Butterfly species diversity in the urban environment of the derived Savanna Forest of Nigeria

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Abstract

The study examined the effects of various land-use types, resulting from continuous land-use changes and conversions, on the distribution and diversity of butterflies in an urban-derived savanna location. The area was divided into five land-use zones: farm, residential, recreational, aquatic, and utility areas using the transect method for five months in 2024 (January-May). Data was analyzed using Python. A total of 2,173 butterflies from five families were recorded: Nymphalidae (52%), Papilionidae (23%), Lycaenidae (9%), Hesperiidae (9%), and Pieridae (7%). Hesperiidae was recorded for the first time and was exclusive to aquatic areas. Nymphalidae and Pieridae dominated aquatic and recreational areas, while Lycaenidae and Papilionidae exhibited a balanced distribution across locations. Wet season butterfly abundance was higher than dry season. Significant differences were found in butterfly counts ($p < 0.05$) across land use types. Butterfly counts peaked between March and April and slightly declined in May. Aquatic and residential areas had the highest counts, while aquatic and farmland areas exhibited the greatest species diversity. The study concluded that land-use types significantly influence butterfly abundance, diversity, and species richness, with the aquatic area supporting the highest species count.

Keywords: butterfly, land use type, diversity, distribution, derived savanna, Nigeria.

Diversidade de espécies de borboletas no ambiente urbano da Floresta de Savana Derivada da Nigéria

Resumo

O estudo examinou os efeitos de vários tipos de uso da terra, resultantes de mudanças e conversões contínuas, sobre a distribuição e a diversidade de borboletas em uma savana de origem urbana. A área foi dividida em cinco zonas de uso da terra: agrícola, residencial, recreativa, aquática e utilitária, utilizando o método de transecção durante cinco meses em 2024 (janeiro a maio). Os dados foram analisados utilizando o software Python. Um total de 2.173 borboletas pertencentes a cinco famílias foi registrado: Nymphalidae (52%), Papilionidae (23%), Lycaenidae (9%), Hesperiidae (9%) e Pieridae (7%). A família Hesperiidae foi registrada pela primeira vez e foi exclusiva das áreas aquáticas. Nymphalidae e Pieridae dominaram as áreas aquáticas e recreativas, enquanto Lycaenidae e Papilionidae apresentaram distribuição equilibrada entre as localidades. A abundância de borboletas na estação chuvosa foi maior do que na estação seca. Diferenças significativas foram observadas nas contagens de borboletas ($p < 0,05$) entre os tipos de uso da terra. As contagens de borboletas atingiram o pico entre março e abril e declinaram levemente em maio. As áreas aquáticas e residenciais apresentaram as maiores contagens, enquanto as áreas aquáticas e agrícolas exibiram a maior diversidade de espécies. O estudo concluiu que os tipos de uso da terra influenciam significativamente a abundância, diversidade e riqueza de espécies de borboletas, sendo a área aquática a que apresentou o maior número de espécies.

Palavras-chave: borboleta, tipo de uso da terra, diversidade, distribuição, savana de origem, Nigéria.

1. Introduction

Butterflies are insects classified under the Arthropoda phylum and the order Lepidoptera (Sundufu and Dumbuya, 2008). Insects make up a significant portion of animal diversity (Ananthaselvi et al., 2009) in most ecosystems. Each group has an impact on ecosystems and their functioning: some of which are pollinators, others are a source of nutrition for animals (Cardoso et al., 2020). The populations of many butterfly species, along with other pollinators, are facing decline primarily caused by habitat loss, climate change, and pesticide use (IPBES, 2019).

These factors pose significant threats to food security and ecosystem health, underscoring the urgent need for conservation and management measures to safeguard pollinators and their habitats. The survival of butterfly species might be seriously threatened in a school environment by habitat damage caused by anthropogenic activities, including building construction, lawn mowing, and other development projects (Chidi; Odo, 2020). Altered habitats frequently affect butterfly species and their population dynamics (O'Farrell; Anderson, 2010). This is due to their short life cycle, limited ecological niches, and relatively low mobility, which make them more vulnerable to changes in land use and land cover (Koneri et al., 2022; Wale; Abdella, 2021).

Human activities, such as deforestation to facilitate urban development, have significantly disrupted the energy balance within ecosystems (Kasim, 2018). The widespread use of pesticides, human interference, and a lack of awareness regarding the ecological importance of butterflies have contributed to the rapid decline in butterfly populations (Mobeen et al., 2016). These anthropogenic actions have not only modified natural habitats but have also resulted in the long-term loss of species groups from their environments, ultimately pushing some toward extinction (Herrmann et al., 2023; Aviron et al., 2007).

