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UCSB Scientists Show that Female Fruit Flies Can be 'Too Attractive' to Males

Females can be too attractive to the opposite sex -- too attractive for their own good -- say biologists at UC Santa Barbara. They found that, among fruit flies, too much male attention directed toward attractive females leads to smaller families and, ultimately, to a reduced rate of population-wide adaptive evolution.

In an article published in the December 8 issue of Public Library of Science Biology, the authors described their experiments on the sex lives of fruit flies.

"Can females be too good looking?" asks William Rice, biology professor at UCSB. "Can there be disadvantages to being attractive? The answer is yes: If you are too attractive, you get too much male attention, and that interferes with your ability to function biologically."

The authors explain that the term "good looking," among fruit flies, refers to something, like a large body. From the perspective of a male fly, a desirable mate is a female that is larger and can therefore produce more offspring.

"These larger females are disproportionately courted and harassed by males attempting to obtain matings," said Tristan A. F. Long, the study's first author. "When these males are 'choosy' with their courtship, there may be negative

consequences to the species' ability to adaptively evolve."

According to the scientists, too much mating is harmful to the females because seminal fluid from the male has toxic side effects. Too much courtship can also hinder the female's ability to forage effectively.

"When they court the females, the males sing to them; they do this by vibrating their wings," said Rice. "They dance and sing at the same time. This might sound romantic, and it would be if it only happened once. But males are doing it all the time. This courtship is unrelenting -- like mosquitoes on a warm summer night -- as the male fruit flies try to persuade females to mate. The males are so persistent that they get them to mate almost every day."

In many species, females are frequently subject to intense courtship "harassment" from males attempting to obtain additional matings, according to the researchers. These coercive activities can result in attractive females becoming less fit to reproduce -- a factor that has a major effect on the entire population.

"We found that when harmful courtship behaviors were directed predominantly toward larger females of greater fecundity potential -- and away from smaller females, of lesser fecundity potential -- this resulted in an overall reduction in the variation of lifetime reproductive success of females in the population," said Long.

The male-mediated, persistent courtship bias can have important consequences for the ability of a population to adaptively change over time. If, for example, a female acquires a mutation that increases metabolic efficiency, allowing her to grow larger, and produce more offspring over her lifetime, this mutation should rapidly spread through the population. However, if the males get in the way of the biological success of these more attractive females, the mutation won't spread through the population as well as it might if males courted females indiscriminately.

The experiments clearly showed that the evolutionary adaptation of fruit flies is hindered by this mating situation. "This change in the distribution of fitness represents a previously unappreciated aspect of sexual selection -- one with important implications for the ability of beneficial genetic variation to spread through the gene pool, and ultimately for a species' capacity to adaptively evolve," Long explained.

Long was a Natural Sciences and Engineering Research Council of Canada (NSERC) postdoctoral fellow at UCSB at the time that he carried out the experiments designed with Rice. Long is currently a postdoctoral fellow with the University of Toronto in the Department of Ecology and Evolutionary Biology. The other authors are Alison Pischedda, a graduate student, and Andrew D. Stewart, a postdoctoral fellow, both of UCSB.

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