

# Journal of Biological Research & Biotechnology

Bio-Research Vol. 18 No.1; pp. 1071-1077 (2020). ISSN (print): 1596-7409; eISSN (online):9876-5432

---

---

## Checklist and Comparison of Butterfly Species found in Zoological and Botanical Gardens, University of Nigeria, Nsukka, Enugu State, Nigeria.

§<sup>1</sup>Echude D, <sup>2</sup>Amobi MI, <sup>3</sup>Umar SU, <sup>1</sup>Ezenwa IM and <sup>1</sup>Okechukwu CN

<sup>1</sup>Department of Zoology and Environmental Biology, University of Nigeria, Nsukka, Enugu State, Nigeria.

<sup>2</sup>Department of Biological Sciences, Federal University of Kashere, Gombe State, Nigeria.

<sup>3</sup>Department of Zoology and Environmental Biology, Kogi State University, Anyigba, Nigeria.

§Corresponding author: Echude Daniel. Email/Phone: daniel.echude@unn.edu.ng, +2348037754452

### Abstract

Butterflies are creatures of nature with great economic importance as pollinators and bio-indicators. This study provides checklist of butterfly species present in Zoological and Botanical gardens of University of Nigeria, Nsukka and was conducted for three Months. Butterflies were sampled twice a week between 7.00 -10.00am from May to July 2019; using sweep net along existing transects within the gardens. Non-invasive method was adopted, butterflies were captured, photographed and released. Photographed samples were identified to species level by cross matching with relevant keys. A total of 91 butterflies belonging to 16 species, 10 genera and 3 families were sampled. Alpha diversity test showed a significant difference ( $p < 0.05$ ) in terms of Relative Abundance, Diversity and Dominance of butterfly species between the two gardens. The Botanical garden had Relative Abundance of 63.73%, Dominance of 0.23 which was higher compared to Zoological garden which had 36.16% and 0.10; but these was contrary to species diversity where Zoological garden was more diverse ( $H^1=2.48$ ) than botanical garden ( $H^1=1.82$ ). The differences observed could be attributed to variations in vegetation composition.

**Keywords:** Botanical, Butterflies, Gardens, Vegetation, Zoological.

<https://dx.doi.org/10.4314/br.v18i1.1> This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by-nc-nd/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. Journal Homepage: <http://www.bioresearch.com.ng>.  
Publisher: **Faculty of Biological Sciences, University of Nigeria, Nsukka, Nigeria.**

### INTRODUCTION

Butterflies are creature of nature with great economic importance as efficient pollinators and bio-indicators of the environment (Farzana and Fatima, 2013). They are one of the most

taxonomically studied group of diurnal flying insects and belongs to the second largest order Lepidoptera of the phylum arthropod (Yarger *et al.*, 2016). There are more than 28,000 species

of butterflies distributed across the globe with about 80% found in the tropics (Larson *et al.*, 2001). As pollinators, they increase plants diversity, crop production, seeds and fruits; therefore, they indirectly sustain the survival of other flora and fauna in the ecosystem (Maheshwari, 2003). As bio-indicators, they indicate the health status of an environment and also serve as surrogates for whole biodiversity (Bonebrake and Sorto, 2009). Butterflies wide geographical distribution, ease of sampling and quick response to environmental changes qualifies them as good candidate for bio-indicator therefore, their estimation within a given ecosystem is necessary for biological assessment of the ecosystem (Farzana and Fatima, 2013). This work provided a checklist of butterfly species present in the study area.