Educational institutions are often centers of development, which, while crucial for growth, can sometimes conflict with wildlife conservation efforts. This dynamic is particularly evident in institutions with significant natural areas vulnerable to infrastructural expansion, such as the University of Ibadan. The last documented butterfly survey in the study area was conducted nine years ago, in 2015, by Alarape et al., who provided a checklist of butterfly species and examined their relationship with the area's temperature. Since then, considerable development has taken place, including the clearing of natural sites for new construction projects, with further developments ongoing. These changes underscore the need for this study, which aims to update the checklist of butterfly species in the area and investigate the effects of various land-use types on their distribution

Understanding the abundance and distribution of butterfly species across different land-use types is critical for evaluating the ecological impacts of human activities. Butterflies, as bioindicators, provide valuable insights into environmental health, making their study crucial for biodiversity conservation and ecosystem management. This research aims to address these gaps by focusing on the University of Ibadan, a landscape experiencing diverse land-use practices. The primary objective of this study is to evaluate the diversity and abundance of butterfly species within the University of Ibadan. The specific objectives are: To analyze the spatial distribution of butterfly species across the University of Ibadan; To identify and classify the butterfly species present within the university's environment, and To investigate the influence of different land-use types (forestry areas, utility areas, residential areas, and farming areas) on the abundance and diversity of butterfly species.

2. Materials and Methods

2.1 Study area

This study was conducted at the University of Ibadan (UI), the oldest and one of the most esteemed Nigerian universities, founded in 1948. The university is located approximately 8 kilometers from the center of Ibadan, a major city in southwestern Nigeria. The campus, situated at latitude 7˚46'N and longitude 3˚54'E, covers an area of 100 acres with a mean altitude of 277 m above sea level (Alarape et al., 2015). The landscape includes various land use types—such as aquatic zones, farmlands, recreational spaces, residential areas, and utility zones—representing diverse ecological niches. The university's vegetation is rich and diverse, featuring trees, shrubs, and herbs that lie within a transitional zone between the rainforest and derived savanna (Alarape et al., 2015).

The topography of the campus is characterized by gently undulating terrain, with elevation ranging from 185 to 230 m. The region experiences a distinct seasonal pattern, with the rainy season spanning from April to

November and a short dry period in August. The dry season typically occurs from November to February, with an annual rainfall range of 788 mm to 1884 mm (Farinde et al., 2015).

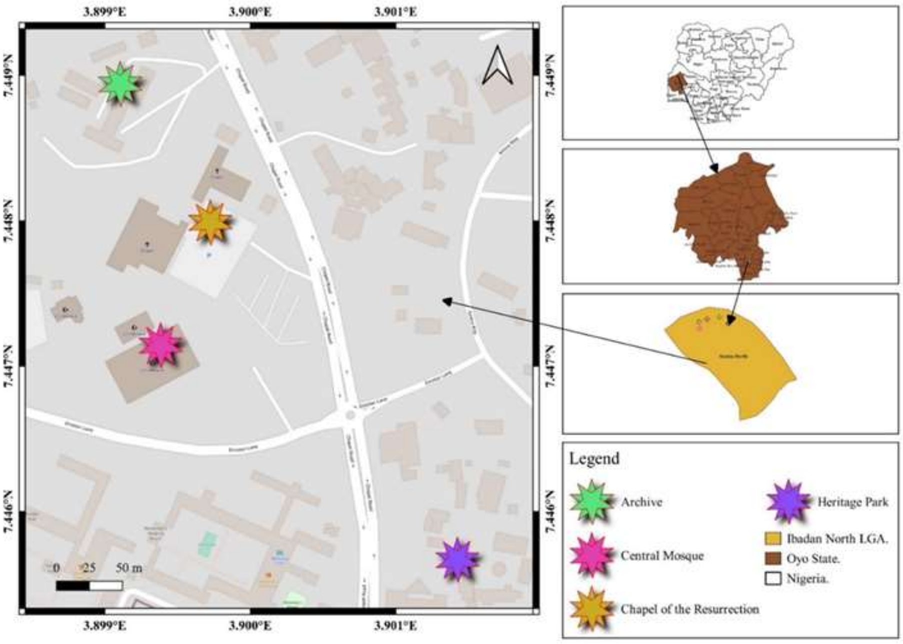

Figure 1. Map of the University of Ibadan, Ibadan, Nigeria, showing the study area. Source: Authors, 2025.

2.2 Sampling design

For this study, the university's environment was divided into five distinct land-use zones to capture ecological variability: Farm area, Residential area, Recreational area (Heritage Park), Aquatic area (Awba Dam), and Utility area (including the Chapel, Mosque, and National Archive).

1. Farming Area (FA): The farm, located at latitude N 7.451103 and longitude E 3.892485, spans a substantial tract of land opposite the Faculty of Veterinary Medicine. Various crops, including maize, banana, cassava, and vegetables, are cultivated in this area.

