# Diversity and Abundance of Insects in Ekiti State University, Ado Ekiti

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## ABSTRACT

Insects are an integral part of our environment; their lives are inextricably interwoven with human. This study investigates the diversity and abundance of insect species in the study area. Three locations were sampled for this study which were; Nursery, Plantation, and Central Laboratory. Sampling was done bi-weekly using pitfall and yellow pan trapping methods. Pit fall trap which was used to trap ground dwelling insects and yellow pan was used to trap flying insects. A checklist was made comprising a total number of 186 insects belonging to 5 Orders, 7 Families and 11 species were recorded across the three locations. The insects were identified as *Acheta domesticus, Heteronyechus orator, Carabius monilis, Camponotus pennsylvanicus, Aspidomorpha miliaris, Lasius niger, Ecitom burchullii, Pheidole megacephale, Rhopalocera spp, Thymelicus sylvestris* and *Macrotermes natalensis.* Parameters such as Shannon Index, Simpson Index, Margalef index and Evenness Index were used to analyze the diversity of insects. The result showed that Hymenoptera was the most dominant order (41.29%) followed by Isoptera (20.43%), Coleoptera (19.35%), Orthoptera (13.98%) and the least dominant was Lepidoptera (1.61%) in all the locations. The Plantation location had the highest insect abundance (n = 91) with species dominance of 24.19%, followed by the central laboratory (n= 58) with specie dominance of (15.05%) while the nursery location had the lowest insect abundance (n = 38) with species dominance of (5.38%). The nursery location had the highest Shannon index (H'=1.649) while plantation had the least Shannon index (H'=1.351). The nursery location had the highest Simpson index (D = 0.7947) while plantation had the least Simpson index (D = 0.6813). The central laboratory had the highest Margalef index (d =1.478) while plantation had the least Margalef index (d = 0.8867) which showed that species abundance and diversity varied for all the locations. Therefore, the study recommends that efforts to conserve both plant and insect species should be intensified through enhanced management strategies on campus

**Keywords:** Insects, Species, Diversity, Abundance, Shannon index

## INTRODUCTION

Insects are an essential part of biodiversity, ecological significance, and impact on agriculture, human health, and natural resources (Raven and Wagner, 2021). They are highly sensitive to changes in climatic factors such as rainfall, temperatures, wind, humidity and altitudes (Skendzic *et al.,* 2021) as these affect their population dynamics, distribution, abundance, intensity and feeding behavior. Insects are vital to ecological balance, representing 58% or more of the world's documented biodiversity. They thrive in diverse environment and are essential to maintaining health and stability of both aquatic and terrestrial ecosystems (Scudder, 2017). They contribute to the provision of various ecosystem services that are essential to certain aspects of human livelihoods (Sharma and Birman, 2024). Insects are eaten as food by humans from over 3000 ethnic groups in 80 percent of the world's countries (Omuse *et al.,* 2024).

Insects are a critical component of the soil and ecosystem, functioning as pollinators, decomposers, and prey for a diverse array of other organisms. (Verma *et al*., 2023) Insects serve as a major food source for various taxa and play a key role in controlling the populations of other organisms. (Elizalde *et al*., 2020). A diverse array of

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insects, through their complex interactions, provide sustenance for humans and assist in the elimination of waste. Human existence would be impossible without these services (Govorushko and Norwicki, 2019).

The diversity and abundance of insects is greatly influenced by the chemical, physical, and biological qualities of the environment (Menta and Remelli, 2020) as well as anthropogenic activities. Despite their significance to ecology, insect populations are drastically declining due to indiscriminate bush burning and overgrazing, leading to habitat destruction and consequently impacting insect species (Akani, 2010). However, it is imperative to comprehend the diversity and abundance of insects, understanding their values and knowing the variety and quantity of insects in the region can provide important information about the general ecological health of the study area. Furthermore, this research provides a checklist of insects, identify insect pests and ascertain the composition and diversity pattern of insect species in the study area. Understanding the diversity, abundance and population of the diverse species will ensure their preservation. This study therefore, reveals the diversity and abundance of insects' species in Ekiti State University and the need for sustainable actions to conserve beneficial species.

## MATERIALS AND METHODS

### Study area

This study was carried out at Ekiti State University Ado Ekiti, Nigeria. Ekiti State is located in the tropical region of Nigeria and within the longitudes 4°51' and 5°45' East and Latitudes 7°15' and 8°5' North. According to the National Population Commission (NPC, 2022), Ekiti State has a population of 3,592,200. The region experiences a tropical climate with two distinct seasons: a wet season from April to October and a dry season from November to March. The temperature generally ranges between 21°C and 28°C with minimal annual variation. The mean annual precipitation is around 1,500 - 1,700 mm

### Sampling location

Three locations were sampled for this study. The first location was the Nursery site of Forest Resources and Wildlife Management, the second location was the Plantation of Forest Resources and Wildlife Management, and the third location was an open field, Central laboratory, Ekiti State University, the map showing the locations is as shown in Figure 1.

