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SURVEY OF WILDLIFE DIVERSITY AND ABUNDANCE ALONG RIVER MU, MAKURDI LOCAL GOVERNMENT AREA, BENUE STATE, NIGERIA

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ABSTRACT

This study presents a comprehensive survey of wildlife diversity along the banks of River Mu, situated in the Makurdi Local Government Area of Benue State, Nigeria. The primary objectives of this survey were to document the presence of various wildlife species, assess their distribution patterns, and evaluate potential conservation challenges. Field surveys were conducted over a period of 4 months utilizing a combination of techniques, including direct observations, and interviews with local communities. A total of 36 wildlife species were recorded, representing diverse taxonomic groups, including mammals, birds, reptiles, and amphibians. Notable species included Bats, Catfish, Frogs, Village Weaver birds and others.. The distribution patterns of wildlife species varied along the river's gradient, with distinct communities inhabiting different habitat zones, such as riparian forests, wetlands, and grasslands. Factors influencing these distribution patterns included habitat availability, human activities, and seasonal variations. The study also identified several conservation challenges, including habitat degradation, poaching, and human-wildlife conflicts. Local communities expressed varying degrees of awareness and attitudes towards wildlife conservation, suggesting a need for targeted awareness and education programs.

Keywords: River Mu,Diversity, Wildlife, Benue, Nigeria

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INTRODUCTION

Wildlife species diversity is an important aspect of wildlife management. It focuses on the array of animals on land, water, and in the air. The diversity of wildlife, regardless of their habitats, depend on both abiotic and biotic factors: include soil, air, and water quality; while biotic factors include the availability of plant and animals they depend on anthropogenic factors such as hunting, pollution and other forms of disturbance also play important roles in animal diversity. Hence, animal diversity or population may increase or decrease based on the quality of these variables and the level of human intrusion (Abere and Lateef, 2015; Olajesu *et al.,* 2019).

Wildlife diversity is the sum total of all the different species of animals, organisms living on earth and the variety of habitat in which they live of any particular region or time (Meduna, 2019). Diverse fauna are due to their unique biogeographic location, varied climatic conditions and enormous eco- and geodiversity. Fauna distribution across different habitats may be uneven or dense in most cases, areas with dense animal population are expected to be safe from poaching. For instance, a permanent waterhole with moderate competition and predation (Fryxell *et al.,* 2014; Rduch, 2013). Unfortunately, in Nigerian National Parks, problems such as poaching, habitat encroachment, logging, fishing, unsustainable

agricultural practices, constrain wild animal diversity (Lameed, 2017). Conservation of wildlife in National Parks through sustainable management is essential for wildlife management and preservation of genetic resources (Reid, 2011). Consequently, effective management of parks and other wildlife habitats play significant roles in ensuring the continuous presence of animals for conservation and touristic benefits. However, most parks in Nigeria have challenges with monitoring and documentation of the current status of resident wildlife. This is attributed to poor funding, inadequate infrastructure, weak legislation, limited logistics, maladministration, corruption, and other administrative lapses (Dore, 2001; Amusa, 2013). There is a need for regular updating of the checklist of wild animals to ensure proper management, effective monitoring, and increased availability of resources to potential tourists around our location. Wildlife became the issue of global anxiety over the past few decades for its rapid reduction worldwide and interestingly, the majority of the world's wildlife is present in most of the economically non-solvent countries like Bangladesh (Koziell 2011). It is widely supposed that the poorest people of the poor countries depend on their local ecosystems for their livelihoods are responsible for the degradation of wildlife (Sodhi, 2015).

Wildlife plays ecological and economical role in both invertebrate and vertebrate pest control (Jaman *et al.,* 2014), scavenging and pollinating as well as providing food to mankind. The larvae of frogs and toads feed mainly on algae, dead animals in water, diatoms, planktons or other small organisms playing an important role in the ecosystem (Hasan and Feeroz, 2014). Wildlife is on the decline around the world due to habitat destruction. New communities also emerge after such disturbances. The need to study wildlife affected and communities formed, therefore, becomes imperative (Sodhi, 2015). Study on wildlife and distribution is important for conservation efforts in different area (Abie *et al.,* 2019). Habitat destruction is a major factor affecting biodiversity; changes in vegetation composition, food, water and cover drastically affect biodiversity, abundance, and distribution (Abdar, 2013).

