A Survey of Insect Pests in Hostels of Taraba State University, Jalingo. Taraba State, Nigeria

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Abstract*— Insects are a diverse and abundant group of organisms that play both beneficial and detrimental roles in the ecosystem. While many insects contribute to pollination, nutrient cycling, and food, a significant proportion of them are destructive pests that cause substantial economic losses and jeopardize global food security. Understanding the impact and effective control strategies of insect pests is crucial for sustainable agriculture and pest management practices. This study presents a comprehensive survey of insect pests, aiming to shed light on their distribution, behavior, and the possible damage they may inflict on Taraba State University Hostels and is occupants. The research involved an extensive literature review, field surveys, and data analysis to provide valuable insights into the current status of insect pest in Taraba State University Hostels. A total of 901 insect pests were caught. A total of 217 Mosquitoes were caught which belong to anopheline and culicine groups, 242 Musca domestica were caught, 136 Ants which belong to genus Camponotus and genus Solenopsi were caught, 99 Isoptera were caught, 134 P. Americana were caught, 73 Spider in six (6) different hostels which include: Block A, B, and C for the boys hostels, Josephine Tuktur, Undergraduate and Zenith for the girls hostels. The M. domestica group had a higher number of individuals 242, followed by the An. gambiae 148. In conclusion, this survey of insect pests highlights the urgency of implementing integrated and environmentally friendly pest management strategies to mitigate the negative impacts of insect pests.

Index Terms- Insect Pests, Hostels, Taraba, Nigeria.

I. INTRODUCTION

1.0 Background of The Study

Over the years, insect pests have been responsible for the continual, often undetected, erosion of our cultural heritage and the undermining of the structural integrity of many of our significant architectural masterpieces. Insect pests are responsible for damage to buildings, their components and furnishings. (Mason et al., 2010). The effects of insect infestation on the environment are numerous (Borror et al. 2004)

There is an overwhelming evidence that insect pests are responsible for some of the world's deadliest diseases like malaria, yellow fever, cholera amongst others (CDC, 2021). The cockroach is considered an allergen source and an asthma trigger for residents (Mason et al., 2010). They are found in every household, office building, school building etc. Their impacts are felt globally (CDC, 2021)

Insects pest have become well adapted to living with and near humans, and their hardiness is legendary. In light of these facts, insect pest control may become a homeowner's most difficult task because of the time and special knowledge it often involves (Credland et al.2003)

Insects represent the largest and most diverse group of organisms on Earth, with over one million described species and potentially several million more yet to be discovered. While many insects play beneficial roles in ecosystems, such as pollination and nutrient cycling, a fraction of them have adapted to exploit human activities, becoming insect pests. Insect pests are species that cause harm or damage to humans, crops, livestock, and the environment, often leading to significant economic and ecological consequences (Borror et al. 2004)

The coexistence of humans and insect pests has a long history, dating back to the development of agriculture thousands of years ago. As early humans settled into agricultural communities, they encountered pests that attacked their crops and stored food supplies. Over time, this interaction led to the development of rudimentary pest management practices, such as manual removal and the use of natural deterrents (Calcaterra and Tschinkel, 2008)

With the advancement of civilizations and trade, insect pests spread globally, causing devastating crop losses and famines. The Industrial Revolution brought new chemical pesticides, which were initially hailed as miraculous solutions to pest problems. However, the indiscriminate use of pesticides led to unintended consequences, such as resistance in pest populations, environmental pollution, and harm to non-target organisms (Bousquet, 2005; Evans and Lai, 2013

During the mid-20th century, the concept of Integrated Pest Management (IPM) emerged, emphasizing a more balanced and sustainable approach to pest control. IPM aims to use a combination of cultural, biological, and chemical control methods to minimize the use of pesticides while maintaining pest populations below economic damage thresholds (Credland et al 2003)

Despite significant advancements in pest management practices, insect pests continue to be a significant challenge worldwide. Factors such as globalization, climate change, and intensive agricultural practices have influenced the dynamics of pest populations, leading to new pest outbreaks and the resurgence of previously controlled pests (Oke 2003; Brenner and Goldman, 2018)

Research into insect pests has been ongoing for decades, with scientists studying their biology, behavior, ecology, and interactions with the environment and host plants. Various monitoring and survey methods, such as pheromone traps, visual surveys, and remote sensing technologies, have been developed to assess pest populations and predict their potential impact on crops (Crowson, 200, Credland et al., 2003)

Understanding the complex relationships between insect pests, their host plants, natural enemies, and the environment is critical for developing effective and sustainable pest management strategies. Research on insect pests continues to evolve as new challenges arise, and there is an increasing focus on ecological approaches that consider the broader ecosystem dynamics in pest management decisions.