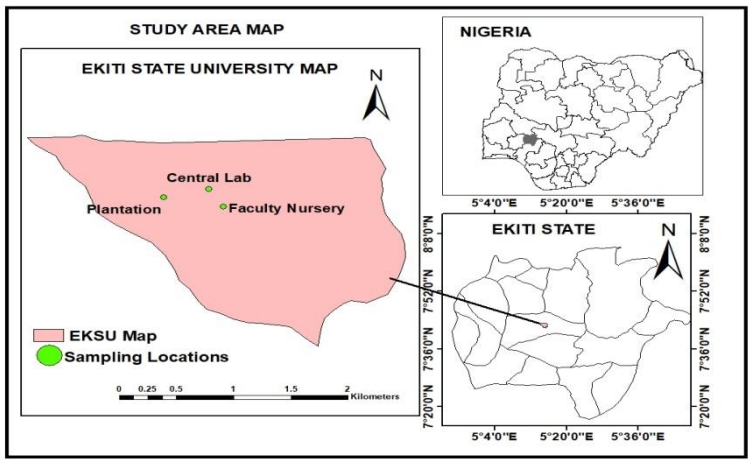


Figure 1: Ekiti State University Map showing the Sampling Location

### Insect sampling, techniques and collection

The field survey was conducted from October to December 2024. Insect sampling was performed bi-weekly using two different trapping methods. The first trapping method was; a pitfall trap to collect ground-dwelling insects while the second type of trap was the yellow pan trap which was used to collect flying insects.

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**Pitfall trap**

Fifteen pitfall traps (5-10 metres apart) made of red plastic containers with mouth diameters of 12 cm and 13cm deep with soil packed around it to the level of the container were used on each of the three selected study sites. The traps were filled to one-fifth with water and, 2% mild detergent were used as killing agents. The content of the trap was serviced after 72 hours, by pouring the content through sieve and rinsing with gently running water and preserving in a container containing 70% ethanol. and the insects were sorted, identified and counted in the laboratory.

**Yellow pan trap**

The second type of trap was a yellow pan trap, where a yellow plastic dish of 6 cm length and 12 cm wide containing a mixture of water with 2% mild detergent which broke the surface tension of the water was placed 25 cm above the ground level, in an opened field where flying insects that landed on the surface of the water was trapped in the container. The trap was set up for a period of 72hours, and insect collected were poured into a sieve and rinsed with gently running water and the preserved in a container of silica gel.

**Preservation of collected insects**

All collected insects were preserved by immersion in 70% ethanol. However, insects like moths that have scales on their wings were preserved dry in a tight container containing silica gel.

**Identification of insects**

The insects collected was taken for identification at the insect museum centre of the Federal Research Institute of Nigeria (FRIN), Oyo State, Ibadan. The insects were identified with the aid of appropriate identification keys (Walter, 2017).

**Computation of Diversity Indices**

The following biodiversity indices were computed:

1) Total Individuals N = the number of individuals in each sample

2) Margalef diversity index, $(d) = S - 1/\log(n)$ where S: the total number of Species and N is the total number of individuals in the sample

3) Shannon Index $(H) = -\sum pi * In(ph)$ where $\sum$: a greek symbol that means sum, ln: natural log, pi: The proportion of the entire community made up of species

4) Simpson Index $(D) = -\sum \mathrm{n(n-1)/N(N-1)}$where n= total number of individuals of each species, N= total number of individuals of all species

5) Evenness $(E) = H/InS$ S ere H: Shannon Weiner Diversity, S: total number of species in a sample, across all samples in dataset

**Statistical Analysis**

Biodiversity indices such as species diversity, species richness and evenness were computed using Past3 software. The Shannon-Weiner diversity index (H') was used to compute the location diversity index.

