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Eusocial evolution in termites

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Understanding how and why eusociality evolved requires inferences about ecological pressures faced by each clade's non-eusocial ancestors. In the case of prototermites, ancestors co-inhabited resources and would have inevitably met neighboring conspecific families. The extant species *Zootermopsis nevadensis* (Archotermopsidae) forms fused colonies following interactions with neighbors. When laboratory-maintained colonies interact, reproductives are killed, surviving members of both families merge, and developmentally flexible helpers from both original colonies may differentiate into new reproductives within the fused colony. Samples taken one and two years following the interaction also confirm that some individuals, including reproductives, can be hybrids of the two original lineages. The larger fused colony has an advantage in future meetings with smaller colonies occupying the same piece of wood. Colonies collected directly from the field demonstrate that interactions and fusions are relatively common in nature. As a consequence, termite helpers have opportunities to become reproductives in young colonies, providing incentives to stay in their nest, rather than attempt high risk dispersal, despite lowered relatedness within a fused colony. Therefore, direct opportunities for offspring to reproduce may have favored cooperative, fused colonies, and functioned as a key selective pressure impacting prototermites. Fusions of unrelated colonies also occur in some other ‘one piece' (feed within their nest wood; never forage outside that resource; cannot relocate) termites as well as in some more derived species. Comparisons of differing ecological situations that favor colony fusion could yield clues regarding selection for eusocial traits and cooperation with non-relatives. Useful comparisons can be made with colony fusions in ants and honeybees, as well as drifting and usurping behavior of primitively eusocial bees and wasps. The unique ecological contexts affecting each taxon may have favored different suites and convergences of key traits, both early and later in the evolutionary progression from family groups to eusocial colonies.