

The diversity of bird communities in Louzishan is closely related to the Normalized Difference Vegetation Index (NDVI)

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Abstract: Human activities are worldwide modifying natural ecosystems in different ways and scales, with land-use change recognized as one of the main causes of global biodiversity decline. This study conducted bird diversity surveys in the Louzishan Nature Reserve using the sampling method in summer (May-June 2023) and winter (November 2022 and February 2023). Utilizing remote sensing data to represent plant productivity (Normalized Difference Vegetation Index, NDVI) and land-use diversity, exploring the impact of environmental factors on taxonomic and functional species richness and species composition differences (alpha and beta diversity), to validate the productivity-biodiversity and variability-biodiversity hypotheses. In addition, beta diversity was partitioned into turnover and nestedness components to further study the patterns and compositional differences of bird communities in Louzishan during summer and winter. The results showed that in summer bird communities, taxonomic alpha diversity showed an increase with the increase of NDVI; taxonomic beta diversity and its turnover component increased with the increase of NDVI, while the nestedness component increased with the increase of land-use diversity. That is, the differences in taxonomic diversity in this region were mainly driven by species replacement and closely related to plant productivity. Functional alpha diversity also increased with increasing NDVI; however, we failed to find significant effects of the two environmental factors on functional beta diversity and its components. In winter bird communities, we only found that taxonomic alpha diversity was negatively correlated with land-use diversity, that is, areas with lower land use diversity had higher bird taxonomic diversity. Overall, the results support the productivity-biodiversity hypothesis and emphasize the role of NDVI as an important environmental variable that influences the process of shaping species richness and compositional differences in birds.

楼子山鸟类群落多样性与归一化植被指数 NDVI 密切相关

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摘要: 人类活动正在世界范围内以多种方式对自然生态系统产生影响, 其中土地利用变化被认为是导致全球生物多样性降低的主要原因之一。本研究在夏季(2023 年 5 至 6 月)和冬季(2022 年 11 月、2023 年 2 月)用样点法对楼子山保护区开展了鸟类多样性调查。利用遥感数据代表植物生产力(归一化植被指数, NDVI)和土地利用多样性, 探讨环境因素对分类和功能物种丰富度和物种组成差异(alpha 和 beta 多样性)的影响, 以验证生产力-生物多样性和栖息地多样性-生物多样性假说。此外将 beta 多样性分解为周转和嵌套组分, 以深入研究楼子山鸟类群落在夏冬两季的格局和组成差异形成原因。结果表明, 在夏季鸟类群落中, 分类 alpha 多样性随着 NDVI 的增加而增加; 分类 beta 多样性及其周转组分随着 NDVI 的升高而增加, 嵌套组分则随着土地利用多样性的增加而增加。即该地区分类多样性差异主要由物种替换驱动, 且与植物生产力密切相关。功能 alpha 多样性亦随 NDVI 的增加而增加, 然而我们未能发现环境因素对功能 beta 多样性及其组分的显著影响。在冬季鸟类群落中, 我们仅发现土地利用多样性越低的地区, 鸟类分类多样性越高。总体而言, 研究结果支持生产力-生物多样性假说, 并强调了 NDVI 作为重要的环境变量, 影响鸟类物种丰富度和组成差异的形成过程。