1.2 Statement of Problem

Taraba State University is one of the fastest growing University in Nigeria, it admits about Five thousand (5000) students per session, and most of these students stay in the hostels throughout their periods of study. With higher number of students in these hostels, the level of waste and dirt goes up which makes rooms for insect pests which in turn affect the quality of life for both students and hostel infrastructure (Tim, 2011; Toews et al., 2002)

1.3 Aim/Objectives of the study

1.3.1 Aim of Study

The aim of this study is to Survey the Insect Pests found in hostels of Taraba State University.

Objectives of the Study

- To identify different insect pest found in hostels of Taraba State University.
- To assess the distribution of insect pests in the male and female hostels.
- To relate activities of occupants to insect pest in the hostel.

II. MATERIALS AND METHOD

2.1 Study Area

Taraba State University also known as TSU is located in Jalingo, Taraba State. The university was established by the Taraba State Government in 2008, to widen access to university education for Taraba State indigenes. It is one of the state-owned universities in Nigeria and is recognized as a center of learning, research, and community engagement to promote economic growth and development in the state particularly and the country at large. The institution offers courses and programs leading to officially recognized higher education degrees such as bachelor's degree in several areas of study. It has a population of 50,000-249,999 inhabitants. The institution is located between latitudes 8 0 47' to 9 0 01'N and longitudes 11 0 09' to 11 0 30'E.

There are four hostels namely; Josephine Tuktur, Undergraduate and Zenith for the female hostels, and Block A, B, C and D for the male hostels.

Josephine Tuktur hostel consist of one (1) block and 54 rooms, each room contains three (3) students.
Undergraduate hostel consists of four (4) blocks and 78 rooms consisting of three (3) students per room.Zenith hostel consist of four (4) blocks, 216 rooms consisting of three (3) students per room.
Boys hostel has four (4) blocks; Block A, B, C, and D consisting of fourteen (14) students per room.

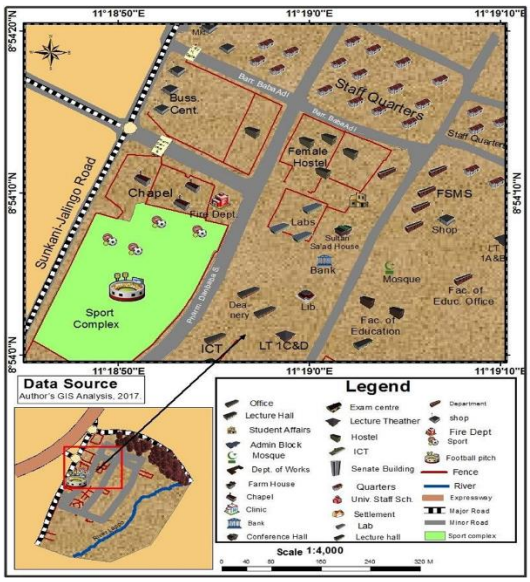

Figure 1: Map showing Taraba State University and the University Hostels

3.2 Population of study

Block A, B, and C from the male hostel was selected for the survey; 15 rooms were selected at random. 25 rooms from Josephine Tuktur, 25 rooms from Undergraduate and 25 rooms from Zenith hostel was selected randomly from the female hostels for the purpose of data collection and identification during the course of this research work. Since the survey was carried out in Taraba State University Hostels, only residents within the hostels were considered for data collection.

3.3 Sample and sample Technique

Since the total population of the study area is 200 rooms, the respondents considered were people within the age of 18 years and above. All respondents must live in the hostels included in the study. The sample size to be used were determined using Taro Yameni formula:

$$n = \frac{N}{1+N\ (e^2)}$$

Where n = is the sample size
N = is the population
1 = constant
e2 = is the estimated standard errors which is 5% for 95% confidence level

$$n = \frac{5000}{1+5000\ (0.05^2)}$$

Questionnaires was shared amongst occupants of the hostels.

3.4 Collection, Preservation and Processing

Indoor spray for morning and evening was done in selected rooms, knocked down insects were picked, counted and preserved in 70% alcohol in eppendorf tubes or insect container and brought to the Biological Science Laboratory for identification.