## MATERIALS AND METHODS

### Study area

This study was carried out in both Zoological and Botanical gardens of the University of Nigeria, Nsukka Campus. The Zoological garden which was fenced with wire covered an area of 161,700m<sup>2</sup> (10,500m × 15,400m) has a coordinate of 6°51'57.79"N and 7°24'40.63"E, elevation of 397.154m above sea level. It harbors wild animals such as Monkeys (*Chlorocebus pygerythrus*), Chimpanzee (*Pan troglodytes*), Alligator (*Alligator mississippiensis*), Crocodile (*Crocodylus niloticus*), land tortoise (*Geochelone elegans*) and Python (*Python sebae*) all caged. It served as external laboratory for research for the students of Department of Zoology and Environmental Biology and also as recreational park for relaxation and frequently visited by secondary school and higher institution students for excursion. Species of trees such as Mango, Palm trees and some ornamental flowers were identified within the garden. It as a natural footpath created by visitors and workers in the garden. The Botanical garden is separated from the Zoological garden by a wire gauze, both gardens are adjacent each other. The Botanical garden covered an area of 80,850000m<sup>2</sup> (5250m × 15400m), located on a coordinate of 6°51'56.29"N, 7°24'43.2"E and elevation of 391.67m and made up majorly of ornamental plants.

### Sampling procedure and identification

Butterflies were sampled twice a week during the morning hours (7.00-10.00 am) using sweep net of metal handle 121cm, circular mouth of 76cm, diameter 26cm and depth 64cm along existing transects not less than 100m within the gardens. Non-invasive method was adopted; each butterfly caught was photographed with camera (Samsung NX 50-200mm f/ 4.0-5.6 OIS Zoom camera lens) and released back into the garden. The photographed samples were used for identification to species level by cross matching with relevant keys at the crop protection Department, Entomology laboratory, Ahmadu Bello University, Zaria, Nigeria.

### Statistical analysis

Data obtained were subjected to different analysis. Relative abundance of butterflies was calculated using the formula by Braimah and Popoola (2018). Shannon Wiener Diversity (H<sup>1</sup>) and Simpson Dominance (D) were analysed using PAST3 software and t-Test was analysed using R statistical software package (386.3.3.2 version).

### Relative abundance:

This was obtained by dividing the number of arthropods of a particular species with the total number of arthropods species sampled and multiplying by 100

