

Sirens and sailors: collective sexual deception at its finest

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Sirens are the characters from Greek mythology that are half women and half bird and are known to lure sailors to death with their irresistible symphonies. Yet, a similar example can also be witnessed in insect societies wherein the Meloid beetles lure the male solitary bees mimicking their sex pheromones.

The Mojave (Fig. 1) and Oregon Deserts, located in the southwest of the United States of America, is a sizable dry region where summertime highs regularly exceed 50°C and wintertime lows approach -18°C. Additionally, it receives scanty rains and is buffeted by scorching, sandy winds. Even such wilderness supports a range of exotic flora and fauna. *Meloe franciscanus* (Coleoptera: Meloidae), blister beetle, is one exceptional insect that endures this difficult environment. Like all other meloids, it too emit oil droplets from the joints in their exoskeleton, containing cantharidin, a potentially hazardous toxin that causes blistering and boils on the skin.

This beetle's life cycle (Fig. 2) is pretty entertaining. The females (Fig. 3) dig down in the sand to lay their eggs in groups (a maximum of 761 eggs recorded) in region that are comparatively cooler. Triungulins, which have three claws on each foot, are the first instar larvae that hatch; they aggressively seek out food and hosts. The miniature larvae ascend and

clamber up onto the closest grass stem, and hundreds of them group together to form a tiny mating ball (Fig. 4) that visually resembles the females of the solitary digger bee, *Habropoda pallida* and *Habropoda miserabilis* (Hymenoptera: Apidae). In addition to their aesthetic similarity, these wriggling balls of beetles vibrate to create a buzzing noise and mimic the female pheromones of bees, which fool their male counterparts (Saul-Gershenz et al., 2007).

The fuzzy male catches the larvae mounting to its body hairs when it tries to mate with the larval aggregation, assuming it to be a female bee. Therefore the male bees unwittingly wear a shiny brown vest of parasitic beetle larvae (Fig. 5). These small larvae switch hosts when the male bee mates with a genuine female bee. The male bees rarely get assaulted and are only employed for phoresy. The female bee then transports the larvae of the beetle to her underground nests. At this point the larvae have finally succeeded to reach their intended destination. These uninvited guests spend the next phase of their lives feeding on the pollen and nectar arranged by the female and also on the eggs and young bee larvae that hatch. With time it progressively deprives the bee's nest of all resources that are needed to develop to adult. The adult beetles finally leave bee's nest, mate with their opposite sex and lay eggs only to repeat the process. Unlike the larval stages of the beetle, the adults are



Fig. 1. Mojave desert



Fig. 2. Life cycle of *Meloe franciscanus*



Fig. 3. Female of *Meloe franciscanus*



Fig. 4. Mating ball of *Meloe franciscanus* triungulins



Fig. 5. Two species of bee from the Mojave (A) and Oregon (B) parasitized by beetle larvae (Saul Gershenz et al., 2018)

flightless and feed on *Astragalus lentiginosus*. Similar case of parasitism of solitary bees *Colletes hederæ* (Hymenoptera: Colletidae) by the beetle larvae of *Stenoria analis* (Coleoptera: Meloidae) was reported in western France (Vereecken and Mahe, 2007).

This is probably one of the most remarkable instance of sexual deception in insects wherein these horror beetles faux the female bees to hitchhike over the male. This is also a classical example of cooperation, pseudo-copulation, cleptoparasitism and chemical mimicry portrayed by the beetles.

It should be emphasised that adaptation to scent of the bees is a local behaviour. For example, male bees in Mojave deserts were not lured by the olfactory cues of the triungulins larvae of Oregon implying that the beetles have evolved to produce signals tailored to the sympatric bee species (Saul-Gershenz et al., 2018). Also, the height from ground at which the mating ball is formed is variable in Mojave and Oregon and perfectly matches with the cruising altitude of local bees. Additionally, the tendency and propensity of the larvae to aggregate and cooperate is of utmost significance in luring the sex-hungry bees. Solitary or small groups of larvae can't produce enough scent to

lure the male bees. Thus, there is an extremely specific ecological intimacy between these bees and beetles.

Therefore, this story of gangs of beetle larvae luring fathers of their next meal into a sex trap is an existential dread. The beetles can be reputed as “masters of deception” exhibiting visual, olfactory, and auditory mimicry.

References

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