Use Of Urban Water Bodies By Birds

I. Abstract

Habitat destruction as a result of urbanization has led to species extinction and biotic homogenization in ecosystems across the world. This report investigates how the size of urban water bodies influences which birds use them. An ecological survey of Sydney ponds The results were not found to be statistically significant

II. Introduction

Today, 55% of the world's population is urban, and by 2050, that figure is projected to reach 68% (United Nations 2019). As cities become increasingly populous, highly developed land swells to meet the needs of its residents. City expansion into surrounding natural environments, known as "urban sprawl", is a major threat to biodiversity. Urban areas are constructed with only one species in mind: Homo sapiens. And it is at the expense of the native species.

Changing landscapes

- a. Urbanization is closely associated with two basic factors that increase non-native species richness: (1) increasing importation of non-native individuals and (2) favourable habitat for the establishment of non-native species (McKinney 2006).
- b. In urban areas, species abundances often increase while species richness decreases (Faeth et al 2011).
- c. Species richness is positively correlated to vegetation cover (Filloy et al 2019).

Availability of sufficiently structured natural vegetation is essential to high bird biodiversity in urban green spaces. To create functional green infrastructures in urban landscapes, compaction should be clustered with adequate amount and quality of green spaces in between developed areas (Sandstrom 2006).

It is not known the extent to which biodiversity in urban areas can be restored once it is lost.

The aim of this report is to evaluate how the size of urban water bodies relates to the diversity of birds that interact with the water. It was hypothesised that urban water body size would be positively correlated with bird biodiversity. This report is based on the statistical analysis of ecological survey data, using species richness and species abundance, as well as a diversity index.

III. Materials and methods

A bird monitoring survey was conducted in September 2019 at six urban water bodies in Sydney. The water bodies ranged from around 2000 m2 to 7500 m2 and were located within 15 km of one another. Each site was surveyed two times over a two-week period. Each survey lasted 30 minutes and took place between 2 p.m. and 6 p.m.

An interaction was recorded for each bird that came in contact with the water or came within 1 metre of the perimeter. Each bird counted for only one interaction and birds that flew over the site without contact were not counted. Site areas and perimeters were found using Google Earth. Species were identified using the Merlin Bird ID mobile app.

Biodiversity was measured with Simpson's Diversity Index: where ni represents the number of individuals in species i, and N is the total number of species in the sample (Kiernan 2019). Simpson's Index is a mean of proportional abundance, which measures the probability that two individuals randomly selected from a sample will belong to the same species. The value of D ranges from 0 to 1, with 0 representing infinite diversity and 1 representing no diversity (Kiernan 2019).

Statistical analyses were calculated in Excel and SPSS. P-values less than or equal to 0.05 were considered statistically significant. The data was processed following a linear regression model and met the parameters for normality and homoscedasticity.

In comparing green space size to bird biodiversity, the dependent variable is the water surface area (m2) and the independent variable is the Simpson's Diversity Index of the bird populations.

IV. Results

A total of 21 bird species were observed across the 6 sites. Of the birds observed, 17 species are classified as water birds. Only 1 is an introduced species and the other 20 are native to Australia.

The sites with the highest and lowest mean number of total birds were of approximately the same size; the highest count was 85 birds in 3759 m2 (Royal Botanic Gardens), and the lowest count was 12 in 3944 m2 (Fearnley Grounds). The highest and lowest mean species richness were found at the biggest and smallest sites, respectively; 14 species were found at the largest site of 7483 m2 (Kippax Lake), and 7 species were found at the smallest site of 2072 m2 (Chinese Garden of Friendship).

According to Simpson's Diversity Index, the most diverse site had a value of 0.694 (Kippax Lake) and the least diverse had a value of 0.951 (Fearnley Grounds). However, the connection between the Simpson's Diversity Index of the bird populations and the water surface area was not found to be statistically significant ($P = 0.73$, $R2 = 0.26$).

V. Discussion

This survey did not reveal a statistically significant correlation between urban water body size and bird biodiversity (Figure 1). These results do not support the vast majority of research that suggests

While this survey is representative of urban water body size and bird biodiversity in Sydney. This could be due to the small scale of the survey. With only 6 sites. Other studies suggest increasing green areas within cities (Ortega-Alvarez 2009, Sandstrom 2006).

Species vary in their tolerance to urbanisation. Urban environments filter species according to their biological traits and reduces beta diversity and promote biotic homogenisation (Sol et al 2014).

This study has potential limitations. The selection of sites was not random. Confounding variables. Short period of time. Impact limitation

One limitation is the scale of the survey. There are fewer than 10 water bodies in urban Sydney. During a pilot study, it was discovered some water bodies were completely dry. Of the original 8 sites that were visited, only 6 were viable survey areas. While the results are representative of Sydney, they

Because most of Australia's waterbirds are migratory,

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