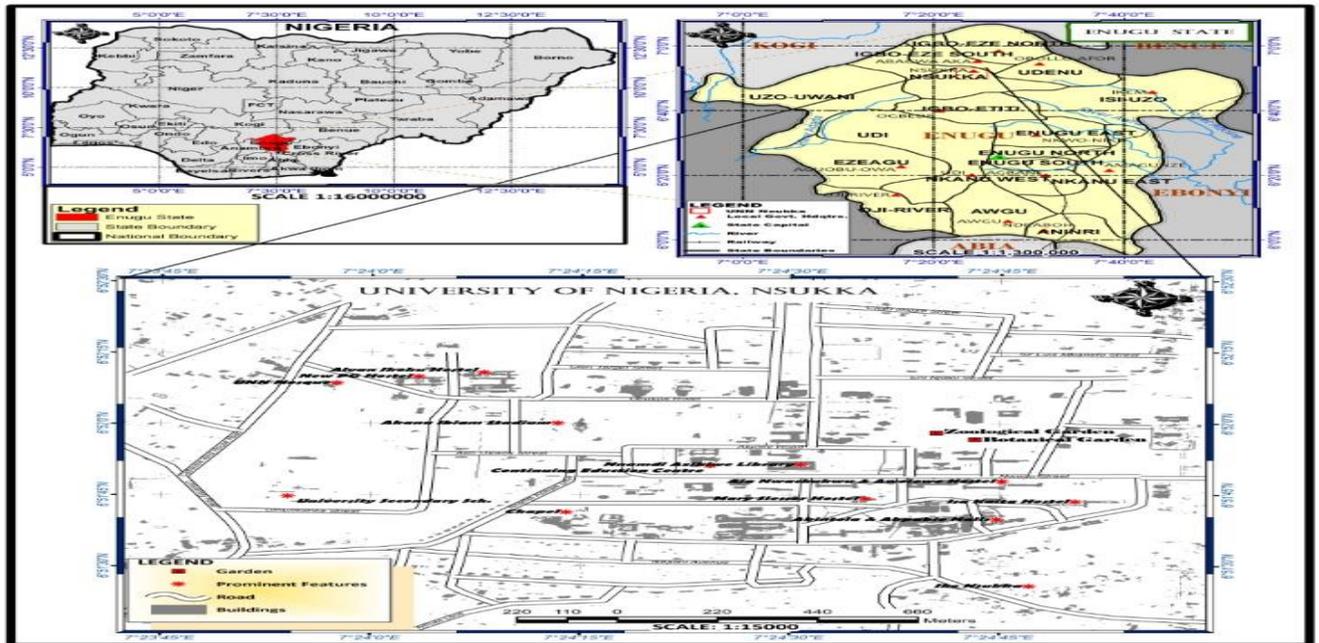


Figure 1: Location of study sites.

Table 1: Species Compositions and Relative Abundance of Butterfly Species Sampled (all are of the order Rhopalocera).

F	Scientific name	Common Name	NC	RA
N	<i>Acraea eponina</i> (Crammer, 1780)	Orange Acraea Butterfly	3	3.29
N	<i>Acraea pharsalus</i> (Ward, 1871)	East African Foresy Acraea Butterfly	5	5.49
N	<i>Acraea terpscote</i> (Linnaeus, 1758)	Tawny Coster Butterfly	8	8.79
N	<i>Acraea uvui</i> (Schultze, 1920)	Tiny mountain Acraea Butterfly	2	2.19
N	<i>Precis oenone</i> (Fabricius, 1807)	Dark Blue Pansy butterfly	7	7.69
N	<i>Bebearia oxione</i> (Hewitson, 1866)	Banded Forester Butterfly	3	3.29
N	<i>Euphaedra medon</i> (Linnaeus, 1763)	Widespread Forester Butterfly	2	2.19
N	<i>Hypolimnas dubius</i> (Beauvaus, 1805)	Great Eggfly butterfly	1	1.09
N	<i>Bicyclus safitza</i> (Westwood, 1850)	Common savanna bush brown	31	34.1
N	<i>Melanitis leda</i> (Durry, 1773)	Common evening brown butterfly	5	5.49
N	<i>Bicyclus auricruda</i> (Buttler, 1879)	Small marbled bush brown butterfly	11	12.1
<b>ST</b>			<b>78</b>	<b>85.7</b>
P	<i>Papilio demoleus</i> (Linnaeus, 1758)	Swallowtail Butterfly	2	2.19
P	<i>Papilio nireus</i> (Linnaeus, 1758)	African Blue-banded Swallowtai	1	1.09
P	<i>Papilio sosia</i> (Rothschild, 1903)	Medium Green-banded Swallowtail	1	1.09
<b>ST</b>			<b>4</b>	<b>4.39</b>
Pi	<i>Eurema senegalensis</i> (Boisduval, 1836)	Forest Grass Yellow Butterfly	5	5.49
Pi	<i>Pseudopontia paradoxa</i> (Plötz, 1870)	Wet Forest Butterfly	4	4.39
<b>ST</b>			<b>9</b>	<b>9.89</b>
			<b>91</b>	<b>100</b>

\*F= Family, N= Nymphalidae, P= Papilionidae, Pi= Pieridae, ST= Subtotal, T=Total, NC= Number caught, RA=Relative Abundance.