3.5 Identification of samples

All insects collected were identified and sorted out under a dissecting microscope (Entomological microscope). The female Anopheles mosquitoes were identified using morphological keys of Gillies and De Meillion (1968), Gillies and Coetzee (1987) by sex and whether they were anophelines or culicines. Other insects were also identified based on standard keys (Crowson, 2001; El-shebini and El-shebini, 2011; Paupy et al. 2009); Su and Scheffrahn 1990)

3.6 Data Analysis

Data collected for the study were subjected to Chi – square Goodness-of-fit analysis and Shannon Weiner diversity index (Scott et al, 2013).

III. RESULTS AND DISCUSSION

Results

A total of 901 insect pests were caught out of which 217 Mosquitoes were caught which belong to anopheline and culicine groups, 242 M. domestica were caught, 136 Ants which belong to Camponotus and Solenopsi were caught, 99 Isoptera were caught, 134 P. Americana were caught. 73 Spider in six (6) different hostels which include: Block A, B, and C for the boys' hostels, Josephine Tuktur, Undergraduate and Zenith for the girls hostels were also caught.

The M. domestica group had a higher number of individuals 242, followed by the An. gambiae 148.

Table 1: different insect species caught in the hostels

Different Hostels	Insect Pest							
	An. gambiae	*Culex*	*M. domestica*	*Camponotus*	*G. Solenopsi*	*Isoptera*	*P. Americana*	*Spider*
Josephine	42	18	66	9	22	15	25	19
Undergraduate	36	16	49	13	18	17	33	13
Zenith	63	24	84	17	35	53	48	33
Male Block A	18	4	14	3	6	10	12	3
Block B	9	5	16	5	5	2	7	4
Block C	7	2	13	0	3	2	9	1

Table2. different species of insect pest found in the male and female hostels

Hostels	Insect Pest							
	An. gambiae	*Culex*	*M. domestica*	*Camponotus*	*G. Solenopsi*	*Isoptera*	*P. Americana*	*Spider*
Male	34	11	43	8	14	14	28	8
Female	114	58	199	39	75	85	106	65
Total	148	69	242	47	89	99	134	73

Table 3: Activities of occupant in the hostels

ACTIVITIES	MALE	FEMALE	TOTAL
Waste bin			
Yes	23	115	138
NO	7	45	52
Stagnant water			
Yes	3	123	126
No	26	35	61
Door/ window open			
Yes	25	108	133
No	4	48	52
Proper disposal of waste			
Yes	21	129	129
No	8	58	66

Table 4: Diversity of insect pest using Shannon Weiner diversity index H= £ PiInPi

The table below shows the diversity of insect pest in the boys Hostel

Specie	No. specie	P*i*	InP*i*	*PiInPi*
An. gambiae	34	0.2125	-1.5488	-0.3291
Culex	11	0.0687	-2.6780	-0.1839
M domestica	43	0.2687	-1.3141	-0.3530
Camponotus	8	0.0500	-2.9957	-0.1498
G. Solenopsi	14	0.0875	-2.4361	-0.2131
Isoptera	14	0.0875	-2.4361	-0.2131
P. americana	28	0.1750	-1.1429	-0.3050
Spider	8	0.0500	-2.9957	-0.1498
Total	160	0.9999	-18.1474	-1.8968

Table 5: Diversity of insect pest using Shannon Weiner diversity index H= £ PiInPi

The table below shows the diversity of insect pest in the girl's hostel

Specie	No. specie	P*i*	InP*i*	*PiInPi*
An. gambiae	114	0.1538	-1.8721	-0.2879
Culex	58	0.0783	-3.0303	-0.2373
M domestica	199	0.2685	-1.3160	-0.3527
Camponotus	39	0.0556	-2.9450	-0.1549
G. Solenopsi	75	0.1012	-2.2906	-0.1549
Isoptera	85	0.1147	-2.1654	-0.2484
P. americana	106	0.1430	-19449	-02981
Spider	65	0.0877	-2.4338	-0.2134
Total	741	0.9998	-17.9981	-1.9476

DISCUSSION

The presence of insect pests in the hostels of Taraba State University will possibly expose occupants to high risks of human-vector contacts that will result in food contamination, nuisance, rapid reproduction, disease transmission, and most especially mosquitoes-borne diseases which will negatively affect the health and wellbeing of occupants in the hostels (Russel et al., 2015; Heminguay et al., 2016) The study found that M. domestica were the most abundance due to level of waste not properly disposed and stagnant water especially in the female hostels, this is in line with the study of Gogarten et al. (2019) who suggests that flies appears to move and are rarely found outside their vicinity. Moreover, they carry and presumably spread pathogens that cause disease in both animals and humans.

