

# Do frequent heatwaves damage male reproductive tissue?

Abhishek Meena<sup>1</sup>, Alessio De Nardo<sup>1</sup>, Komal Maggu<sup>1</sup>, Jeannine Roy<sup>1</sup>, Sonja Sbilordo<sup>1</sup>, Rhonda Snook<sup>2</sup>, Stefan Lüpold<sup>1</sup>

<sup>1</sup>Department of Evolutionary Biology and Environmental Studies, University of Zurich, Switzerland

<sup>2</sup>Department of Zoology, Stockholm University, Sweden

Extreme weather events are a threat to biodiversity. Studies on the consequences of climate change on biodiversity tend to focus on where and how species can survive. However, the persistence of a species depends not only on survival but also on reproduction. Fertility is often more sensitive to heat stress than survival, as damage to gametes can occur at sublethal temperatures. Thermal sensitivity usually varies between life stages. Most previous studies focus on one stage and/or sex at one point just after the heat stress or without including genetic variation. However, there is still a lack of understanding of the fitness consequences of heatwaves in multiple life stages and the underlying genetic variation. Therefore, to address these issues, we investigated the following questions: (i) how heatwaves impact male reproduction during the developmental and/or the adult stage in *Drosophila melanogaster*, (ii) whether males' reproductive capacity can recover from such a heatwave and to what extent. We found a significant interaction between larval and adult heat stress on male reproductive tissue, resulting in a decline in fertility, hatching success, and fecundity even after a recovery period. Extreme heat waves seem to have a damaging effect on male reproductive function. This study illustrates the severe impact of heat stress on male reproductive traits. It could speed up population declines through fertility loss, highlighting the need to include effects on reproduction in studies of biodiversity loss. This study is especially important for insects, given their fast global decline and direct dependence on the temperature of their environment.