

A Preliminary Survey of Insect Fauna around the Lake Chad Basin Area of Borno State, Nigeria

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Abstract

A survey was conducted during dry season of 2011/2012 around the Lake Chad Basin area of Borno State, Nigeria to collect and identify insects inhabiting different habitats in the area. The survey was conducted during dry season between 8.00am to 1.00pm between November and April. Sweep net and aspirator were used to catch insects and 95% alcohol was used to kill the insect specimens. The insect specimens were identified at the Insect Museum, Department of Crop Protection / Institute for Agricultural Research, Ahmadu Bello University, Zaria. Thirty four (34) insect species were identified representing 24 families relating to 8 insect orders. Among the insects identified, were insect pests of agricultural crops and vectors of human diseases.

Key words: Insect fauna, Lake Chad, Survey, Insect order, Insect species, dry season, habitats, economic importance.

INTRODUCTION

Insect are segmented animals with relatively jointed limbs. The number of known kinds or species of insect is difficult to estimate but certainly exceeds that of all other animals together (Imms, 1959). Insects represent the majority of living organism, accounting for about two-third of all living animals on earth filling many niches in both terrestrial and aquatic ecosystem (Goergen, 2009). Their distribution ranges from the poles to the equator. Approximately 100,000 species of insect have been described from sub-Saharan Africa, but there are very few overview of the fauna as a whole (Miller and Rogo, 2001). It has been estimated that the African insects make up about 10-20% of the global insect species richness (Gaston and Hudson, 1994). One thousand six hundred (1,600) species of bees (Eardley, 1989) and 2,000 species of ants among the Hymenoptera are known from Africa. There live also 3,607 species of butterflies being the best known group of insects (Ackery, 1995). However, existing knowledge on insect diversity is still inadequate for large parts of the globe and no one knows exactly how many species of insects exist.

Lake Chad Basin occupies 2381635km² of land and only 7.5% of this total area lies within Nigeria (FAO, 1997). The Lake Chad Basin area of Nigeria is characterized by sandy soil with low organic matter (Acknor and Vijime, 1995). The area is busy with agricultural activities in both dry and rainy seasons. Crops cultivated during dry season include sweet potato, cowpea, onion, tomato, eggplant, okra, sorrel, amaranthus, pepper, and watermelon. The species of insect inhabiting different habitats around the Lake Chad Basin area of Nigeria is not known and no work has been done previously to know how many species of insects exist around the area. Rapidly accelerating human trade, transport, travel, tourism and porous borders have contributed to the ease of movement and the introduction and spread of invasive insects into different habitats. Many of them can become notorious pests of agricultural, medical and veterinary importance. Therefore, identification of insects around the area will give more insight on the species richness of African insect diversity in various ecosystems, the structure of their populations, their interrelationships and interaction with their habitats (Goergen, 2009). The aim of this survey is to collect and identified insect species around the Lake Chad Basin area of Nigeria.

MATERIALS AND METHODS

Insect specimens were collected around the Lake Chad Basin area of Nigeria on-shore and offshore where most of the agricultural and other commercial activities are taking place. Sampling was conducted between 8.00am and 1.00pm daily between November and April during the peak of dry season where most of the dry season crops are cultivated.

Materials

1. Vial containing alcohol.
2. Killing bottles of various sizes.
3. Plastic vials for storing specimens.
4. Aspirator for collecting tiny insects.
5. Sweep net of different texture/sizes
6. Fine brush (camel's hair brush)
7. Absorbent tissue paper

8. Notebook and writing materials
9. A hand lens
10. A hand bag

Procedure of Collection of Insects

Sweep net was used to catch flying insects; the net was stroke-swing through the insect population rapidly to force the insect into the very bottom of the net. It was then twisted to hang the bottom of the net over the rim so that the specimens cannot escape. For flying insects that alight on the ground, a down stroke was quickly swung down on top of the insect. With the rim in contact with the ground, the tip of the net was held up with one hand to allow the insect fly or crawl upward into the tip of the net. The tip of the net was then flipped over the rim to entrap the specimens. Insects within vegetation were collected by sweeping the net through the vegetation, along the sand and up and down tree trunks, and near water bodies to catch specimen. After a catch was made, a strong swing was done to move anything in the net to the bottom and then immediately the middle of the net was grasped with the free hand to confine the specimen to a small part of the net. The catch was then transferred from the net to a killing bottle.

Aquatic insects were collected using a net with finer texture. The net was swept through the water and then lifted up. Insect collected were left behind in the net immediately the net was out of water. The catch was transferred to a killing bottle. Soil dwelling insects were collected using white paper and fine brush. However, some were hand-picked. Smaller insects were collected using aspirator.

