

Cryptic Female Choice in the Context of Sexual Selection

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Sexual selection is a facet of reproductive behavior where individuals make choices regarding specific mates or their gametes. This process can unfold in two primary ways. Firstly, there may be competition among members of one sex for access to the opposite sex. Secondly, a preference may be demonstrated by one sex for particular members of the opposite sex, as noted by Darwin in 1874. Essentially, females have the capacity to exercise choice in selecting males before, during or after mating termed as pre-mating, mating and post mating choice respectively. In the case of premating female choice, females may opt not to respond to certain males or decline to mate with them, favoring others instead.

Female choice during mating

When it comes to mating, female choice refers to situations in which females choose to end mating with particular males, either before or after insemination occurs. Two main situations exist where post-mating female choice is evident: first, the female may choose to fertilize eggs primarily or only with the sperm of favored mates; second, the female may choose to concentrate her caring efforts primarily or only on zygotes produced by superior mates.

Scorpionflies

Thornhill (1983) presented findings on female choice before, during and after mating in the scorpionfly *Harpobittacus nigriceps* (Mecoptera: Bittacidae). This species involves a unique mating behavior where males provide females with a nuptial arthropod gift. Thornhill extensively investigated the potential for fitness enhancement linked to female choice in this context. Notably, the post-mating female choice in *H. nigriceps* is particularly intriguing, as females exhibit a regulatory mechanism for oviposition based on both the body size and nuptial prey size provided by the mate. This behavior likely leads to a higher utilization of sperm from larger males and those offering larger prey.

Flour beetles

Tribolium flour beetles have served as crucial model organisms for investigating post-mating sexual selection. In contrast to many insects, *Tribolium* females display high levels of polyandry, engaging in frequent mating without evident pre-mating courtship rituals. *Tribolium*'s Cryptic Female Choice (CFC) processes influence the paternity of offspring. Females use tactics like rejecting the transmission of spermatophores or restricting the quantity of sperm transmitted by unattractive men during mating. Re-mating with different males is another strategy used by CFCs. Mating *Tribolium* females are more likely to accept a spermatophore from a male that they find more beautiful than their last partner. Furthermore, *Tribolium* females can affect the paternity of their young by timing the ejection of spermatophores following mating.

Mating biology of eusocial insects

The mating biology of eusocial insects, such as ants, bees, wasps, and termites, is remarkable due to the evolution of reproductive traits uncommon or rarely observed in other species. These traits include the absence of re-mating later in life, extended sperm storage, and exceptionally high levels of queen fertility. The investigation into sexual selection, including female choice, remains relatively limited in social insects. Given the absence of female re-mating later in life and the substantial need for a large number of viable sperm, queens are likely to exercise mate choice throughout the entire copulation process (Baer, 2015).

Key Points

Cryptic female choice may involve subtle cues, as females typically retain greater control over the reproductive process compared to males. Females may exhibit distinct egg-laying patterns based on the characteristics of their mate. Overall, the outcomes of female choice often contribute to improved female fitness through increased offspring success, as outlined by Thornhill in 1980. The existing literature suggests that numerous nuanced mechanisms of female choice are poised to be unveiled in a diverse array of animals and plants in the foreseeable future.

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