IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

Insect Biodiversity within Owala Dam and Ilobu, Southwestern Nigeria

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Abstract

Insect Biodiversity study is known to be effective means of determining ecosystems health status and means of identifying areas of conservation action. Field survey of insects was conducted from 6 sampling sites within Owala dam and Ilobu in Osun State, Nigeria. Investigation was done in the year 2019 and 2021. This survey was carried out in both wet and dry seasons. Insects were trapped by Malaise trap, pitfall trap and insects nets on plants and aquatic body in the sampling sites. Data collected was analyzed by using descriptive (tables and charts) and inferential statistics. Paleontological Statistics Software package (PAST) was used to analyze the population of insects in the six sampling sites. One way anova was used to test for significant difference in the diversity of insects among the locations. In this study, 5406 individual insects were captured, 343 species were recorded belonging to 103 families of 17 orders. The results obtained showed that insects are most diverse in reserved areas and the herbivore insects are most common insects in the region. Most reported order of insect captured was Hymenoptera with 14.93% and least captured order was Mantodea with 0.28%. This study shows that Coleoptera is the most diverse order of insect in the study area with 64 different species recorded in 16 families. This study also shows that collection from Owala dam areas were statistically differs ($P \leq 0.05$) from that of Ilobu areas and insects are more diverse at Owala areas than that of Ilobu.

Keywords: Diversity, family, captured, reserved, order

Introduction

The relationship between biodiversity and ecosystem stability is complex and generally belief that diversity of insects is important for the stability and proper functioning of ecosystem. The variability among living organisms, including insects, from all sources ranging from terrestrial, arboreal, aquatic and any other ecosystems and the ecological complexes of which they are part, is known as Biodiversity. This biodiversity includes diversity within species, diversity between species and diversity of ecosystems (Noss,1990) Biodiversity study of invertebrates is most tractable and wide application in number of species at sites (richness or α-diversity) and among habitat

(turnover or β-diversity) as reflected in the studies of Pearson (1994) and Oliver and Beattie (1996). Biodiversity increase from the poles to tropics due to reasons like environmental variability, predictability, productivity, evolutionary time and sunshine variability (Rohde, 1992). Jan Leps (2013) reported that whenever there are changes in environmental conditions that affect productivity and disturbance regime, nearly all species will be affected in a given population. Typical examples of this situation are land use changes, changes in nature management, large scale pollution and climate change.

Land use changes between Owala Dam and Ilobu is what prompt this study to investigate the effect on the insect population in the study areas. Owala dam is characterized with aquatic ecosystem combined with terrestrial diversity (Plate 1) whereas the adjacent town, Ilobu, is predominantly terrestrial ecosystem. This study aims at documenting insect families present within the study areas. The objectives are to investigate the distribution of insect families within the region and determine the diversity level of insect within Owala dam and Ilobu.

Plate 1: Owala Dam ecosystem

Materials and Methods

Fields surveys of insects were conducted from 6 sampling locations in and around Owala dam and Ilobu in Osun State, Nigeria. Investigation was done in the year 2019 and 2021, COVID 19 pandemic lock down did not permit us to carry out the research in the consecutive year 2020.

The study area is situated approximately between longitudes 4°28′ E and 4°34′ E of the Greenwich Meridian, and latitudes 7°50′ N and 7°67′ N of the Equator. Six representative locations were selected within the study area to cover the vegetation pattern and ecological zones present in the study area. It covers Ilobu (7°50′ N and 4°29′ E) and) Owala dam (7°57′ N and 4°33′ E) Since the distribution of insects is mainly influenced by the host plants and the factors affecting the plants within their environment therefore, the selection of the study area in this research was based on the type of the vegetation and agricultural practice that land in the area being subjected to. Therefore, each of the two broad locations is subdivided into three different areas (cultivated area, reserved area and residential area). It was done in a way that areas with similar vegetation are not severally repeated. Random sample was made to represent the entire populations of insects present in Ilobu and Owala Dam. Cultivated area in this study means land on which insects were captured is put into farming especially crop planting (Plate 2).

Plate 2: Showing cultivated area

Reserved area in this study means undisturbed pieces of land that is not presently under farming and is usually a thick forest (Plate 3).

Plate 3: Reserved area

The residential area is where we have buildings which can be dense or not. Based on these environmental factors, we have six sampling sites for this research: Owala dam Cultivated Area, Owala dam Reserved Area, Owala dam Residential Area, Ilobu Cultivated Area, Ilobu Reserved Area and Ilobu Residential Area.

Insect samples were collected from the six areas at every fortnight between November and March for Dry season collection and between April and August for wet season collections. Flying insects were trapped by malaise trap whereas ground dwelling and surface insects were collected by pit fall traps. Insect nets (butterfly, sweep and aquatic nets) were used to collect other insects during the study. The 100ml plastic pit fall trap was buried into the ground until the brim of the container was at the same level with the ground surface. The solution in the pit fall consists of 10% formalin with detergent mixed with water. Each pit fall trap is half filled with the solution and buried into the ground to catch free ground dwellers and crawlers.

Data collected was analyzed by using descriptive (tables and charts) and inferential statistics. Data were analyzed with Paleontological statistics software package (PAST). One way analysis of variance (ANOVA) plus *post hoc* pairwise comparison of the means were performed to determine whether populations were significantly affected by land use changes and other environmental changes in the study areas.