2. Residential Area (RA): This area primarily comprises staff quarters along Sankore Road, Pepple Road, and Poly Road (latitude N 7.448948 and longitude E 3.889173). Three transects were established here to monitor species diversity within human-dominated habitats.

3. Recreational Area (RC): Located between latitude N 7.444760 and longitude E 3.902432 along Oduduwa Road, the Heritage Park is a serene green space with varied vegetation. It contains both flowering plants and trees, such as Terminalia superba and Monoon longifolium, providing shade and creating a conducive habitat for various species. Three transects were established within the park, along the roadside and Amina Way.

4. Aquatic Area (AQ): Situated at latitude N 7.442747 and longitude E 3.891513, Awba Dam lies in the southern area of the campus at an altitude of 185 meters above sea level. The dam was created in April 1964 for water storage, laboratory use, fish culture, and research. Its size and depth vary with seasonal rainfall, and the surrounding drainage pattern is dendritic. The reservoir has a surface area of 6 hectares and a maximum depth of 5.5 meters, holding approximately 230 million liters of water. Accessibility is available year-round through well-maintained paved roads (Ojo, 2016).

5. Utility Area (UT): This zone encompasses the Mosque, Chapel of Resurrection, and National Archive of Nigeria, where three 500-meter transects were established. Each site presents unique vegetation and low disturbance, ideal for biodiversity studies:

a) Mosque: Located at latitude N 7.446947 and longitude E 3.8899617, adjacent to Mellanby Hall, this area has diverse vegetation, including *Mangifera indica* and *Terminalia superba*.

b) Chapel: Located at N 7.447812 and E 3.899173, the transect near the Chapel of Resurrection traverses a small garden with flowers that attract butterfly species. Shade trees like *Azadirachta indica* and *T. superba* provide canopy coverage.

c) Archive: Located at N 7.448217 and E 3.899735, this area has lush vegetation on a lawn, creating a relatively undisturbed environment that supports various butterfly species.

2.3 Methods

The stratification of these zones facilitates a comprehensive examination of species distribution across different habitats within the University of Ibadan. The transect method was used as the basic sampling unit for all butterflies and habitats data. It involves the visual observation of butterflies along transects. In this method, a permanent three 500 x 10 m line transects at least 100 m apart was established in each stratum. The transect in each habitat was traversed at a uniform pace for 1hour at each habitat from 10.00 h to 13.00 h.

• Field observations were made 5 times in a week (Monday – Friday), i.e., one stratum per day. For each day, the 3 transects in each habitat were visited one after the other at the rate of 500m/hr. This was repeated twice a month (1st and 2nd week) for the period of 5months from January to May 2023; January to March for the dry season and April to May 2023 for the wet season. All observations were made on clear, warm days, when winds were calm. Butterfly species were identified by consulting literature, nomenclature, and colored plates of "Butterflies of West Africa" and the "Common butterflies of IITA". All unidentified butterflies were captured using a hand-held sweep net. Photographs of butterflies that were difficult to identify in the field were taken for proper identification with the aid of a standard field guide and a Lepidopterist. The butterfly species that were captured were identified and released immediately at the spot of capture. Materials used include Measuring Tape (50 m), Sweep net, Camera, Twine, and Global Position System (GPS).

2.4 Data analysis

2.4.1 Data preparation

The collected data was structured into a dataset using Python. The dataset included columns for land use type, day, month, transect number, species, count, and year. Data cleaning procedures were applied to handle missing values, standardize month names (e.g., correcting inconsistencies such as "Apr" and "April"), and ensure overall consistency in formatting.

2.5 Statistical analysis

To determine the effects of land use type on butterfly distribution and abundance, several statistical tests were performed.

2.5.1 Species richness

The number of unique butterfly species (species richness) observed in each land use type was calculated to assess biodiversity levels.

2.5.2 Shannon diversity index (SDI)

The Shannon Diversity Index was computed for each land use type. The SDI provides a quantitative measure of species diversity, incorporating both species richness and species evenness within the different land use types.

2.5.3 One-way analysis of variance (ANOVA)

A one-way ANOVA test was conducted to assess whether significant differences existed in butterfly counts across the different land use types. This test compares the mean counts of butterflies to determine if land use type significantly influences butterfly abundance.

2.5.4 Post-hoc analysis

Following the ANOVA, *Tukey's* HSD test was conducted to identify specific differences between land use types in terms of butterfly counts.

3. Results

3.1 General rules

A total of 43 butterfly species were recorded across all land use types (refer to Tables 1 and 2). The species Junonia oenone was the most abundant, with a count of 300 individuals, followed by Eurema hecabe, which totaled 237 individuals. The least abundant species were Hypolimnas missippus and Nepheronia thalassina, with only 2 individuals each (Table 2).

