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ABUNDANCE AND SPECIES RICHNESS OF BUTTERFLY IN FEDERAL COLLEGE OF WILDLIFE MANAGEMENT ESTATE NEW-BUSSA, NIGERIA

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ABSTRACT

Butterflies are an indicator species, these creatures are so sensitive to change in climate and any other changes in the environment. So there is a great need to study their diversity as this gives advantage on how best to manage and revert the problems facing them so as to reduce these threats which in turn help heals the ecosystem. Therefore, this study assessed the abundance and species richness of Butterfly in Federal College of Wildlife Management Estate New-Bussa, Nigeria. The college was stratified into three locations namely developed, cultivated and undeveloped which all have two replicates. The study used direct methods of insect collection. Data obtained were analyzed using descriptive statistics. The diversity indices were calculated using Shannon's Wiener and Evenness. The finding showed that thirteen (13) butterflies' species were found within the college estate. The abundance and distribution of Butterflies in developed area indicated that Forest grass yellow recorded the highest with 25.9%, followed by African emigrant with 20.3% while Blue pansy recorded the least with 5.6%. The abundance and distribution of Butterflies in cultivated area revealed that *Eurema senegalensis* recorded the highest with 38.7%, followed by African emigrant with 21.0% while Mocker swallowtail recorded the least with 1.6%. The abundance and distribution of Butterflies in undeveloped area showed that Forest grass yellow recorded 34.4% while African emigrant recorded 25.0%. The results of the diversity of Butterflies species indicated that undeveloped area had the highest diversity index of 1.99 and evenness of 0.863. The results from this study showed a high diversity of butterfly species within Federal College of Wildlife Management estate, New-Bussa. The most commonly found species in FCWM estate include forest grass yellow butterfly (*Eurema senegalensis*), Blue Pansy (*Junonia oenone*) and Calypso White (*Belenois calypso*) and Dirty Albatross (*Appias phaola*) occurring in all the selected locations.

Keywords: Abundance; Butterfly; Species Richness; Wildlife

Introduction

Butterflies are scaled wing insects belonging to the order Lepidoptera of class Insect and are regarded as one of the best taxonomically studied groups of insects. Butterflies have been studied systematically since early 18th century; so far 28,000 species documented worldwide (Tiple and Arun, 2009).

Butterflies belong to a subdivision (phylum) of the animal kingdom arthropoda in the order

lepidoptera (Sundufu and Dumbuya 2008; Ojianwuna 2015). Over 273,000 species of lepidoptera (butterflies (28,000) and moths (245,000)) exist in the world today contributing to one-quarter of all named species on the earth (Emmel 2012; Nair *et al*. 2014; McGuire Center for Lepidoptera and Biodiversity (MCLB) 2021). Lepidoptera is important to man and the health of the environment. Butterflies play a significant role in the pollination of crops and as aesthetics (Ramesh *et al*. 2010; Ghazanfar *et al*. 2016). Lepidoptera communities are greatly influenced by species richness and composition of local plant communities in tropical rainforest (Novotny *et al*. 2002; Kurylo *et al*. 2020; Delabye *et al*. 2021). Consequently, there is much fear that many species of butterflies will go into extinction due to the fast rate of disappearance of their natural habitats such as swamps and forests. This was supported by Gascon *et al*. (1999) who reported that modified habitats and anthropogenic activities are often influencing butterfly species and their dynamics. The increasing number of landscape fragmentation and destruction of natural habitat for the establishment of structures without deliberate attempts to maintain or re-establish pristine eco-habitat are detrimental to native butterfly species, which could be gradually disappearing (Alarape *et al*. 2015; Pignataro *et al*. 2020).

Butterflies are indicators of a healthy environment and ecosystem; they indicate a wide range of other invertebrates, which comprise over two-thirds of all species (Ubach *et al*. 2020). These collectively provide a wide range of environmental benefits, including pollination and natural pest control. They are pollinators (Vane-Wright, 2005), silk producers for textile industries and good indicators of the ecological quality of a habitat (Cleary and Mooers, 2004). They are very well known for their beauty as their wings are of various colour patterns. They are benign and aesthetically pleasing that they are greatly appreciated in ecotourism (Tiple and Arun, 2009) and form important components of the food chain, particularly as larvae. One of the groups of animals with diverse species richness is insects which represent over 50% of terrestrial biodiversity (Orimaye *et al.*, 2016).