Killing and Preserving of Insects

Insect specimens were killed using a liquid killing agent. A wide mouthed plastic bottle was half filled with 95% alcohol (USDA, 2005). Insects were submerged in the solution and allowed to die. Killed insect specimens were removed and dried on an absorbent white paper in a ventilated room. The dried specimens were preserved in a labeled bottle.

Identification of Insects

The preserved insect specimens were sent to the Insect Museum, Department of Crop Protection/ Institute for Agricultural Research, Ahmadu Bello University Samaru, Zaria for identification. Identified insect specimens were presented in table 1.

RESULTS

The insects are presented in the table 1 below from left to right, starting with the serial number column, the order, family and the genera/species of the insects. Thirty-three insect species were identified out of the thirty-four samples submitted (Table 1). The insects belong to eight different Orders and twenty-four different Families. The order Hymenoptera has nine species of five different families. Coleopteran has six species of four families, while the order Orthoptera has five species of two families. The orders Homoptera, Heteroptera and Diptera have four species each. Diptera has three species identified out of the four Dipterans of the family Muscidae, Culicidae, and Asilidae. Two of the insects, *Chrysopa* spp and *Periplaneta americana* were found to be members of the order Neuroptera and Dictyoptera respectively. The family Acrididae has the highest number of insect species (four) followed by the family Formicidae (three). All insect belonging to the orders Homoptera, Heteroptera and Diptera are of different families. Tables 2 and 3 shows the classification of the insects surveyed according to their different habitats and economic importance.

Table 1: List of insects collected and identified around the Lake Chad Basin area of Borno State, Nigeria in the dry season of 2011/2012

S/No.	Order	Family	Genera/Species
1	Hymenoptera	Formicidae	<i>Cataglyphis bicolar. Fab.</i>
2	Hymenoptera	Formicidae	<i>Dorylus affinis. Emy</i>
3	Hymenoptera	Formicidae	<i>Dorylus (Alaopone) spp</i>
4	Hymenoptera	Apidae	<i>Apis mellifera. L.</i>
5	Hymenoptera	Apidae	<i>Xylocopa spp.</i>
6	Hymenoptera	Sphecidae	<i>Cerceris mazimba. Brauns.</i>
7	Hymenoptera	Sphecidae	<i>Stizus spp.</i>
8	Hymenoptera	Scolidae	<i>Scolia morio rufipes</i>
9	Hymenoptera	Mutillidae	<i>Dolichomutilla guineensis. Var</i>
10	Coleoptera	Tenebrionidae	<i>Zophosis quadrilineata. Olivier.</i>
11	Coleoptera	Tenebrionidae	<i>Pimelia spp.</i>
12	Coleoptera	Lygaeidae	<i>Lygaeus festivus. Thunp.</i>
13	Coleoptera	Coccinellidae	<i>Epilachna chrysomelina. F.</i>
14	Coleoptera	Chrysomelidae	<i>Monolepta spp.</i>
15	Coleoptera	Chrysomelidae	<i>Estcourtiana spp.</i>
16	Orthoptera	Acrididae	<i>Tropidopola punctipennis. Walk.</i>
17	Orthoptera	Acrididae	<i>Anacridium melanorhodon. Walker.</i>
18	Orthoptera	Acrididae	<i>Mesopsis abbreviatus. Beauv.</i>
19	Orthoptera	Acrididae	<i>Paracomacris spp.</i>
20	Orthoptera	Pyrgomorphidae	<i>Chrotogonus senegalensis. Krauss</i>
21	Homoptera	Achilidae	<i>Cridus spp.</i>
22	Homoptera	Cidellidae	<i>Jimara maculata. Dworak.</i>
23	Homoptera	Cicadellidae	<i>Igerna spp.</i>
24	Homoptera	Aphididae	<i>Aphis craccivora. Koch.</i>
25	Heteroptera	Arctiidae	<i>Utetheisa lotrix. Cram.</i>
26	Heteroptera	Nepidae	<i>Hydrometro albolineata. Reur</i>
27	Heteroptera	Nabidae	<i>Arbela spp.</i>
28	Heteroptera	Pentatomidae	<i>Amayosana punctata. Dist.</i>
29	Diptera	Muscidae	<i>Coenosia spp.</i>
30	Diptera	Muscidae	<i>Musca domestica.</i>
31	Diptera	Asilidae	
32	Diptera	Culicidae	<i>Culex pipiens.</i>
33	Neuroptera	Chrysopidae	<i>Chrysopa spp.</i>
34	Dictyoptera	Blattidae	<i>Periplaneta americana.</i>