Extinction of wildlife and population declines may lead to deterioration of ecosystem services they provide to humans (Whittingham *et al.,* 2011). One role of ecology is to determine the factors affecting the distribution and abundance of biodiversity. Unfortunately, the wildlife populations of certain location have been decreasing at an alarming rate mainly due to anthropogenic developmental activities including habitat destruction and fragmentation, water pollution degradation of vegetation, deforestation, conversion of wetlands and forests to agricultural land and conversion of farm-land to urban and industrial uses (Sarker *et al*. 2000, Hossain *et al.* 2004, Khan and Ahsan 2011, Karmakar *et al.* 2011, Rahman *et al.* 2012). To address the role of wildlife in an area, rigorous scientific studies are therefore needed to protect them from their critical positions.

However, some studies have been conducted on avian diversity in different parts of makurdi. No specific study has yet been done on wildlife diversity along River Mu. Therefore, this study may play a significant role to make baseline information on wildlife diversity in the study area. The current state of wildlife diversity is facing several critical issues that need to be addressed urgently. The problem of wildlife diversity lies in the rapid decline and loss of various species, including plants, animals, and microorganisms, which are essential for maintaining the overall balance and health of ecosystems. Human activities, such as habitat destruction, pollution, climate change, illegal wildlife trade, and invasive species introduction, are major drivers of this problem. These activities have resulted in the depletion of natural habitats, fragmentation of landscapes, and disruption of food chains, leading to a significant decrease in wildlife worldwide.

The consequences of wildlife diversity loss are severe and wide-ranging. It negatively impacts ecosystem functioning, disrupts nutrient cycling, reduces the resiliency of ecosystems to natural disasters, and impairs essential ecosystem services, including pollination, nutrient cycling, and water filtration. Moreover, the loss of species also threatens the cultural, economic, and recreational values associated with wildlife,

impacting local communities and economies heavily reliant on these resources. The loss of wildlife diversity also poses risks to human health by increasing the incidence of zoonotic diseases. When natural habitats are destroyed, and species are forced into closer contact with human populations, the potential for disease transmission from wildlife to humans significantly increases. Recent outbreaks of diseases like Ebola, COVID-19, and Zika virus have highlighted the urgency of addressing this problem to protect the health and well-being of both wildlife and humans.

Given the interconnectedness of all living organisms and ecosystems, the decline in wildlife diversity is a global concern that requires immediate attention and action. Conservation efforts, sustainable land-use practices, habitat restoration, and stricter regulations against illegal wildlife trade are crucial steps to mitigate this problem. Educating and raising awareness among individuals, communities, and policymakers about the importance of preserving wildlife diversity and the consequences of its loss is also essential to foster a collective responsibility towards protecting and conserving wildlife for future generations

The main objective of this study is to assess the diversity of wildlife along River Mu, Makurdi LGA of Benue State, Nigeria. Specifically, the study aimed to: determine the species list of wildlife in the study area; the abundance of different classes of wildlife within the study area and diversity of the wildlife in the study area

MATERIALS AND METHODS

Study Area

Makurdi is the capital city of Benue state. It lies in the flood plains of the River Benue within the north central region of Nigeria about the middle of the eastern half of Nigeria between latitude 7°44′01″ N and longitude 8°31′17″ E *(*Figure 3.1). In the pre-colonial era up to 1920 Makurdi was just a system of scattered Tiv settlements and Jukun fishermen (Iorliam 2008). The population of Makurdi town was considered within a range of a few thousand people but according to the current National Population Census data, it has a population of and 300 000 (Tyubee and Anyadike 2015). The growth of Makurdi town put pressure on natural resources within its environs including wetlands.

Climate

Makurdi climate is characterized by wet and dry seasons dominated by N.E and S.W monsoon. The convergence of these wind masses is the highest influencing factor of rainfall within Makurdi. The rain begins in April and stops in October. The mean duration of rainy season is 182 days, with highest monthly rainfall total of 221mmis recorded in August. Tyubee (2005) has identified three temperature periods of cool dry season (November to January), hot dry season (February to April) and hot wet season (May to October). Seasonal atmospheric humidity are eighty percent for the wet and thirty percent for dry seasons respectively.