The greatest threats to butterflies are habitat loss due to residential, commercial and agricultural development (Koch *et al*. 2015). A remarkable decline in butterfly diversity is becoming increasingly evident which are largely caused by human activities (Kemabonta *et al.*, 2015). Indeed, concern for the status of the butterflies biodiversity is on the increase and arises from the observation that biodiversity is being rapidly depleted, seriously threatening the continued support that nature provides for human existence and development (Kehinde *et al.*, 2014). Butterflies are an indicator species because they are so sensitive to change in climate, the presence of harmful chemicals, pollution in the air and water, and any other changes in the environment (Vickery, 2008). So there is a great need to know and study Butterflies diversity as this gives advantage on how best to manage and revert the problems facing them so as to reduce these threats which in turn helps heals the ecosystem.

Materials and Methods

Study Area

Federal College of Wildlife Management Estate is situated between the Kainji Dam and New Bussa Town about 3km along Awuru Road with a total area of about 2.56km^2. The

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college lies between latitude 9°52'50"N and 4°30'50"E. 9°53'10"N and longitude 4°30'25"E and

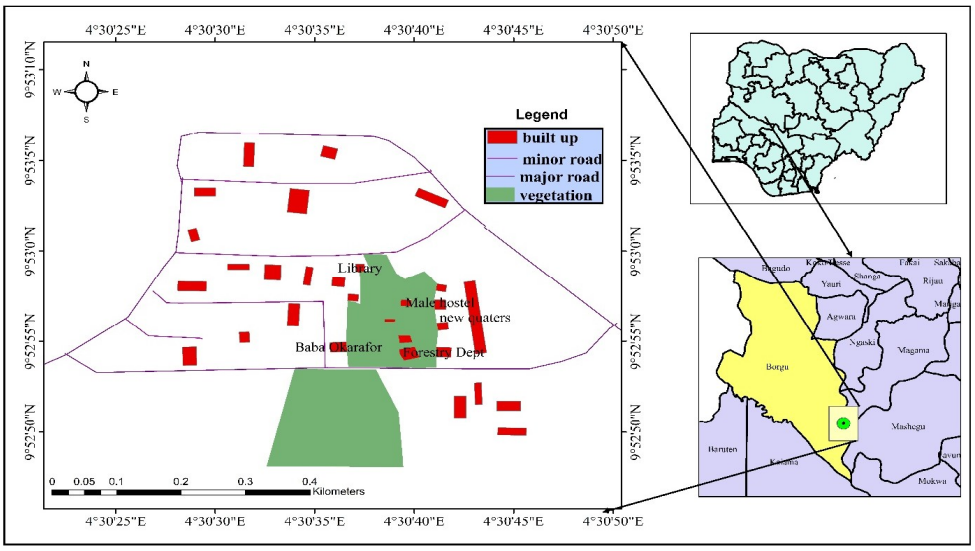


Figure 1: Map of study Area **Source: Ogialekhe, 2018**

Method of Data Collection

The college was stratified into three locations namely developed, cultivated and undeveloped which all have replicates as follows: Developed area (Site 1; Lecture room areas (latitude N9°49'10" and longitude E4°34'53"), Site 2 Admin area (latitude N9°49'23" and longitude E4°34'52")); cultivated area (Site 3; School Gate (latitude N9°49'55" and longitude E4°35'2"), Site 4 School Farm (latitude N9°49'6" and longitude E4°35'00"); and undeveloped area (Site 5; Front of Wildlife department (latitude N9°49'15" and longitude E4°34'59"), Site 6 Back of Boys Hostel (latitude N9°49'42" and longitude E4°35'6"). Each of the selected locations has two replicates each. The study used direct methods of insect collection. The direct insect collection was by the use of butterfly net (Hand net). A line transects of 200 m by 200 m was set up in each location. Each transect was slowly traversed at a uniform pace of 30 Minutes at each location from 7-9 am and 4-6 pm. Butterfly species were recorded around a radius of five meter from the observer covering either sides, above and front. Identification of Butterflies species was done using taxonomical keys of Sáfián and Warren (2015).

