Abstract

[Research Title]

Genetic and epigenetic changes against urbanization and gene flow swamping local adaptation

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Urban areas on Earth are expanding year by year, directly impacting population size and biodiversity through habitat loss and fragmentation. Urbanization is recognized as a significant contributor to the global decline or extinction of insect species. Conversely, urbanization may indirectly decrease populations by inducing various non-adaptive phenotypic changes via rising temperatures, light pollution, and noise pollution. However, certain species capable of urban adaptation may experience population growth within cities. In this study, we aimed to identify the genetic (evolutionary) and epigenetic alterations induced by urban stressors, including high temperatures, light pollution, and noise pollution in *Drosophila suzukii*.

Initially, we established isofemale lines using females collected from urban and rural areas, primarily in the Kanto region. Larvae and adults from these lines were subjected to high temperatures, light pollution, and noise stress to assess their effects on phenotype and gene expression changes. Our findings reveal that these stressors significantly impact daily activity rhythms, survival rates, reproductive traits, and body size. Notably, individuals from rural strains exhibited greater susceptibility to urban stresses, suggesting that urban populations have developed resistance mechanisms. Additionally, when comparing gene expression patterns under light pollution stress, individuals from urban strains displayed distinct alterations compared to those from rural strains. This indicates that urban individuals enhance stress resistance through modulation of gene expression response to urban stress. These results are anticipated to provide foundational insights for predicting the impacts of human activities and guiding conservation efforts.

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