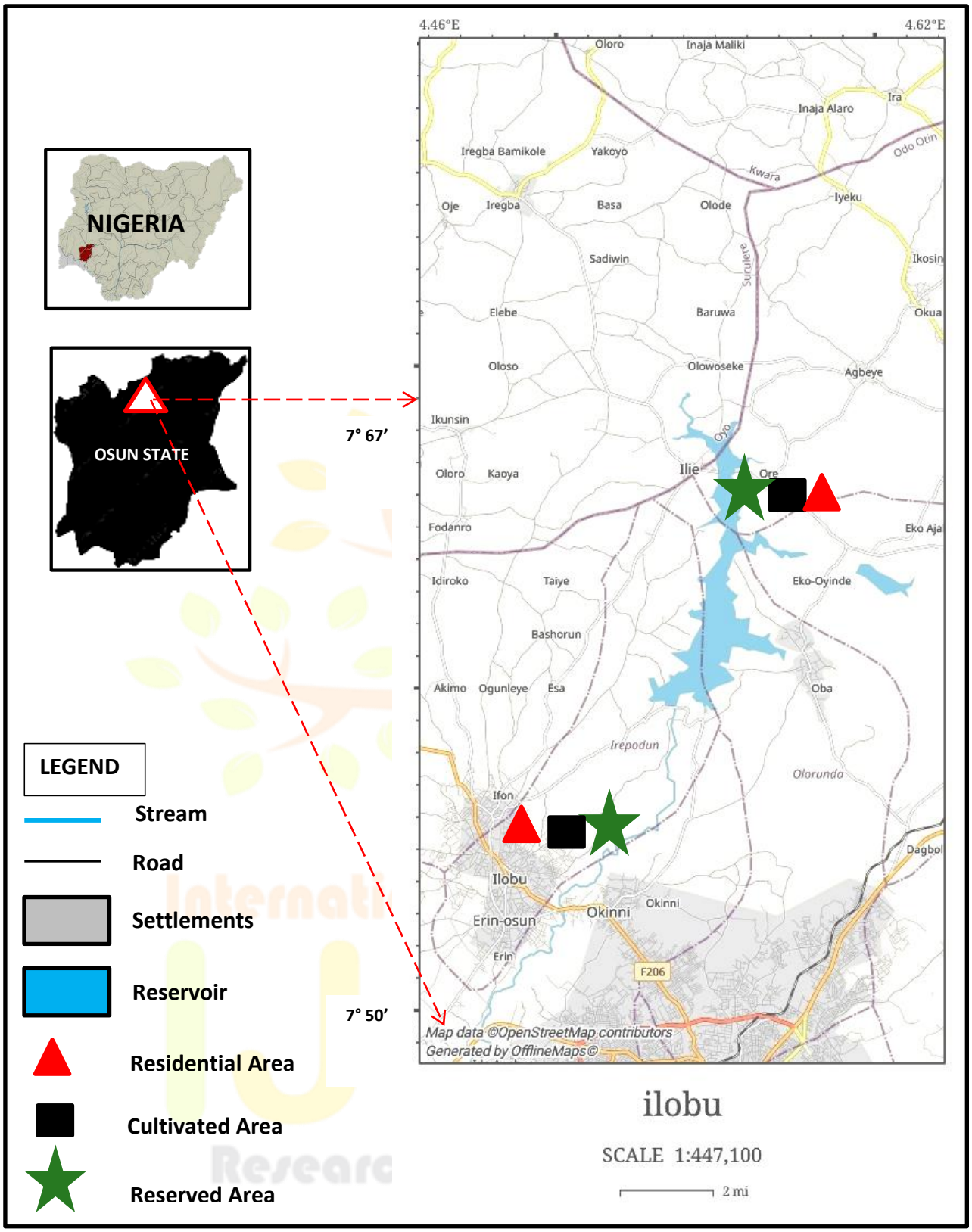

Figure 1: Map of the study area

Results

The species richness (α-diversity) of insects captured in the six sampling sites zones is presented in Table 1. Total of 343 species were captured during this study. Reserved Area of Owala Dam has the highest number of insect

species captured of 253 species belonging to sixteen orders in 58 families. Residential Area at Ilobu has the least species richness of 66 species in nine orders belonging to37 families.

Table 2 shows the occurrence of different insect families captured in the six sampling sites. Insects were present and widely distributed in all the six locations in the study. Reserved area of Owala dam has the highest occurrence and high significant occurrence of insects was also observed at Reserved area of Ilobu as presented in table 2.

Table 3 depicts the frequency of distribution of captured insects within seventeen different insect orders. The highest captured order in this study is Coleoptera with 64 species captured and abundance of 18.66%. The least captured insect orders were Plecoptera and Zygoptera with one species captured and abundance of 0.29%. In table 3, it was observed that the order with highest captured individual is Hymenoptera with 807 individual insects captured amount to 14.93%. The insect order with the least captured individual is Mantodea with 15 individual insects captured amount to 0.28%.

Figure 2 shows the diversity of insects in and around Owala dam and Ilobu of southwestern Nigeria. Reserved area of Owala dam and Reserved area of Ilobu have the highest diversity index of 0.5 with distribution range of 0.5. Cultivated area at Owala dam and Cultivated area at Ilobu have highest distribution range of 1. 2 with diversity index of 0.25. Residential area of Ilobu has diversity index of 0.1 and distribution range of 0.5.

Abundance of insects captured in and around Owala dam were compared and presented in figure 3. Insects captured were also categorized into three major groups based on their mode of feeding (Herbivores, Scavengers and Carnivores). Herbivores are insects that feed on plants for example, *Apis mellifera* (plate 4). Scavengers are insects that feed on dead plant and animal materials or refuse, for example, *Musca domestica* (plate 5). The third group is carnivores that feed on animals as blood or flesh eaters, predators and parasites. Figure 3 show that herbivores have highest abundance of 255 and follow by carnivores with the abundance of 180. Figure 4 represents abundance of insects at Ilobu and it was observed also that herbivores has the highest abundance of 300 and follow by carnivores with abundances of 200. Reserved areas both at Owala dam and Ilobu have the highest proportion of captured insects (figure 5)

Table 4 shows the study diversity turnover which is also known as habitat β-diversity. The β-diversity in the results is paired comparison of insect populations at Reserved area Owala dam with that of the 3 locations at Ilobu. There were significant difference in the collections at Reserved area of Owala Dam when compared with that of Ilobu Residential area and Ilobu Cultivated area. There is no significant difference in the populations collected at Reserved area of Owala dam when compared with the Reserved area of Ilobu. Likewise, Table 5 represents comparison of populations of insects at Reserved area of Owala dam compared with other two locations within Owala dam. There is no significant difference when compared with Cultivated area of Owala dam. Nevertheless, there is significant difference when compared with Residential area of Owala dam (Table5).

