ANALYSE THE STUDY OF DESTRUCTION EFFECT OF NESTING BIRDS

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ABSTRACT

Most East African urban areas have a limited understanding of the bird species that make their nests there. Breeding bird species in the Mwalimu Nyerere Campus thicket fragments at the University of Dar es Salaam in Dar es Salaam, Tanzania, were studied. The number and variety of bird species that make their nests in the thickets were analysed to see how their numbers and ranges were affected by habitat fragmentation. Breeding bird nests in the splintered thickets were physically searched on a regular basis. Vegetation, bare ground, cavities, stream (river) banks, and other potential nesting locations were inspected along transects to look for active nests. Most nesting birds appear to avoid smaller fragments, and the majority of nesting bird species may be negatively impacted by habitat size reductions, as the number and variety of species nesting there increased with fragment size.It is recommended that the remaining pieces of campus thicket be protected to ensure the survival of the campus' bird population.

Keywords: Fragmentation, bird nesting, thickets, the University of Dar es Salaam, and nest species diversity

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1.INTRODUCTION

Birds are an interesting class of vertebrates because many of them live for more than a year, and their life cycles, which include breeding, moulting, and migration, tend to repeat on a sub-annual basis. [1] Millions of birds migrate twice yearly, once in the spring to high latitudes that offer ideal breeding conditions and again in the fall, after breeding has concluded, to warmer climes where they will spend the majority of the non-breeding season. The annual migrations are not random movements but rather two distinct and predetermined states shaped by selective evolutionary pressures. Each migration—spring and fall—occurs during a specific window of time and is accompanied by dramatic seasonal changes in morphology, physiology, and behaviour [2]. Particular seasonal changes include those brought on by a lack of sleep (as in night migrants), shifts in feeding behaviour and metabolism in preparation for battle, and the involution and subsequent re-emergence of internal tissues. On land, biodiversity is especially vulnerable to habitat loss and fragmentation. Forty percent of the world's land has been used for farming, and 90 percent of the original habitat in places as diverse as the eastern United States, the Philippines, and Ghana has been destroyed. Large habitat patches support more species than small ones, and connected patches support more species than isolated ones [3], a central tenet of both conservation theory and practise. Few would argue with this basic premise, but we still don't know the overall value of patch area and isolation as predictors of species occupancy in fragmented terrestrial systems. There has been no rigorous quantitative synthesis of the results of the hundreds of patch occupancy studies conducted over the past four decades. [4] While there have been several syntheses looking at species-area and diversity relationships, the species occupancy patterns that underlie diversity patterns in fragmented landscapes have been largely ignored.

Causes of habitat fragmentation

Both natural and human-caused processes, operating on different time and space scales, contribute to fragmentation. The landscape's physical features, in conjunction with very slow geomorphic processes (such as erosion), may also cause some patches to remain isolated over evolutionary timescales.

Fragmentation is a Mother Nature.

Landscapes break apart over extremely long time periods (thousands or millions of years) due to geological forces (such as continental drift) and climatic change (e.g., glaciations, changes in rainfall, sea level rise).For relatively short time frames (decades or months), natural disasters like forest fires, volcanoes, floods, landslides, windstorms, tornadoes, hurricanes, and earthquakes alter and dissect landscapes. [5] Mountain ranges, canyons, rivers, and lakes all serve to break up the scenery in their own unique ways. The natural distribution of some ecosystems tends to be patchy. Many species rely on the diversity of landscapes and the heterogeneity of their habitats, both of which are produced by natural processes.

The fragmentation of natural environments as a result of human interference

Nearly all fragmentation indices are strongly correlated with the proportion of habitat loss in the landscape, making anthropogenic habitat modification the most important and largest-scale cause of changes in the degree of fragmentation. For thousands of years, people have been changing the world's scenery. Similar to how modern ranchers manipulate grasslands to attract specific game species, early hunters would set fire to certain areas of the landscape to increase their chances of success. Agriculture, settlement, resource extraction (such as mining or harvesting timber), and industrial development (such as the building of hydroelectric dams) are just a few examples of the many ways in which human activities change and fragment landscapes. Agriculture is the primary culprit in the destruction and fragmentation of ecosystems around the world today. [6]