Data Analysis

Data obtained were analyzed using descriptive statistics where results were expressed in tables, frequency and percentage. The diversity indices were calculated using Shannon's Wiener and Evenness using this formula.

$$H' = \sum_{i=1}^{s} pi \times lnpi$$

Where pi: Proportion of individuals for the i^{th} species

ln: Natural logarithm

S: Total number of species (Species richness)

While Evenness Index (E) was calculated as:

$$E = \frac{H'}{Hmax}$$

Journal of Forestry Research and Management. Vol. 23 (1). 111-118; 2026, ISSN 0189-8418
www.jfrm.org.ng

E=evenness index
H'=Shannon Weiner index
Hmax=the highest value of Shannon Weiner index

Results and Discussions

Results

Butterflies species encountered in the study area are shown in table 1, thirteen (13) butterflies were enumerated. Abundance and distribution of Butterflies in Developed Area are revealed Table 2, in which Forest grass yellow and African emigrant recorded the highest with 25.9% and 20.3%, followed by Dirty albatross with 16.7% while Blue pansy recorded the least with 5.6%. Abundance and distribution of Butterflies in cultivated area are indicated in table 3, *Eurema senegalensis* (Forest Grass Yellow) recorded the highest with 38.7%, followed by African emigrant with 21.0% while Mocker swallowtail recorded the least with 1.6%. Abundance and distribution of Butterflies in undeveloped area are shown in table 4, Forest grass yellow recorded 34.4% while African emigrant recorded 25.0%. The results of the diversity of Butterflies species are shown in table 5 indicated that Undeveloped area had the highest diversity index (*H*') of 1.99 and evenness of 0.863.

Table 1: Butterflies Species Identified in the Study Area

S/N	Common Names	Scientific Names	Developed Area	Cultivated Area	Undeveloped Area
1.	Forest Grass Yellow	*Eurema senegalensis*	+	+	+
2.	Rhodope	*Mylothrisrhodope*	-	+	+
3	Common Pathfinder Skipper	*Pardaleodesedipus*	-	+	-
4	Purple-brown Hairstreak	*Hypolycaenaphilippus*	+	-	-
5	Mocker Swallowtail	*Papilio dardanus*	-	+	-
6.	Citrus Swallowtail	*Papilio demodocus*	-	+	+
7.	Blue Pansy	*Junoniaoenone*	+	+	+
8	Calypso White	*Belenois calypso*	+	+	+
9.	Dirty Albatross	*Appiasphaola*	+	+	+
10	Common Bush Brown	*Bicyclussafitza*	-	-	+
11	Little Commodore	*Junoniasopia*	-	-	+
12	Grey Bush	*Bicyclustaenia*	+	+	+

13	Brown African Emigrant	*Catopsiliaflorella*	+	+	+

+ Presence -Absence

Table 2: Abundance and Distribution of Butterflies in Developed Area

S/N	Common Names	Scientific Names	Frequency	%
1.	Forest Grass Yellow	*Eurema senegalensis*	14	25.9
2.	Purple-brown Hairstreak	*Hypolycaenaphilippus*	8	14.8
3.	Blue Pansy	*Junoniaoenone*	3	5.6
4.	Calypso White	*Belenois calypso*	5	9.3
5.	Dirty Albatross	*Appiasphaola*	9	16.7
6.	Grey Bush Brown	*Bicyclustaenias*	4	7.4
7.	African Emigrant	*Catopsiliaflorella*	11	20.3
		Total	**54**	**100.0**

Table 3: Abundance and Distribution of Butterflies in Cultivated Area

S/N	Common Names	Scientific Names	Frequency	%
1.	Forest Grass Yellow	*Eurema senegalensis*	24	38.7
2.	Rhodope	*Mylothrisrhodope*	3	4.8
3.	Common Pathfinder Skipper	*Pardaleodesedipus*	5	8.1
4.	Mocker Swallowtail	*Papilio dardanus*	1	1.6
5.	Citrus Swallowtail	*Papilio demodocus*	3	4.8
6.	Blue Pansy	*Junoniaoenone*	8	12.9
7.	Calypso White	*Belenois calypso*	3	4.8
8.	Dirty Albatross	*Appiasphaola*	9	14.5
9	Grey Bush Brown	*Bicyclustaenias*	6	9.7
10.	African Emigrant	*Catopsiliaflorella*	13	21.0
		Total	**62**	