Table 1: Species richness of insects at Owala Dam and Ilobu.

Insect Family	Number of species captured						
	Owala Dam			Ilobu			
ORDER HYMENOPTERA	Cultivated Area	Reserved Area	Residential Area	Cultivated Area	Reserved Area	Residential Area	**α-diversity**
Vespidae	4	7	3	4	6	2	8
Tiphiidae	0	2	0	1	0	0	2
Apidae	2	3	2	2	2	1	4
Ichneumonidae	1	0	1	0	0	0	1
Pamphilidae	0	1	0	0	1	0	1
Sphecidae	1	0	0	1	0	0	1
Chrysididae	0	0	1	0	0	0	1
Braconida	0	1	0	1	0	0	1
Pergidae	0	1	0	0	0	0	1
Gasteruptiidae	1	0	0	1	0	0	2
Formicidae	3	8	4	4	8	4	10
Evaniidae	2	2	2	2	2	1	3
Cimbicidae	0	1	0	0	1	0	2
Siricidae	2	2	0	0	2	0	3
Sub Total	16	27	13	16	22	8	40
ORDER DIPTERA							
Muscidae	4	6	3	3	4	3	8
Culicidae	3	4	2	3	3	2	5
Asilidae	1	2	0	0	2	0	3
Bombyliidae	0	2	1	1	1	0	2
Drosophilidae	1	0	1	1	0	1	2
Tephritidae	1	2	1	1	1	1	2
Anthomyiidae	1	3	1	1	2	1	5
Calliphoridae	2	3	2	1	2	1	4
Sarcophagidae	1	1	1	1	2	1	3
Tipulidae	0	1	0	0	1	0	2
Cecidomyiidae	0	2	0	0	1	0	2
Simulidae	0	1	0	0	0	0	1
Chironomidae	1	2	0	0	0	0	2
Dixidae	0	1	0	0	0	0	1

Tabanidae	1	2	1	1	1	1	3
Sub Total	16	32	13	13	20	11	45
ORDER LEPIDOPTERA							
Sesiidae	0	2	0	3	0	0	4
Pterophoridae	0	2	0	2	0	0	3
Pryalidae	3	4	0	2	0	0	5
Nympalidae	2	3	2	2	3	2	5
Pieridae	3	4	3	3	4	3	7
Satyridae	0	0	3	0	0	0	3
Papilionidae	3	4	3	3	4	3	10
Coleophoridae	0	2	1	1	0	0	3
Psychidae	0	2	0	0	0	0	2
Tineidae	0	2	0	0	0	0	2
Sphingidae	0	1	0	0	0	0	1
Limacodidae	0	2	0	0	0	0	2
Saturnidae	1	4	3	2	4	2	5
Noctuidae	3	5	3	3	6	3	8
Sub Total	15	36	18	21	21	13	60
ORDER COLEOPTERA							
Chrysomelidae	4	8	2	3	6	2	12
Bruchidae	0	2	1	0	2	1	3
Cerambycidae	0	3	0	1	0	0	3
Buprestidae	0	3	0	2	0	0	4
Dermestidae	0	2	0	1	0	0	2
Carabidae	3	5	2	2	4	1	8
Dysticidae	0	2	0	0	0	0	2
Brentidae	0	2	0	0	2	0	3
Anthribidae	2	2	5	2	4	2	7
Curculionidae	3	4	2	2	3	2	7
Elateridae	0	2	0	0	2	0	3
Helodidae	2	2	0	0	2	0	3
Byturidae	0	0	0	0	1	0	1
Gyrinidae	0	0	0	0	1	0	1

Scarabaeidae	2	3	2	2	2	1	4
Hdrophilidae	0	2	0	0	0	0	2
Sub Total	16	42	14	15	29	9	64
ORDER HEMIPTERA							
Tingidae	0	2	0	0	2	0	3
Miridae	2	3	0	2	2	0	4
Corixidae	0	0	0	0	1	0	1
Gelastocoridae	0	2	0	0	1	0	2
Anthocoridae	1	2	1	1	2	1	3
Reduviidae	2	3	1	1	2	1	4
Belostomatidae	0	2	0	0	2	0	3
Nepidae	2	3	0	3	3	0	4
Pentatomidae	3	4	4	4	4	3	6
Lygaeidae	0	3	0	0	2	0	4
Geridae	0	2	0	0	0	0	2
Notonectidae	0	2	0	0	0	0	2
Sub Total	10	28	6	11	21	5	38
ORDER HOMOPTERA							
Aphididae	2	6	2	2	3	1	7
Kerridae	0	1	0	0	1	0	1
Cicadellidae	1	2	1	2	2	1	3
Fulgoridae	3	4	0	2	3	1	6
Aleyrodidae	4	7	3	3	5	2	10
Cicadidae	0	2	0	0	2	0	2
Membracidae	0	3	0	0	4	0	3
Pseudococcidae	1	2	1	1	2	2	3
Coccidae	0	2	0	0	2	0	3
Psyllidae	0	2	0	0	2	0	3
Issidae	0	1	0	0	1	0	2
Sub Total	11	32	7	10	27	7	16
ORDER ISOPTERA							
Termitidae	8	8	0	4	4	0	10
Kalotermitidae	0	0	0	0	1	0	1