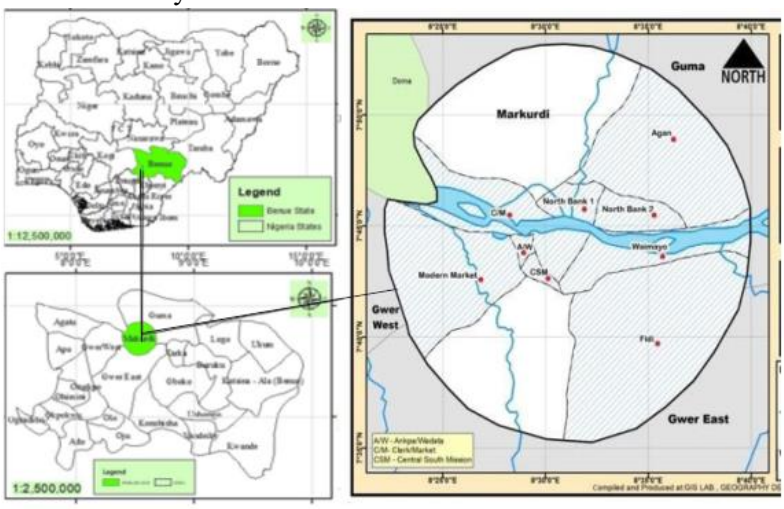

Fig. 3.1. Map of Benue State showing the study area

Data collection

Method of data collection

Data was collected by direct field observations from August to September. Four (4) weeks was spent in the field for data collection. Observations started early in the morning and continued till sunset. During the study period a pair of binoculars (Bushnell Power View 10 × 42) was used in order to identify bird species from the longer distance. For identification of birds Grimmett *et al.,* (1999), Halder (2010) and Khan (2015) was followed. In many cases birds was photographed with a digital semi-SLR camera (Canon SX 50HS) in order to confirm the identification. Hasan *et al.,* (2014) and Daniel (2002) will be used for the identification.

Walk-and-Counts

Wildlife was counted using visual census method (Munyuli 2010). During each sampling visit, wildlife was counted while walking at a /steady pace of 10m/min at round, frequently stopping, and observing wildlife species within the range. With the use of a field guide, Caution was taken to avoid double counting of individuals of a given species by walking in one direction and by not moving back to resample a species seen behind.

Data Analysis

Results obtained was analyzed using descriptive statistics, ANOVA and diversity index.

Diversity indices such as Shannon-Wiener (*H'*) index Eveness (E_H) and Margalef Index (*MI*) were determined for wild animals.

Shannon-Wiener Index (H') – The index depends on species richness and evenness.

$H' = -\sum(P_i)lnP_i$ …….. (1)

Pilou evenness (*J*) compares the actual diversity value

$J = \frac{H'}{H_{max}}$ …… (2)

Margalef's index (MI) – The higher the index the greater the richness

$MI = \frac{n-1}{lnN}$ (3)

Where *ni* is the number of individuals of amount (biomass) of each of the *i* species and *N* is the total number of individuals (or biomass) for the site

RESULTS

The result presented in Table 1: shows the species list of wildlife species found along river Mu, Makurdi, Benue state. A total of 36 species of faunas were observed of which 13 (36.11%) were aves, 8(22.22%) mammals, 5 (13.89%) reptiles, 5 (13.891%) Actinopterygii, 3(8.33%) Mollusca and 2 (5.56%) were amphibians.During the study period, Sharp-tooth catfish (*Phractocephalus hemioliopterus)* and Frog (*Rana trigrina)* recorded the highest relative abundance respectively 8.77% (15 individuals), whereas Village weaver (*Ploceus cucullatus*) and Green wood-hoope (*Phoeniculus purpureus*) showed the lowest relative abundance 0.58% (1 individual) in the study area (Table 1).The relative abundance of the fauna revealed in (Table 3) indicates that class mammalia: 22%, aves: 22.81%, amphibian 14.62%, actinophtergii 19%, mollusca 6.43% and reptilia: 14.62 %). The class aves, as the most abundant fauna class accounted for over 23% of all the fauna classes.The results of the fauna species diversity estimated from data obtained along river Mu, Makurdi, Benue state is presented in (Table 2). The Shannon-Weiner Diversity Index (H) estimated to be 3.3657. The summary of all the diversity indices are presented in Table 4.

