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PRELIMINARY STUDY ON COMPOSITION AND ECOLOGICAL DISTRIBUTION OF SMALL MAMMAL SPECIES IN FEDERAL UNIVERSITY, GASHUA, YOBE STATE NORTHEAST NIGERIA

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ABSTRACT

The study assessed Composition and Ecological distribution of small mammals' species in Federal University Gashua. Four (4) habitat types in the university area were identified and used for the study namely: Residential Area (RA), Acacia Wood Land (AWL), Lake Area (LA) and Open Grass Land (OGR). Direct and indirect methods were adopted; capture mark recapture (CMR) using spring door traps were used. The work involved a total of One hundred and twenty (120) trap/nights from September, 2019 - February, 2020; the study yielded nine (9) individual species cutting across eighth (8) families were recorded. Family Muridae has the highest number which represented by (2) individual species. RA had the highest individuals of One hundred and forty (140) species; followed by AWL with (84) species, LA (51) species and OGR which has the lowest of thirty-six (36) species were encountered. Desert Hedgehog Paraechinu aethiopicus has the highest frequency of (53) individual captured at the acacia woodland, while Striped Ground Squirrel Xeru erythropu which has the lowest frequency of (6) individual encountered by direct observation in the Open Grassland area only. The composition of small mammal's species produced would provide baseline information for further research activities and education in the study area.

Keywords: Habitat, Composition, Small Mammal Species

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INTRODUCTION

The land areas are becoming fragmented in to the urban and cities, due to the predicted rapid increase in human population growth worldwide (Angel *et al.*, 2011). Consequently, between 2000 and 2030, global urban areas will triple and hundreds of thousands of additional land area square kilometers will be modified in to urban type land use (UN, 2015). Cities are often located in naturally species-rich regions (Luck 2007) where native species are threatened by a series of anthropogenic factors, including habitat loss due to the clearing of land for urban development, other purposes and species introduction (William *et al.*, 2009) that present serious conservation challenges (Mckinney 2002). In such ecosystems only certain representatives of the native flora and fauna are able to exist in the residential areas. Many studies have found that within cities, native flora and fauna communities are usually radically altered in terms of species composition, abundance, richness and evenness (Lattman *et*

al., 2014). Construction of infrastructure development, however, invariably results in loss of biological diversity due to loss and fragmentation of species' habitats, increased accessibility of fauna to poachers, and changes in land use and land cover (Peres, 2010). Biodiversity offsets offer options for addressing effects of infrastructural projects on biological diversity.

Human activities exert pressures on the global environment, biological diversity declines as habitats are being transformed (Whitmore and Sayer, 1992). The most critical factors that have been found to influence small mammal species distribution are thought to be availability of food and shelter Mulungu *et al*., 2011). Small mammal's species, due to their sensitivity to little changes in their community structure alteration of their habitat can be used as alternative and a quick way of measuring environmental disturbance, (Ofori *et al.*, 2016). Since, small mammal's species have been reported to play crucial role as an indicators of habitat's ecological success and improving socio-economic status of the rural people.

In recent decades, many extensive studies on avian species have been carried out in the Hadejia Nguru wetlands (on checklist of the birds species by (Sulaiman, 2010; Lameed, 2011; Ringim, 2016; Adam, 2019), in which Gashu area is part of the Hadejia Nguru wetlands, therefore no study has been conducted on the composition of the small mammal species inhabiting Federal University Gahsua section of the wetlands in which this study covered. The objective of this study was therefore to determine the composition and ecological distribution of small mammal species in the university environment as this will give insight to an understanding of the current present status of small mammal species present in federal university Gashua and also to provide device, ways and means to implement ecologically-based management strategies focusing on specific land use types and land management practices which include Biodiversity Offsets, which involved taken measures to compensate for any adverse effects on biological diversity that cannot be avoided, minimized, or mitigation (BBOP, 2009) is currently lacking.

Thus, dearth of knowledge on small mammals' species composition and distribution in study area was addressed and documented in the university environment, under the issues of environmental changes ranging from land clearing for university developmental projects to seasonal variations. Hence, the present study was undertaken to provide baseline information on the composition of small mammals' fauna occurring in Federal University Gashua, for proper management initiation plan and conservation action in the study area.

