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Inventory of Selected Butterfly Species of Obafemi Awolowo University Ile-Ife, Nigeria

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ABSTRACT

Butterflies are important species required to be conserved because of its ecological, economical, and scientific and ecotourism benefits. The study of butterflies' species composition, their distribution and abundance in Obafemi Awolowo University Ile-Ife was carried out between May to June 2016 and 2017. The study area was stratified into three locations (developed, cultivated and undeveloped). Direct methods using both butterfly bait trap and butterfly net (hand net) was adopted. Data obtained were analysed both by descriptive (tables and charts) and inferential (ANOVA) statistics. PAST Software (Version 16) was used for analysis of butterfly Diversity indices (Dominance, Shannon's Wiener and Evenness). One way ANOVA was used to test for significant difference in the diversity indices and abundance in the three locations. A total of 65 species from 5 families were recorded during this study. Cultivated area had the highest number of 62 species; developed area had 50 species while undeveloped areas had 56 species. The result also revealed that *Junonia oenone* is the most abundant with the sighting frequency of 30, followed by *Hamanumida daedalus* with 22 and the butterfly species with least frequency of occurrence are: *Cymothe coccinata, Ypthima vuattouxi, Cyrestia camillus, Eupaedra ihermis, Hypolycaena philippus* with a sighting frequency of 1. The result from ANOVA and Diversity indices shows that there is no significant difference in diversity between the three locations. The study has shown that we have diverse species of butterflies at Obafemi Awolowo University. Comparison of butterfly research with other countries shows that Nigeria is far behind making most of the recorded species not yet assessed under the IUCN list. Encouraging that more research should be done on butterfly.

Keywords: Abundance, Diversity, Location, Checklist, Species

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 [1]. 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. These collectively provide a wide range of environmental benefits, including pollination and natural pest control. They are pollinators [2], silk producers for textile industries and good indicators of the ecological quality of a habitat [3]. 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 [4] 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 [5]. There is a disparity in the ecological niche for different habitats and many species of plants and animals are limited in ecological capabilities yet some are constrained to one or a small set of habitat. Several animal species could tolerate only

a limited level of human disturbances in their natural environments [5]. This is of special significance to Nigerian landscapes where human impact on land use for several hundreds of years changed the great majority of natural habitats. Butterflies, unlike most of other groups of insects, are popular, well documented, and easy to recognize. They are well adapted to the landscape and react quickly to any alteration in their habitat as a result of human-induced activities such as farmland intensification [6] and intensive logging. A viable butterfly population depends on a connection of breeding habitats scattered over the landscape which makes butterflies particularly susceptible to habitat fragmentation [7]. Moreover, the phenomenon of climate change affects quite a lot of butterflies and this has been used as a model to predict the impact of climate change on wildlife. This, however, has made butterflies one of the best species groups for monitoring biodiversity changes. To this effect, Brown [8] identified that plant plays an important role in butterfly biodiversity, emphasizing that the value of the diversity of any ecosystem is viewed from the perspective of the number of species.

The greatest threats to butterflies are habitat loss due to residential, commercial and agricultural development. A remarkable decline in butterfly diversity is becoming increasingly evident. Losses are largely caused by human activities [9]. Indeed, concern for the status of the earth's biodiversity (to which butterflies are part) 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 [10]. Butterflies are an indicator species, these creatures 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 [11]. So there is a great need to know and study their abundance and distribution 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 [11]. Looking at these species helps know how healthy the campus is. What species of butterflies are at Obafemi Awolowo University? What are their proportion and distribution? By knowing answers to these questions will help know the problem in the environment and how to tackle it. The diversity of butterfly communities has been studied in different parts of the world including Asia. Few studies has been done in the study area and these include [12-15] but there is a need for more studies on the diversity of butterflies in Nigeria especially in Obafemi Awolowo University. This study, therefore, seeks to explore the Lepidopteran fauna of the three varying habitats in Obafemi Awolowo University Ile-Ife, South-western Nigeria so as to update or provide new data on Nigerian butterfly fauna.

