

Species Composition And Seasonal Distribution of Cockroaches in Bali Town, Taraba State, Nigeria

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Abstract: A study on species composition and seasonal distribution of cockroaches in Bali Town, Taraba State, Nigeria was conducted between June-October, 2023 and November 2023-February 2024. A total of 5,146 adult cockroaches comprising of 2,437 males and 2,709 females were collected actively by hand picking and passively by trapping methods from different sites within the households. They were all identified using standard taxonomic entomological keys based on their morphological characteristics as *Periplaneta americana* species. Of these cockroaches, Females were more abundant (53%) compared to their male counterpart (47%). Anguwan Tiv had the most abundant cockroach infestation (26%) followed by Daniya and Sabon Layi with 22% each while the least was Anguwan Yobe (2%). Dry season had higher distribution (58%) of cockroaches compared to wet season (42%), although, there was no statistical significant difference ($P > 0.05$) between the seasons.

Keywords: Abundance, Bali Town, cockroaches, distribution, dry season, wet season

INTRODUCTION

According to reports, insects have been around for more than 350 million years, longer than humans, making them the most successful and prevalent group of animals. More than two million bug species have been identified as the source of widespread disease transmission as well as extreme physical and psychological disturbance (Tyagi, 2003). These insects, which belong to the class insecta and phylum arthropoda, are incredibly diverse and abundant due to a variety of features including their highly adaptable nature, relatively tiny body size, ability to fly, and large reproductive capability. Aside from their sheer quantity, they serve a variety of useful purposes such as pollinating flowers, acting as biological controllers, providing food for humans, and, in some cases, as parasites on both plants and animals. Certain insects, including cockroaches, can transmit parasite diseases to humans. (NOUN, 2012).

Periplaneta americana, the scientific name for the common cockroach, belongs to the order Blattaria and has about 4500 species (Hassan, 2016). Most of these species are found in tropical and subtropical regions (Vazirianzaden et al., 2009). Less than 1% of these cockroach species are thought to be a worldwide nuisance; the remaining 25–30 species are synanthropic, meaning they associate with human habitat (El-Sherbini and El-Sherbini 2001). They are dorsoventrally flattened, brownish, fast-moving insects that recycle dead materials (Odibo et al., 2019). Their antennae extend the whole length of their bodies. Some species have two pairs of wings folded flat over their oval-shaped bodies. Cockroaches are found in man-made buildings with warm, humid environments. The best places for them to reside are in the kitchen, bathroom, drainage system and even the sewage (Isaac et al., 2014; Nasirian, 2017). In addition to dead plant and animal materials, leather, glue, hair, wallpaper, textiles, and the starch used in bookbindings, they also devour ants, beverages, and food, whether human or animal (Gyan, 2008). Among the most notorious pests found in residences are cockroaches, which can contaminate food by leaving droppings and bacteria that can lead to food poisoning. Additionally, they can spread bacteria, fungi, and other pathogenic microorganisms in areas where they are present, as well as act as potential carriers of parasites that can lead to illnesses like typhoid fever, gastroenteritis, and dysentery (Omudu and Eyumah, 2008). Tafeng et al. (2005) state that certain individuals have allergies to cockroach antigens

and faeces, which can lead to health issues connected to asthma. The most important ones medically, are *Supella longipalpa* (brown-banded cockroach), *Periplaneta americana* (American cockroach), *P. australasiae* (Australian cockroach), *Blattella germanica* (German cockroach), and *Blatta orientalis* (Oriental cockroach).

Their distribution is largely worldwide, and they facilitate the mechanical spread of bacteria, viruses, and protozoa (Mike, 2012). The number of cockroaches in public areas and private dwellings has increased to an unprecedented degree in the Middle East (Kutrup, 2003), Australia (Miller and Peter, 2004), Asia (Ghosh and Gayen, 2006), and North America (Rauh et al., 2002). Maintaining cleanliness is essential for control, but it can be challenging in homes with kids and pets. Although they are rare to form colonies, cockroaches can occasionally be spotted in extremely clean homes (Odibo et al., 2019). But in Bali town, there's little to no knowledge about cockroaches. Hence, the need to investigate the common cockroache species, their seasonal distribution and abundance in Bali metropolis, Taraba State, Nigeria.

MATERIALS AND METHODS

STUDY AREA

Bali local government area of Taraba State lies between latitude 7°46' N and 7°54' N of the equator and longitude 10°30' E and 11°00' E of the prime meridian (Bureau for land and survey Jalingo, 1968). It is found in dry guinea savannah. It is the largest local Government in Taraba State, with an estimated land area of 11,540 km². It has some mountains like Gazabu, Dakka, Maihula, Bagoni, among others. Bali local Government had a population of about 211,024 persons (NPC, 2006). It has a tropical climate marked by two seasons; dry and rainy seasons. The rainy season starts around April and ends November occasionally, with 1350 – 1500mm rainfall annually. The dry season is from December to March. Daily temperature varies from 37 to 40°C during the hottest months of March/April. It also varies from 32 to 37°C during the coldest months of December/January. The relative humidity is about 23.00 % during the hot dry weather and can reach 80.00 % during the peak of wet season in July/August (Dammo et al., 2015; Wikipedia, 2015). The major ethnic groups in the area include; Jibawa, Tiv, Chamba, Fulani, Hausa, Itchen etc. The major occupation of the inhabitants is farming, fishing and nomadism. In addition, Public servants, traders and artisans also inhabit the area. Their water sources for domestic and agricultural uses are River Taraba, Borehole, ponds and wells.