Table 2: Classification of insects surveyed around the Lake Chad Basin area of Borno State, Nigeria in the dry season of 2011/2012 according to their different habitats

S/N	Habitat	Order	Family	Genus/Specie
1	Aquatic insect	Heteroptera	Nepidae	<i>Hydrometra albolineata</i> . Reur.
2	Aquatic insect	Heteroptera	Nabidae	<i>Arbela</i> spp
3	Aquatic insect	Homoptera	Cicadellidae	<i>Igerna</i> spp
4	Aquatic insect	Coleoptera	Chrysomelidae	<i>Monolepta</i> spp
5	Aquatic insect	Coleoptera	Chrysomelidae	<i>Estcourtiana</i> spp
6	Soil dwelling insect	Coleoptera	Tenebrionidae	<i>Pimelia</i> spp
7	Soil dwelling insect	Coleoptera	Tenebrionidae	<i>Zophosis quadrilineata</i> Oliver.
8	Soil dwelling insect	Hymenoptera	Mutillidae	<i>Dolichomutilla guineensis</i> . Var.
9	Plant inhabiting insect	Hymenoptera	Formicidae	<i>Cataglyphis bicolor</i> . Fab.
10	Plant inhabiting insect	Hymenoptera	Formicidae	<i>Dorylus affinis</i> . Emy
11	Plant inhabiting insect	Hymenoptera	Formicidae	<i>Dorylus (Alaopone) spp</i>
12	Plant inhabiting insect	Hymenoptera	Apidae	<i>Apis mellifera</i> . L.
13	Plant inhabiting insect	Hymenoptera	Apidae	<i>Xylocopa</i> spp.
14	Plant inhabiting insect	Hymenoptera	Sphecidae	<i>Cerceris mazimba</i> . Brauns.
15	Plant inhabiting insect	Hymenoptera	Sphecidae	<i>Stizus</i> spp.
16	Plant inhabiting insect	Hymenoptera	Scolidae	<i>Scolia morio rufipes</i>
18	Plant inhabiting insect	Coleoptera	Lygaeidae	<i>Lygaeus festivus</i> . Thunp.
19	Plant inhabiting insect	Coleoptera	Coccinellidae	<i>Epilachna chrysomelina</i> . F.
20	Plant inhabiting insect	Orthoptera	Acrididae	<i>Tropidopola punctipennis</i> . Walk.
21	Plant inhabiting insect	Orthoptera	Acrididae	<i>Anacridium melanorhodon</i> . Walker.
22	Plant inhabiting insect	Orthoptera	Acrididae	<i>Mesopsis abbreviatus</i> . Beauv.
23	Plant inhabiting insect	Orthoptera	Acrididae	<i>Paracomacris</i> spp.
24	Plant inhabiting insect	Orthoptera	Pyrgomorphidae	<i>Chrotogonus senegalensis</i> . Krauss
25	Plant inhabiting insect	Homoptera	Achilidae	<i>Cridus</i> spp.
26	Plant inhabiting insect	Homoptera	Cidellidae	<i>Jimara maculata</i> . Dworak.
27	Plant inhabiting insect	Homoptera	Aphididae	<i>Aphis craccivora</i> . Koch.
28	Plant inhabiting insect	Heteroptera	Arctiidae	<i>Utetheisa lotrix</i> . Cram.
29	Plant inhabiting insect	Heteroptera	Pentatomidae	<i>Amayosana punctata</i> . Dist.
30	Plant inhabiting insect	Diptera	Muscidae	<i>Coenosia</i> spp.
31	Plant inhabiting insect	Diptera	Muscidae	<i>Musca domestica</i> .
32	Plant inhabiting insect	Diptera	Asilidae	
33	Plant inhabiting insect	Diptera	Culicidae	<i>Culex pipiens</i> .
34	Plant inhabiting insect	Neuroptera	Chrysopidae	<i>Chrysopa</i> spp.
35	Plant inhabiting insect	Dictyoptera	Blattidae	<i>Periplaneta americana</i> .

Table 3: Classification of some of the insects surveyed around the Lake Chad Basin area of Borno State, Nigeria in the dry season of 2011/2012 according to their economic importance

S/No.	Economic importance	Order	Family	Genus/Specie
1	Plant pollinators	Hymenoptera	Sphecidae	<i>Cerceris mazimba</i> . Brauns.
2	Plant pollinators	Hymenoptera	Apidae	<i>Xylocopa</i> spp
3	Plant pollinators	Hymenoptera	Apidae	<i>Apis mellifera</i> L.
4	Plant pollinators	Heteroptera	Arctiidae	<i>Utetheisa lotrix</i> . Cram.
5	Vectors of plant diseases	Homoptera	Aphididae	<i>Aphis craccivora</i> . Koch.
6	Vectors of plant diseases	Coleoptera	Coccinellidae	<i>Epilachna chrysomelina</i> . F.
7	Vectors of human diseases	Dictyoptera	Blattidae	<i>Periplaneta americana</i> .
8	Vectors of human diseases	Diptera	Culicidae	<i>Culex pipiens</i> .