## RESULTS

Table 1 shows the list of identified insects in the studied area, Eleven (11) insects belonging to five (5) Orders (Orthoptera, Coleoptera, Hymenoptera, Lepidoptera, Isoptera) and seven (7) Families (Gryllidae, Carabidae, Formicidae, Chrysomelidae, Nymphalidae, Hesperilidae, Termitidae) were identified as *Acheta domesticus* ,

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*Heteronyechus orator*, *Carabius monilis*, *Camponotus pennsylvanicus, Aspidomorpha miliaris*, *Lasius niger*, , *Eciton burchullii* , *Pheidole megacephale*, *Rhopalocera* spp, *Thymelicus sylvestris* and *Macrotemes natalensis.*

Table 1. Identification of insect species in the study area

| S/N | Common name | Order | Family | Genus | Scientific Name |
|---|---|---|---|---|---|
| 1 | Cricket | Orthoptera | Gryllidae | Acheta | *Acheta domesticus* |
| 2 | Necklace ground beetle | Coleoptera | Carabidae | Calosoma | *Carabius monilis* |
| 3 | Carpentar ant | Hymenoptera | Formicidae | Dinoponera | *Camponotus pennsylvanicus* |
| 4 | Round brown beetle | Coleoptera | Chrysomelidae | Aspidomorpha | *Aspidomorpha milliaris* |
| 5 | Black garden ant | Hymenoptera | Formicidae | Lasius | *Lasius niger* |
| 6 | Garden black beetle | Coleoptera | Carabidae | Pterostichus | *Heteronyechus arator* |
| 7 | Soldier ant | Hymenoptera | Formicidae | Iridomyrmex | *Eciton burchellii* |
| 8 | Big-headed ant | Hymenoptera | Formicidae | Pheidote | *Pheidole megacephala* |
| 9 | Brush footed butterfly | Lepidoptera | Nymphalidae | Danaus | *Rhopalocera spp.* |
| 10 | Skipper butterfly | Lepidoptera | Hesperiidae | Isoteinom | *Thymelicus sylvestris* |
| 11 | Termite | Isoptera | Termitidae | Ancistrotermes | *Macrotermes Natalensis* |

Source: Field Survey, 2024.

Table 2 shows the diversity and abundance of insect in study locations. A total of 186 individual insects belonging to five (5) insect orders, seven (7) families and Eleven (11) species were encountered in the three Locations. The order Hymenoptera had the highest abundance while Lepidoptera had lowest abundance in all the three locations. The result however revealed that Plantation had the highest occurrence of insect in the order Hymenoptera, followed by Central lab while Nursery had the least insect. Results also showed that the pitfall trap method collected the highest number of insects (116), while yellow pan method had seventy (70) insects respectively.

The highest number of insects collected from pitfall trap was eighty-three (83) belonging to the Order Hymenoptera, (Family Formicidae), in all the locations while the lowest number of insects collected by yellow pan trap method was thirty-eight (38) insects belonging to the Order Isoptera (Family Termitidae).

Table 3 shows the relative abundance of insect orders in the selected locations. Hymenoptera had the highest relative abundance (41.29%) followed by Isoptera (20.43%) while Lepidoptera had the lowest relative abundance (1.61%). In terms of species dominance, Plantation had the highest number of species (24.19%) followed by Central Lab (15.05%) while Nursery had the lowest number of species (0.54%) respectively.

Table 2. Diversity and Abundance of Insect in the study area

| ORDER | FAMILY | SITE | | | | | COLLECTION METHOD | |
|---|---|---|---|---|---|---|---|---|
| | | L1 | L2 | L3 | STC | PF | YP | CT |
| Orthoptera | Gryllidae | 8 | 12 | 6 | 26 | 23 | 3 | 26 |

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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Coleoptera | Carabidae | 6 | 11 | 8 | 25 | 19 | 6 | 25 |
| | Chrysomelidae | 4 | 5 | 2 | 11 | 8 | 3 | 11 |
| Hymenoptera | Formicidae | 10 | 45 | 28 | 83 | 66 | 17 | 83 |
| Lepidoptera | Nymphalidae | - | - | 1 | 1 | - | 1 | 1 |
| | Hesperiidae | 1 | - | 1 | 2 | - | 2 | 2 |
| Isoptera | Termitidae | 8 | 18 | 12 | 38 | - | 38 | 38 |
| Total | 7 | 37 | 91 | 58 | 186 | 116 | 70 | 186 |

**KEY:**

LI – Nursery Location, L2 -Plantation Location. L3 -Central Lab Location, STC - Site Total Collect, PF - Pit Fall, YP- Yellow pan, CT- Collection Total

Table 3: Relative Abundance and Species dominance of insect orders in the Nursery, Plantation and Central Lab of Ekiti State University. Nigeria

| **ORDER** | **ORDER ABUNDANCE** | **RELATIVE ABUNDANCE** | **SPECIE DOMINANANCE (%)** | | |
|---|---|---|---|---|---|
| | | | L1 | L2 | L3 |
| Orthoptera | 26 | 13.98 | 4.3 | 6.45 | 3.23 |
| Coleoptera | 36 | 19.35 | 5.38 | 8.6 | 5.38 |
| Hymenoptera | 83 | 41.29 | 5.38 | 24.19 | 15.05 |
| Lepidoptera | 3 | 1.61 | 0.54 | - | 1.08 |
| Isoptera | 38 | 20.43 | 4.3 | 9.68 | 6.45 |

**KEY**

L1 – Nursery, L2 - Plantation, L3 - Central Lab.