COCKROACH SAMPLING

A total of five thousand one hundred and forty-six (5,146) adult cockroaches were collected randomly (both actively and passively) at strategic locations in households, such as bedrooms, parlours, toilets, septic tanks, waste bins and kitchen with the help of sticky traps and hand catch method using sterile hand-gloves (Sosan et al., 2019; Jirage, 2018). Sampling was made twice per month encompassing both the wet season (June-October, 2023) and dry season (November 2023-February 2024). Traps were set from 06:00 P.M and collected by 07:00 A.M the next morning. Alternatively, when it becomes difficult to get samples, spraying with insecticides to move them from their hiding places and those temporarily dosed by the pyrethroids were hand-picked and placed in separate labelled plastic containers containing cotton wool soaked in 10% chloroform. They were immediately transported to the Biology/Microbiology laboratory, Department of Biological Sciences, Federal Polytechnic Bali, Taraba State, Nigeria for sorting and identification.

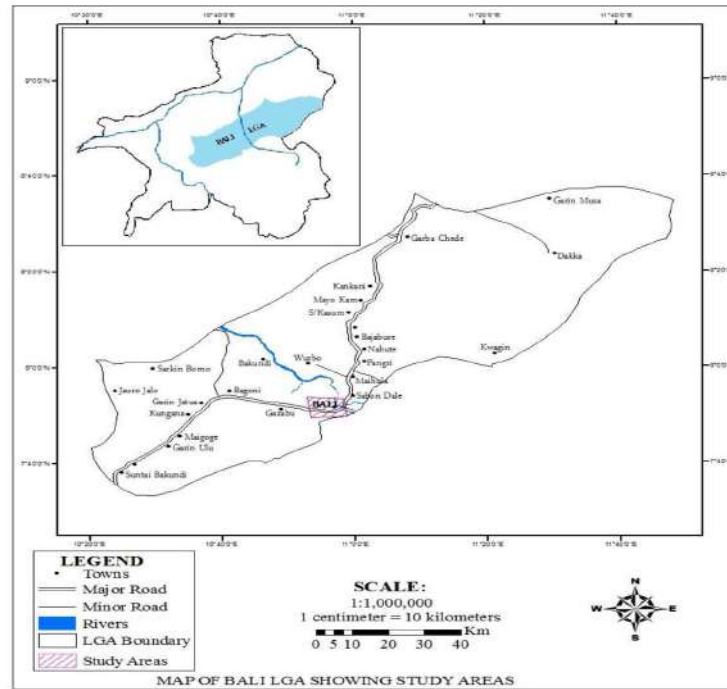


Figure 1: Map of the study Area

Source: Bureau for land and survey Jalingo, Taraba State, 2019)

IDENTIFICATION OF COCKROACHES

The species and sexes of the cockroaches were identified according to their morphological characteristics using standard taxonomic keys as described by Bell et al. (2007).

RESULTS

Table 1: Distribution of cockroaches at different locations in Bali town during the wet and dry season

Locations	Seasons		Total (%)
	Wet (%)	Dry (%)	
<u>Anguwan Bonki</u>	120(42)	167(58)	287(6)
<u>Anguwan Mission</u>	152(42)	207(58)	359(7)
<u>Anguwan Tiv</u>	504(37)	859(63)	1,363(26)
<u>Anguwan Tasha</u>	115(45)	141(55)	256(5)
<u>Anguwan Musa</u>	69(45)	83(55)	152(3)
<u>Anguwan Munmuye</u>	57(39)	91(61)	148(3)
<u>Anguwan Yobe</u>	51(40)	75(60)	126(2)
<u>Anguwan Jibawa</u>	108(47)	124(53)	232(5)
<u>Anguwan Daniya</u>	506(45)	610(55)	1,116(22)
<u>Sabon Layi</u>	498(45)	609(55)	1,107(22)
Total	2,180(42)	2,966(58)	5,146(100)

NB: Figures in parenthesis are percentage abundance

X² calculated = 10.81; X² tabulated = 16.92, df= 9, p>0.05, ** = Statistically insignificant

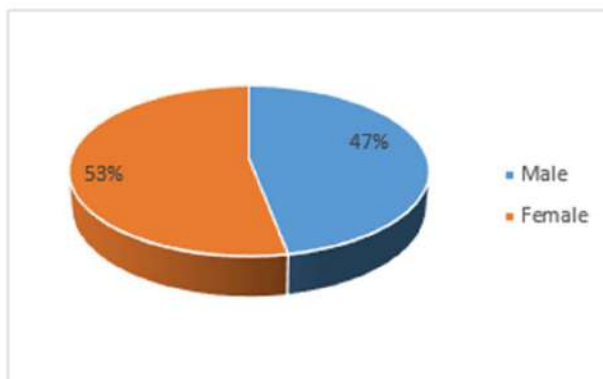


Figure 2: Percentage abundance of cockroaches (*Periplaneta americana*) in relation to gender



Figure 3: Specie of cockroache (*Periplaneta americana*) encountered in the study Area

5,146 cockroaches (2,437 males and 2,709 females) that were examined were all identified as belonging to *Periplaneta americana* species. Of these cockroaches, Figure 2 shows that females were found to be more prevalent (53%) than males.