MATERIALS AND METHOD

Study Area

Ile-Ife, also called Ife town in Osun state of south-western Nigeria, is one of the larger centres and probably the oldest town of the Yoruba people. Physically, the city of Ile – Ife is surrounded by hills. As a result of these hills, the town itself was built in a bowl – like physical layout which provides it with security. Ile-Ife is located within the tropical savannah climate zone of West Africa. It has an average rainfall of 1000-1250 mm usually from March to October and a mean relative humidity of 75% to 100%. Ife is west of the city of Ibadan and connected to it through the Ife-Ibadan highway. The study area, Obafemi Awolowo University is located in the city of Ile-Ife in Osun State of Nigeria (Figure 1). There is the Opa River and reservoir that serves as a water treatment facility for Obafemi Awolowo University. Its coordinates are 7°31′06″N 4°31′22″E (Obafemi AwolowoUniversity Ile-Ife) (www.Latlong.net). Campus size of 2,020 hectares and a population of about 35,000 students.
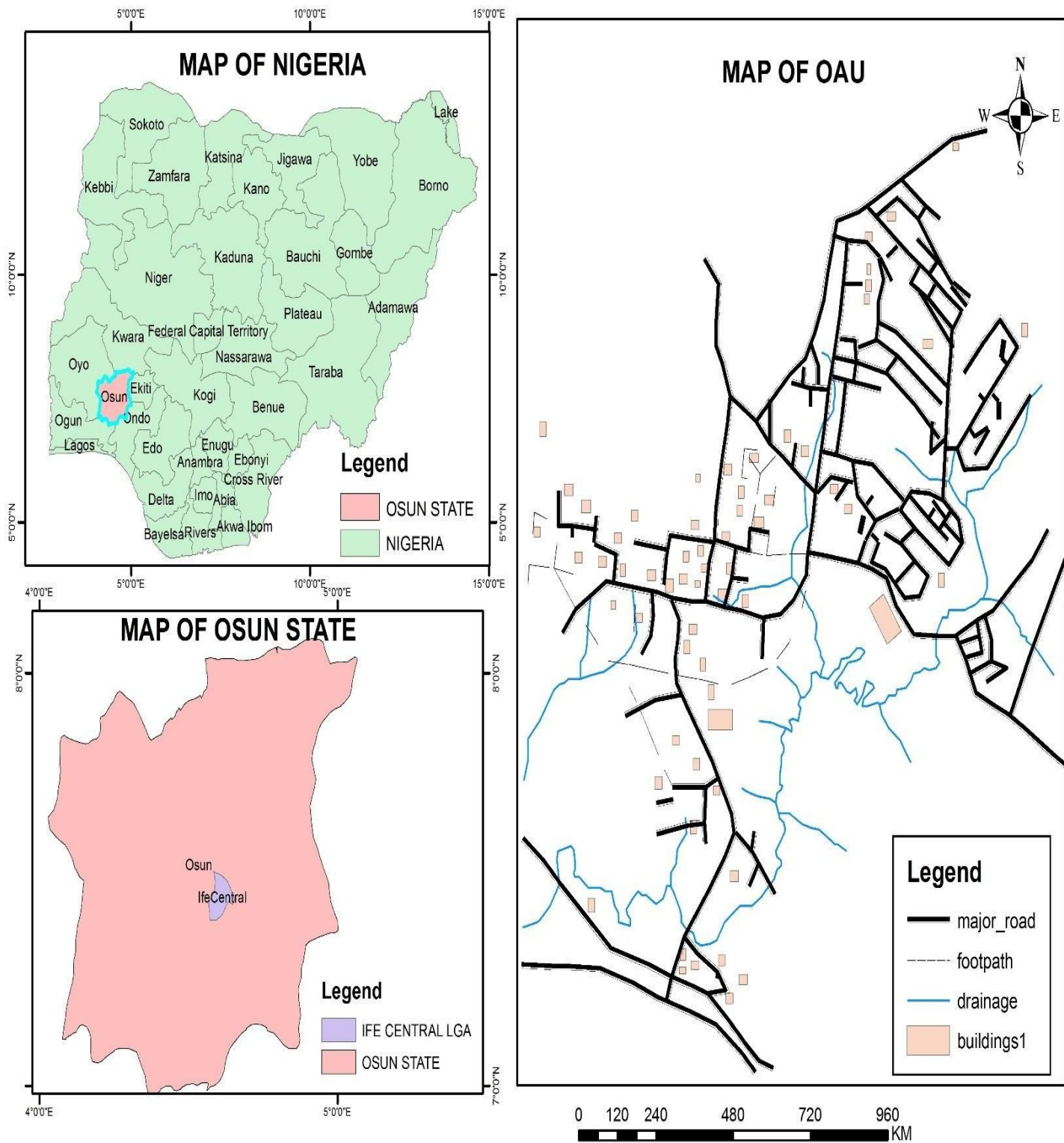
Figure 1: Map showing the study area

Data Collection

The study area was stratified into three locations developed, cultivated and undeveloped which all have replicates as follows: Developed area (Site 1; Museum environment, Site 2 Sport complex/

church areas); cultivated area (Site 3; Parks and gardens, Site 4 Park at the gate); and undeveloped area (Site 5; Research farm, Site 6 Mountain area). This study made us of both direct and indirect methods of insect collection. The direct insect collection by butterfly net (Hand net) and indirect butterfly bait trap with feeder follow after the procedure of [16].