Nymphalidae are the most abundant family, with a total of 1,097 individuals comprising 22 species and representing 51% of the total butterflies observed, followed by Pieridae (23%), Papilionidae (9%), Lycaenidae (9%), and Hesperiidae (7%) (Figure 2). Pieridae is the second most abundant family, with 629 individuals, and is dominant in AQ (227) and RC (146). Lycaenidae species show a balanced distribution across locations, totaling 195, with notable presence in AQ (57) and UT (37).

Papilionidae has 107 individuals. This family has its highest counts in AQ (37) and RS (27), but no presence in UT. Hesperiidae species are exclusive to AQ, with 14 individuals, making them the least diverse and abundant group. The wet season recorded a higher butterfly abundance than the Dry season (Figure 6). They are present in significant numbers across all locations, particularly AQ (372) and RC (290).

The ANOVA results revealed a significant difference in butterfly counts across the different land use types. The analysis yielded an F-statistic of approximately 5.54 and a p-value of 0.000209. Given the low p-value ($p < 0.05$), we reject the null hypothesis, which assumes no difference in mean butterfly counts among the land use types.

The analysis identified significant differences in butterfly counts between several land use types. Specifically, butterfly counts were significantly lower in Aquatic areas compared to Residential areas (mean difference = -0.887, p = 0.0007) and in Recreational areas compared to Residential areas (mean difference = -0.8812, p = 0.0023). Figure 3 illustrates the distribution of butterfly counts by land use type. Butterfly counts peaked between March and April, followed by a slight decline in May (Figure 4). In terms of species richness, Aquatic and Residential land-use types reached the highest values, while Aquatic and Farmland-use types had the highest species diversity. Overall, these differences were minimal (Figure 5).

Table 1. Butterfly species sighted at the University of Ibadan.

S/N	Family	Common Name	Scientific Name
1	Hesperiidae	Striped Policeman	*Coeliades forestan*
2	Hesperiidae	Skipper	*Spialia spp.*
3	Hesperiidae	Clouded forester	*Tagiades flesus*
4	Lycaenidae	Common ciliate blue	*Anthene larydas*
5	Lycaenidae	Common hairstreak	*Hypolycaena philippus*
6	Lycaenidae	Common zebra blue	*Leptotes pirithous*
7	Lycaenidae	Dark grass blue	*Zizeeria kynsna*
8	Nymphalidae	Alciope Acraea	*Acraea alciope*
9	Nymphalidae	Elegant Acraea	*Acraea egina*
10	Nymphalidae	Westwood’s Acraea	*Acraea pseudegina*
11	Nymphalidae	Dancing Acraea	*Acraea serena*
12	Nymphalidae	Forest glade nymph	*Aterica galena*
13	Nymphalidae	Light bush brown	*Bicyclus dorothea*
14	Nymphalidae	Common bush brown	*Bicyclus safitza*
15	Nymphalidae	Pearl emperor	*Charaxes varanes*
16	Nymphalidae	Plain tiger	*Danaus chryppissus*

17	Nymphalidae	Widespread forester	*Euphaedra medon*
18	Nymphalidae	Guineafowl butterfly	*Hamanumida daedulus*
19	Nymphalidae	Variable eggfly	*Hypolimnas anthedon*
20	Nymphalidae	Danaid eggfly	*Hypolimnas misippus*
21	Nymphalidae	Golden pansy	*Junonia chorimene*
22	Nymphalidae	Yellow pansy	*Junonia hierta*
23	Nymphalidae	Dark blue pansy	*Junonia oenone*
24	Nymphalidae	Little commodore	*Junonia Sophia*
25	Nymphalidae	Soldier pansy	*Junonia terae*
26	Nymphalidae	Darker commodore	*Precis antilope*
27	Nymphalidae	Gaudy commodore	*Precis Octavia*
28	Nymphalidae	Fashion commodore	*Precis pelarga*
29	Nymphalidae	Common ringlet	*Ypthima doleta*
30	Papillionidae	African swallowtail	*Papillio dardanus*
31	Papillionidae	Citrus swallowtail	*Papillio demodocus*
32	Papillionidae	Western emperor swallowtail	*Papillio menesthetus*
33	Papillionidae	Green-banded swallowtail	*Papillio nireus*
34	Pieridae	Pioneer white	*Belenois aurota*
35	Pieridae	Calypso caper white	*Belenois calypso*
36	Pieridae	African common white	*Belenois croena*
37	Pieridae	African emigrant	*Catopsilla florella*
38	Pieridae	Round-winged orange tip	*Colotis euippe*
39	Pieridae	Common grass yellow	*Eurema hecabe*
40	Pieridae	African wood white	*Leptosia alcesta*
41	Pieridae	Common dotted border	*Mylothris chloris*
42	Pieridae	Cambridge vagrant	*Nepheronia thalassina*
43	Pieridae	Cabbage butterfly	*Pieris brassicae*

Source: Authors, 2025.

Table 2. Butterfly distribution by family across land use type.

