城市绿地中蝴蝶物种多样性和功能多样性差异研究

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摘　要:【目的】城市绿地空间是重要的野生动物栖息地和迁徙通道。现有研究主要关注物种多样性，很少有研究考虑功能多样性。本研究旨在调查公园绿地、居住区绿地和街头绿地中蝴蝶物种多样性和功能多样性的现状。此外，本研究旨在探讨蝴蝶物种多样性与功能多样性之间的关系，进一步解释蝴蝶群落与城市绿地之间的关系，剖析城市绿地所存在的问题，进而为城市绿地建设和提升城市绿地生物多样性提供相关建议。【方法】基于此，本研究选取安徽省合肥市 80 处绿地作为研究对象，蝴蝶作为指示物种，对 187 条样段进行了为期一年，每月一次的实地调查。【结果】不同城市绿地中的蝴蝶物种多样性和功能多样性指数存在差异。公园绿地中的蝴蝶丰富度、Shannon 指数、Simpson 指数、功能丰富度和 Rao's 二次熵（RaoQ）指数的平均值显著高于居住区和街头绿地（$P<0.05$）。城市绿地中小型体型、多食性、一年多代、飞行时间较长的蝴蝶占主导地位。具有最高 RaoQ 指数和功能分散度（FDis）指数的 3 个样地中不包括公园绿地，而前 2 个位置是居住区绿地。蝴蝶的 FDis 均值在街头绿地中最高。【结论】城市绿地空间中的蝴蝶物种多样性和功能多样性指数之间存在强烈的正相关关系。相比功能多样性，物种多样性在不同绿地中表现出更高的敏感性。部分居住区和街头绿地样地具有较高的功能多样性，这表明在实际的城市绿地规划中不应忽视居住区绿地和街头绿地的重要潜力。

Differences in Species Diversity and Functional Diversity of Butterflies in Urban Green Spaces

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Abstract: 【Objective】Urban green spaces are important wildlife habitats and migration corridors. Existing studies mainly focused on species diversity, without considering functional diversity. This study aimed to investigate the current status of butterfly species and functional diversity in park, residential, and street green spaces. Additionally, it aimed to explore the relationship between butterfly species diversity and functional diversity, further explain the relationship between butterfly communities and urban green spaces, analyze the issues present in urban green spaces, and provide relevant recommendations to enhance urban green space development and biodiversity.【Method】We selected 80 green spaces in Hefei City, Anhui Province, with butterflies as the indicator species. A one-year field survey was conducted on 187 lines, with monthly sampling intervals. 【Result】There were differences in species diversity and functional diversity indices of butterflies among the different urban green spaces. The mean values of richness, Shannon, Simpson, functional richness, and Rao's quadratic entropy (RaoQ) indices for butterflies in park green spaces were significantly higher than those in residential and street green spaces ($P<0.05$). Small, polyphagous, multivoltine, and long-duration flying butterflies dominated urban green spaces. The top three plots with the highest RaoQ and functional dispersion (FDis) indices did not include park green spaces, while the top two sites were residential green spaces. The mean FDis of butterflies was highest in street green spaces.【Conclusion】Species

diversity and functional diversity indices of butterflies in urban green spaces were strongly positively correlated. Species diversity demonstrated higher sensitivity across different green spaces compared to functional diversity. Residential and street green spaces exhibit high functional diversity with potential for urban green space planning.
Key words: urban green space; species diversity; functional diversity; butterflies; urban ecology