The butterfly bait trap was locally constructed using white mosquito net based on the specification of [16] following carefully the dimensions and made modification based on other literature. In which the length was 100 cm, diameter of 38 cm, plate holder is 20 cm in diameter, the bait used were mango and pineapple; this was hung on a branch. The trap was hung 5m away from the ground. The trap was checked every day to harvest the tapped butterflies [16]. The hand net used during this study was made of net like fabric with a diameter of 60 cm it was gotten from the Natural History Museum in Obafemi Awolowo Univerity, Ile-Ife. It was made of a light metal handle and white net like fabric, of 60 cm in diameter with one open end and the other end closed.

Procedure of the butterfly collection in this study is as follows

Bait traps (Image 1) were used during the research and different numbers were placed in different sites depending on the size covering cultivated area, parks and garden, and undeveloped areas. Each stratified location was worked on simultaneously. Butterfly nets (Image 2) were also used during collection, sampling was carried out every weekday, and collection was conducted for about five hours each day between 08:30 and 14:00 hrs. All captured butterflies were killed in a killing jar containing ethanol soaked in cotton wool. Samples were pinned using number 2 and 3 entomological pins depending on it size then oven dried and stored in insect box and for identification at Natural History Museum, Obafemi Awolowo University, Ile-Ife. The species that couldn't be identified was sent to Lepidoteran expert Jon Baker for identification.

Image 1: Constructed butterfly bait trap

Image 2: Butterfly net used during the research

Statistical Analysis

The collected data was subjected to analysis using descriptive and inferential statistics. The descriptive gave the summaries of raw data which is represented in tabular forms showing the species composition, distribution and abundance. Data from the different sites was analysed with descriptive statistics and variance from different sites were also compared. Further analysis done include diversity indices (Dominance, Shannon's Wiener and Evenness) using PAST Software (Version 16) while ANOVA was used to test for significant difference in the diversity indices in the three locations.

RESULTS AND DISSCUSSION

A total 65 species and 5 families were recorded. For developed area a total of 50 species from 5 families, the cultivated area a total of 62 species from 5 families and the undeveloped as an estimate of 56 species from 5 families. Some species tend to be evenly distributed among all locations while some were not. Table 1 shows a checklist of all butterfly species observed at the study area. The result also revealed that *Junonia oenone* is the most abundant with the sighting frequency of 30 Hertz, followed by *Hamanumida daedalus* 22 and the butterfly species with least frequency of occurrence are, *Cymothe coccinata, Ypthima vuattouxi, Cyrestia camillus, Eupaedra ihermis, Hypolycaena philippus* with a sighting frequency of 1 Hertz (Table 2).

The Table 1 shows that most of the butterfly species have not been assessed with only five been assessed with IUCN status of LC (least concerned).

Table 1: The checklist of the butterfly species observed in the study area

Family / Subfamily	Scientific Name	Common Name	IUCN Status
Nymphalidae			
Nymphalinae	*Vanessa atalanta*	Red admiral	**LC***
	Hypolimnas anthedon	variable eggfly	**NA**
	Junonia oenone	Dark blue pasnsy	**LC***
	Hypolimnas misippus	Diadem	**NA**
	Junonia sophia	little commodore	**NA**
	Junonia chorimene	golden pansy	**NA**
	Junonia terea	soldier commodore	**NA**
	Precis pelarga	fashion commodore	**NA**
Danainae			
	Danaus chrysippus	Common tiger	**LC***
	Amauris damocles	small monk	**NA**
Limenitidinae			
	Cymothoe sangaris	Blood red glider	**NA**
	Cymothe coccinata	common red glider	**NA**
	Pseudacraea lucretia	false diadem	**NA**
	Hamanumida daedalus	Guineafowl	**NA**
	Euphaedra medon	wildspread forester	**NA**
	Euphaedra ihermis		**NA**
	Cymothoe theobene	angular glider	**LC***
	Euphaedra proserpina	splendid Ceres forester	**NA**
	Aterica galena galena	forest glide nymph	**NA**
	Euphaedra viridicaerulea	brown-patch ceres forester	**NA**
	Neptis morose	savannah sailer	**NA**
Satyrinae			
	Ypthima vuattouxi	vuattouxi ringlet	**NA**
	Elymniopsis bammakoo	African palmfly	**NA**

