

Females butterflies can smell if a male butterfly is inbred

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Photo by Derek Ramsey. Via Wikipedia.

The mating success of male butterflies is often lower if they are inbred. But how do female butterflies know which males to avoid? New research reveals that inbred male butterflies produce significantly less sex pheromones, making them less attractive to females. The research was published today in the journal *Proceedings of the Royal Society B*.

If animals (and humans) breed with a relative their offspring will be inbred and more likely to have genetic disorders. Because of these disorders inbred males are often weaker and, for instance, less able to defend the nest or provide food for their youngsters. To make sure her offspring will have the highest chance of survival and reproduction, females are expected to avoid mating with a weak inbred male. That is,

if she is able to recognize who is inbred and who is not.

Erik van Bergen, currently at the University of Cambridge and formerly with Leiden University, where he conducted much of the research, said: "Interestingly, traits used by males to attract the opposite sex are often strongly affected by [inbreeding](#) and might be used by females to recognize inbred individuals. For example, inbred male zebra [finches](#) produce a lower number of different individual songs and inbred male guppies have less conspicuous [colour patterns](#). Additionally, in one cricket species, the inbred males are known to produce less [acoustic signals](#) while trying to attract females."

For the butterfly *Bicyclus anynana*, it is critical that the female avoids breeding with an inbred male as some 50 per cent of the latter are completely sterile. As a result, if a female mates with a sterile inbred male none of her eggs will hatch, and she will therefore produce no offspring.

For the study, the researchers produced inbred [butterflies](#) by ensuring that sisters could only reproduce with their own brothers. The male inbred offspring were then tested for their [flight performance](#) (as an index of general condition) and the amount of sex pheromones they produced. The researchers found that the general condition of the inbred males was worse, and that they also produced less sex pheromones than normal outbred males.

Next, to test whether the low mating success of inbred males could be restored, the scientists released males and females in a large cage. The genitals of the males were marked with fluorescent dust with different colours for inbred and outbred males. During mating, this dust is transferred to the female and can later be detected using UV light. The antennae of some of the females were painted over with nail polish to prevent them from detecting the amount of sex pheromone produced by

males.

During the experiment, females with the treated antennae and therefore no sense of smell had no preference and mated with inbred and normal outbred males equally. In contrast, females with untreated antennae (and thus able to detect the sex pheromone differences) mated significantly more often with normal outbred males. These results indicate that the lower production of [sex pheromones](#) by inbred males, and not the general health of the inbred butterflies, is the reason for the low mating success of inbred males.

van Bergen added: "We know that inbreeding contributes to the decline and eventual extinction of small and isolated populations, so it is valuable to have more knowledge about the processes involved in general."

More information: The paper 'The scent of inbreeding: male sex pheromones betray 1 inbred males' will be published in the March 6th edition of *Proceedings of the Royal Society B*.

Provided by University of Cambridge

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