Family	**AQ**	**FM**	**RS**	**RC**	**UT**	**Total**
Hesperiidae	14	0	0	0	0	14
Lycaenidae	57	40	30	31	37	195
Nymphalidae	372	255	158	290	22	1097
Papilionidae	37	18	27	25	0	107
Pieridae	227	142	114	146	0	629

Note: AQ = Aquatic, FM = Farm, RS = Residential, RC = Recreational, UT = Utility. Source: Authors, 2025.

Table 3. Frequency of individual butterfly species distribution across land use types.

S/N	Family	Common Name	Scientific Name	AQ	FM	RS	RC	UT	TOTAL
1	Hesperiidae	Striped Policeman	*Coeliades forestan*	4	0	0	0	0	4
2	Hesperiidae	Skipper	*Spialia* spp.	5	0	0	0	0	5
3	Hesperiidae	Clouded forester	*Tagiades flesus*	5	0	0	0	0	5
4	Lycaenidae	Common ciliate blue	*Anthene larydas*	0	1	1	1	14	17
5	Lycaenidae	Common hairstreak	*Hypolycaena philippus*	40	16	8	21	0	85
6	Lycaenidae	Common zebra blue	*Leptotes pirithous*	3	0	4	2	3	12
7	Lycaenidae	Dark grass blue	*Zizeeria kynsna*	9	19	17	7	20	72
8	Nymphalidae	Alciope Acraea	*Acraea alciope*	65	19	12	46	21	163
9	Nymphalidae	Elegant Acraea	*Acraea egina*	0	11	5	6	0	22
10	Nymphalidae	Westwood's Acraea	*Acraea pseudegina*	14	5	1	8	29	57
11	Nymphalidae	Dancing Acraea	*Acraea serena*	17	14	3	0	12	46
12	Nymphalidae	Forest glade nymph	*Aterica galena*	0	0	0	0	4	4
13	Nymphalidae	Light bush brown	*Bicyclus Dorothea*	6	12	23	16	1	58
14	Nymphalidae	Common bush brown	*Bicyclus safitza*	21	9	4	9	7	50
15	Nymphalidae	Pearl emperor	*Charaxes varanes*	9	0	5	6	1	21
16	Nymphalidae	Plain tiger	*Danaus chryppissus*	21	31	22	2	24	100
17	Nymphalidae	Widespread forester	*Euphaedra medon*	7	2	2	6	2	19
18	Nymphalidae	Guineafowl butterfly	*Hamanumida daedulus*	22	18	6	0	23	69
19	Nymphalidae	Variable eggfly	*Hypolimnas anthedon*	17	17	2	18	11	65
20	Nymphalidae	Danaid eggfly	*Hypolimnas misippus*	0	2	0	0	0	2
21	Nymphalidae	Golden pansy	*Junonia chorimene*	24	22	14	38	27	125
22	Nymphalidae	Yellow pansy	*Junonia hierta*	24	37	6	10	22	99
23	Nymphalidae	Dark blue pansy	*Junonia oenone*	108	34	12	72	74	300
24	Nymphalidae	Little commodore	*Junonia Sophia*	36	16	11	19	12	94
25	Nymphalidae	Soldier pansy	*Junonia terae*	28	24	15	7	6	80
26	Nymphalidae	Darker commodore	*Precis antilope*	1	0	0	3	1	5
27	Nymphalidae	Gaudy commodore	*Precis Octavia*	5	2	2	2	0	11
28	Nymphalidae	Fashion commodore	*Precis pelarga*	3	0	0	0	2	5
29	Nymphalidae	Common ringlet	*Ypthima doleta*	8	1	0	6	0	15
30	Papillionidae	African swallowtail	*Papillio dardanus*	8	0	1	0	0	9
31	Papillionidae	Citrus swallowtail	*Papillio demodocus*	21	18	24	24	15	102
32	Papillionidae	Western emperor	*Papillio*	0	0	2	0	2	4

		swallowtail	*menesthetus*						
33	Papillionidae	Green-banded swallowtail	*Papillio nireus*	8	0	2	1	0	11
34	Pieridae	Pioneer white	*Belenois aurota*	0	7	9	12	3	31
35	Pieridae	Calypso caper white	*Belenois calypso*	24	19	28	34	20	125
36	Pieridae	African common white	*Belenois croena*	8	4	0	9	2	23
37	Pieridae	African emigrant	*Catopsilla florella*	35	33	29	60	42	199
38	Pieridae	Round-winged orange tip	*Colotis euippe*	48	4	53	27	23	155
39	Pieridae	Common grass yellow	*Eurema hecabe*	79	42	24	49	43	237
40	Pieridae	African wood white	*Leptosia alcesta*	6	3	0	7	7	23
41	Pieridae	Common dotted border	*Mylothris chloris*	24	29	14	22	18	107
42	Pieridae	Cambridge vagrant	*Nepheronia thalassina*	0	2	0	0	0	2
43	Pieridae	Cabbage butterfly	*Pieris brassicae*	5	6	9	2	0	22
TOTAL				768	477	367	557	4	2173

Source: Authors, 2025.