	Melanitis leda	**common evening brown**	**NA**
	Bicyclus dorothea	**light bush brown**	**NA**
	Bicyclus pavonis	rock bush brown	**NA**
Cyrestinae			
	Cyrestia camillus	African map butterfly	**NA**
Heliconiinae			
	Acraea orestia	glassy Acraea	**NA**
	Acraea serena	dancing Acraea	**NA**
	Acraea egina	elegant acraea	**NA**
	Acraea encedon	common acraea	**NA**
Charaxinae			
	Charaxes tiridates	common blue charaxes	**NA**
Papilionidae			
Papilioninae			
	Papilio machaon	old world swallowtail	**NA**
	Battus polydamas	gold rim swallowtail	**NA**
	Papilio dardanus	African swallowtail	**NA**
	Papilio nireus	blue banded swallowtail	**NA**
	Papilio demodocus	citrus swallowtail	**NA**
	Papilio sosia	medium green-banded swallowtail	**NA**
	Papilio chrapkowskoides	broadly green-banded swallowtail	**NA**
	Graphium leonidas	veined swordtail	**NA**
Pieridae			
Pierinae			
	Leptosia medusa	dainty spirit	**NA**
	Eurema hecabe	common grass yellow	**NA**
	Hebomoia glaucippe	great orange tip	**NA**
	Colotis celimene	lilac tip	**NA**
	Colotis aurora	orange tip	**NA**

	Eurema brigitta leuce	small grass yellow	**NA**
	Belenois calypso	**calypso white**	**LC***
	Dixeia orbona	**creamy small white**	**NA**
	Mylothris chloris	common dotted border	**NA**
	Mylothris sulphurea	sulphur dotted border	**NA**
	Nepheronia argia	large vagrant	**NA**
	Nepheronia pharis	round-winged vagrant	**NA**
	Nepheronia thalassin	Cambridge vagrant	**NA**
Coliadinae			
	Catopsilia florella	African emigrant	**NA**
Hesperiidae			
Pyrginae			
	Tagiades flesus	clouded forester	**NA**
Hesperiinae			
	Borbo bevani	Bevan's swift	**NA**
	Borbo perobscura	small swift	**NA**
	Telicota ancilla	dark palm dart	**NA**
	Telicota colon	pale palm dart	**NA**
	Pardaleodes incerta	savannah pathfinder skipper	**NA**
Lycaenidae			
Polyommatinae			
	Leptotis pulchra	beautiful zebra blue	**NA**
	Azanus jesous	topaz-spotted blue	**NA**
Lipteninae			
	Cephetola subcoerulea	Roche's epitola	**NA**
Miletinae			
	Spalgis lemolea	African apefly	**NA**

Theclinae			
	Hypolycaena philippus	common hairstreak	NA

Note: NA means Not assessed and LC means Least concerned

Table 2: The relative abundance of butterfly species observed in the study area

S.No. Scientific name	Occurrence	Percentage
1. Junonia oenone	30	5.85%
2. Hamanumida daedalus	22	4.29%
3. Danaus chrysippus	21	4.09%
4. Eurema hecabe	18	3.51%
5. Papilio demodocus	18	3.51%
6. Hypolimnas anthedon	17	3.31%
7. Precis pelarga	17	3.31%
8. Eurema brigitta leuce	15	2.92%
9. Belenois calypso	13	2.53%
10. Hypolimnas misippus	12	2.34%
11. Junonia sophia	12	2.34%
12. Papilio dardanus	12	2.34%
13. Mylothris chloris	12	2.34%
14. Pardaleodes incerta	11	2.14%
15. Junonia chorimene	11	2.14%
16. Graphium leonidas	11	2.14%
17. Catopsilia florella	11	2.14%
18. Nepheronia pharis	11	2.14%
19. Battus polydamas	10	1.95%
20. Amauris damocles	9	1.75%
21. Neptis morose	9	1.75%

22. Bicyclus dorothea	9	1.75%
23. Dixeia orbona	9	1.75%
24. Nepheronia argia	9	1.75%
25. Tagiades flesus	9	1.75%
26. Mylothris sulphurea	8	1.56%
27. Papiliomachaon	8	1.56%
28. Telicota ancilla	7	1.36%
29. Telicota colon	7	1.36%
30. Leptotis pulchra	7	1.36%
31. Euphaedra medon	7	1.36%
32. Acraea orestia	7	1.36%
33. Acraea encedon	7	1.36%
34. Elymniopsis bammakoo	7	1.36%
35. Papilio sosia	7	1.36%
36. Nepheroni thalassin	7	1.36%
37. Acraea serena	6	1.17%
38. Bicyclus pavonis	6	1.17%
39. Papilio nireus	6	1.17%
40. Junonia terea	5	0.97%
41. Euphaedra proserpina	5	0.97%
42. Euphaedra viridicaerulea	5	0.97%
43. Papilio chrapkowskoides	5	0.97%
44. Colotis celimene	5	0.97%
45. Borbo perobscura	5	0.97%
46. Hebomoia glaucippe	4	0.78%
47. Aterica galena galena	4	0.78%