DISCUSSION

The survey revealed that, there were as many as 34 insect species represents 24 families relating to 8 insect orders collected in the Lake Chad Basin area of Nigeria. The insect species include destructive insects (insect

pests), insect pollinators, saprophytic insects, parasitoids, predators and insect vectors. The genera and species of one of the family Asilidae was not identified. This indicates that the insects may not have been identified previously. It was earlier reported that the species of thousands of insects have not been identified (Imms, 1959). In addition, existing knowledge on insect diversity is still inadequate for large parts of the globe and no one knows exactly how many species of insects exist (Goergen, 2009). Not many of the insect species identified are major pest to the annual crops and vegetables grown in the area except *Aphis craccivora* that is a major pest of dry season cowpea in the Lake Chad Basin area. However, many of them could have medical or veterinary importance. This implies that crop cultivation could be conducted with less insect pest problem in the area during the dry season. Among the insect identified are insect vectors of human diseases. This indicates that diseases sprayed by insect vectors could be commonly found in the area. The economic importance of some of the insects identified is not known. However, their contributions to the stability of the ecosystem cannot be disputed. Aquatic insects are good indicators of stream disturbances by human activities (Norris, 1995., Wright *et al.*, 1995). The insects were collected during dry season when crops are few in the field and the vegetation is relatively drier, therefore not many insect species were found. However, rapidly accelerating human trade, transport, travel, tourism and porous borders have contributed to the introduction, ease of movement and spread of invasive insects (Goergen, 2009) thereby constantly changing the diversity of insect fauna in any habitat.

CONCLUSION AND RECOMMENDATIONS

It could be concluded that 34 insect species representing 24 families relating to 8 insect orders were found during the survey. Out of the 34 species of insects identified, were insect pests of agricultural crops and vectors of human diseases. The survey has provided a list of insect species inhabiting soil, water and plant in the Lake Chad Basin area. Knowledge of the insect species identified and their distribution around the Lake Chad Basin area would help farmers organize farming activities to better manage insect pests. Control and management of non-farming activities like disease spread by insect vectors would also be achieved. The species of insect previously unknown would be identified and named and this would also add to our knowledge of insect taxonomy and nomenclature. Above all, the list of insects identified in this survey marks a beginning for identifying the insect species around the Lake Chad Basin area. It is therefore recommended that, similar survey should be conducted during rainy season of the year to have a list of insect occurring at every particular season of the year and the economic importance of insects surveyed should also be investigated.

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REFERENCES

- Ackery, P.R.(1995) *Carcasson's African Butterflies: An Annotated Catalogue of the Papilionidae and Hesperioidea of the African region*. CSIRO, Canberra.
- Ackonor, J.B. and Vijime, C.K. (1995) Factors affecting *Locusta migratoria migratorioides* egg development and survival in the Lake Chad basin outbreak area. *International Journal of Pest Management* 41 (2):87-96.
- Eardley, C.D. (1989) Diversity and endemism of southern African bees. *Plant Protection News* 18:p1-2
- FAO (1997) Irrigation potentials in Africa: A basin approach. *FAO Land and Water Bulletin*, 4.
- Gaston, K. J. and Hudson, E. (1994) Regional patterns of diversity and estimates of global insect species richness. *Biodiversity and Conservation* 3:493-500.
- Goergen, G. (2009) Unraveling the diversity of African insects. *IITA Benin*
- Imms, A.D. (1959) *Outlines of Entomology*. 5th ed. Chapman and Hall, London.
- Lewis, T. and Taylor, L. R. (1979) *Introduction to Experimental Ecology. A study guide to fieldwork and analysis*. Academic Press, London 401pp.
- Miller, S. E. and Rogo, L. M. (2001) Challenges and opportunities in understanding and utilization of African insect diversity. *Cimbebasia* 17: 197-218.
- Norris, R. H. (1995) Biological monitoring: the dilemma of data analysis. *J. of North Am. Benthol. Soc.*, 14:440-450.
- USDA (2005) *Collecting and Preserving Insects and Mites: Tools and Techniques*. Agricultural Research Service.
- Wright, J. F., Furse, M. T. and Armitage, P. D. (1995) R1VPACS: A technique for evaluating the biological quality of rivers in the UK. *European Water Pollution Control* 3:15-25.

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