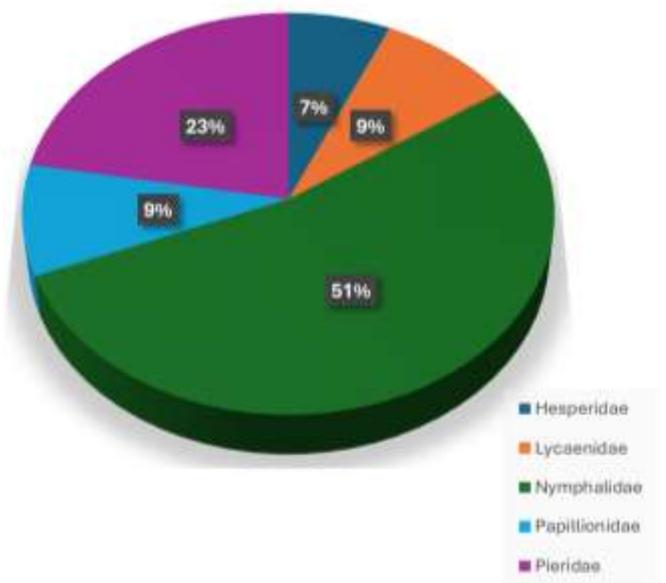

Figure 2. Butterfly Family composition. Source: Authors, 2025.

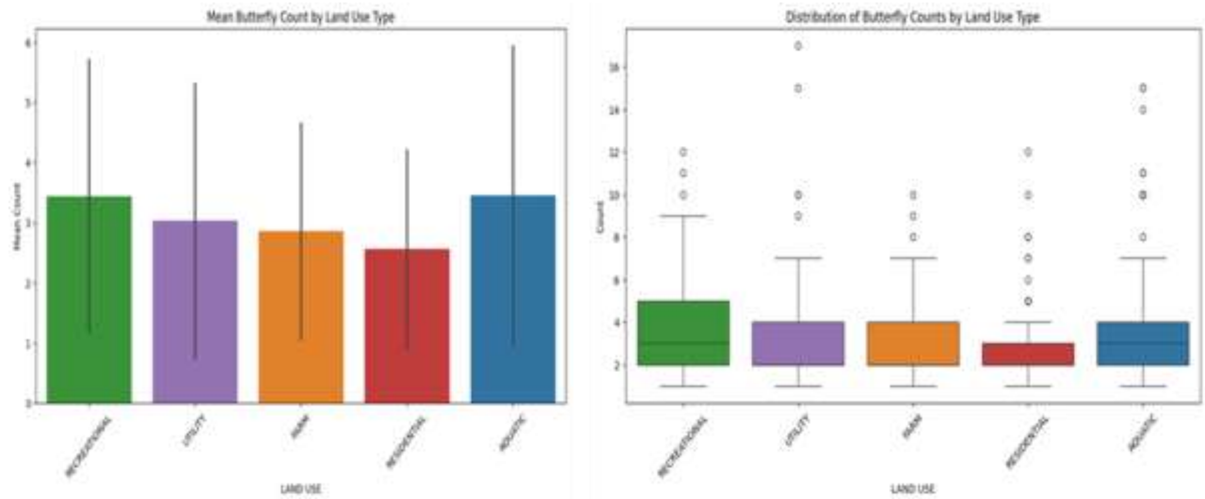

Figure 3. Mean butterfly count by land use type. Source: Authors, 2025.

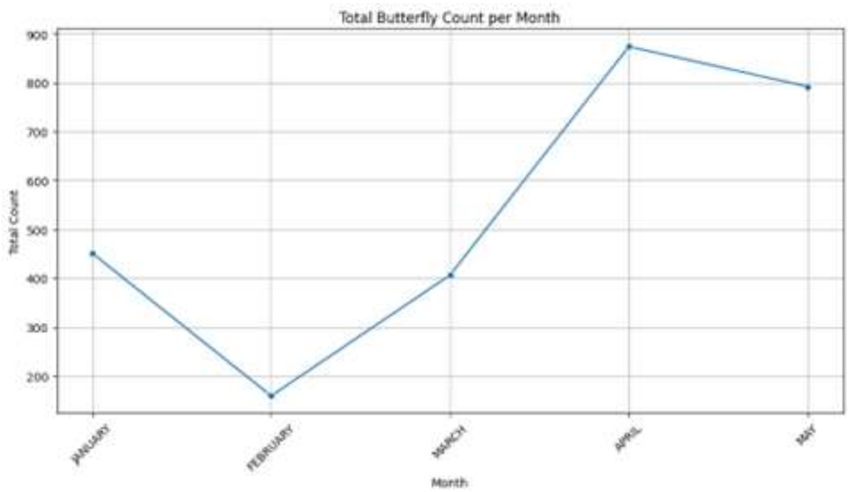

Figure 5. Total count per month. Source: Authors, 2025.

