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　本論文は、市街化が進む中国北京市の経年的な土地被覆データから、鳥類群集に影響を及ぼす緑地とその接続性から明らかにし、新たな緑地評価手法の開発を目的としたもので、その内容を以下に示す。

Urbanization has been regarded as the main reason for habitat fragmentation and biodiversity loss. Particularly in urbanized areas, urban green space is playing an important role in biodiversity conservation. Under the increase of human population and land cover change, the evaluation of urban green space is an essential step in landscape planning, which should be conducted based on a deep understanding of the impacts of urbanization.

Previous studies have paid a lot of attention to the evaluation green space from the perspective of landscape pattern, for instance, landscape connectivity. Green space with high connectivity is often considered to provide better conditions for species migration and gene exchange, which contributes to biodiversity conservation. In this case, landscape connectivity has been widely used as an indicator to evaluate the capacity of green space to support biodiversity, which is called the ecological efficiency in this study.

Recently, an increasing number of studies argued that ecological processes should be involved in the evaluation of green space. For example, different species respond to environmental changes at different scale, while how to apply knowledges of ecology and biology to the evaluation of green space still needs to be further explored. Several studies modeled the evaluation of green spaces from the eyes of focal species. However, there are still some limitations in the existing research. First, studies using empirical data of species census in the evaluation of urban green space are limited due to that the acquisition of empirical data is time-consuming and laborious. Second, long-term observation is regarded to be necessary to identify the mechanism of how environmental changes resulted from urbanization affect biodiversity. However, most studies use various space instead of time to measure the effects of urbanization. Third, since environmental factors in a complex ecosystem are various and interacting with each other, multiple spatial scales should be considered in quantifying the response of species to environmental changes.

To fill the research gaps, this study tried to evaluate the green space of Beijing, where has been experiencing a rapid development and urbanization for decades, by involving the response of species to environmental changes at multiple scales. The objectives of this study are: 1) to test the advantage and necessity of introducing species in evaluating the ecological efficiency of urban green spaces, compared with the widely used landscape connectivity assessment; 2) to explore the variation of bird abundance, richness, and diversity as a function of environmental changes resulted from rapid urbanization at both local- and landscape level; 3) to identify influential environmental variables that can best describe the variation of bird communities at multiple scales based on long-term observation.

The thesis consists of 6 chapters.

Chapter 1 introduces the academic background, especially the existing research in the effects of urbanization, the evaluation of urban green space, and the response of bird communities to environmental changes. Research gaps are concluded from the literature review, according to which, the aims and objectives of this research are stated.

Chapter 2 describes the current situation of urbanization and biodiversity conservation in Beijing, and the current green space planning concerning about ecological conservation in China. In addition, land covers were interpreted from remote sensing images of Beijing in 1995, 2000, 2005, 2010, and 2015 respectively. The result shows the process of land cover change.

Chapter 3 proposed a multi-species approach synthesizing the biological traits of two focal species (i.e. *Nyctereutes procyonoides* and *Phasianus colchicus*) to evaluate urban green spaces in Haidian District, Beijing. Specifically, the range of green space for analyses and the distance threshold of landscape connectivity were defined by the habitat type and dispersal ability of each species respectively. Finally, the most important green spaces cores and corridors for each species were identified and overlaid to obtain a final evaluation of urban green spaces. Results support the hypothesis that the evaluation of urban green space should involve species and their biological characteristics.

Chapter 4 took riparian areas of the Tsing River as a case study to clarify the responses of bird communities to environmental variables at both local- and landscape-scale along the river. Bird surveys were made from May 2016 to April 2017 once a month along 18 transect lines; on the other side, the characteristics of local habitats (i.e. vegetation structure and human disturbance) were collected from field surveys conducted during September 2018; besides, the surrounding land cover and landscape connectivity were extracted and calculated from the Gaofen-2 remote sensing images. Finally, redundancy analysis was applied to identify the important environmental variables that significantly affect the biodiversity of bird communities in the urban riparian areas. Results show that local variables tend to be more influential to bird communities, especially the coverage of grassland and the number of pedestrians passing by.

Compared with Chapter 4, Chapter 5 explored a general linear mixed model that synthesizes the long-term responses of bird communities to environmental changes resulted from urbanization in the whole central Beijing. First, the long-term observation data of birds were collected from citizen science data on China Bird Report, where observers can upload and share the bird observation information. Second, the historical land cover changes from 2005 to 2015 surrounding each observation site were interpreted from remote sensing images; the surrounding area was defined by multiple buffers (500 m, 1,000 m, 3,000 m, 5,000 m). Third, generalized linear mixed model was built to examine the responses of bird communities to environmental changes at multiple spatial scales, including the land cover change and the landscape pattern change. Finally, the model was further used to evaluate the urban green spaces from the eyes of birds. To highlight the advantages of using birds as indicators for urban green spaces assessment, the comparison between two methods of evaluation was achieved by building a matrix. Taking 2015 as an example, urban green spaces were assessed from the perspective of landscape connectivity and bird communities, respectively.

　本研究は、北京市の都市計画における緑地評価の新たな方法を示した意義は大きく、その手法と結果にも新規性が認められる。
　よって本論文は博士（環境学）の学位請求論文として合格と認められる。

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