Natural vs. Human-caused Fragmentation

Naturally fragmented landscapes and those caused by humans are distinct in a number of ways. Numerous distinct types of patches can be found in a naturally patchy landscape. As a result of human development, many landscapes have become fragmented, creating a simplified patchwork structure with more distinct edges where only isolated pockets of natural habitat remain. Human-modified landscapes typically feature patch types that are unsuitable for many species, while natural landscapes typically feature patch types that are hospitable to a wider range of organisms. [7] When compared to artificially created patchy landscapes, the borders (or edges) of patches in natural patchy landscapes tend to be less abrupt. 4. Negative effects of habitat fragmentation Both the quantity and quality of habitat for formerly dependent species decline as a result of habitat fragmentation. Consequently, losses are most noticeable in the smallest

fragments, leading to a decline in the abundance and diversity of native species. As a result of fragmentation, movement, dispersal, and behavioural change are all negatively impacted. There are three components to the process of habitat fragmentation, all of which have significant effects on the survival of plant and animal species that once inhabited vast, continuous areas of natural habitat. [8]

First, fragmentation causes a net loss of habitat by dividing large patches into a greater number of smaller ones. By encouraging the arrival of generalist predators, these edges also increase the rate of predation, which has a significant effect on the local population of these species. Third, habitat fragmentation separates patches of the natural environment from one another, leaving them geographically isolated in a sea of developed and farmed areas. Because of this, some populations may become isolated because their range is severely reduced. However, inbreeding poses a significant threat to the survival of small, isolated populations and can even cause population extinction in extreme cases. In addition, local populations are more vulnerable to extinction due to random events like fires or epidemics. As the likelihood of recolonization decreases and habitat patches become more isolated, they become increasingly vulnerable to extinction. Therefore, it is unrealistic to expect populations living in isolation to persist over the long term. However, not every species is equally vulnerable to the effects of habitat loss. While abundant mobile generalist species are less affected or even favoured in the case of edge specialists, naturally rare sedentary species with specialised habitat requirements show a significant decline. It's possible that the migration abilities of the species living in a given habitat patch also affect how isolated that patch is overall. That being said, habitat fragmentation

loss of habitat due to fragmentation

Habitat loss is the most noticeable consequence of fragmentation. Because of this, many scientists now assess habitat fragmentation by counting the areas of natural landscape that have been preserved. In the minds of ecologists, the term "fragmentation" conjures up more than just the removal of habitat: fragmentation not only causes the loss of habitat but also changes the properties of the remaining habitat by dividing it up into numerous small, isolated patches. [9] There are a wide variety of spatial patterns that can emerge when habitats are removed from a landscape. If there are negative effects of habitat fragmentation on biodiversity that can be attributed to changes in the pattern of habitat but which cannot be attributed to habitat loss, then we can say that habitat fragmentation means something more than habitat loss. Habitat fragmentation leads to four outcomes in addition to habitat loss: more patches, smaller patches, greater isolation between patches, and greater connectivity between patches. [10]

Other than total habitat area, these or closely related measures are typically used to quantify fragmentation (e.g., the amount of edge). There are at least 40 different ways to quantify habitat loss, and many of them are highly correlated with one another and the total amount of habitat. There is a lack of consensus on how various fragmentation measures relate to one another. In their studies, researchers often fail to disentangle the effects of habitat loss from those of fragmentation, which can also have a profound impact on ecosystem structure. This makes it difficult to draw firm conclusions about how habitat configuration affects species richness. It is also common for fragmentation studies to only report the effects of single fragmentation measures rather than the relationships between them. [11]

2. MATERIALS AND METHOD

On the Dar es Salaam University campus, nine patches of thicket were identified, and six were mapped. The Msewe thicket was 4.73 hectares in size, the Udasa thicket was 101.62 hectares, the Mama Lishe thicket was 5.42 hectares, the Septic thicket was 12.88 hectares, the Mosque thicket was 3.34 hectares, and the Botany thicket was 3.34 hectares (2.77 ha). From November 2018 until the end of March 2019, the breeding season for most birds in East Africa and coastal Tanzania in particular, we conducted systematic physical searches of breeding individuals to assess breeding bird species in the area. To account for the fragments' varying sizes, we chose transects with widths of up to 50 m and lengths ranging from 100 m at the mosque fragment to 1000 m at the Udasa fragment. Every week, we went through each piece looking for bird nests. We walked methodically through each transect fragment looking for nests while keeping an eye out for bird activity and behaviour along the transect. Nesting sites were looked for in a systematic manner, with the searchers visually inspecting areas of vegetation, bare ground, cavities, and stream (river) banks. In addition, we used the following methods to locate nests: monitoring of tree cavities for signs of use, such as down or white wash on twigs; monitoring of birds carrying other materials, such as food, for possible detection of nests; monitoring of birds calling nestlings; monitoring of birds making repeated flights to

particular areas; and following birds carrying nesting materials.