The presence of M. domestica as the most dominant specie of insect pest in this study suggests that the anthropogenic activities have given rise to more temporary breeding site for rapid reproduction. This is in accordance to the study of Scott (2019) and Gerry et al (2021) who showed that transient habitats accounted to breeding success of M. domestica. and

Nelon (2016), who reported the dangers of living with house flies in the communities of North Carolinas, United State. The high number of M. domestica over other species of insect pest in the hostels is due to the high level waste not properly disposed and stagnant water in order to prevent nutrient for the development of their fertilized eggs.

The observed variation of in M. domestica in favor of the female hostels maybe due to the high amount of dirt flying in the environment and stagnant waters which contributes to more abundance of M. domestica than the male hostels. This is in line with Mason and Gibb. (2010) who showed Insect pests of home stored foods.

The large numbers of Anopheles and Culex mosquitoes found could be as a result of the presence of collections of dirty/stagnant water, open wells in sample locations which serve as their breeding grounds. Similarly, the surrounding bushes around the various residential hostels which include tufts of grass and other emergent vegetation which could serve as their resting places, this could be responsible for large number observed. These findings agree with the report of Michael (2014) and Lamidi and Emmanuel (2022) who reported the presence of similar species of mosquitoes in Zaria dam in which Culex Quinquefasciatus and Anopheles Gambiae were the most dominant, and Bali Taraba state, Nigeria respectively. The study of El-Sherbini and El-Sherbini 2011 also recorded that Musca domestica and P. Americana live closely with humans and domestic animals, and often found in areas of human activities.

CONCLUSION

The present finding indicates that there are more M. domestica in the three female hostels (Josephine Tuktur, Undergraduate and Zenith) than other species of insect pests. The results showed that majority of the mosquitoes and house fly species were fed and carriers of various diseases, therefore control measures aimed at eliminating the breeding sites and reducing its contact with the students so as to minimize disease transmission among the student hostel. Strong emphasis should also be laid on the importance of personal protection and environmental hygiene in the student hostels. Population of housefly may be suppressed by utilization of their natural enemies like entomic pathogenic fungi, nematodes, fire ants, predatory, beetles, mites, parasitic wasps (not harmful for human and animals).

RECOMMENDATIONS

1. Routine survey of insect pest density should be observed by the body concerned, in order to detect early any potential risk to the students in the hostel.
2. Further studies should be carried out to include outdoor survey of the insects' pests of the hostel environment
3. There should be adequate control measures to tackle the high prevalence of pests in our environment

REFERENCES

[1] Borror, D. J., De Long, D. M. and Triplehorn, C.A. 2004. An introduction to the study of insects. Saunders, Philadelphia. 827 pp.

[2] Brenner, R. J., and Goldman, C. R. (Eds.). (2018). Cockroaches as Vectors of Microorganisms and Parasites. Springer Science & Business Media.

[3] Credland, D M Armitage, C H Bell, P M Cogan, E (2003) Highley, Eds.). Proc. 8th Int. Working Conference on Stored Product Protection, York, UK, 22–26 July 2002. CABI International, Wallingford, UK; 1071 pp.

[4] Bousquet Y. (2005) Beetles associated with stored products in Canada. Agriculture and Agri-Food Canada, Research Branch Agriculture, Canada Publication X: 214pp.

[5] Crowson R A. (2001) Coleoptera: introduction and key to families. Handbooks for the identification of British insects. Royal Entomological Society of London, London; 59 pp.

[6] Calcaterra, L. A., & Tschinkel, W. R. (2008). Polymorphism and division of labor in a socially complex ant: colony structure, worker size, and genetic relatedness in the Florida harvester ant (Pogonomyrmex badius). Insectes Sociaux, 55(4), 351-359.

[7] CDC. (2021). Cockroaches and Disease. Centers for Disease Control and Prevention. Retrieved

from https://www.cdc.gov/nceh/ehs/docs/factsheets/cockroaches_and_disease.pdf

[8] Evans, T. A., & Lai, J. C. S. (2013). A taste of the tropics: stable isotopes reveal the land-locked Polyrhachis ants are termites. Proceedings of the Royal Society B: Biological Sciences, 280(1766), 20130559.