**Table 2:** Species Compositions and Relative Abundance Based on Garden (all are of the order Rhopalocera).

F	Species	Garden	NC	RA
N	<i>Acraea eponina</i> (Crammer, 1780)	1	3	3.29
N	<i>Precis oenone</i> (Fabricius, 1807)	1	9	10.88
N	<i>Bicyclus safitza</i> (Westwood)	1	24	26.37
N	<i>Melanitis leda</i> (Durry, 1773)	1	4	4.39
N	<i>Bicyclus auricruda</i> (Butler, 1879)	1	11	12.08
P	<i>Papilio demoleus</i> (Linnaeus, 1758)	1	1	1.09
P	<i>Papilio nireus</i> (Linnaeus 1758)	1	1	1.09
Pi	<i>Eurema senegalensis</i> (Boisduval ,1836)	1	3	3.29
Pi	<i>Pseudopontia paradoxa</i> (Plötz, 1870)	1	2	2.19
		<b>Total</b>	<b>58</b>	<b>63.73</b>
N	<i>Acraea pharsalus</i> (Ward, 1871)	2	5	5.49
N	<i>Acraea terpiscore</i> (Linnaeus, 1758)	2	3	3.28
N	<i>Acraea uvui</i> (Schultze, 1920)	2	2	2.19
N	<i>Bebearia oxione</i> (Hewitson, 1866)	2	3	3.28
N	<i>Euphaedra medon</i> (Linnaeus, 1763)	2	2	2.19
N	<i>Hypolimnas dubius</i> (Beauvaus, 1805)	2	1	1.09
N	<i>Precis oenone</i> (Fabricius, 1807)	2	3	3.29
N	<i>Bicyclus safitza</i> (Westwood,1850)	2	7	7.69
N	<i>Melanitis leda</i> (Durry, 1773)	2	1	1.09
P	<i>Papilio demoleus</i> (Linnaeus, 1758)	2	1	1.09
P	<i>Papilio sosia</i> (Rothschild, 1903)	2	1	1.09
Pi	<i>Eurema senegalensis</i> (Boisduval, 1836)	2	2	2.19
Pi	<i>Pseudopontia paradoxa</i> (Plötz, 1870)	2	2	2.19
		<b>Total</b>	<b>33</b>	<b>36.16</b>
		<b>Grand Total</b>	<b>91</b>	<b>100</b>

\* F= Family, N= Nymphalidae, P= Papilionidae, Pi= Pieridae, NC = Number caught, RA =Relative Abundance; 1 = Botanical Garden; 2 =Zoological Garden

## RESULTS

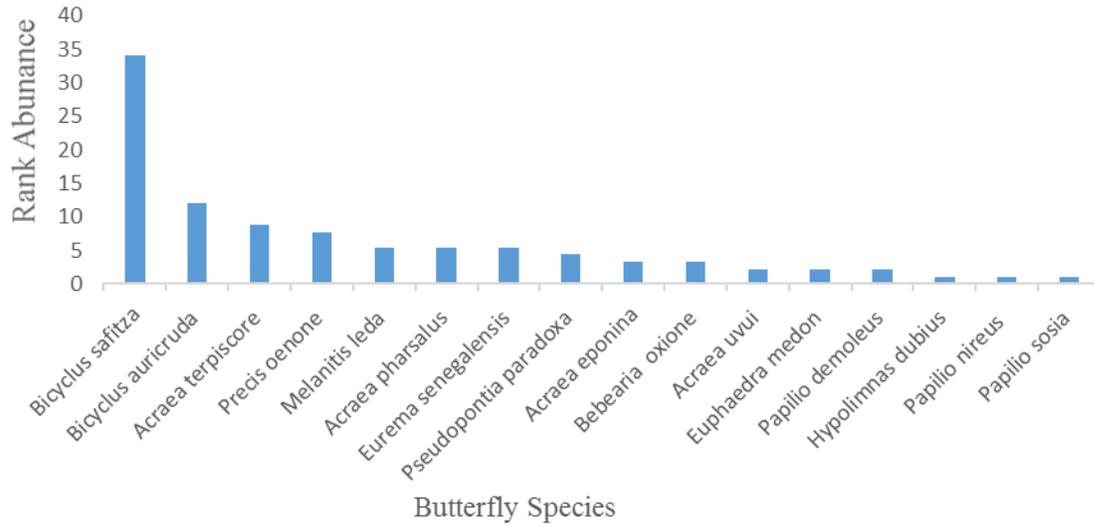


Figure 2: Rank abundance of Butterfly species sampled in both gardens.