48. *Charaxes tiridates*	4	0.78%
49. *Cymothoe sangaris*	3	0.58%
50. *Acraea egina*	3	0.58%
51. *Melanitis leda*	3	0.58%
52. *Colotis aurora*	3	0.58%
53. *Azanus jesous*	3	0.58%
54. *Cephetola subcoerulea*	3	0.58%
55. *Spalgis lemolea*	3	0.58%
56. *Vanessa atalanta*	2	0.39%
57. *Pseudacrea lacretia*	2	0.39%
58. *Cymothoe theobene/Harma theobene*	2	0.39%
59. *leptosia medusa*	2	0.39%
60. *Borbo bevani*	2	0.39%
61. *Cymothe coccinata*	1	0.19%
62. *Ypthima vuattouxi*	1	0.19%
63. *Cyrestia camillus* 64. *Eupaedra ihermis*	1 1	0.19% 0.19%
65. *Hypolycaena philippus*	1	0.19%
TOTAL	513	100.00%

The following gives the result observed at developed, cultivated and undeveloped areas respectively table 3 shows the butterflies species observed at the developed location, the result reveals that *Junonia oenone* is the most abundant with a frequency of occurrence of 9 and a percentage frequency of 6%, followed by *Danaus chrysippus, Hamanumida daedalus, Papilio demodocus* with all having a frequency of occurrence of 7 and percentage frequency of 4.61%, and with the least frequency of occurrence been 1 (*Pseudacrea lacretia, Cymothoe theobene/Harma theobene, Amauris damocles, Melanitis leda, Charaxes tiridates, Acraea egina, Leptosia medusa, Colotis aurora*) some of the species been represented here.

Table 4 reflects the frequency of occurrence and percentage frequency of butterflies species observed at the cultivated areas, the result of the frequency of occurrence reveal that *Junonia oenone* is the most abundant, with a frequency of occurrence 11 and percentage frequency of 6% , followed *by Danaus chrysippus* with a frequency of occurrence of 9 and percentage frequency of 5%,

with the least recorded frequency of occurrence of 1 (*Vanessa atalanta, Cymothe coccinata, Cyrestia camillus, Pseudacrea lacretia, Cymothoe theobene, Harma theobene, Junonia terea*) showing only a few.

Table 5 shows the frequency of occurrence and percentage frequency of butterflies species recorded at the undeveloped areas, which shows that *Junonia oenone* with an abundance of 10 and a percentage frequency of 7%, followed by *Nepheronia pharis* with an occurrence frequency of 8 and a percentage frequency of 5%. With (*Cephetola subcoerulea, Spalgis lemolea, Hypolycaena philippus, Euphaedra proserpina, Papiliososia*)
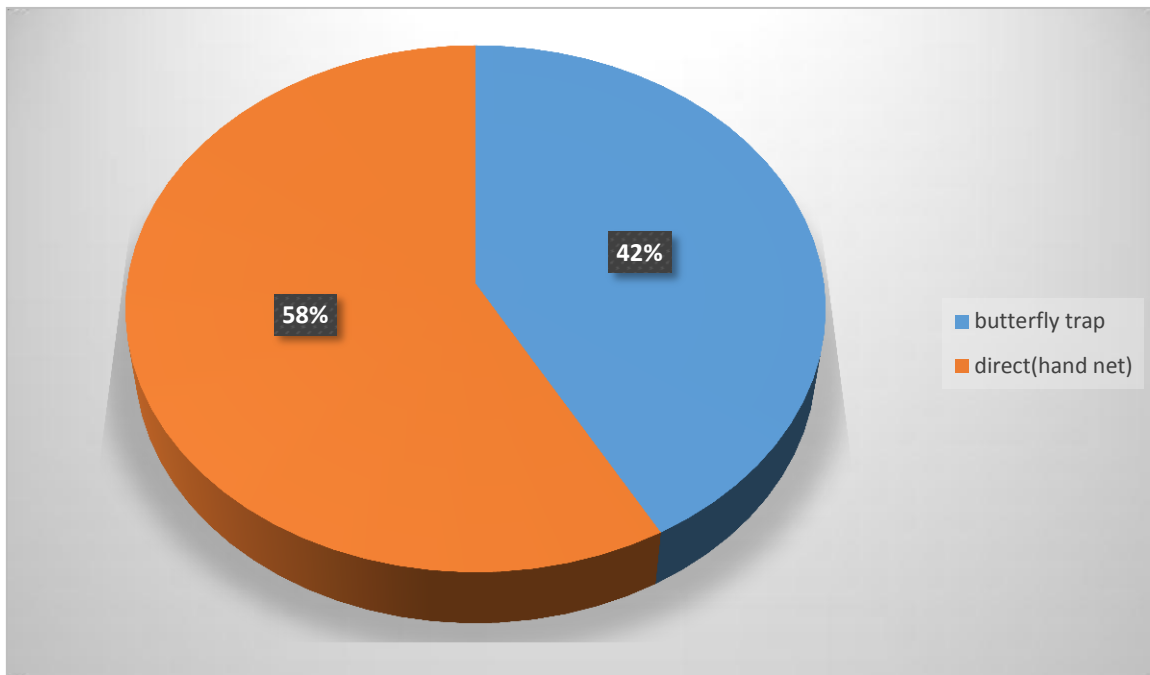