Table 1: Species list of faunas and their relative frequency along river Mu, Makurdi, Benue state, Nigeria.

Common name	Scientific name	Class	No. of occurrence	Relative abundance
African Catfish	*Heterobranchus spp.*	Actinopterygii	6	3.51
African civet	*Civettictis civetta*	Mammalia	2	1.17
Barn owl	*Tyto alba*	Aves	2	1.17
Bat	*Taphozous mauritianus*	Mammalia	10	5.85
Black billed wood-dove	*Turtur abyssinicus*	Aves	4	2.34
Black kite	*Milvus migrans*	Aves	3	1.75
Black rat	*Rattus rattus*	Mammalia	7	4.09
Brown-garden snail	*Cornu aspersum*	Mollusca	5	2.92
Budgett catfish	*Synodontis budgetti*	Actinopterygii	4	2.34
Bush buck	*Tragelaphus sylvaticus*	Mammalia	2	1.17
Common bulbul	*Pycnonotus barbatus*	Aves	2	1.17
Double-spurred spur-fowl	*Pternistis bicalcaratus*	Aves	3	1.75
Frog	*Rana trigrina*	Amphibian	15	8.77
Grasscutter	*Thryonomys swinderianus*	Mammalia	8	4.68
Green grass snake	*Opheodrys aestivus*	Reptile	2	1.17
Green wood-hoope	*Phoeniculus purpureus*	Aves	1	0.58
Laughing dove	*Spilopelia senegalensis*	Aves	3	1.75
Lizard	*Caloles versicolor*	Reptile	9	5.26
Moss snail	*Cochlicopa lubrica*	Mollusca	3	1.75
Nile perch	*Lates niloticus*	Actinopterygii	3	1.75
Nile rat	*Arvicanthis niloticus*	Mammalia	4	2.34
Northern alligator lizard	*Elgaria coerulea*	Reptile	5	2.92
Northern green bush snake	*Philothemus irregularis*	Reptile	3	1.75
Northern puffback	*Dryoscopus gambensis*	Aves	4	2.34
Osprey	*Pandion haliaetus*	Aves	2	1.17
Pygmy rabbit	*Brachylagus idahoensis*	Mammalia	2	1.17
Red adder	*Bitis rubida*	Reptile	6	3.51
Red-eyed dove	*Streptopelia semitorquata*	Aves	7	4.09
Senegal coucal	*Centropus senegalensis*	Aves	4	2.34
Sharp-tooth catfish	*Phractocephalus hemioliopterus*	Actinopterygii	15	8.77
Snail	*Achatina achatina*	Mollusca	3	1.75
Stripped ground squirrel	*Euxerus erythropus*	Mammalia	3	1.75
Tilapia	*Oreochromis niloticus*	Actinopterygii	5	2.92
Toad	*Bufo bufo*	Amphibian	10	5.85
Village weaver	*Ploceus cucullatus*	Aves	1	0.58
Yellow-eyed pigeon	*Columba eversmanni*	Aves	3	1.75

Table 2: Fauna Species Diversity along river Mu, Makurdi, Benue state.