MATERIALS AND METHODS

Study area

The study was conducted in Federal University Gashua, which is located in Bade Local Government Area of Yobe State, northeast Nigeria and the university was established in February 2013. It lies on latitude 07 ° 49' N and 07° 52' N and longitude 08 ° 40 ' E and 08 ° 38 ' E Gashua being the head quarter of Bade Local Government Area of Yobe State, it has an area of 772 km² (Yusuf, 2015), with estimated population of about 139,782 (NPC, 2006). Shares a common boundary with Bursari, Yunusari, Jakusko and Karasuwa Local Government areas of Yobe State. Fig.1 Shows the Map of the study area. Bade Local Government Area. The principal inhabitants of the Town include Badawa, Hausawa, Takarawa, Mangawa and Fulani (Yusuf, 2015). The predominant religion in the area is Islam. The presence of rivers, stream and tributaries notably, River Yobe, Gashua area provides opportunity for the people of the area to engage in irrigation farming and fishing activities (Diamond, 1993). Development had reached Bade early? This was manifest even in the composition of the early settlers of the area. Gashua commercial significance attracts early settlers from different walks of life. There were traders, artists, craftsmen, fishermen, farmers, scholars and administrators, the development of this area had come about so rapidly especially in the late 70s. The Town is a fairly large semi urban settlement with some surface road, a rice mill factory, banks, cinema houses to mention just a few.

The few scattered trees found in the area are mostly the Gum Arabic (*Acacia senegal*), Baobab

(*Adansonia digitata*) and Doun palm (*Hyphaen thebaica*). *Acacia seyal, Acacia nilotica, Faidherbia albida, Maerua crassifolia, Tamarindus indica, Anogeissus leiocarpus, Bauhinia refescence Ziziphus muritiana* and *Ziziphus spina-christi* (Wakawa *et al.*, 2017). Neem trees *Azadiracta indica* are found in area of settlement. In most cases, grasses are known to be seen growing all over the place, but are discontinues in nature and highly related to rainfall reliability and the general condition of the area (Golchin and Asgari, 2008). These grasses are used for building material as well as provide fodder for livestock in the area. Scattered tress and short grasses characterize the northern part. With the presence of the river, animal species such as fish, birds, mammals and other animals are found in the area. include little egret *(Egretta garzetta),* Laughing Dove *Streptopelia senegalensis* African mourning dove *(Streptopelia capicila),* African collared Dove *(Streptopeia roseogrisea*) Speckled Pigeon *(Columba guinea)* Double-spurred Francolin *(Pternistis petrosus)* Red cheeked cordon blue (*Uraeginthus bengalus*) Purple glossy starling (*Lamprotonis purpureus)* Monitor lizard *(Varanus niloticus)* Mosque Swallow *(Cecropis senegalensis)* white-billed buffalo weaver (*Bubalornis albirostris*) (Adam *et al.*, 2019) Squirrel (*Funisciurus anerythrus)* Giant Pouched Rat (*Crycetomys gambianus)* Rat *(Mus minutoides)* for fish major types are caught in the river include as Bagrus, Clarias, Protopterus, Alestes, and Tilapia (Hamidu, 2015).