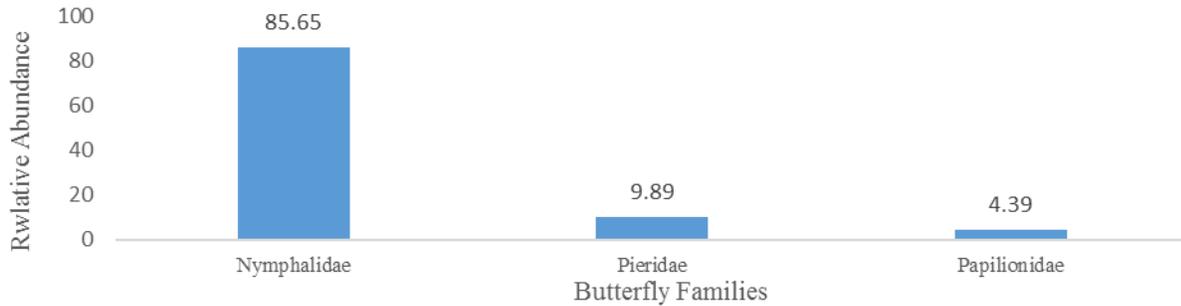


Figure 3: Rank abundance of Butterfly based on family

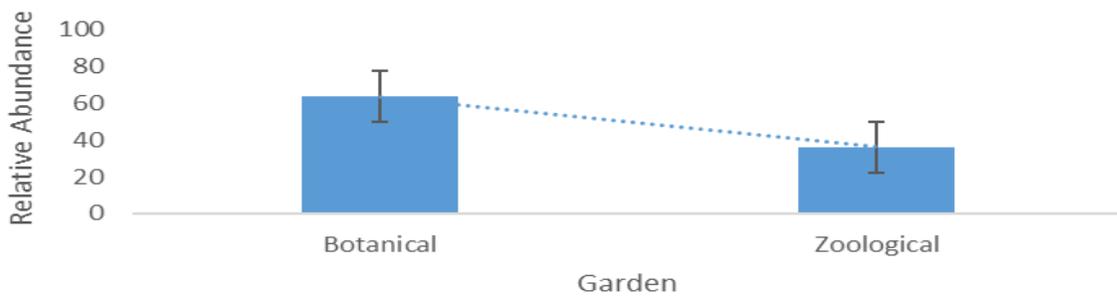


Figure 4: Relative abundance of Butterfly species between the two gardens. Independent *t*-Test ( $P < 0.001$ )

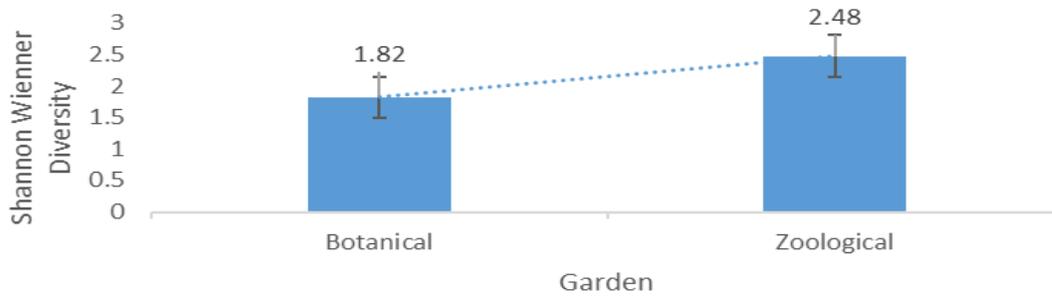


Figure 5: Diversity of Butterfly species between the two gardens. Independent *t*-Test ( $P < 0.05$ )