Common name	No. of occurrence	Pi	In Pi	n(n-1)	Pi In Pi
African Catfish	6	0.03509	-3.3499	30	-0.1175
African civet	2	0.01170	-4.4485	2	-0.0520
Barn owl	2	0.01170	-4.4485	2	-0.0520
Bat	10	0.05848	-2.8391	90	-0.1660
Black billed wood-dove	4	0.02339	-3.7554	12	-0.0878
Black kite	3	0.01754	-4.0431	6	-0.0709
Black rat	7	0.04094	-3.1958	42	-0.1308
Brown-garden snail	5	0.02924	-3.5322	20	-0.1033
Budgett catfish	4	0.02339	-3.7554	12	-0.0878
Bush buck	2	0.01170	-4.4485	2	-0.0520
Common bulbul	2	0.01170	-4.4485	2	-0.0520
Double-spurred spur-fowl	3	0.01754	-4.0431	6	-0.0709
Frog	15	0.08772	-2.4336	210	-0.2135
Grasscutter	8	0.04678	-3.0622	56	-0.1433
Green grass snake	2	0.01170	-4.4485	2	-0.0520
Green wood-hoope	1	0.00585	-5.1417	0	-0.0301
Laughing dove	3	0.01754	-4.0431	6	-0.0709
Lizard	9	0.05263	-2.9444	72	-0.1550
Moss snail	3	0.01754	-4.0431	6	-0.0709
Nile perch	3	0.01754	-4.0431	6	-0.0709
Nile rat	4	0.02339	-3.7554	12	-0.0878
Northern alligator lizard	5	0.02924	-3.5322	20	-0.1033
Northern green bush snake	3	0.01754	-4.0431	6	-0.0709
Northern puffback	4	0.02339	-3.7554	12	-0.0878
Osprey	2	0.01170	-4.4485	2	-0.0520
Pygmy rabbit	2	0.01170	-4.4485	2	-0.0520
Red adder	6	0.03509	-3.3499	30	-0.1175
Red-eyed dove	7	0.04094	-3.1958	42	-0.1308
Senegal coucal	4	0.02339	-3.7554	12	-0.0878
Sharp-tooth catfish	15	0.08772	-2.4336	210	-0.2135
Snail	3	0.01754	-4.0431	6	-0.0709
Stripped ground squirrel	3	0.01754	-4.0431	6	-0.0709
Tilapia	5	0.02924	-3.5322	20	-0.1033
Toad	10	0.05848	-2.8391	90	-0.1660
Village weaver	1	0.00585	-5.1417	0	-0.0301
Yellow-eyed pigeon	3	0.01754	-4.0431	6	-0.0709
	171				**ΣH= 3.3657**

Table 3: Relative Abundance of Fauna Classes along river Mu, Makurdi, Benue state

Classification	Total number of species seen	Total number of animals sighted	Relative % of abundance
Mammalia	8	38	22.22
Aves	13	39	22.81
Reptile	5	25	14.62
Amphibian	2	25	14.62
Actinopterygii	5	33	19.30
Mollusca	3	11	6.43