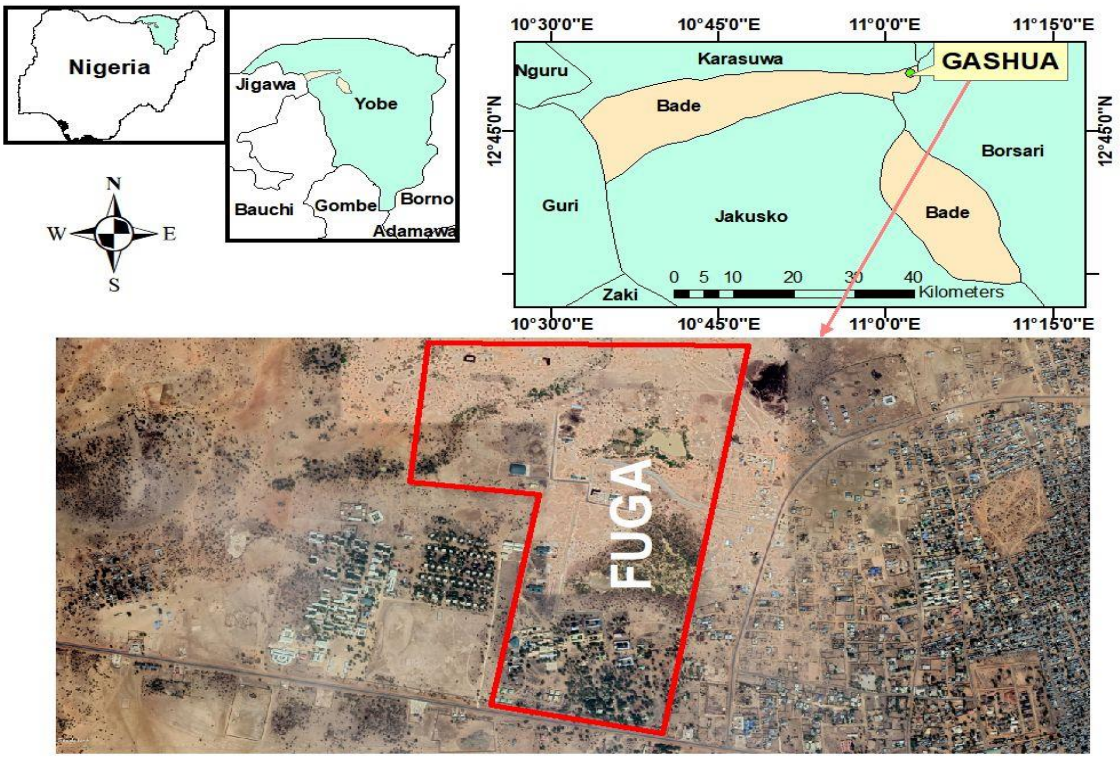

Figure 1: Map Showing Federal University Gashua (FUGA) in Bade Local Government Area of Yobe State

Sampling Procedure and Data Collection Techniques

Preliminary study was carried out for the purpose of identifying and delineating major small mammal species habitats in Federal University Gashua. Four (4) habitat types were identifying according to their vegetative characteristics and other features of the area, namely; Residential area, open woodland, Acacia area, and lake area were used for this study. Mark recapture method and indirect observation were used for surveying small mammal species in

Federal University Gashua for (5) consecutive days making a total of One hundred and twenty (120) days of trapping effort from September 2019 - February, 2020, at each of the identified four (4) habitat types trapping occurred. Data were collected by using three (3) different live wire cage traps or spring door traps of vary sizes; 22. 2 x 20.1cm, 17.1 x 13.5cm and 14 x 13.5cm respectively. Traps were set in the late evening hour 6:00 pm, and baited with Ground Nut seed, Ground Nut cake, Condiment, Yam and Onion**,** were set under cover of shrubs or dense grass/herbs (Shown in plate B) to conceal them and checked early morning hours 6: 00 am the specimen caught were identified to species using Jonathan Kingdom Field Guide to African Mammals (Kingdom, 2015).

Data Analysis

The data obtained from this study was analyzed using descriptive statistics. Spreadsheet package (Microsoft Excel) for the construction of tables was used as adopted by (Wakawa *et al*, 2016).

RESULTS

Table 1 Shows the Composition of small mammal Species and their mode of identification in the four (4) habitat types at Federal University Gashua, Yobe State, as observed. The findings of the study reveals that a total of nine (9) small mammal species belonging to seven (7) families were recorded, The findings of the study further shows that the family *Muridae* has the highest number which represented by (2) individual species and the remaining species while *Leporidae Erinaceidae, Nesomyidae, Gerbillinae, Soricidae, Pteropodidae* and *Sciuridae* has the lowest number of representation with each recording (1) frequency respectively (Figure 1) Four (4) species of small mammals were identified through captured mark recaptured method (CRM) while three (3) others species includimg *Lepus capensis, Eidolon helvum* and *Xeru erythropu* were identified by direct observation (DO).