Rhinotermitidae	4	4	0	0	0	0	5
Sub Total	12	12	0	4	5	0	16
ORDER DERMAPTERA							
Labiidae	0	2	0	0	1	0	2
Sub Total	0	2	0	0	1	0	2
ORDER MANTODEA							
Mantidae	0	0	2	0	1	0	2
Sub Total	0	0	2	0	1	0	2
ORDER BLATTARIA							
Blattidae	2	3	2	2	3	2	4
Blattelidae	2	2	1	1	2	1	3
Sub Total	4	5	3	3	5	3	7
ORDER PHASMIDA							
Phasmatidae	0	2	0	0	1	0	2
Sub Total	0	2	0	0	1	0	2
ORDER ORTHOPTERA							
Gryllidae	3	4	3	2	4	2	7
Gryllotalpidae	2	3	0	0	2	0	4
Acrididae	5	8	5	4	7	3	10
Tetrigidae	2	3	0	0	4	3	6
Tettigoniidae	3	4	0	0	5	0	6
Sub Total	15	22	8	6	22	8	33
ORDER PLECOPTERA							
Capniidae	0	0	0	0	1	0	1
Sub Total	0	0	0	0	1	0	1
ORDER ZYGOPTERA							
Coenagrionidae	0	1	0	0	0	0	1
Sub Total	0	1	0	0	0	0	1

ORDER ODONATA							
Macromiidae	0	2	0	0	0	0	2
Libellulidae	0	3	0	0	0	0	3
Aeshnidae	0	2	0	0	0	0	2
Sub Total	0	7	0	0	0	0	7
ORDER THYSANURA							
Lepismatidae	1	2	0	1	2	0	2
Sub Total	1	2	0	1	2	0	2
ORDER COLLEMBOLA							
Isotomidae	1	2	1	2	3	2	4
Sminthuridae	0	1	0	0	1	0	1
Sub Total	1	3	1	2	4	2	5
Over all Total	**117**	**253**	**85**	**102**	**182**	**66**	**343**

Table 2: Occurrence of Insect families captured in Owala Dam and Ilobu. "X" means a particular insect family was present.

Insect Family	**Owala Dam**			**Ilobu**		
	Cultivated Area	**Reserved Area**	**Residential Area**	**Cultivated Area**	**Reserved Area**	**Residential Area**
ORDER HYMENOPTERA						
Vespidae	X	X	X	X	X	X
Tiphiidae		X		X		
Apidae	X	X	X	X	X	X
Ichneumonidae	X		X			
Pamphilidae		X			X	
Sphecidae	X			X		
Chrysididae			X			
Braconida		X		X		
Pergidae		X				
Gasteruptiidae	X			X		

Formicidae	X	X	X	X	X	X
Evaniidae	X	X	X	X	X	X
Cimbicidae		X			X	
Siricidae	X	X			X	
ORDER DIPTERA						
Muscidae	X	X	X	X	X	X
Culicidae	X	X	X	X	X	X
Asilidae		X			X	
Bombyliidae		X	X	X	X	
Drosophilidae	X		X	X		X
Tephritidae	X	X	X	X	X	X
Anthomyiidae	X	X	X	X	X	X
Calliphoridae	X	X	X	X	X	X
Sarcophagidae	X	X	X	X	X	X
Tipulidae		X			X	
Cecidomyiidae		X			X	
Simulidae		X				
Chironomidae	X	X				
Dixidae		X				
Tabanidae	X	X	X	X	X	X
ORDER LEPIDOPTERA						
Sesiidae		X		X		
Pterophoridae		X		X		
Pryalidae	X	X		X		
Nympalidae	X	X	X	X	X	X
Pieridae	X	X	X	X	X	X
Satyridae			X			
Papilionidae	X	X	X	X	X	X
Coleophoridae		X	X	X		
Psychidae		X				
Tineidae		X				
Sphingidae		X				
Limacodidae		X				
Saturnidae	X	X	X	X	X	X

Noctuidae	X	X	X	X	X	X
ORDER COLEOPTERA						
Chrysomelidae	X	X	X	X	X	X
Bruchidae		X	X		X	X
Cerambycidae		X		X		
Buprestidae		X		X		
Dermestidae		X		X		
Carabidae	X	X	X	X	X	X
Dysticidae		X				
Brentidae		X			X	
Anthribidae	X	X	X	X	X	X
Curculionidae	X	X	X	X	X	X
Elateridae		X			X	
Helodidae	X	X			X	
Byturidae					X	
Gyrinidae					X	
Scarabaeidae	X	X	X	X	X	X
Hdrophilidae		X				
ORDER HETEROPTERA						
Tingidae		X			X	
Miridae	X	X		X	X	
Corixidae					X	
Gelastocoridae		X			X	
Anthocoridae	X	X	X	X	X	X
Reduviidae	X	X	X	X	X	X
Belostomatidae		X			X	
Nepidae	X	X		X	X	
Pentatomidae	X	X	X	X	X	X
Lygaeidae		X			X	
Geridae		X				
Notonectidae		X				
ORDER HOMOPTERA						

Aphididae	X	X	X	X	X	X
Kerridae		X			X	
Cicadellidae	X	X	X	X	X	X
Fulgoridae	X	X		X	X	
Aleyrodidae	X	X	X	X	X	X
Cicadidae		X			X	
Membracidae		X			X	
Pseudococcidae	X	X	X	X	X	X
Coccidae		X			X	
Psyllidae		X			X	
Issidae		X			X	
ORDER ISOPTERA						
Termitidae	X	X		X	X	
Kalotermitidae					X	
Rhinotermitidae	X	X				
ORDER DERMAPTERA						
Labiidae		X			X	
ORDER MANTODEA						
Mantidae			X		X	
ORDER BLATTARIA						
Blattidae	X	X	X	X	X	X
Blattelidae	X		X	X	X	X
ORDER PHASMIDA						
Phasmatidae		X			X	
ORDER ORTHOPTERA						
Gryllidae	X	X	X	X	X	X
Gryllotalpidae	X	X			X	
Acrididae	X	X	X	X	X	X
Tetrigidae	X	X			X	X
Tettigoniidae	X	X			X	