Table 4: Abundance and Distribution of Butterflies in Undeveloped Area

S/N	Common Names	Scientific Names	Numbers	%
1.	Forest Grass Yellow	*Eurema senegalensis*	33	34.4
2.	Rhodope	*Mylothrisrhodope*	1	1.0
3.	Citrus Swallowtail	*Papilio demodocus*	1	1.0
4.	Blue Pansy	*Junoniaoenone*	1	1.0

Journal of Forestry Research and Management. Vol. 23 (1). 111-118; 2026, ISSN 0189-8418
www.jfrm.org.ng

5.	Calypso White	*Belenois calypso*	1	1.0
6.	Dirty Albatross	*Appiasphaola*	7	7.3
7.	Common Bush Brown	*Bicyclussafitza*	13	13.5
8.	Little Commodore	*Junoniasopia*	9	9.4
9.	Grey Bush Brown	*Bicyclustaenias*	6	6.3
10.	African Emigrant	*Catopsiliaflorella*	24	25.0
		Total	**96**	**100.0**

Table 5: Diversity of Butterflies Species Composition in the Study Area

Location	Occurence	Richness	Shannon Wiener's Index (*H'*)	Evenness
Developed Area	54	7	1.76	0.765
Cultivated Area	62	10	1.83	0.94
Undeveloped Area	96	10	1.99	0.863

Discussion

The 13 species of butterfly recorded in the study area were lower compared with the findings of the survey of Alarape *et al*. (2015) at the University of Ibadan Botanical Garden, Nigeria, who identified 57 butterfly species belonging to 9 families. Also 76 species of butterfly was recorded by Ojianwuna (2015) in Okomu National Park, Edo State, Nigeria. This disparity in Alarape *et al*., (2015) and Ojianwuna (2015) could be attributed to differences in vegetation at the different sampling sites, vegetation cover, and ecological zones, species abundance and methods of identifications.

The result of species abundance and distribution was highest in undeveloped area followed by cultivated area and was low in the developed area. This result may be attributed to the relatively large landmass of habitat types and adaptations to land use type of the Federal College of Wildlife Management estate. Forest Grass yellow butterfly (*Eurema senegalensis*) was observed to have the highest abundance in the entire study area, followed by Dirty Albatross (*Appias phaola*), Blue pansy (*Junoniaoenone*) and Calypso white (*Belenois calypso*). This observation agrees with the findings of Alarape*et al*., (2015), that reported that Pieridae family which *Eurema senegalensis* belong to as the most abundance species in university of Ibadan Botanical Garden. The study disagrees with that of Kemabonta*et al*. (2015), who ranked *Acraea serena* as highest.

Species diversity and evenness indices were least in developed area and highest on undeveloped area. The variation may be attributed to the fact that a large proportion of different flowering and non-flowering plant species including crops which serve as food sources for butterflies that are present in the undeveloped area and where there may also be relatively undisturbed forest habitat unlike in developed areas. The study agrees with Efenakpo*et al*. (2021) that ascertain that butterfly tends to prefer undisturbed habitat due to availability of food sources.

Conclusion

The results from this study showed a high diversity of butterfly species within Federal College of Wildlife Management estate, New-Bussa. The most commonly found species in

FCWM estate include forest grass yellow butterfly (*Eurema senegalensis*), Blue Pansy (*Junonia oenone*) and Calypso White (*Belenois calypso*) and Dirty Albatross (*Appias phaola*) occurring in all the selected locations. Butterflies are arthropods that are essential for the healthy functioning of the ecosystem. Their role in pollination helps in the regeneration of forest thereby sustaining the ecosystem and humans alike, which makes them an important fauna species. Butterflies should be conserved for their ecological and economic benefits. The study therefore recommends that the College estate should be reforested especially with flowering plants including trees and edge-plants in addition to conserving the remaining secondary forest,Periodic monitoring of the abundance and diversity of butterflies in the study area should be prioritized and study should be conducted based on seasons so as to provide a full checklist of butterfly species in the study area.

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