Effects of Urbanization on Moth Mating Behavior: Insights From Street Lighting Exposure

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The escalating urbanization and proliferation of artificial light at night (ALAN) represent significant ecological stressors impacting nocturnal organisms globally. Moths, as prominent nocturnal insects, serve as exemplary models to investigate the consequences of anthropogenic light pollution on mating behavior, yet very little is known about the impact of ALAN on development and reproduction. Here, we address this gap by examining the impact of simulated street lighting and natural moonlight on the mating behavior of the privet hawkmoth (Sphinx ligustri). In a series of four controlled flight tunnel experiments, male moths were exposed to rural (green backdrop) and urban environments (gray backdrop) in contrasting light conditions and the presence of female moths. The results indicate that male moths exhibit a strong preference for artificial light, significantly hindering their ability to locate mates. This unexpected behavior was strongest in rural areas, suggesting a lack of evolutionary adaptation to ALAN compared to their urban counterparts. These findings underscore the urgent need to comprehend the mechanisms underlying nocturnal navigation and mating in the context of urbanization-induced light pollution. Such insights are essential for devising effective conservation strategies aimed at mitigating the adverse effects of artificial lighting on nocturnal ecosystems. Our study contributes to a deeper understanding of the ecological ramifications of urbanization and illuminates pathways for sustainable coexistence between human development and nocturnal biodiversity.

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