ORDER PLECOPTERA						
Capniidae					X	
ORDER ZYGOPTERA						
Coenagrionidae		X				
ORDER ODONATA						
Macromiidae		X				
Libellulidae		X				
Aeshnidae		X				
ORDER THYSANURA						
Lepismatidae	X	X		X	X	
ORDER COLLEMBOLA						
Isotomidae	X	X	X	X	X	X
Sminthuridae		X			X	

Table 3: Frequency distribution of insects captured during the study

S/N	Order	Number of species (%)	Individual (%)
1	**Hymenoptera**	**40 (11.66)**	**807 (14.93)**
2	**Diptera**	**45 (13.12)**	**560 (10.36)**
3	**Lepidoptera**	**60 (17.49)**	**595 (11.00)**
4	**Coleoptera**	**64 (18.66)**	**450 (8.32)**
5	**Hemiptera**	**38 (11.08)**	**680 (12.58)**
6	**Homoptera**	**16 (4.66)**	**180 (3.33)**
7	**Isoptera**	**16 (4.66)**	**700 (0.13)**
8	**Dermaptera**	**2 (0.58)**	**35 (0.65)**
9	**Mantodea**	**2 (0.58)**	**15 (0.28)**
10	**Blattaria**	**7 (2.04)**	**368 (6.81)**
11	**Phasmida**	**2 (0.58)**	**17 (0.31)**
12	**Orthoptera**	**33 (9.62)**	**609 (11.27)**
13	**Plecoptera**	**1 (0.29)**	**16 (0.30)**
14	**Zygoptera**	**1 (0.29)**	**17 (0.31)**

15	**Odonata**	**7 (2.04)**	**207 (3.83)**
16	**Thysanura**	**2 (0.58)**	**46 (0.85)**
17	**Collembola**	**5 (1.46)**	**104 (1.92)**

