



Selection of male traits in a monogamous social bee: evidences from behavior and quantitative genetics

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The operation of sexual selection on social insect males remains a puzzle. In Hymenoptera, while queens are long-lived and show high fecundity, males' main role is restricted to insemination. After mating, sperm is stored in the spermatheca and used for egg fertilization during the queen's entire life, as queens do not remate. Thus, ejaculate quality and quantity is expected to be under strong selection, allowing colony growth and reproduction. Since ejaculate is also subject to sperm competition, understanding specific pressures of social behavior on male traits requires investigating monogamous insect societies. Here we investigated how sexual selection shapes male traits in the monogamous stingless bee *Scaptotrigona aff. depilis*. As high male-male competition is expected at male aggregations in this species, we compared males with different persistence times at aggregations. In addition, we estimated heritability and genetic correlations among male traits, in order to infer selection patterns and potential trade-offs. Sperm viability, sperm length, and male size were affected by persistence time at aggregations, but not sperm counts. Males that persisted longer showed shorter spermatozoa and were smaller. Heritability estimates were lower for sperm length than other traits, suggesting that sperm length is a fitness-related trait. High coefficients of additive genetic variation (C_{Va}) for sperm viability and sperm counts suggest the action of directional selection and potential to respond to further selection. On the other hand, lower C_{Va} for sperm length indicates stabilizing selection. Genetic correlations were low and not significant, suggesting no trade-offs among male traits. Selection of males with shorter sperm may be an adaptation to maximize sperm storage since shorter cells occupy less volume. Overall, our findings reveal that sperm traits can be under selection even in the absence of sperm competition.