

PP-428 [Bee Biology]

Bee-yond ants: Evidence for complex colony structures in honey bees

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As a eusocial organism, individual honey bees cooperate to function as a collective colony and superorganism. Within the honey bee literature, it is widely assumed that a colony consists of a single nest with a single queen. Other eusocial organisms, like ants and termites, demonstrate that colony structure can range from simple, with a single nest and queen, to very complex, with multiple nests and queens covering a large geographic region. Complex colony structures (CCSs), like polydomous colonies and supercolonies, have been well studied in ants but are rarely investigated in other eusocial organisms, including honey bees. We examined the current literature to identify common behavioral, chemical, spatial, genetic, and life history characteristics found in ants with CCSs. Additionally, we evaluated potential evidence for or against characteristics of CCSs in the current honey bee literature. Honey bees share many common characteristics with ants displaying CCSs, such as sophisticated communication, superorganism reproduction by budding, aggregation of nest sites, and movement of individuals among nest sites. Key behavioral characteristics to identify CCSs definitively have yet to be investigated in honey bees, especially in unmanaged populations. To identify CCSs in honey bees, future research should investigate behavioral and chemical aspects of nestmate recognition, drivers of nest aggregations, and the presence of multiple queens in a colony. Exploring CCSs in honey bees can provide insights into conserving wild populations and managing problematic feral populations. Challenging the accepted social structure of honey bee colonies may transform our understanding of honey bee biology and, in turn, reform management strategies for beekeepers.