An active nest was confirmed by the sighting of an egg or eggs, a calling nestling, and the adult bringing food to the young. After eggs were laid, a nest was confirmed in which birds had been observed carrying nesting materials. The diversity of nesting birds was measured using the Shannon-Wiener index. We used regression analyses to look for a correlation between (I) the total number of nests and (II) the variety of nesting species found in each fragment. To reduce the skewness of the area data, log transformations were applied to both the fragment areas (ha) in both cases.

3.RESULTS

Table 1. Number of nesting species and nests, and nest species diversity of different fragments

Aspects	Udasa	Septic	Mama lishe	Msewe	Mosque	Botany
No.of nesting species	25	8	6	5	3	3
No.of nests Shannon wiener diversity	48	28	10	11	8	3
Index	2.999	1.669	1.558	1.469	0.7357	1.099

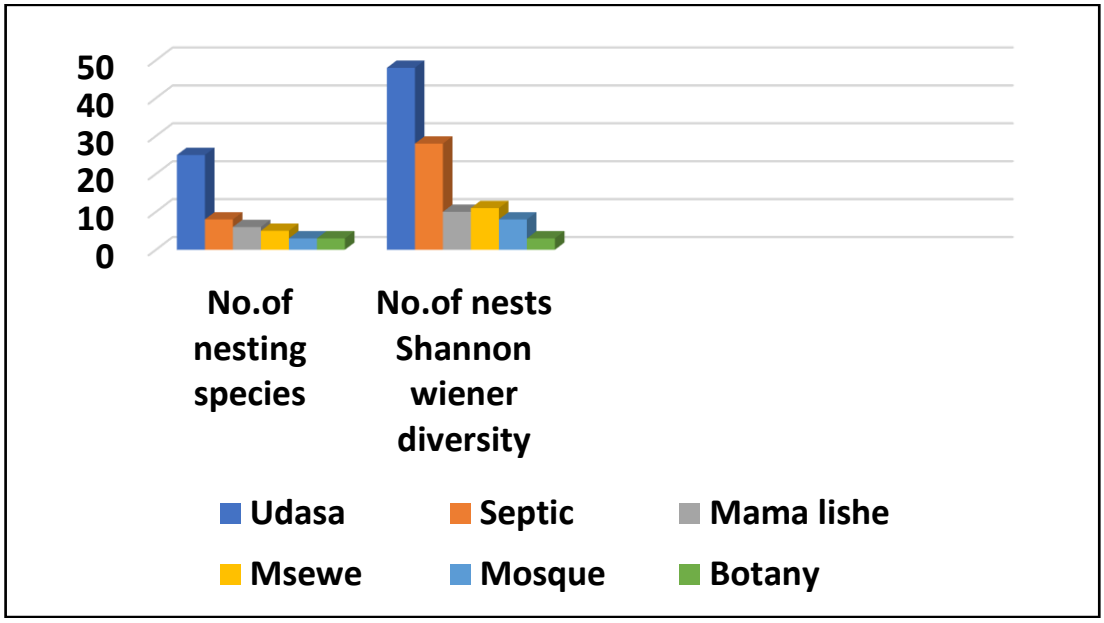

Fig 1. Number of nesting species and nests, and nest species diversity of different fragments

The variety and number of nesting species can be seen in Table 1 and Figure 1. All six pieces were used to locate active nests for 27 different bird species.

