biological Sciences.

"When Western hive bees want to find a new place to nest, the queen along with a subset of the colony's workers set out as a swarm, which forms a temporary cluster in the vegetation close to their existing nest site. Then, from this cluster, scout bees take off and search for a specific nest location."

According to James, the scout bees will spend around 40 minutes evaluating a potential nest site before returning to the swarm and communicating the distance, direction and the quality of the site they've found, through the figure-of-eight movements of their distinctive 'waggle' dance.

The scout bees then head back and re-evaluate the site a number of times

before eventually convincing the entire swarm to move to a very specific location.

But James and his colleagues have found that the giant Asian honeybee and the red dwarf honeybee aren't quite as fussy when it comes to deciding where to go.

"Both the giant Asian honeybee and red dwarf honeybee species come to a much more rapid decision," says James. "We found that only during the final 15 minutes of the decision-making process do swarms reach a directional consensus on where to go, and that in some cases the scout bees' dances were still indicating different distances. We assume they figure out a specific nest location once the swarm is on the move in that direction."

From their observations, the team has developed computer models to help make sense of honeybee communication, which James says could also help inform new technologies in other areas.

"Hopefully in the near future, bee-inspired algorithms will be helping humanity solve complex problems and deal with big datasets."

James was an Australian national finalist of FameLab—a global science communication competition for early-career scientists. He was also the winner of the NSW state final.

More information: "Consensus building in giant Asian honeybee, Apis dorsata, swarms on the move." James C. Makinson, Timothy M. Schaerf, Atsalek Rattanawannee, Benjamin P. Oldroyd, and Madeleine Beekman (2014), *Animal Behaviour*, Volume 93, July 2014, Pages 191–199. www.sciencedirect.com/science/ … ii/S0003347214002000