Table 1: Composition and Mode of Identification of Small mammal Species in four (4) habitat types at Federal University Gashua, Yobe State

S/N	Family	Scientific name		Mode of Indentation			Habitat Type		
			Common name	OD	CAP	RA	AWL	LA	OGL
1	*Leporidae*	*Lepus capensis*	Cape here	،		—	x	—	—
2	*Erinaceidae*	*Paraechinus Aethiopicus*	Desert Hedgehog		•	—	x	x	x
3	*Nesomyidae*	*Cricetomys gambianus*	Giant Poached Rat		•	x	x	x	—
4	*Muridae*	*Mus musculus.*	Mice		•	x	x	x	—
5		*Rattus rattus*	Black Rat		•	x	—	—	—
6	*Gerbillinae*	*Desmodillus auricularis*	Namaqua gerbil		•	x	—	—	x
7	*Soricidae*	*Suncus varilla*	Musk Shrew		•	x	—	x	—
8	*Pteropodidae*	*Eidolon helvum*	Straw colored fruit	،		x	—	—	—
9	*Sciuridae*	*Xeru erythropu*	Striped ground squirrel	،		—	x	—	—

Table in the above Table DO=Direct Observation, CAPT= Capture= Residential Area, AWL=Acacia Woodland Area, LA= Lake Area, OGL= Open Grassland, √ = Direct Observation · = Captured, X = present and — = absent

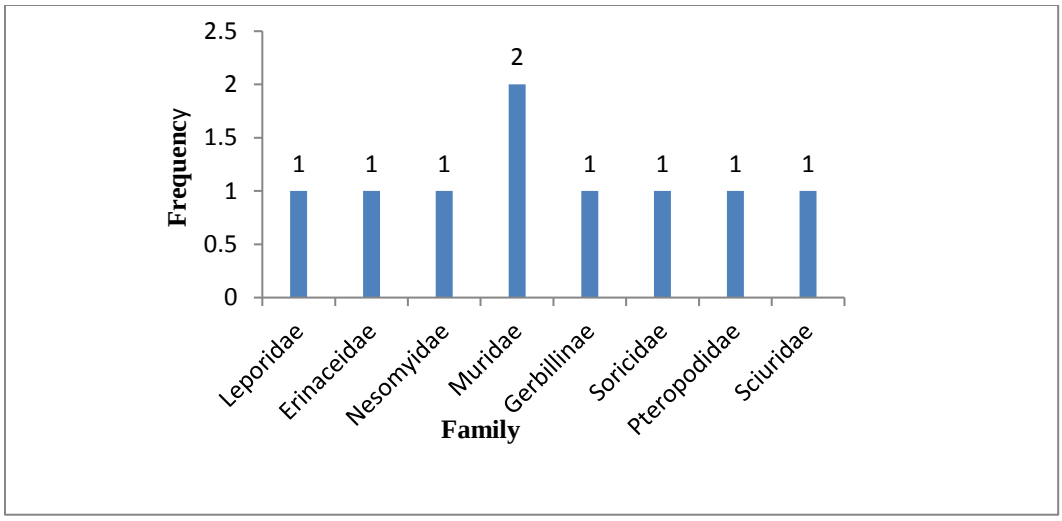

Figure 1: Small Mammal Species Family in Federal University Gashua, Yobe State

Table 2 indicates that the ecological distribution of small mammal species cutting across four (4) habitat types in federal university Gashua that Desert Hedgehog *Paraechinus aethiopicus* were found in all the habitat types except residential area and has the highest frequency of (53) individual captured at the acacia woodland area, followed by Mice *Mus musculus* which were captured in all the habitat types except open grassland area and has the frequency of (42) individual captured in residential area. Striped Ground Squirrel *Xeru erythropu* which has the lowest of (6) frequency found in the Open Grassland area only. The low number of small mammal species in the university environment, might be attributed to lack of vegetation cover and food material. Out of nine (9) species identified by this study, only (3) species were not found at the residential area (RA) these includes Cape here *Lepus capensis*, Desert Hedgehog *Paraechinus Aethiopicus*, and Striped Ground Squirrel *Xeru erythropu* but the rest of the species were all captured at residential area which made it recorded the highest frequency of One hundred and forty species (140) as shown in (Table 2).