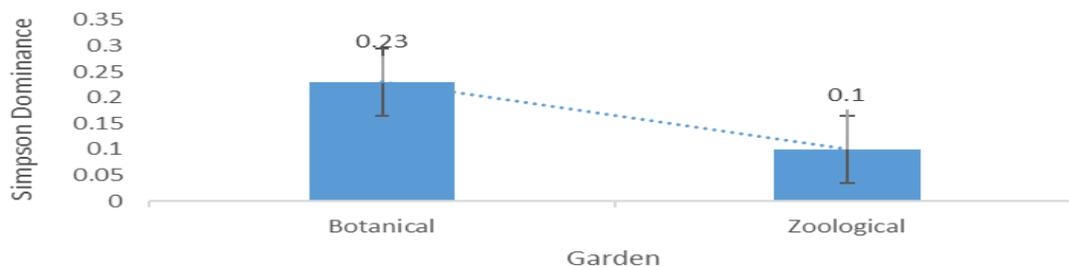


Figure 6: Simpson dominance of Butterfly species between the two gardens. Independent *t*-Test ( $P < 0.05$ ).

## DISCUSSION

### Species compositions and Relative Abundance of Butterflies sampled between the two gardens.

A total of 91 individuals belonging to 16 species, 10 genera and 3 families were recorded during the study from both gardens (Table1). The Botanical garden has 58 individuals belonging to 10 species, 7 genera and 3 families while Zoological garden has 33 individuals belonging to 13 species, 10 genera and 3 families (Table 2). On the basis of species collected, *Bicyclus safitza* had the highest relative abundance (34.06), followed by *Bicyclus auricruda* (12.08), *Precis oenone*, (7.69), *Acraea pharsalus*, *Acraea terpiscore*, *Eurema senegalensis*, and *Melanitis leda* ( $n=5.49$ ), *Pseudopontia paradoxa* ( $n=4.39$ ), *Acraea eponina* and *Bebearia oxione* (3.29), *Acraea uvuli*, *Euphaedra medon*, and *Papilio demoleus* (2.19) while *Hypolimys dubius*, *Papilio nireus* and *Papilio sosia* had the least number and ranking (1.09) Table 2 and Figure 2. In-terms of family relative abundance Nymphalidae had the highest (85.65) followed by Pieridae (9.98%) while Papilionidae was the least (4.39) Figure 3. The high relative abundance of Nymphalidae in this work agreed with the observation of Bhuyan *et al.*, (2002), a preliminary study on the Butterflies of Regional Research Laboratory Campus, Jorhat, Assam. A total of 70 species of Butterflies belonging to 45 genera were recorded. Out of the five families, Nymphalidae was found to be dominant contributing 40 different species. Also, with the work of Ali *et al.*, (2000), a study carried out in Zoo-Cum-Botanical garden, Guwahati, they recorded 72 species belonging to 43 genera with Nymphalidae family being dominant out of the five families. The work of Mozumdar *et al.*, (2010), a study carried out in Trishna Wildlife Sanctuary, Tripura, Assam. A total of 1,005 individuals representing 59 species in 48 genera belonging to five families were recorded. Out of these, 23 species belonged to the family Nymphalidae and accounted for 38.98% of the total species and 45.20% of the total number of individuals.

### Difference in the Relative Abundance of Butterfly species between the two gardens.

The t-Test showed a highly significant difference ( $P < 0.001$ ) in the Relative abundance of butterfly species between the two gardens. The Botanical garden had high relative abundance of 63.73% ( $n=58$ ) compared to Zoological garden which had 36.16% ( $n=33$ ) Figure 4. This may be attributed to the level of anthropogenic activities taken place in each garden. The Zoological garden has much human activities than the Botanical garden. The animals in the Zoological garden attracts excursionist, students and researchers visiting frequently compared to the Botanical garden. This difference observed in this work agrees with the observation of Nwosu and Iwu (2011), were they reported that rich butterfly species are found in protected areas with flowering and ornamental plants. The Botanical garden has much ornamental plants and less human activities as compared to the Zoological garden.