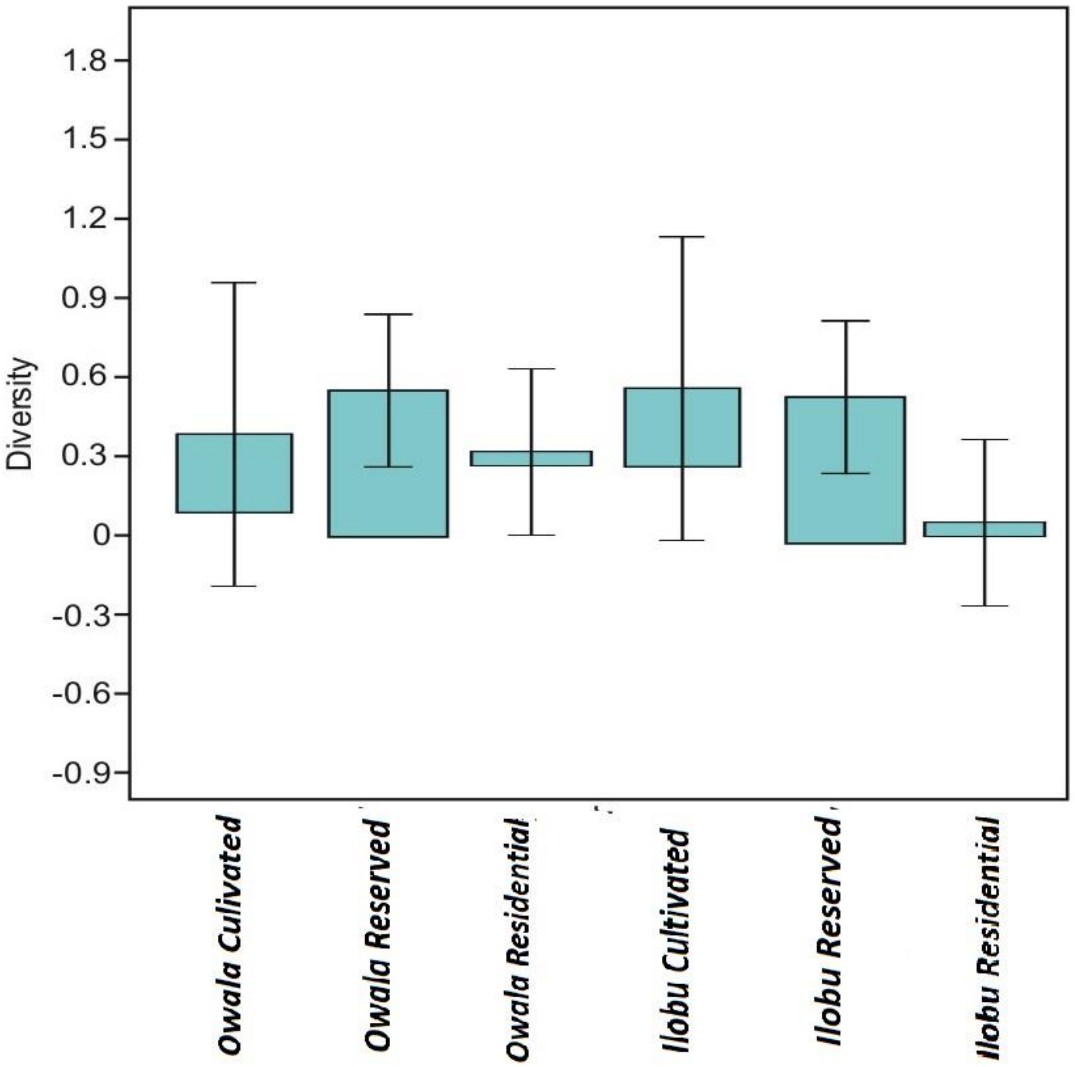

Figure 2: Diversity of Insects in the study area

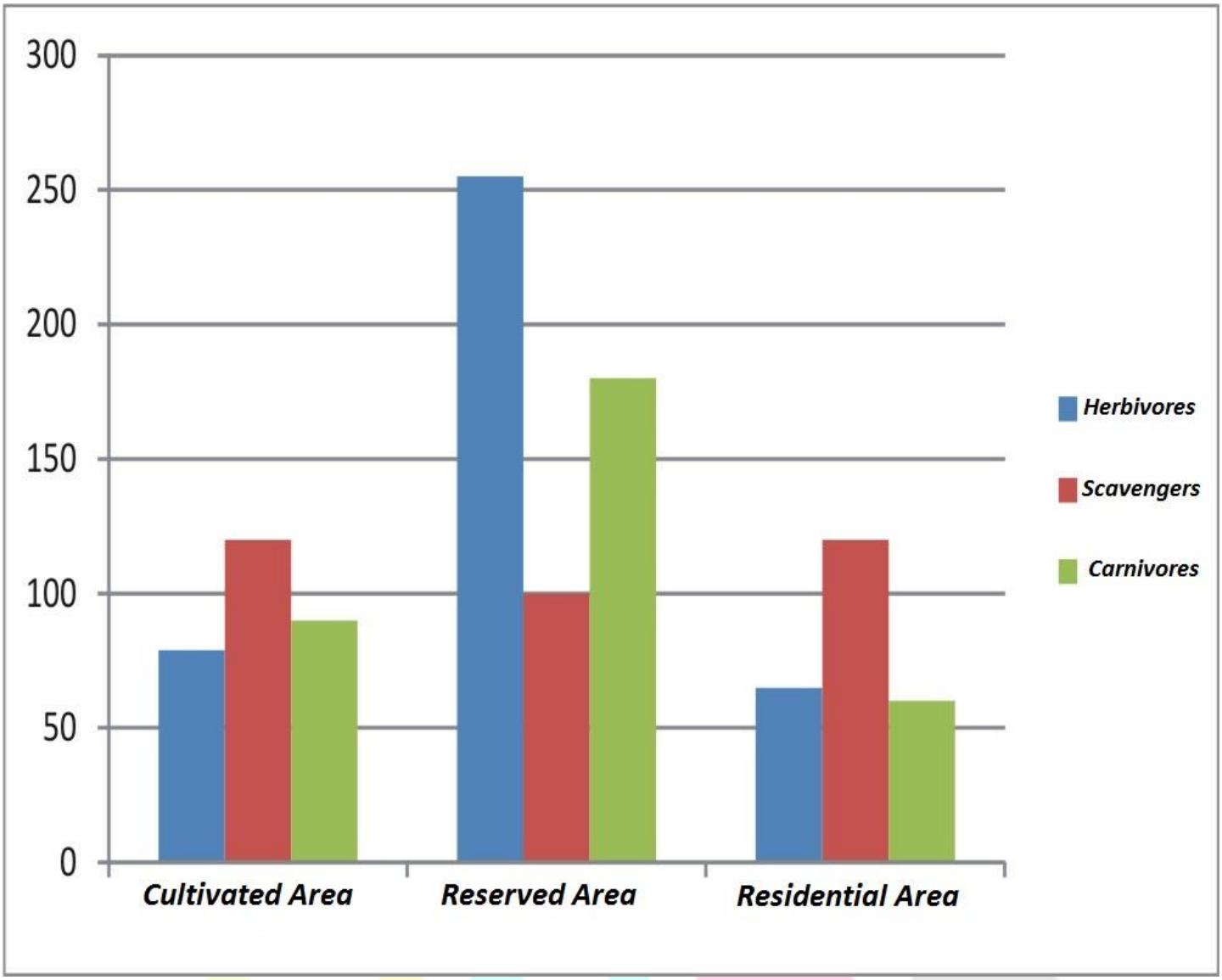

Figure 3: Comparison of abundance of insects in Owala dam

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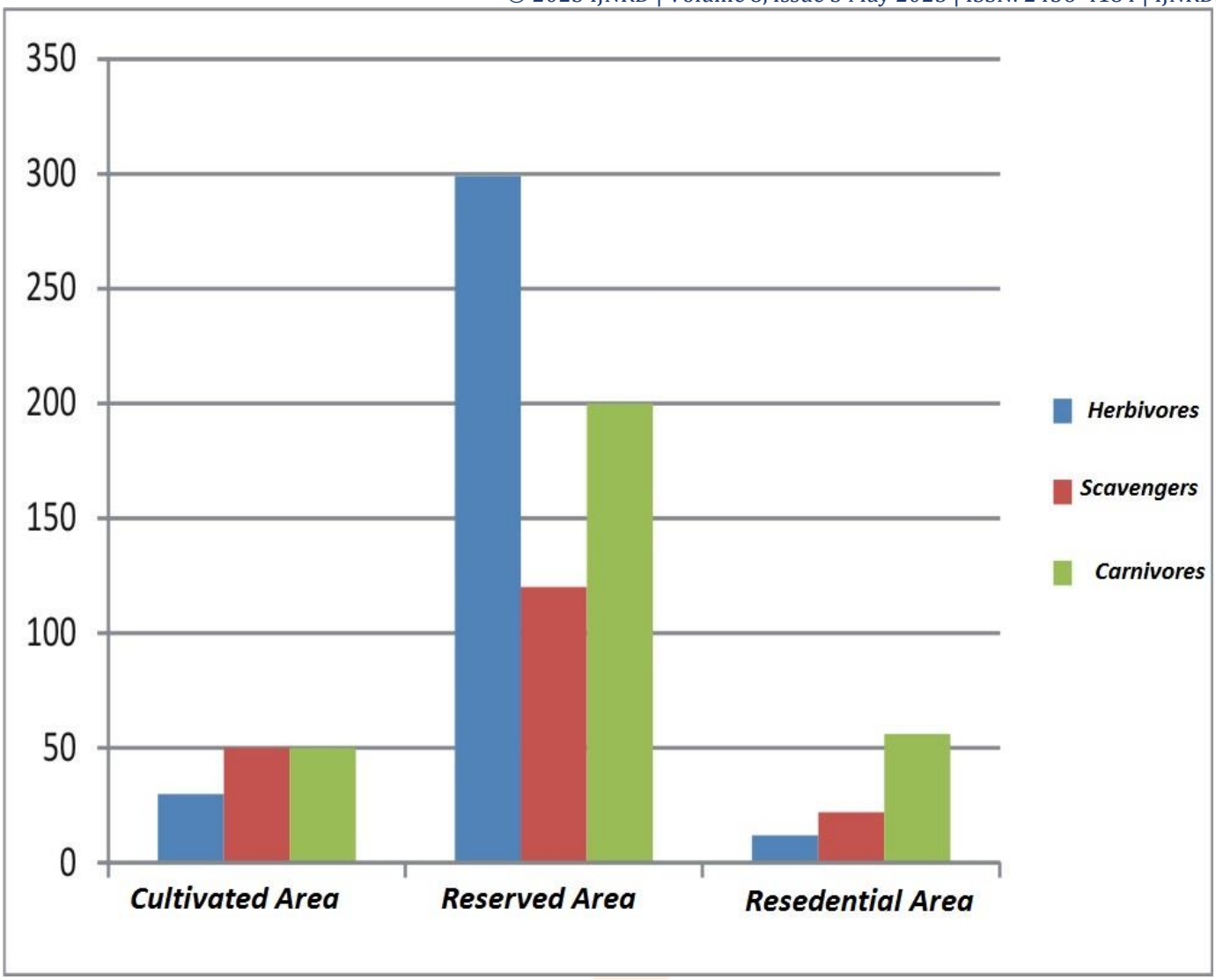

Figure 4: Comparison of abundance of insects in Ilobu

Plate 4: Apis mellifera (Hymenoptera:Apidae)

Plate 5: Musca domestica (Diptera: Muscidae)

Table 4: Paired Comparisons (β-diversity) of insect populations at Reserved Area Owala with Ilobu Areas

	Sum of Squares	df	Mean Square	F	Sig.

Cultivated area Ilobu * Reserved Area Owala	Between Groups	(Combined)	24.400	6	2.733	20.400	.024*
	Within Groups		.800	3	.167		
	Total		25.200	9			
Reserved area Ilobu * Reserved area Owala	Between Groups	(Combined)	15.500	6	2.583	12.600	.523
	Within Groups		.500	3	.167		
	Total		16.000	9			
Residential area Ilobu * Reserved Area Owala	Between Groups	(Combined)	33.400	6	5.750	13.500	.035*
	Within Groups		1.700	3	.500		
	Total		35.100	9			

* indicates probabilities that are significantly different ($P \leq 0.05$).

Table 5: Paired Comparisons (β-diversity) of insect populations within Owala dam

			Sum of Squares	df	Mean Square	F	Sig.
Residential area Owala* Reserved Area Owala	Between Groups	(Combined)	16.333	4	3.833	6.053	.028*
	Within Groups		3.269	5	.633		
	Total		19.602	9			
Cultivated area Owala * Reserved Area Owala	Between Groups	(Combined)	28.333	4	7.542	6.464	.071
	Within Groups		8.667	5	1.167		
	Total		37.000	9			

* indicates probabilities that are significantly different ($P \leq 0.05$).