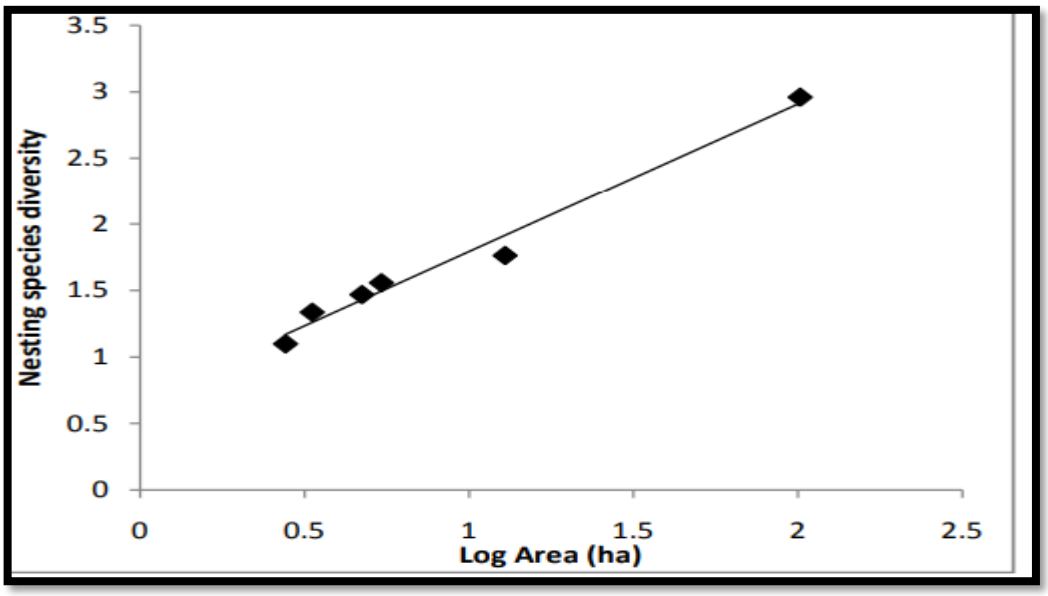

Fig 2. Relationship between nest diversity of bird species and fragment size

More species of birds nested in larger fragments than in smaller ones, and this trend continued as fragment size increased.

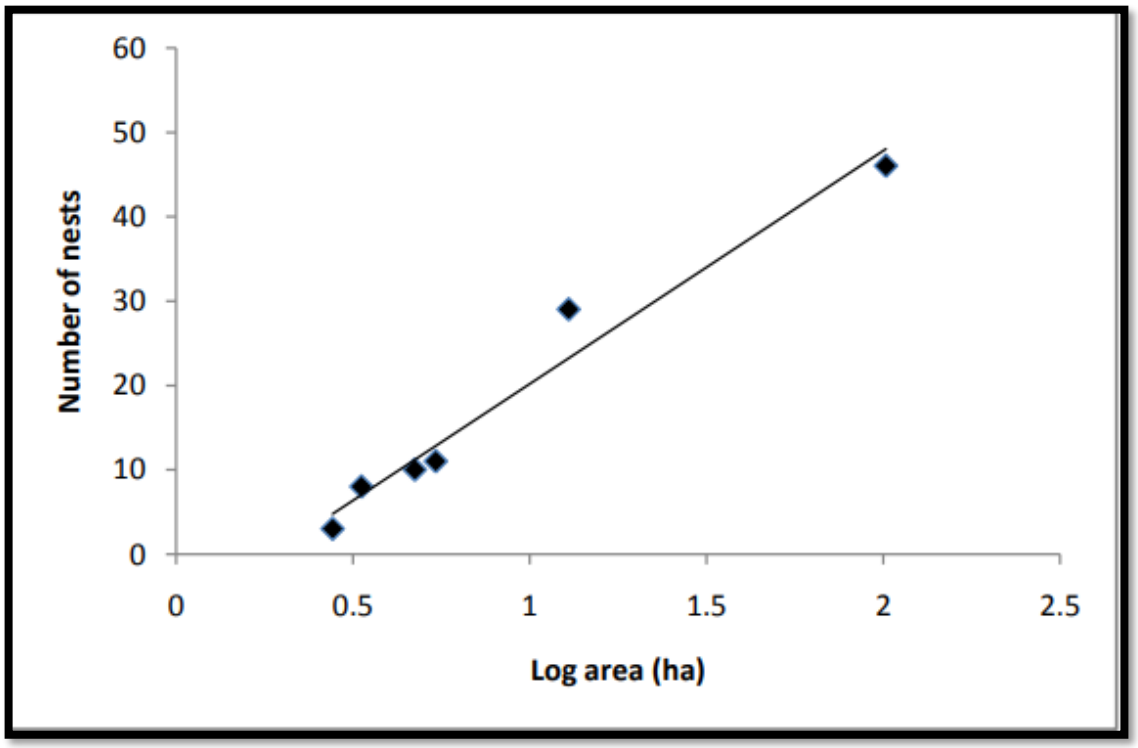

Fig 3. Relationship between number of nests and area of the thicket fragment

Greater nest and species abundance was found in larger fragments compared to smaller ones, and nest abundance positively correlated with fragment size.