Table 2 Distribution of Small Mammal Species across 4 Habitat Types at Federal University Gashua

Species			Habitat Types			
Scientific Name	**Common Name**	**Local Name**	**RA**	**AWL**	**LA**	**OGL**
Lepus capensis	Cape here	Zumo	—	3	—	—
Paraechinus Aethiopicus	Desert Hedgehog	Bushiya	—	53	25	22
Cricetomys gambianus	Giant Poachet Rat	Gafiya	8	7	11	—
Mus musculus	Common Mice	Berakuso	42	21	10	—
Desmodillus auricularis	Namaqua gerbil	Bera masar	26	—	—	8
Suncus varilla	Musk Shrew	Jaba	14	—	5	—
Rattus rattus	Black Rat	Bera gida	22	—	—	—
Eidolon helvum	Straw colored fruit bat	Jamage	28	—	—	—
Xeru erythropu	Striped Ground Squirrel	Kurege	--	—	—	6
TOTAL			140	84	51	30

Table in the above RA= Residential Area, AWL=Acacia Woodland Area, LA= Lake Area, OGL= Open Grassland and— = absent

DISCUSSION

This study used spring door wire cage trapping surveys to assess composition and ecological distribution of small mammal species in federal university Gashua. The findings of the study reveals that a total of Nine (9) small mammal species belonging to seven (7) families were recorded, we also found that a similar results was

observed by Akpan, *et al*., (2015) who reported a total of seven (7) species of small mammals belonging to three (3) orders: Rodentia, Carnivora and Pholidota were encountered at Idu forest, Akwa Ibom State, Nigeria. The similarity may be connected with the vegetation characteristic of the area which comprises few wetland, shrub land, moderate, grassland and trees as found in federal university Gashua. Anadu (2006) reported a total of (392) small mammal species belonging to five families of rodent and four families of Shrews in Ogba forest reserve Nigeria. The low number of species recorded in the present study area might be due to construction of infrastructural development/facilities which are going on in university premises. However, the study also shows that some of the small mammal species were ecologically distributed nearly in all the habitat type where Desert Hedgehog *Paraechinus aethiopicus* were encountered in AWLA, LA and OGLA, while Giant Poachet Rat *Cricetomys gambianus* and Mice *Mus musculus* were also captured in RA, AWLA and LA Namaqua gerbil *Desmodillus auricularis* and Striped Ground Squirrel *Xeru erythropu* Striped Ground Squirrel *Xeru erythropu* were identified in OGLA and this might be due to availability of water, food and shelter and preference this is supported by the observation made by (Ofori *et al.*, 2016) that availability of food and shelter are the most critical factors which have been found to influence small mammal species distribution and abundance across habitat types and Small mammal species abundance has been described to increase with increasing shrub cover in any community (Blaum *et al.*, 2007).

CONCLUSION AND RECOMMENDATION

Base on the findings from this study it is evident that Federal University Gashua, harbor some number of small mammal species, including *Desert* Hedgehog *Paraechinus aethiopicus* being the most abundant species in the university environment. The current study has demonstrated that small mammal species composition and ecological distribution is strongly influenced by the land use types and the study recommends that the land use and management practices in the study area, should place more emphasis on the issues of Biodiversity offsets which must be considered in the context of the mitigation, avoidance, minimization and ecosystem restoration. Biodiversity offsets, referred to as biodiversity compensation, environmental compensation, ecological compensation, and net conservation benefits. Meanwhile further studies on small mammal species diversity, relative abundance, adaptation and their habitat preference should be conducted in the study area.

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Plate A: Researcher Setting a Trap during Field Work in the Study Area

Plate B: Dead body of *Eidolon helvum*

Plate C: Captured Hedgehog) and Marked

Plate: D showing captured *Cricetomys gambianus* **Plate: E** *Paraechinus aethiopicus* (Hedgehogs)