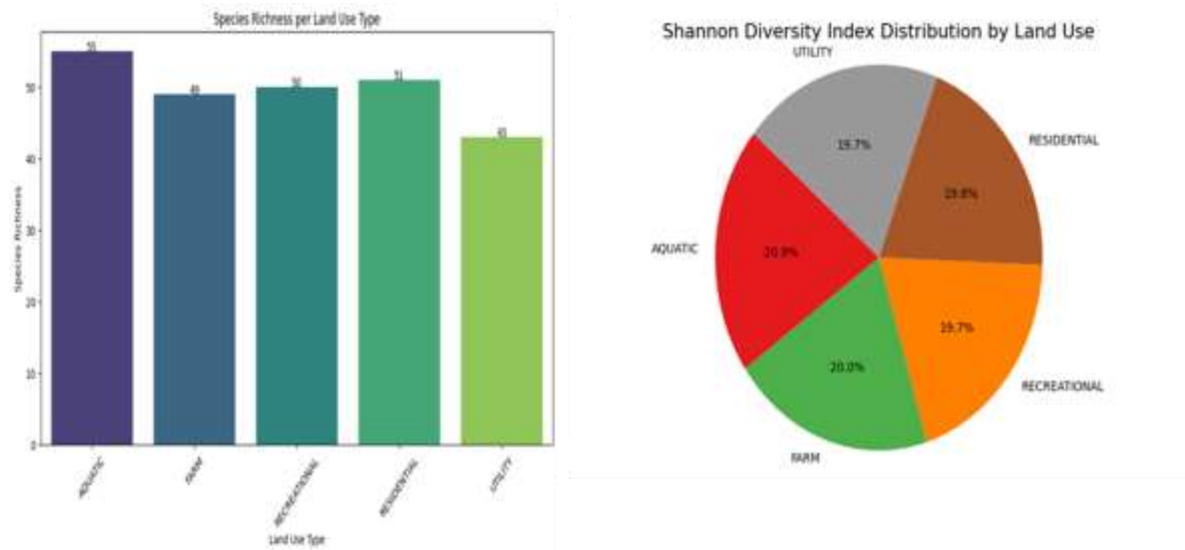

Figure 5. Butterfly species richness and diversity. Source: Authors, 2025.

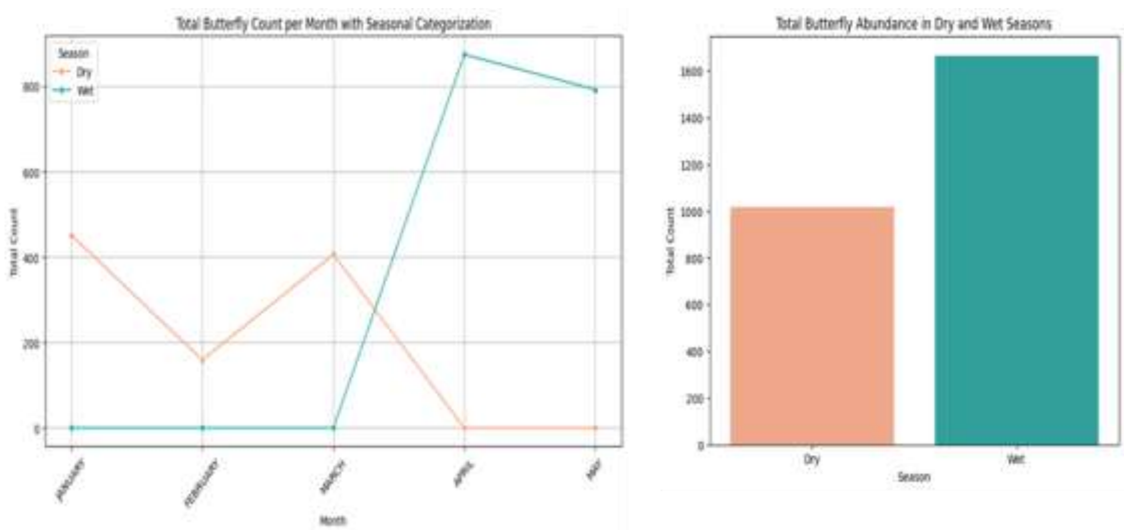

Figure 6. Butterfly distribution by season. Source: Authors, 2025.

4. Discussion

Butterflies were observed across all land-use types, with noticeable variations in their abundance and species distribution. Among these, aquatic and recreational areas appeared to be slightly more conducive to butterfly presence. This may be attributed to the availability of water and the diverse vegetation in these environments, which provide essential resources such as food and shelter. In this study, over 40 butterfly species were documented, which is fewer than the 57 species recorded by Alarape et al. (2015). Notably, this research is the first to identify butterfly species from the family Hesperiidae within and around the study location, marking a significant contribution to the knowledge of local butterfly biodiversity.

