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Thelytoky in the honeybee

Frances Goudie, Benjamin Oldroyd

Thelytoky, the asexual production of females, is rare in honeybees. However, it is ubiquitous in workers of the Cape honeybee *Apis mellifera capensis*. Thelytoky allows some workers to be reincarnated into the queen phenotype, and thereby selects for reproductive competition among workers. Thelytoky also acts as an exaptation for the emergence of reproductive parasites, the most extreme example of which is an entirely clonal 'cancerous' lineage of workers (the Clone) that lethally parasitises colonies of another subspecies *Apis mellifera scutellata*. The Clone is an enigma because thelytoky results in the accumulation of homozygosity at any loci that are free to recombine, yet the Clone retains considerable heterozygosity. The Clone pays a cost for its thelytoky: the selective removal of homozygous offspring at each generation. We propose that workers, queens and Clones have differing abilities to endure the costs and benefits of sex and asexuality, accounting for the heterogeneous distribution of reproductive strategies across the *A. mellifera capensis* population. We further suggest that multiple factors must fall into place for thelytoky to emerge as an effective reproductive strategy in a honeybee population, and that geographic isolation resulting in genetic drift and founder effects may have enabled thelytoky to emerge in *A. mellifera capensis*. Finally, we consider the honeybee in the broader context of haplodiploid Hymenoptera, and argue that constraints on the evolution of sex in non-haplodiploid taxa may make sexual reproduction an evolutionary 'one-way street'.