Figure 2: Percentage of butterflies based on capture method
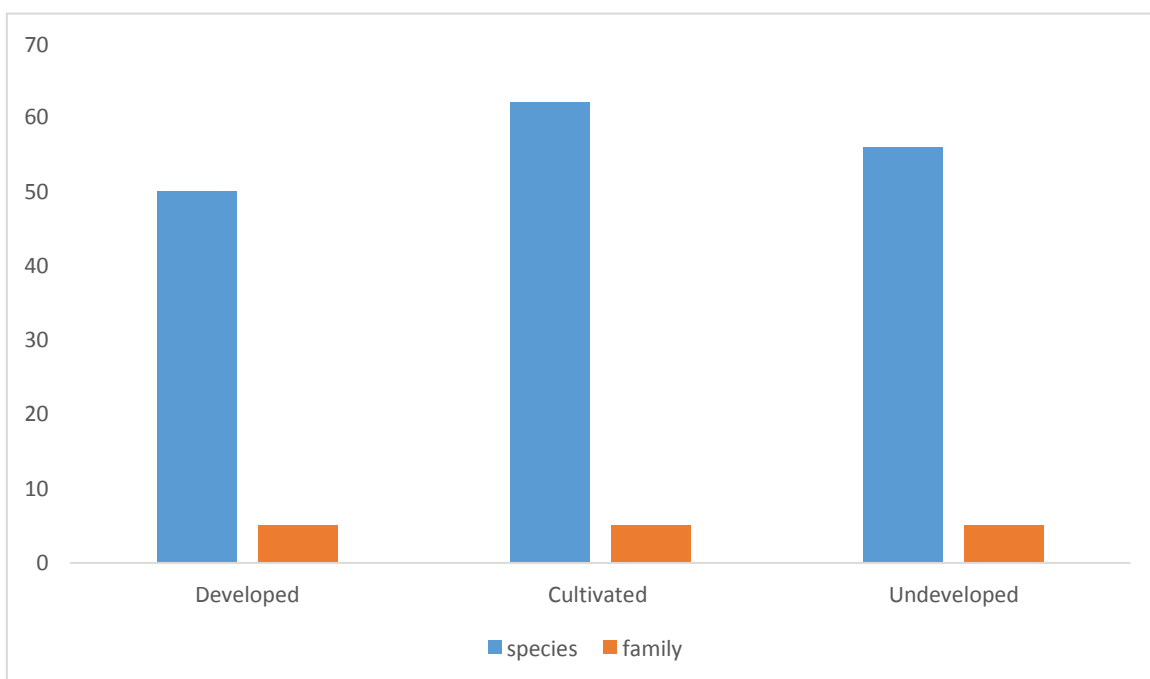

Figure 3: Chart showing the species and family distribution

Table 3: occurrence and percentage frequency of butterfly species observed at developed area

Species	Occurrence	Percentage
Junonia oenone	9	6%
Hamanumida daedalus	7	4.61%
Danaus chrysippus	7	4.61%
Papilio demodocus	7	4.61%
Hypolimnas anthedon	6	4%
Junonia sophia	6	4%
Precis pelarga	6	4%
Junonia chorimene	5	3%
Eurema hecabe	5	3%
Mylothris chloris	5	3%
Leptotis pulchra	4	3%
Hypolimna smisippus	4	3%
Neptis morose	4	3%
Bicyclus dorothea	4	3%
Graphium leonidas	4	3%
Nepheronia argia	4	3%
Dixeia orbona	3	2%
Mylothris sulphurea	3	2%
Junonia terea	3	2%
Elymniopsis bammakoo	3	2%
Bicyclus pavonis	3	2%
Papilio dardanus	3	2%
Eurema brigitta leuce	3	2%

