How sexual competition and choice could protect species from extinction

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New research shows that removing sexual competition and choice through enforced monogamy creates populations that are less resilient to environmental stress, such as climate change.The research team looked at how flour beetles (pictured) coped with environmental and genetic stress after they had evolved

under monogamous versus polyandrous mating patterns.The researchers say that their findings should apply to any species that reproduces sexually, experiences some degree of sexual selection, and faces environmental stress. They hope their work will help with conservation management, and where species are being bred in captivity. Credit: University of East Anglia

The way animals compete and choose within their struggle to reproduce could have big consequences for extinction risk, according to new research from the University of East Anglia.

A new study, published today in *Global Change Biology*, shows how removing sexual competition and choice through enforced monogamy creates populations that are less resilient to environmental stress, such as climate change.

The research team looked at how flour beetles (*Tribolium castaneum*) coped with environmental and genetic stress after they had evolved under monogamous versus polyandrous mating patterns.

They say that their findings could help with conservation management, and where species are being bred in captivity.Lead researcher Prof Matt Gage, from UEA's School of Biological Sciences, said: "Species around the world are undergoing mass extinction due to a range of factors such as climate change, habitat loss and genetic bottlenecks.

"These different stresses can trap populations within a reinforcing feedback loop known as the extinction vortex.

"We used this extinction vortex scenario to experimentally measure the importance of sexual competition and choice for population resilience."

The research team studied flour beetle populations that had been evolved in a lab for 10 years. While some lines of beetles were allowed to engage in a polyandrous mating pattern where each female was given a choice of five males every generation, another group were forced to be monogamous with no competition or choice.

After 95 generations of these two conditions, the team looked at how well the different lines coped with 15 further generations of different environmental and genetic stresses down a simulated 'extinction vortex'.

Prof Gage said: "We mimicked 'real life' scenarios facing biodiversity today through repeated cycles of stress from food limitation, exposure to heatwaves, and being forced through a genetic bottleneck.

"We found that the beetles from the monogamous history of selection could not cope with environmental or genetic stress in the vortex. They were much more likely to decline, and all had become extinct by the end of the trial.

"So the removal of competition and choice from reproduction had created populations that were weaker when facing environmental and genetic stress.

"By contrast, the beetles with a polyandrous background, where males had been forced to compete and females had been given the opportunity to choose their mates for reproduction, declined much more slowly with 60 percent of the population still alive at the end of the study.

"It's not clear whether the forces that operate in the struggle to reproduce are positive or negative for population resilience. Darwin famously felt sick when he looked at the tail of a peacock because he could not understand how such a flamboyant structure could evolve if it hampered survival, but our study clearly shows how important this sexual selection

is for maintaining wider population health.

"Our long-term experiment suggests that sexual selection is a positive force for population resilience by purging out bad genes and fixing in good genes, improving a population's overall genetic quality and therefore resilience for facing harsh environments or genetic stress."

The researchers say that their findings should apply to any species that reproduces sexually, experiences some degree of sexual selection, and faces environmental stress.

Prof Gage added: "We propose that, if an endangered species has an evolved mating pattern where competition and choice is evident, then that opportunity should wherever possible be given to maintain genetic health."

'Mating patterns influence vulnerability to the extinction vortex' is published in the journal *Global Change Biology* on June 19, 2020.

Provided by University of East Anglia