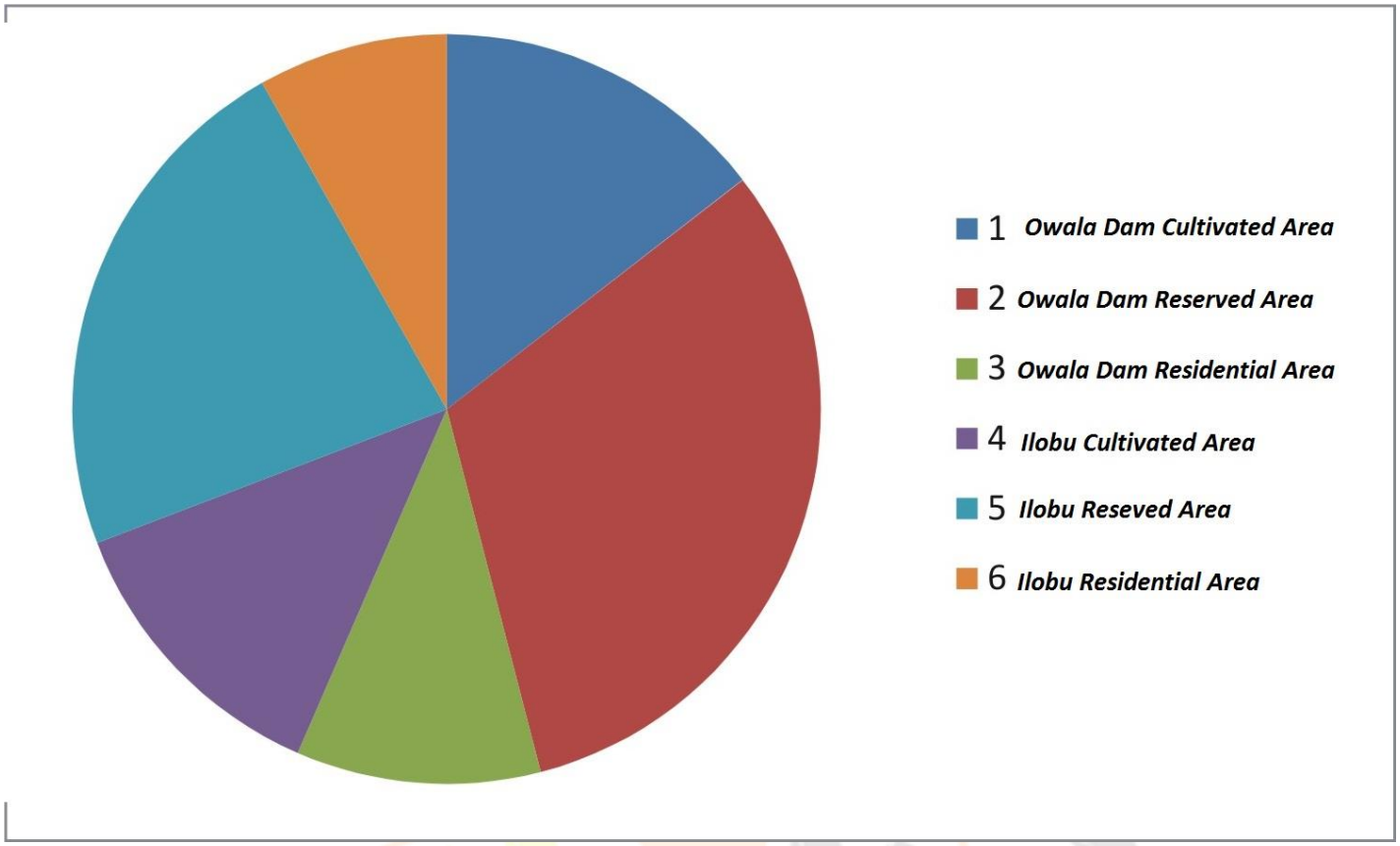

Figure 5: Pie chart showing proportions of Insects in the study area

Discussion

This work agreed with Margules (1986) who declares that conservation evaluation and monitoring programs mainly rely on estimates of diversity which are usually assessed as species richness derived from biodiversity study. This study has shown how rich in insect species of the six areas in and around Owala dam and Ilobu. The results of this study show that Coleoptera is the dominant insect order with 18.66% followed by Lepidoptera and Diptera with 17.49% and 13.12% respectively. This is not in accordance with the work of Naman *et. al.* (2019) which portrayed Odonata as the dominant order. The similarity to this study is just that Lepidoptera is the second dominant order in term of species richness. This present study is partially in accordance with the work of Yager *et. al.* (2018) who reported Hemiptera and Hymenoptera as the dominant insect Order. In this study, Hemiptera is the fifth dominant insect Order with 11.08%. Similar work on different forest types has been carried out in Ondo State, Nigeria by Adeduntan and Olusola (2013) but Orthoptera was reported as dominant insect Order in their study. The difference in the research findings could be as a result of difference in the study locations and environmental factors as observed by Alarapa *et. al*. (2015). Abiotic factors like temperature, humidity and light combine with the effects of biotic factors like host, vegetative biodiversity, crowding and diets will significantly influence insects and their population dynamics (Khaliq *et. al*., 2014).

The results on diversity of insects of areas under this study agrees with the findings of Gaston (1991); Cheng *et. al*. (2007) who showed that plants and insects interact by mutalism and phytophagy. The trend of the results of this research followed after the pattern of the more the vegetation the more the insect species captured. This can be accountable for the reason why we captured more insects at reserved areas than any other area in this study. The availability of different plants, within a given location for insect utilization, promotes the diversity and abundance of insect species in all the six locations in this study. Alarape *et. al.* (2015) has demonstrated that habitat vegetation complexity and forms is correlated to insect species diversity, and the results from this study also agree with that. The results of this study also shows that reserved areas both at owala dam and at Ilobu conserved more species than other areas in the study and this agreed with the work of Ma *et. al*. (2010) that reported that current rates of land modifications have resulted in the loss of more than half of the wetlands worldwide. Residential and cultivated areas exhibited lower taxa (species/site) and lower diversity. The probable reason could be land use and heterogeneity due to land fragmentation coupled with destruction of insect habitats during house building and agricultural practices. The reserved areas in the study have the highest diversity of insect fauna.

This study observed that reserved area around Owala dam is richer in species composition than any other area in the study. This result likely occurred because nutrients and canopy coverage were high in small streams and dam which provide food and predation protection for the invertebrate insects (Mundie *et. al*., 1991; Sweeny, 1993). The results from the reserved area can be related to the status of the forest health which Kolb *et. al*. (1994) in his work relates forest health to be synonymous to habitat productivity. The health of our forest ecosystems is important for plants and animals including insects that live in them. Forest that is healthy produce oxygen and clean water, holds soil in place and recycle nutrients (Tara, 2014). The results from this study shows that Owala dam reserved area is more healthy than other areas in the study. This means that we have to conserve our environment and put our land in good usage in other to make our forest healthy like that of reserved areas in this study. Healthy ecosystem will promote insect biodiversity and enhance speciation of different animals.

Conclusion

There were no significant difference in the diversity of insect between Owala dam and the adjacent ancient town called Ilobu. Nevertheless, there was significant difference between diversity of insects captured at reserved area if compared with insect species captured at other areas in this study. Residential areas exhibited least taxa (species/site) and low diversity the probable reason could be land use and heterogeneity and land fragmentation coupled with destruction of insect habitats during house building. The Reserved areas in the study have the highest diversity of insect fauna and the most captured insect Order is Hymenoptera with 11.66% and the least captured Orders are Plecoptera and Zygoptera with 0.29%. Herbivores have highest abundance within Owala dam and Ilobu, Southwestern, Nigeria.

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