Table 4 shows the species diversity indices of insects in the study location where Nursery has the highest Shannon Weiner index (H= 1.6449) while Plantation had the lowest Shannon Weiner index (H=1.351). Nursery has the highest Simpson index (D=0.7947) whole Plantation had the lowest Simpson index (D=0.6813).; Central Laboratory had the highest Margalef index (d= 1.478) while Plantation had the lowest Margalef index (d=0.8867). Nursery has the highest Evenness (E=0.8869) while Central Laboratory had the lowest Evenness (E=0.6039).

Table 4: Diversity indices of Insects encountered according to location

| **VARIANCES** | **NURSERY** | **PLANTATION** | **CENTRAL LAB** |
|---|---|---|---|
| Shannon index | 1.649 | 1.351 | 1.442 |
| Simpson index | 0.7947 | 0.6813 | 0.6926 |

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| | | | |
|---|---|---|---|
| Dominance | 0.2053 | 0.3187 | 0.3074 |
| Margalef | 1.385 | 0.8867 | 1.478 |
| Evenness | 0.8669 | 0.7721 | 0.6039 |

## DISCUSSION

A total of 186 individual insect species, belonging to five (5) Orders, seven (7) Families and eleven (11) insect species were encountered in the locations surveyed in Ekiti State University. The insects were identified as *Acheta domesticus*, *Heteronyechus orator*, *Carabius monilis*, *Camponotus pennsylvanicus, Aspidomorpha milliaris*, *Lasius niger*, *Ecitom burchullii*, *Pheidole megacephale*, *Rhopalocera spp, Thymelicus sylvestris* and *Macrotemes natalensis.* Pitfall trap method and yellow pan trap method were used to attract different kinds of insects. This is in line with the report of Okrikata and Yusuf, (2019) who reported that using a combination of traps gives better species richness data.

The study evaluated the diversity and abundance of insects, the study revealed that Hymenoptera (41.29%) was the most abundant insect order in the study area. This was followed by Isoptera (20.43%), Coleoptera (19.35%), Orthoptera (13.98%) while Lepidoptera (1.61%) was the least insect encountered. This agreed with the report of Akinmuleya and Oso, (2022) who reported Hymenoptera as the most predominant insect Order. This is in contrast with the work of Naman *et al.,* 2019 who recorded Odonata as the most dominated Order insect in Kaduna State University main campus while Adeduntan and Olusola (2013), recorded Orthoptera as the most dominated insect Order in different forest vegetation types in Ondo State. The reason for this disparity might be attributed to differences in study location and other environmental factors.

Diversity and abundance were highest in Plantation than the Nursery and Central laboratory, this is consistent with the report of Ram *et al*, (2020). The variation in insect species composition encountered in Nursery, Plantation and Central Lab could be attributed to differences in habitat characteristics and level of disturbances. The greater insect species composition recorded in the plantation could be as a result of minimal or no disturbances, coupled with canopy cover which may serve as protection for these insects against direct sunlight (Benton *et al,* 2003). This study has also shown that pitfall trap was the most effective and efficient method for collecting insects in comparison with yellow pan trap method. Hence, results obtained in this study are viable and could be used to represent the biodiversity of insects' species in the different studied locations of Ekiti State University Ado Ekiti, Nigeria.

The result of diversity indices across habitats showed that, even though plantation had the highest number of insect species, the Nursery site had the highest insect species diversity (H'= 1.649), (E= 0.8869) and was more in species richness compared to other locations. This implies the presence and variety of plants influences the diversity and abundance of insect species. This agrees with findings of Naman *et al.,* (2019) who reported that the interaction that exist between plants and insects is mutualistic. Alarape *et al*., (2015) stated that the structural complexity of habitat and diversity of vegetation types have been found to be associated with animal and insect species diversity. Nursery and Plantation sites are highly plant and seedlings based and it is believed that plants co-evolve with their insect herbivores as reported by Tscharntke and Brand, (2005). This can also be attributed to the continuous availability of resources in the location, thereby creating a favorable environment for breeding. This finding agrees with the result of Adeduntan and Olusola, (2013) who reported that insects thrive in environments that provide favorable conditions for their survival.

