Traumatic mating plugs corroborate single matings in a monogamous social bee tribe: or not!

Author(s): Jamille Costa Veiga, Jamille Costa Veiga , Gustavo Rodrigo Sanches Ruiz , Gislene Carvalho Zilse , Cristiano Menezes , Felipe Andrés León Contrera

Institution(s): Institute of Biological Sciences, Federal University of Pará, Belém, PA, Brazil ; Institute of Biological Sciences, Federal University of Pará, Belém, PA, Brazil ; Bees Research Group, National Institute for Amazonian Research, Manaus, AM, Brazil ; Embrapa Amazônia Oriental, Belém, PA, Brazil ; Institute of Biological Sciences, Federal University of Pará, Belém, PA, Brazil ; Institute of Biological Sciences, Federal University of Pará, Belém, PA, Brazil

Insects are adapted to withstand high levels of sperm competition, and mating plugs are sexually selected adaptations to reduce potential competition: their purpose is to restrict the number of females' copulations. Our aim was to describe the mechanism of mating plug formed by the male genitalia and to investigate possible copulatory wounds caused by the plugs in the Meliponini, an eusocial bee tribe. To do so: i) we compared and described the genital capsule pre and post mating plug activation in the species *Melipona fasciculata*; and ii) we investigated the wounds in females' genital chamber, by comparing virgin queens (n = 111) and mated queens (n = 141) in seven species (*Frieseomelitta longipes, M. fasciculata, M. flavolineata, M. melanoventer, M. seminigra, Plebeia minima, Scaptotrigona* aff. *postica*). We show that the mating plug is an irreversible mechanism for males, since there is a permanent loss of their genitalia, and may also be irreversible and permanent for females in at least one species (*M. fasciculata*). In the other species (*F. longipes, M. flavolineata, M. melanoventer, M. seminigra, P. minima, S.* aff. *postica*), the plug is temporary. Instead of the plug, we find copulatory wounds, which characterizes the mating plugs as a traumatic mechanism in the tribe. In *M. seminigra*, we observed multiple wounds, this being a strong indication of multiple matings. We report for the first time the copulatory wounds caused by the mating plug and the occurrence of a permanent coercion mechanism of females in the Meliponini. Also, we corroborate previous reports on polyandry mating systems for *M. seminigra* by showing the occurrence of multiple wounds in females's genital chamber. Our study show that mating systems may not be uniform in the group, ranging from strict monogamy to some level of polyandry. The intensity of the sexual conflict is the key to understand the Meliponini female adaptive responses to males' attempts to impose monogamy.