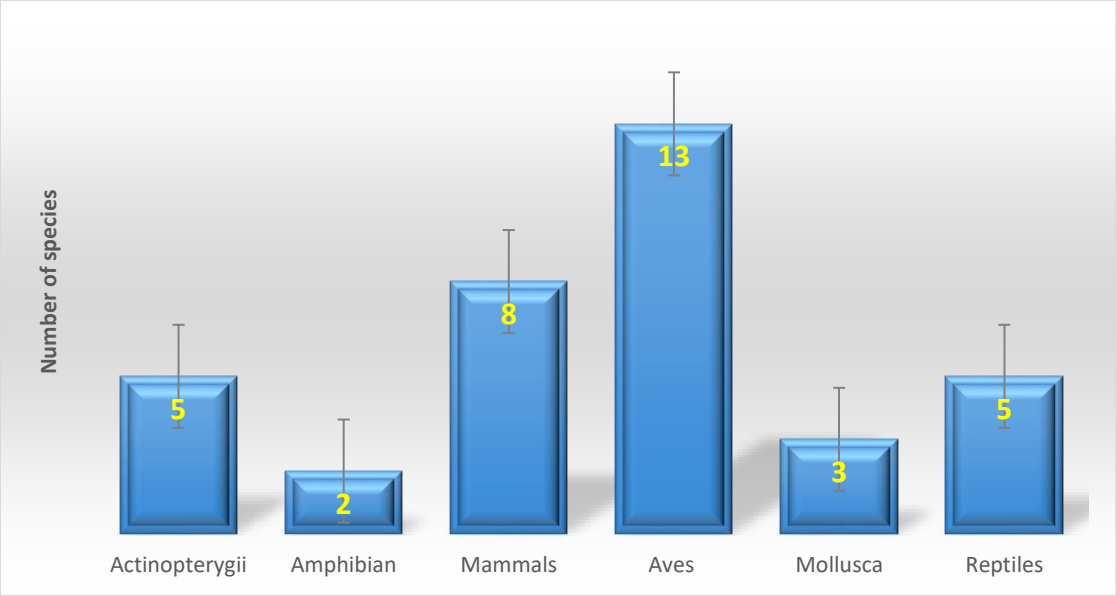

Figure 2: Number of species according to their classes

Table 4: Diversity Indices of wildlife of species found along river Mu, Makurdi

S/No	Diversity Measures	River Mu, Makurdi
1	Shannon-Weiner Index	3.3657
2	Maximum diversity	3.5835
3	Species evenness	0.9392
4	Species richness	36
5	Total species	171

DISCUSSIONS

Total population of fauna found along river Mu, Makurdi, Benue state are 36 only from 6 (six) different classes. Aves class was the dominant with the family Columbidae (*Streptopelia semitorquata)* the highest, according to the IUCN list (2021) the Red-eyed Dove is not classified as globally threatened, and it is listed as a species of "Least Concern". However, specific populations of these doves may face localized threats due to habitat loss and hunting. This agrees with Yang and Gratton (2014) that birds are the most important group for analyzing diversity and abundance in open forest area, while mammals class second with family Emballonuridae (*Taphozous mauritianus)* been highest. This study found diverse habitats, plenty of foods and roosting sites both for residents and migratory birds that facilitated living for these bird species. The area also provided breeding facilities that might be the reason for greater assemblage of resident birds. However, the diversity of species was low. The study area has gradually turned into urban area and this is one of the major causes of habitat loss of wild animals. Sometimes people kill snakes, fish, and birds unconsciously due to lack of adequate knowledge about the ecosystem services of wildlife. The explanations for high diversity have traditionally been based on the equilibrium concept of community structures and a high degree of resource/niche partitioning (Giller, 1984) with habitat food and time amongst the most important niches dimensions.

The species list of all the fauna at the river mu area and Shannon Weiner diversity index was based on result that was obtained from individuals randomly sampled; all the species that were represented in the sample area under study. The species richness of 36 and Evenness = *H/Hmax*, = 0.9392 was obtained which shows a relatively high degree of dominance (by abundance or biomass) of certain *gr*oups within

the entire community, with a few dominants and a majority of species at relatively low numbers.
The levels of diversity or measure of community structures of river mu has a Shannon-Weiner index of 3.3657, Maximum diversity of 3.5835, species evenness of 0.9392, and a total species abundance of 171 (Table 4). This result follows the stability diversity hypothesis which states that the more diverse a community is the more stable, so there are correlations with stability measures like constancy of community. However, the fate of an organism in a habitat is determined by habitat equilibrium, free space, disturbance and settlement.

CONCLUSION

This study has demonstrated the wildlife diversity given a list of species present in understanding the wildlife dynamics in the study area. A number of fauna species particularly class aves may serve as useful organisms that contribute significantly to the determination and regulation of ecosystem productivity. The niches had different diversity indices confirms further the wildlife spatial-temporal management was translated into variations in biological status of use in fauna as bio-indicators thus need further work i.e. relating with keystone species and associated processes., thus, establishing a non-equilibrium community with a higher diversity that would arise if the community is allowed to reach a stable equilibrium state. Thus, the findings provide valuable baseline data for future conservation efforts and underscore the importance of sustainable management practices to preserve this vital natural resource. This study advocates for collaborative efforts among government agencies, local communities, and conservation organizations to protect and conserve the rich wildlife diversity along River Mu and similar riverine ecosystems in Nigeria.

Recommendations

Based on the obtained results of the present study, the following points are recommended in the study area

1. Raise awareness among local communities about the consequences of poaching on wildlife populations and ecosystems
2. Implement habitat restoration initiatives, especially in areas impacted by human activities, to enhance the quality of habitats for wildlife.
3. Promote community-based conservation programs that involve local residents in monitoring and protecting wildlife.
4. Establish a long-term monitoring program to continuously assess changes in wildlife populations and habitats.

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