



The non-additive effects of body size on nest architecture in a polymorphic ant, *Veromessor pergandei*

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Veromessor pergandei is a polymorphic seed harvesting ant of the Sonoran Desert, and an ideal species for studying the interplay between worker variation and variation at the colony level. Within *V. pergandei* colonies, large workers are more than two times the size of small workers. The abundance and frequency of each body size varies considerably across populations, across seasons, and with respect to each colony's patriline number. In the current study, we investigated the independent and synergistic effects of body size on nest architecture in *V. pergandei*. We used network analysis to compare wax casts of nests excavated by small workers alone, large workers alone or a combination of large and small workers. We found that polymorphic groups built longer nests, excavated more sand, and produced more architectural complexity than single-sized worker groups. The nests built by mixed-size groups were not only larger in absolute terms, but larger than expected based on the combined contributions of component size classes in isolation. In effect, the interactions of different worker types yielded a colony-level trait that was not predicted from the sum of its parts. In nature, *V. pergandei* colonies with fewer patrilines produce smaller workers each summer, and produce more workers annually. Because body size is linked to multiple colony-level traits, our findings demonstrate how selection acting on one characteristic, like mating frequency, could also shape unrelated characteristics, like nest architecture.