[9] El-Sherbini GT and El-Sherbini ET (2011). The role of cockroaches and flies in Mechanical transmission of medical important parasites. Journal of Entomology and Nematology

[10] Gerry, MC., Elinor, D. Oliver, E. and Chik, C.(2021). Health Inequalities, Fundamental Causes and Power: Towards the Practice of good theory. Social Health Jan, 43 (1); 20-39

[11] Gillies, M.T. and Coetzee, M.(2011). A supplement to the Anophelinae of Africa South of the Sahara. South African Institute for Medical Research, Johannesburg, South Africa, No 55

[12] Gogarten, J., Dux, A., Mubemba, B., Kamilla, P. Constanze, H.Mielke, A. Jonatha, M. Sachse, A. Wittig, R. Calvignac, S. and Leendertz, F. (2019). Tropical Rainforest Flies Carrying Pathogens from Stable associations with social non-human primates. Molecular Ecology, Environmental Science, Biology. 8 June, 2019

[13] Hemingway, J., Shretta, R., Wells, T. N., Bell, D., Djimdé, A. A., Achee, N., ... & Ranson, H. (2016). Tools and strategies for malaria control and elimination: what do we need to achieve a grand convergence in malaria? PLoS Biology, 14(3), e1002380.

[14] Koehler, P. G., & Patterson, R. S. (2005). Roaches. UF/IFAS Featured Creatures. Retrieved from https://edis.ifas.ufl.edu/in022

[15] Lamidi, B.T and Emmanuel, W.B. (2022). Biting Dipterous Insects Associated with Household in a Bali Community, Taraba state, Nigeria. American Journal of Entomology 6 (3): 88 - 93

[16] Mason L J, Gibb T J. (2010) Insect pests of home stored foods E-37. Stored Product Pests, Purdue Extension; 4pp. Available at: http://extension.entm.purdue.edu/publications/E - 37.pdf

[17] Michael, C. (2014). Abundance of indoor resting mosquito populations and Plasmodium falciparum infection of anopheles spp in settlements around thezaria dam, zaria, kaduna state. a thesis submitted to the school of postgraduate studies, Ahmadu Bello University in partial fulfilment of the requirements for the award of master of science (M.sc.) degree in zoology department of biological Science, Ahmadu Bello University, Zaria.

[18] Oke O. (2003) City size and urban heat island. Atmospheric Environment 7: 769–779.

[19] Paupy, C., Delatte, H., Bagny, L., Corbel, V., & Fontenille, D. (2009). Aedes albopictus, an arbovirus vector: from the darkness to the light. Microbes and Infection, 11(14-15), 1177- 1185.

[20] Rust, M. K., & Su, N. Y. (Eds.). (2011). Managing social insects of urban importance. Annual Review of Entomology, 56.

[21] Russell, T. L., Beebe, N. W., Bugoro, H., Apairamo, A., Collins, F. H., Cooper, R. D., & Lobo, N. F. (2016). Frequent blood feeding enables insecticide-treated nets to reduce transmission by mosquitoes that bite predominately outdoors. Malaria Journal, 15(1), 1-12.

[22] Su, N. Y., & Scheffrahn, R. H. (Eds.). (2000). Economic impact and management of subterranean termites. CRC Press.

[23] Su, N. Y., & Scheffrahn, R. H. (1990). A review of subterranean ant taxonomy (Hymenoptera: Formicidae) in eastern and southern United States. Fla. Entomology 73(3), 447-460.

[24] Scheffrahn, R. H., & Su, N. Y. (Eds.). (2019). Invasive termites. CRC Press.

[25] Sovak, J. (2010). Insects Coloring Book. New York, United States. Dover Publications Inc. 48 pp.

[26] Scott M, Flaherty D, Currall J. (2013) Statistics: Dealing with categorical data. J Small Anim Pract. X; 54:3–8. [PubMed] [Google Scholar]

[27] Toews M, Subramanyam Bh, Roesli R. (2002) Development and validation of sequential sampling plans for Sitophilus species associated with pet specialty stores. p. 115–120. In: “Advances in Stored Product Protection” (P F)

[28] Tim H. (2011) 'The Environmental Control of Timber Decay', Structural Survey, Vol 10:1, summer.

[29] Vinson, S. B. (1997). Invasion of the crazy ants. American Entomologist, 43(1), 12-23.

[30] Veer V, Negi B K, Rao K M. (2005); Dermestid beetles and some other insect pests associated with stored silkworm cocoons in India, including a world list of dermestid species found attacking this commodity. Journal of Stored Products Research. 32: 69-89