### Species Diversity and Dominance between the two gardens.

Alpha Diversity test showed a highly significant difference ( $p < 0.05$ ) in terms of Shannon and Simpson indices between the two gardens. The Zoological garden was more diverse ( $H^1=2.48$ ) than Botanical garden ( $H^1=1.82$ ) Figure 5. While in terms of Dominance the Botanical garden was higher ( $D = 0.23$ ) than the Zoological garden ( $D = 0.10$ ) Figure 6. The high diversity of butterflies in the Zoological garden may be attributed to the presence of different species of fruiting trees such as *Magnifera indica*, *Gmelina aborea* and *Elaeis guineensis* identified during the study; unlike the botanical garden that is majorly made up of ornamental plants.

### Conclusion

From the results, there was a significant difference in the relative abundance, diversities and dominance of butterfly species between the two gardens. The variations could arise as a result of different resources present in the different gardens required by different species of butterfly.

### REFERENCES

Akwashiki, B.A., Amuga, G.A., Nwansat, G.S. and Ombugadu R.J. (2007). Assessment of Butterfly Diversity in Eagle Owl Gully of Amurum Forest Reserve, Jos East Local

- Government Area, Plateau State Nigeria. *The Zoologist*, **5**:33-38.
- Ali, I. and Basistha, S.K. (2000). Butterfly Diversity of Assam State Zoo-Cum-Botanical Garden. *Zoo's Print*, **15**, 264-265.
- Bhuyan, M., Bhattacharya P.R. and Kanjilal, P.B. (2002). Preliminary study on Butterfly diversity in garbhanga reserve forest, Basistha, Assam India Supriyamodak Arup Nama Das. *Asian Resonance*, **7** (3):1-23.
- Bonebrake, T.C. and Sorto, R. (2009). Butterfly (Papilionoides and Hesperioidea) rapid assessment of a coastal countryside in EL-Salvador. *Tropical Conservation Science*, **2**: 34-51.
- Braimah, J.A. and Popoola, K.O. K. (2018). Species compositions and relative abundance of insect pests associated with stored dried cassava chips in selected markets in Oyo State, Nigeria. *International Journal of Entomology Research*, **3**(6):55-59.
- Farzana, P. and Fatima, F. (2013). Biology and distribution of butterfly fauna of Hazara University, Garden Campus, Mansehra, Pakistan. *Open Journal of Animal Sciences*, **3**(2a): 28-36.
- Larson, B.M., Kevan, P.G. and Inouye, D.W. (2001). Flies and flowers: Taxonomic diversity of anthophiles and pollinators. *Canadian Entomologist*, **133**: 439-465.
- Maheshwari, J.K. (2003). Endangered pollinators. *Environmental News Archives*, **9**: 32-45.
- Majumder, J., Lodh, R. and Agarwala, B. K. (2013). Butterfly species richness and diversity in the Trishna Wildlife Sanctuary in South Asia. *Journal of Insect Science*, **13** (79):1-13.
- Nwosu, I.C. and Iwu, C.J. (2011). A comparative study of diversity of butterflies in protected and unprotected habitats of Okwu Ogbaku forest reserve in Mbaitoli L.G.A., Imo State, Nigeria. *Journal of Environmental Issues and Agriculture in Developing Countries*, **3** (1):129-135.
- Sawehik, J., Dufrene, M. and Lebrun, P. (2005). Distribution patterns and indicator species of butterfly assemblages of wet meadows in Southern Belgium. *Belgium Journal of Zoology*, **135**: 43-52.
- Yarger, G.O., Agbidye, F.S. and Okoh, A.O. (2016.) Diversity and Abundance of Butterfly species (Lepidoptera) Fauna in Federal University of Technology, Makurdi Forestry Nursery, Benue State, Nigeria. *Journal of Research in Forestry, Wildlife and Environment*, **8** (3):83-89.