## CONCLUSION

The diversity indices indicated that the insect species abundance, diversity and evenness varied for all the locations. Hymenoptera was the most dominant Order while Lepidoptera was the least dominant Order. This study concludes that Plantation site has a higher potential to support greater insect diversity than Nursery and Central laboratory respectively.

## RECOMMENDATION

Based on this finding, the study recommends that efforts to conserve both plant and insect species should be intensified through enhanced management strategies on campus. There is need to also create awareness and emphasize on the importance of insect diversity in ecosystem functioning.

## REFERENCES

1. Adeduntan, S.A. and Olusola, J.A. (2013). Diversity and Abundance of Arthropods and tree species as Influenced by Different Forest Vegetation Types in Ondo State, Nigeria. International Journal of Ecosystem. (3):19- 23.
2. Akani, G.C. and Luca M. Luiselli (2010) Aspects of community ecology of amphibians and reptiles at Bonny Island (Nigeria), an area of priority relevance for petrochemical industry. African Journal of Ecology, 48 (4) 939-948.
3. Akinmuleya, C.B. and Oso, A.F. (2022). Diversity and Abundance of Insects in farm land, forest and wetland Habitats of Federal University, Oye-Ekiti, Nigeria. FUOYE Journal of Pure and Applied Sciences, 7(2) 73-83.
4. Alarape, A, Omifolaji, J. and Mwansat, G. (2015). Butterfly Species Diversity and Abundance in University of Ibadan Botanical Garden, Nigeria. Journal of Ecology 5(8) 352-360
5. Benton, T.G., Vickery, J.A. and Wilson, J.D. (2003). Farmland biodiversity: Is habitat heterogeneity the key? Trends in Ecology and Evolution. 18(4). 182-188.
6. Elizalde, L., Arbetman, M., Arnan, X., Eggleton, P., Leal, I. R., Lescano, M. N and Pirk, G. I. (2020). The ecosystem services provided by social insects: traits, management tools and knowledge gaps. Biological Reviews, 95(5), 1418-1441.
7. Govorushko, S. M and Nowicki, P. (2019). Lessons from insect conservation in Russia. Journal of Insect Conservation, 23, 1-14.
8. Menta, C and Remelli, S. (2020). Soil health and arthropods: From complex system to worthwhile investigation. Insects, 11(1), 54.
9. Naman. K., Auta. I.K, and Abudullah. M.K. (2019). Insect Species Diversity and Abundance in Kaduna State University Main Campus, Kaduna, Nigeria. J. Science World 14(2), 51-5
10. National Population Commission. (2022). National Bureau of Statistics, demographic bulletin 2022.
11. Okrikata and Yusuf (2019). A Study on the Diversity and Relative Abundance of Insect Fauna: Journal of Advance Biological and Biomedical Research 7(2), 129-14.
12. Omuse, E. R., Tonnang, H. E., Yusuf, A. A., Machekano, H., Egonyu, J. P., Kimathi, E. and Niassy, S. (2024). The global atlas of edible insects: analysis of diversity and commonality contributing to food systems and sustainability. Scientific Reports, 14(1), 5045.
13. Ram, D., Lindstrom, A., Pettersson, L.B. and Caplat, P. (2020). Forest clear-cuts as habitat for Farmland birds and Butterflies. Forest Ecology and Management (473)
14. Raven, P. H., and Wagner, D. L. (2021). Agricultural intensification and climate change are rapidly decreasing insect biodiversity. Proceedings of the National Academy of Sciences, 118(2).
15. Scudder, G. G. (2017). The importance of insects. Insect biodiversity: science and society, 9-43.
16. Sharma, I and Birman, S. (2024). Biodiversity loss, ecosystem services, and their role in promoting sustainable health. In The Climate-Health-Sustainability Nexus: Understanding the Interconnected Impact on Populations and the Environment (pp. 163-188). Cham: Springer Nature Switzerland.
17. Skendzic S., Zovko M., Zivkovic I. P., Lesic V and Lemic D. (2021). The impact of climate change on agricultural insect pests. Insects, 12(5), 440.
18. Tscharntke T, Klein A.M, Kruess A, Steffan Dewenter I, Thies C. (2005). Landscape perspectives on agricultural intensification and biodiversity: Ecosystem service management. Ecology Letters. (8): 857-874.
19. Verma, R. C., Waseem, M. A., Sharma, N., Bharathi, K., Singh, S., Anto Rashwin, A and Singh, B. V. (2023). The role of insects in ecosystems, an in-depth review of entomological research. International Journal of Environment and Climate Change, 13(10), 4340-4348.