Catopsilia florella	3	2%
Tagiades flesus	3	2%
Borbo perobscura	3	2%
Pardaleodes incerta	3	2%
Euphaedra medon	2	1%
Acraea orestia	2	1%
Acraea serena	2	1%
Acraea encedon	2	1%
Aterica galena galena	2	1%
Hebomoia glaucippe	2	1%
Papilio nireus	2	1%
Colotis celimene	2	1%
Belenois calypso	2	1%
Pseudacrea lacretia	1	1%
Cymothoe theobene/Harma theobene	1	1%
Amauris damocles	1	1%
Melanitis leda	1	1%
Charaxes tiridates	1	1%
Acraea egina	1	1%
Leptosia medusa	1	1%
Colotis aurora	1	1%
Cephetola subcoerulea	1	1%
Borbo bevani	1	1%
Telicota ancilla	1	1%
Telicota colon	1	1%
Azanus jesous	1	1%
Spalgis lemolea	1	1%
TOTAL	152	100%

Coordinates: 7.516214, 4.528229 and 7.510702, 4.516022

Table 4: occurrence and percentage frequency of butterfly species observed at cultivated area

Species	Occurrence	Percentage
Junonia oenone	11	6%
Danaus chrysippus	9	5%
Hamanumida daedalus	8	4%
Pardaleodes incerta	8	4%
Papilio dardanus	7	4%
Hypolimnas anthedon	7	4%
Papilio demodocus	7	4%
Precis pelarga	6	3%
Papilio sosia	6	3%
Graphium leonidas	6	3%
Papilio chrapkowskoides	5	3%
Eurema hecabe	5	3%
Catopsilia florella	5	3%
Papilio machaon	5	3%
Battus polydamas	5	3%
Nepheroni thalassin	4	2%
Acraea encedon	4	2%
Eurema brigitta leuce	4	2%
Papilio nireus	4	2%
Hypolimnas misippus	3	2%
Junonia sophia	3	2%
Mylothris chloris	3	2%
Nepheronia argia	3	2%
Nepheronia pharis	3	2%
Tagiades flesus	3	2%
Amauris damocles	3	2%
Euphaedra medon	3	2%
Neptis morose	3	2%
Euphaedra viridicaerulea	3	2%
Bicyclus dorothea	3	2%
Dixeia orbona	3	2%
Mylothris sulphurea	3	2%

Cymothoe sangaris	2	1%
Charaxes tiridates	2	1%
Junonia chorimene	2	1%
Elymniopsis bammakoo	2	1%
Euphaedra proserpina	2	1%
Acraea serena	2	1%
Acraea orestia	2	1%
Belenois calypso	2	1%
Telicota colon	2	1%
Leptotis pulchra	2	1%
Vanessa atalanta	1	1%
Cymothe coccinata	1	1%
Cyrestia camillus	1	1%
Pseudacrea lacretia	1	1%
Cymothoe theobene/Harma theobene	1	1%
Junonia terea	1	1%
Bicyclus pavonis	1	1%
Melanitis leda	1	1%
Aterica galena galena	1	1%
Acraea egina	1	1%
Leptosia medusa	1	1%
Hebomoia glaucippe	1	1%
Colotis celimene	1	1%
Colotis aurora	1	1%
Borbo bevani	1	1%
Borbo perobscura	1	1%
Telicota ancilla	1	1%
Spalgis lemolea	1	1%
Cephetola subcoerulea	1	1%
Azanus jesous	1	1%
TOTAL	195	100%

Coordinates: 7.522280, 4.529752 and 7.498935, 4.523308

Table 5: occurrence and percentage frequency of butterfly species observed at undeveloped areas

Species	Occurrence	Percentage
Junonia oenone	10	7%
Nepheronia pharis	8	5%
Hamanumida daedalus	7	5%
Telicota ancilla	5	3%
Battus polydamas	5	3%
Danaus chrysippus	5	3%
Amauris damocles	5	3%
Hypolimnas misippus	5	3%
Precis pelarga	5	3%
Eurema hecabe	4	3%
Papilio demodocus	4	3%
Mylothris chloris	4	3%
Hypolimnas anthedon	4	3%
Junonia chorimene	4	3%
Eurema brigitta leuce	4	3%
Papilio machaon	3	2%
Dixeia orbona	3	2%
Nepheroni thalassin	3	2%
Tagiades flesus	3	2%
Telicota colon	3	2%
Acraea orestia	3	2%
Junonia sophia	3	2%