4.DISCUSSIONS

The number and variety of bird species nesting in a given thicket fragment increased with its size. [12] Because of possible resource limitations, smaller fragments may support a smaller number of nesting bird species and a narrower range of species within those species. So, smaller pieces wouldn't provide enough space for all the birds. These findings also indicate that species loss has occurred as a result of habitat fragmentation in smaller forest fragments. [13,14] The increased likelihood of nest predation in smaller patches of habitat may cause birds to avoid them when trying to start a family. The Collared Sunbird, Olive Sunbird, Scarlet-chested Sunbird, and Variable Sunbird, along with the Bronze Mannikin, were all spotted nesting in variously sized thicket patches. Except for the Olive Sunbird, all of these species are able to survive and reproduce in habitats that have been severely fragmented due to the reduction in forest cover. [15]

5.CONCLUSIONS

Our research establishes a foundation of knowledge about the nesting birds of this region, demonstrating that the vast majority of these species require expansive breeding habitats to thrive. Continued conservation of the remaining thickets is of high importance for the avifauna of the campus, despite the fact that creating corridors to connect the existing thicket fragments is difficult due to anthropogenic structures like roads, buildings, and electricity power lines. Given the importance of the thickets at the University of Dar es Salaam as a safe haven for urban wildlife in the Dar es Salaam region, any further habitat clearing should be done only after thorough environmental impact assessments. Most species may be at risk if their habitats continue to be fragmented and degraded.

REFERENCES

1. Barth, B. J., FitzGibbon, S. I. “New urban developments that retain more remnant trees have greater bird diversity”. Landsc. Urban Plan. Vol 136, issue (1), page 122–129,2015.
2. Fontana, S., Sattler, T “How to manage the urban green to improve bird diversity and community structure. Landsc”. Urban Plan. Vol 101, issue (1), page 278–285,2011.
3. Kath, J., Maron, M “Interspecifc competition and small bird diversity in an urbanizing landscape”. Landsc. Urban Plan. Vol 92, issue (1), page 72–79,2009

4. Ortega-Álvarez, R "Living in the big city: Efects of urban land-use on bird community structure, diversity, and composition. Landsc". Urban Plan. Vol 90, issue (1), page 189–195,2009
5. Sandström, U. G., "Ecological diversity of birds in relation to the structure of urban green space. Landsc". Urban Plan. Vol 77, issue (1), page 39–53,2006
6. Stagoll, K., Manning, A. D., "Using bird–habitat relationships to inform urban planning. Landsc". Urban Plan. Vol 98, issue (1), page 13–25, 2010.
7. Strohbach, M. W., "Are small greening areas enhancing bird diversity? Insights from community-driven greening projects in Boston. Landsc". Urban Plan. Vol 114, issue (1), page 69–79,2013
8. Tilghman, N. G. "Characteristics of urban woodlands afecting breeding bird diversity and abundance." Landsc. Urban Plan. Vol 14, issue (1), page 481–495,1999
9. Alberti, M. 'Eco-evolutionary dynamics in an urbanizing planet". Trends Ecol. Evol. Vol 30,Issue (1), page 114–126,2015.
10. Alldredge, M. W., "Human-Cougar interactions in the wildland-urban interface of Colorado's front range". Ecol. Evol. Vol 9, Issue (1), page 10415–10431,2019.
11. Atiqah, N., "Comparison of the ranging behavior of Scotophilus kuhlii (Lesser Asiatic Yellow Bat) in agricultural and urban landscape," in AIP Conference Proceedings, Vol. 1678 Issue (1), page 200-26,2015.
12. Bateman, P. W., "Big city life: carnivores in urban environments". J. Zool. Vol 287, Issue (1), page 1–23,2012.
13. Bateman, P. W., "Does human pedestrian behaviour influence risk assessment in a successful mammal urban adapter?" J. Zool. Vol 294, Issue (1), page 93–98,2014.
14. Birnie-Gauvin, K., "Sublethal consequences of urban life for wild vertebrates". Environ. Rev. vol 24, Issue (1), page 416–425,2016.
15. Caro, T. "The behaviour–conservation interface". Trends Ecol. Evol. Vol 14, Issue (1), page 366–369,1999.