

# Male-killing bacteria makes female butterflies more promiscuous

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A study at UCL (University College London) finds that a high-prevalence of male-killing bacteria active in many species of insect including the butterfly, actually increases female promiscuity and male fatigue.

The team found that when the male insect population drops -- killed off by the bacteria -- the female butterfly becomes more sexually rampant. Males on the other hand show signs of fatigue and put less effort into mating.

In some populations of tropical butterfly the entire mating system is determined by a group of bacteria known as Wolbachia, according to the study, published in the journal *Current Biology*.

Dr Sylvain Charlat, of the UCL Department of Biology, who led the study, said: "Male-killing bacteria are found in many insect species including the British ladybird. We wanted to know what the effect of the bacteria is on the mating system, and here we've shown that butterfly mating patterns are strongly determined by the killer bacteria.

"Contrary to expectation, we also find that female promiscuity actually rises when male numbers are reduced. Greater numbers of female partners leads to fatigue in males. They start producing smaller sperm packages. Unfortunately, the female butterflies instinctively know that the packages are smaller and that their chances of having been impregnated after mating are lower than usual. This just makes them

more rampant!"

The male-killing bacterium is transmitted from mother to son and actually kills the son before the embryo hatches into a caterpillar. Only female offspring of female carriers of the bacteria can survive, which can lead to the male population being as low as one male to every hundred females in some areas.

Dr Greg Hurst, of the UCL Department of Biology and a senior author of the study, said: "It's amazing that the numbers of male butterflies can get so low and yet the population is still sustainable and stable. You don't need many male butterflies to continue the population successfully. This is partly because the decision to mate is mainly under female control and because males have a high mating capacity."

This study was carried out on *Hypolimnasthetys bolina* butterflies in Pacific Island and South-East Asian populations. The islands provide an ideal location because every island is differently affected by the male-killing bacteria so that each has a different ratio of males to females.

The researchers assessed the natural sex ratio in 20 populations and combined this data with female mating frequency and the size of the male sperm package (Spermatophore) per copulation to find how female promiscuity was affected by the sex ratio. They found that the size of the Spermatophore was key to female promiscuity. However, female promiscuity only rises up to the point where males become so rare that female virginity rates rise.

The male-killing phenomenon in this species was first identified in 1920 by Hubert Simmonds but has not received much attention until now. This finding is significant for the scientific community because it demonstrates how a species' mating system can be determined by the frequency of a parasite.

Source: University College London

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