Catopsilia florella	3	2%
Belenois calypso	3	2%
Cymothoe sangaris	2	1%
Neptis morose	2	1%
Papilio dardanus	2	1%
Colotis celimene	2	1%
Mylothris sulphurea	2	1%
Nepheronia argia	2	1%
Euphaedra medon	2	1%
Acraea serena	2	1%
Elymniopsis bammakoo	2	1%
Bicyclus dorothea	2	1%
Bicyclus pavonis	2	1%
Euphaedra viridicaerulea	2	1%
Vanessa atalanta	1	1%
Ypthima vuattouxi	1	1%
Eupaedra ihermis	1	1%
Acraea egina	1	1%
Junonia terea	1	1%
Acraea encedon	1	1%
Aterica galena galena	1	1%
Melanitis leda	1	1%
Charaxes tiridates	1	1%
Graphium leonidas	1	1%
Hebomoia glaucippe	1	1%
Colotis aurora	1	1%
Borbo perobscura	1	1%
Leptotis pulchra	1	1%
Azanus jesous	1	1%
Cephetola subcoerulea	1	1%

Spalgis lemolea	1	1%
Hypolycaena philippus	1	1%
Euphaedra Proserpina	1	1%
Papilio sosia	1	1%
TOTAL	150	100%

Coordinates: 7.516288, 4.541997 and 7.529210, 4.526385

Diversity indices (Table 6), these shows little difference between the locations (developed, cultivated and undeveloped) concluding that some species are not evenly distributed in the three environments.

And the analysis from ANOVA the p-value is greater than 0.05, therefore, we accept the Ho (there is no significant difference in the abundance and distribution of butterfly species at Obafemi Awolowo University Ile-Ife). After running all diversity indices used through Analysis of variance it all gave a p-value greater than 0.05 which shows there is no significant difference.

Table 6: Diversity indices

Diversity indices	DEVELOPED		CULTIVATED		UNDEVELOPED	
	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	SITE 6
Dominance_D	0.03365	0.0454	0.02492	0.06063	0.02681	0.0584
Shannon_H	3.518	3.184	3.878	2.889	3.807	3.5057
Evenness_e^H/S	0.8432	0.8942	0.8057	0.8989	0.8188	0.8181

Species distribution and abundance

During the research, about 65 species of butterfly was identified. This study discovered additional butterfly species of Obafemi Awolowo University that were not reported in the work of [15]. With 5 families identified, which is lesser than that recorded by [17] who recorded 9 families. In developed location, a total species composition of 50 was observed, while cultivated area recorded an estimate of 62 species composition. Undeveloped areas recorded an estimate of 56 as shown in Figure 3. The above-revealed estimates show that cultivated areas have the highest abundance and diversity of butterfly species (Table 6), followed by undeveloped and the least species composition at developed areas. This result marked a relatively high diversity of butterfly species in Obafemi Awolowo University, which is in line with the work of [15] and [17], The result is further corroborated by [4,18] and [8] who reported rich butterfly fauna in typical tropical rainforest areas. Nymphalidae as the highest frequency of occurrence of 32 and a percentage frequency of 49.2%

which is supported by the work of [15]. Nymphalidae in high numbers has implications for pollination in this area, since they are known to be among the exceptional fruit-feeding butterfly community. The probable reason for this could be that the study-area provides a better opportunity for these species in terms of larval host plants and nectar plants. Some species were only found at one location, some two and some are widely distributed all through the study area, the most distributed species are; *Junonia oenone and Hamanumida daedalus*. The result also reveal that Parks and Garden which is grouped under the cultivated area, followed by Teaching and Research Farm which is grouped under undeveloped area, this support the work of Amusan *et al.*(2014) [15]. The probable reason behind this numerical difference is that Parks and Garden and Teaching and Research Farm have large water resources, tree plantations and grassland areas providing various breeding sites for different butterfly species.

CONCLUSION

The study has shown that we have diverse species of butterflies at Obafemi Awolowo University, with over 70 species of butterfly were sighted, with 65 identified in the course of the research. The total number of butterflies recorded in this research is 513, with *Junonia oenone* been the most distributed and most abundant in the study area, with parks and garden been the best location for butterfly viewing. Butterflies are insect that are crucial 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.

RECOMMENDATION

More research should be carried out on butterfly in the country so as to address the issues of lack and inadequate data and materials on butterfly, work should be done based on seasons so as to provide a full checklist of butterfly species in Nigeria and to know their conservation status. Also the butterfly bait traps should be further worked on and modified using black side and white roof as against what used in this research which was all white and different bait should be further worked on and for the trap.

Comparison of butterfly research with other countries shows that Nigeria is far behind making most of the recorded species not yet assessed under the IUCN list. Public awareness should be made to increase the interest of the people especially the school children to butterfly, which in turn will increase the conservation rate.

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