Cockroach distribution was higher in the dry season (58%) than in the rainy season (42%). However, there was no statistically significant difference ($P > 0.05$) between the seasons (Table 1). According to location, the findings indicated that Anguwan Tiv had the most cockroaches collected (26%) followed by Daniya and Sabon Layi with 22% apiece, while Anguwan Yobe had the lowest number (2%) (Table 1).

DISCUSSION

In all, 5,146 cockroaches were collected from various locations within the households in the studied area. All of them were examined and identified as *Periplaneta americana*. The present study is consistent with earlier studies by Suntaravitun and Dokmaikaw (2019), Maji and Ahmed (2023), and Ikeh et al. (2023), which reported the identification of the same species of cockroache in Thailand, Jigawa State and Anambra state, respectively. Contrary to the results of this study, Bala and Sule (2012), in Sokoto State identified two species (*Periplaneta americana* and *Blatta orientalis*), while Hanafi-Bojd et al. (2005), observed five species in Iran, including *Blattella germanica* (German cockroach), *Blatta lateralis* (Turkestan cockroach), *Periplaneta americana* (American cockroach), *Supella longipalpa* (Brown-banded cockroach), and *Blatta orientalis* (Oriental cockroach). The observed disparity in cockroach species could potentially be attributed to geographic variations and environmental conditions, as it has been established that environmental factors influence the insect's rate of reproduction (Sosan et al., 2019). The only cockroach species found in this study, *Periplaneta americana*, may be explained by their cosmopolitan distribution, ability to reproduce and survive more readily in tropical climate regions (Auta and Yantaba, 2019), and preference for warm, humid environments, which includes locations where food is prepared or available (Hahn and Ascerno, 2005).

The dominance of female cockroaches over males in the area under study may be explained by differences in behaviour and physiology between male and female cockroaches. Female cockroach food consumption may be related to the reproductive cycle and dietary requirements for oogenesis or embryogenesis. This explains why female cockroaches may visit food-baited traps more often than male cockroaches (Lee et

al., 2011) as well as why they prefer to live in dark areas where they may find food and lay eggs (Bala and Sule, 2012).

The year-round distribution of cockroaches may be related to *Periplaneta americana*'s high degree of environmental adaptability. This was seen in the study's findings, which showed that there was no statistically significant change ($P > 0.05$) between the wet and dry seasons, indicating that the distribution and occurrence of cockroaches in Bali's metropolitan area was unaffected by the season. This may be because the study area's climate favours cockroach growth and development, which typically require warm, humid environments with an abundance of food available year-round (Efe and Aruegodore, 2003). This is consistent with the findings of Odibo et al. (2019), from Abraka, Delta State, Nigeria.

It was not surprising that Anguwan Tiv had the highest percentage of trapped cockroaches (26%), as the area is known to be densely populated and congested due to insufficient land, which leads to the indiscriminate dumping of refuse and the presence of dumpsites around houses, which attract a lot of cockroaches and, as a result, infest houses. Apart from inadequate sanitation and unhygienic living conditions, the majority of the homes in that region are old and have cracks in them that act as hiding places for cockroaches. This outcome agrees with that of Morenikeji et al. (2016), who also noted a high quantity of cockroaches (*Periplaneta americana*) in residential areas near Awotan Dumpsite in Ido Local Government Area of Oyo State, Nigeria. The 22% cockroach abundance observed in Anguwan Daniya and Sabon Layi may be attributed to inadequate maintenance, poor sanitation, and poor hygiene, particularly in Daniya where a Federal institution (Federal Polytechnic Bali) is located and heavily populated with students. These students cook and eat in the same room, producing trash that promotes the growth of cockroaches. Our findings also revealed that Anguwan Yobe had the least cockroaches (2%) trapped. This may be due to the fact that it is a recently established location with a low population density and quite a few number of houses, which may have some level of sanitation. As a result, there is less garbage generated, and careless trash disposal can equally be managed as Lee et al. (2003), opined that the degree of cleanliness, sanitation, and pest control is related to the spatial distribution and quantity of cockroaches in homes.

CONCLUSION

This study provided baseline data on the species of cockroaches that are present, as well as information on their frequency and seasonal dispersion in Bali community, thereby giving an insight into the likelihood of diseases brought on by cockroach infestations. Therefore, it's important to create awareness about hygiene, sanitation, and protecting food sources from being contaminated by these insect pests.

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