The observed variations in species count between this study and previous works can be explained by several factors, including differences in research intensity, the timing of data collection, and the specific characteristics of the land-use types surveyed (Álvarez-García et al., 2016; González-Valdivia et al., 2016). These findings emphasize the need for consistent and comprehensive monitoring efforts to better understand butterfly populations and their responses to changing land-use practices. Habitat heterogeneity, characterized by areas with diverse vegetation types and varying ecological conditions, tends to support higher species diversity compared to less complex habitats (Estrada-Carmona et al., 2022; Furst et al., 2022). This complexity provides a variety of niches and resources, fostering better ecological performance and promoting biodiversity.

Some butterfly species are closely associated with specific habitat types, primarily due to the dominance of their preferred host plants in those areas. For instance, members of the family Satyridae are predominantly grass feeders, relying on grass as their primary food source (Peña; Wahlberg, 2008). This habitat-plant relationship highlights the critical role of vegetation composition in shaping butterfly distributions and underscores the importance of conserving diverse habitats to sustain species richness.

Both our study and that of Alarape et al. (2015) recorded butterfly species from the families Pieridae, Nymphalidae, Papilionidae, and Lycaenidae. However, there were notable differences in the families observed between the two studies. Our research did not identify butterflies from the families Satyridae, Heliconidae, Danainae, Ithomiidae, or Rioninidae, whereas Alarape et al. (2015) did not record any species from the family Hesperiidae.

The discrepancies in species recorded could be attributed to the timing of the two studies. Our research was conducted from January to May, while the study by Alarape et al. (2015) took place between June and July. This suggests that seasonal variation may influence butterfly species distribution, as some species are likely seasonal and may only be present during certain periods. The abundance and distribution of butterfly species in our study were found to increase toward the wet season, which may further support this hypothesis. Given these findings, we recommend that further, more detailed studies be conducted to examine the impact of seasonal variation on butterfly distribution in this area. This would provide a clearer understanding of how the time of year affects butterfly populations and their habitat use.

Our study highlights that the families Nymphalidae and Pieridae are the most widespread and abundant, suggesting their high adaptability to diverse habitats. These findings align with those of Jemal & Getu (2018) and Orimaye (2016), where Nymphalidae was also the most abundant family. In contrast, Alarape et al. (2015) found Pieridae to be the most abundant family. The limited presence of Hesperiidae in aquatic areas indicates a highly specialized habitat preference, emphasizing the ecological significance and distribution patterns of butterfly families across different environments.

Our study also found that butterfly counts were significantly lower in aquatic areas compared to residential areas, with recreational areas also showing fewer butterflies than residential zones. Although the mean butterfly count remained relatively consistent across all land-use types, no statistically significant differences were found between them. However, aquatic and recreational land-use types exhibited slightly higher mean counts, though the differences were minimal. Notably, recreational areas showed a wider range of butterfly counts, suggesting greater variability within this category.

In terms of species richness, aquatic and residential areas recorded the highest values, while aquatic and farmland areas had the greatest species diversity. Although our study did not directly examine the influence of shading on butterfly richness, previous research (e.g., Guderjan et al., 2023; Matteson; Langellotto, 2010; Clark et al., 2007) suggests that areas with less shading tend to support higher butterfly species richness, particularly for flying insects that thrive in warm, sunny conditions. This could explain the differences between our findings and those of Alarape et al. (2015) and Olajesu et al. (2024). Overall, the differences in butterfly abundance and distribution across land-use types were minimal. Seasonally, the wet season recorded a higher butterfly abundance compared to the dry season.

5. Conclusions

In conclusion, this study highlights that Nymphalidae and Pieridae are the most abundant butterfly families in the University of Ibadan, with aquatic areas supporting specialized species like Hesperiidae. Butterfly abundance was higher during the wet season, and species richness was greatest in aquatic and residential areas. However, the total number of species recorded was lower in this study compared to previous research in the area.

These results suggest that land-use types and shading play significant roles in influencing butterfly diversity. For future research, we recommend a more detailed investigation into the effects of seasonal variation, shading, and other ecological factors on butterfly distribution. This will help refine conservation strategies and improve our understanding of butterfly habitat preferences in the region.

6. Authors' Contributions

All authors contributed to the study conception and design. Material preparation, data collection, and analysis were performed by S. O. Olajesu1, D. A. Odejinmi, and Ifeanyi Nwabuoke. The first draft of the manuscript was written by Oni Funmilayo Lewiska, and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

7. Conflicts of Interest

No conflicts of interest.

8. Ethics Approval

Not applicable.

9. References

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