The value of nature: Biodiversity and happiness

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Biodiversity loss and ecosystem collapse are considered one of the three major long-term threats by the World Economic Forum (2024). According to the International Union for Conservation of Nature and Natural Resources (IUCN) Red List, around 28% of species are listed as being threatened to extinction in 2021, and these losses have been proven irreversible. Regarding birds, for example, it has been found that "we are losing birds at an unprecedented rate".

Even though the ecosystems provide immense natural capital, their value often remains overlooked (Costanza et al., 1997). Biodiversity is linked to both physical and psychological well-being, offering direct and indirect economic benefits (Hanley and Perrings, 2019). Studies show that environmental degradation can have negative impacts on happiness (Ferrer-i-Carbonell and Gowdy, 2007), whereas improvements in biodiversity enhance mental health and social welfare (Harvey et al., 2020). However, research on biodiversity's impacts on happiness, particularly in developing nations with unique cultural and ecological conditions, remains limited.

China, a megadiverse country with over 30,000 higher plant species and 6,300 vertebrate species (Xu et al., 2016), faces significant biodiversity challenges due to its rapid economic development. Despite these losses, the country has prioritized conservation efforts, establishing nature reserves, national parks, and biodiversity action plans (e.g., the China Biodiversity Conservation Strategy and Action Plan (2023–2030)).

Nevertheless, China still faces considerable challenges in biodiversity conservation. Fig. 1 provides the distribution characteristics of the bird abundance index across Chinese cities. From 2011 to 2019, both the median (horizontal line in the boxplot) and the mean (purple dots) of the index exhibit a declining trend. This trend aligns with the ongoing global threat of species endangerment and extinction highlighted by the IUCN Red List. Furthermore, the bird abundance index is unevenly distributed across cities (see Fig. 2). Cities in the north and the east of China have higher levels of diversity, but cities in the northeast and southwest regions have experienced significant improvements. Overall, most cities in the sample exhibit a decrease in bird populations, underscoring the challenges that Chinese cities face in biodiversity conservation.

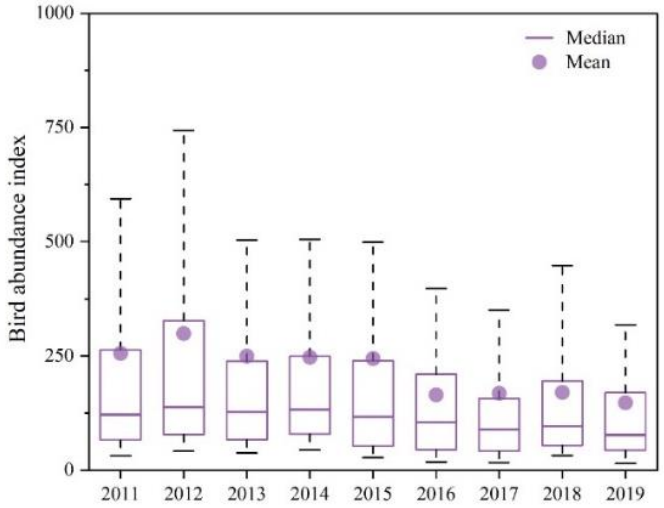

Figure 1: Bird abundance index in China: 2011-2019

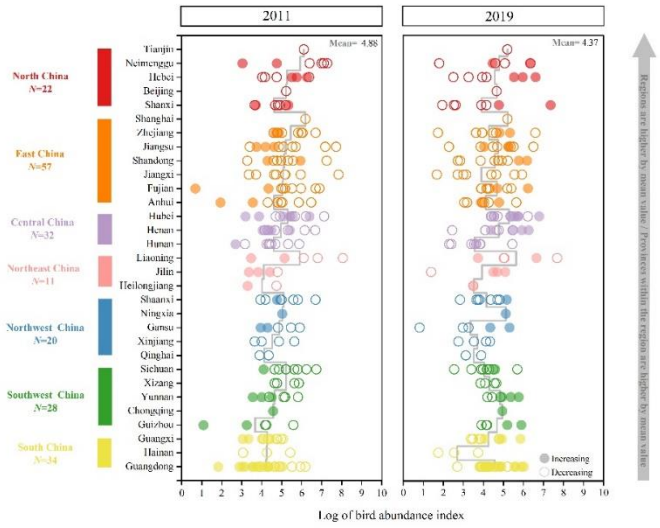

Figure 2 *Bird abundance index distribution of Chinese cities: 2011 and 2019*

Examining the impacts of biodiversity on social welfare and economics is useful to support policy designs. Using the bird diversity index as a proxy for biodiversity at the city level, we empirically confirm a significant positive relationship between biodiversity and self-reported happiness, even after controlling for individual and regional factors. Specifically, the marginal effects of biodiversity indicate that improved biodiversity makes people less likely to be unhappy and more likely to be happy. For example, one standard deviation more in log of city bird abundance index (1.050) can increase the probability of being happy and very happy by 0.315%.

Furthermore, the biodiversity-happiness relationship is found to exhibit clear heterogeneity across different groups. Specifically, we study three age groups and two income groups at the household level and then investigate two city-specific groups. The value of biodiversity is more significant for elderly people, high-income households, developed and non-industrial cities. Moreover, we explore the possible channels with a specific focus on the health effects, demonstrating that biodiversity can improve health status or reduce medical expenses and thus contributing to significantly higher levels of happiness.

To provide further confirmation and avoid endogeneity issues, we conduct a quasi-natural experiment regarding the newly established nature reserves to further analyze the role of biodiversity conservation. As of 2019, China has established over 2700 nature reserves at various levels. The nature reserves are vital components of China's efforts to protect ecosystems and proved to be an effective measure to conserve biodiversity (Chen et al., 2023). Nature reserves play an important role in biodiversity conservation, and cities enjoy improved biodiversity when a new nature reserve is established in that city. The regression results also demonstrate consistent and statistically significant results, thus reinforcing the biodiversity–happiness relationship.

Overall, we show clear evidence to support the non-economic values of improving biodiversity. The policy implications are threefold: First, biodiversity investments yield both ecological and social benefits, with direct implications for human happiness. Second, conservation strategies should account for demographic and regional heterogeneity to maximize benefits. Third, nature reserves play a crucial role in biodiversity conservation and should be expanded to support both ecological and social welfare goals. The findings reinforce the importance of preserving natural capital as a cornerstone of sustainable development and provide actionable insights for policymakers and stakeholders seeking to balance economic growth with environmental sustainability.

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