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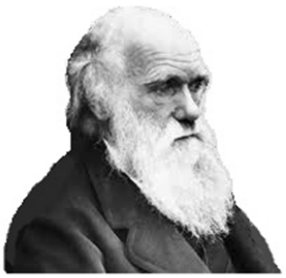

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Survey of Road Kills in Two Major Routes of Kainji Lake National Park, Nigeria

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ABSTRACT

This research work centered on a survey of road kill along two major transportation routes to access the level of road fatality between the routes. A total number of ninety-five (95) questionnaires were administered – forty-eight (48) for park staff and security personnel and forty-seven (47) for road transport workers (kainji – lumma and kainji – ibbi) branch. The data was analyzed using table and simple percentage. Both routes had significant numbers of road kill - mostly reptiles (69% of the total). Our research also revealed that the wild animals were affected most by human habituation/feeding. Furthermore, 73% of the respondents believe that wildlife signage can be used to reduce rate of road mortality, while 27% choose road-warning signs. The study shows the need for proper mitigation measures and also for the application of modern methods of monitoring road activities and for managing wildlife habitats.

***Keywords*:** Road kill, Survey, Major route, Kainji Lake National Park

1. INTRODUCTION

Infrastructure such as roads, usually leads to substantial environmental impacts even with low levels of traffic (UNEP, 2001). The impacts occur at various spatial and temporal scales beyond direct physical footprints. In the united state, for instance, an estimated 15–20% of its landscape is ecologically impacted by roads (Forman and Alexander, 1998). Infrastructure development represents a major driving factor of biodiversity loss, road construction and heavy traffic in the park turn to have impact on wild animals of the park (Benitez-Lopez *et al.* 2010).

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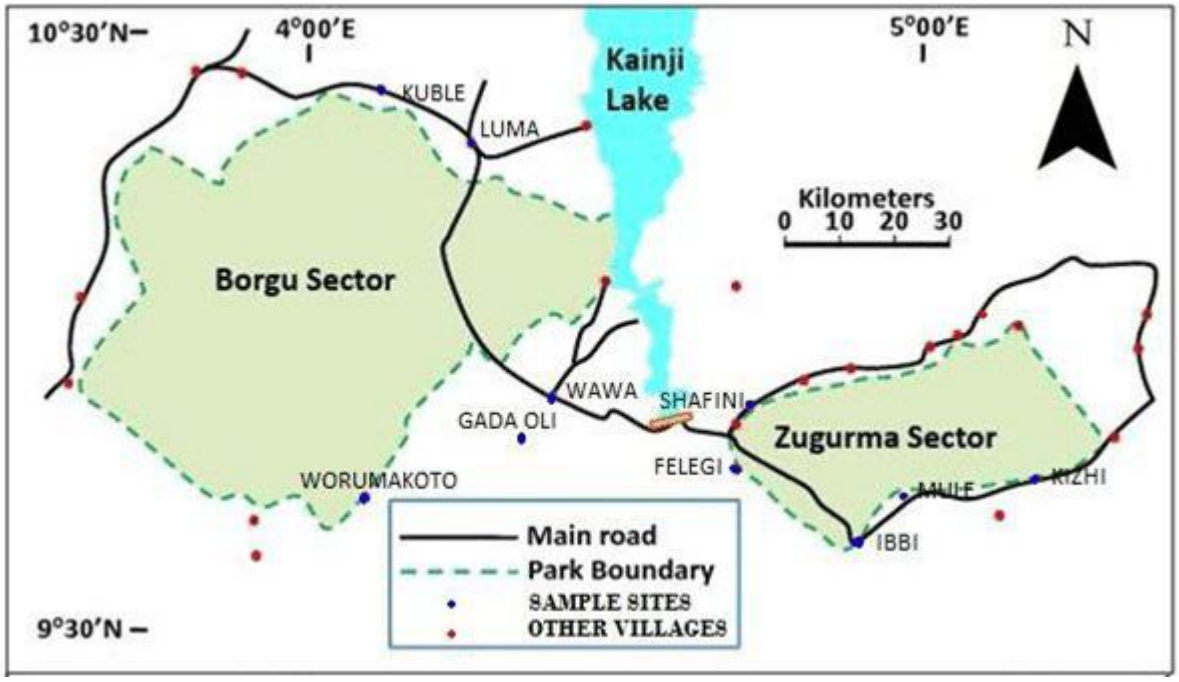
With biological diversity at stake, there has been a growing concern and interest to quantify ecological effects of roads and ultimately to avoid, minimize and compensate for their negative impacts on individuals, populations, communities and ecosystems (Forman *et al.* 2003; Coffin, 2007; Balkenhol and Waits, 2009; Fahrig and Rytwinski, 2009). Roads and their associated vehicular traffic affects the persistence of wildlife populations through processes such as habitat loss, traffic mortality, resource inaccessibility, population subdivision and modification of behavior (Trombulak and Frissell 2000, Jaeger *et al.* 2005, Eigenbrod *et al.* 2009). The magnitude of road impacts varies considerably depending on road type and/or level of use, season, location, time of day, and species of organisms potentially affected (Forman and Alexander 1998). It is assumed that road width can influence permeability of roads to animal movement, though for some species, the more influential component of road width on road crossing decisions, is probably gap width relative to the surrounding habitat (Clair, 2003).

Habitat variables versus proximity to the road influences likelihood of disturbances as well. For example bird populations are likely to be more affected at short distances from the infrastructure whilst the effect on mammal populations extends over longer distances. This fact is justified by research findings showing a decline in species abundance of 28-36% (birds) and 25-38% (mammals) within 2.6 km and 17 km from the infrastructure respectively (Benitez-Lopez *et al.* 2010). Furthermore, scientific evidence suggests that when road networks and traffic volumes increase, road-effects on animal populations become more prevalent (Forman *et al.* 2003, Gagnon *et al.* 2007, Eigenbrod *et al.* 2008). The magnitude of road impacts varies considerably depending on road type and/or level of use, season, location, time of day, and species of organisms potentially affected (Forman and Alexander 1998, Bennett *et al.* 2011). It is assumed that road width can influence permeability of roads to animal movement, though for some species, the more influential component of road width on road crossing decisions, is probably gap width relative to the surrounding habitat (Clair, 2003). If proper regulations are not put in place, so as to promote and regulate the use of vehicle in national parks whose purpose is to conserve the scenery and the natural historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as well leave them unimpaired for the enjoyment of future generations, it may lead to threatened or endangered of some wildlife species (animals), thereby reducing the ecotourism potentials of the park. This study is therefore necessary, as it will examine in details and provide a regulatory tool in this regard.

2. METHODOLOGY - DESCRIPTION OF THE STUDY AREA

Kainji Lake National Park was established in 1979. It is made up of two sectors namely; Borgu and Zugurma sector, under decrees 46 of 29th July, 1979, thereby making Kainji Lake National Park one of the most important National Park in Africa, as highly endowed with many flora and fauna resources, it has high patronage of tourist both nationally and internationally, with an area of 5340.82 km, the park was subsequently reconstituted under Acts 36 of 1991 and Decree 46 of 1999, which established seven additional National Parks (Ezealor, 2002). Kainji Lake National Park area enjoys the savanna climate of Nigeria. In this area there are two distinct seasons of wet and dry seasons. The wet season begins around mid –April of every year and ends in October giving about seven months wet season while November to March represents the dry season. Like most part of Nigeria Kainji Lake National Park enjoys the characteristic West Africans climate, marked by distinct seasonal shift in the wind pattern. There is the

prevalence of moisture-laden south westerly wind during the wet months while the dust-laden northeasterly wind is associated with the dry months. The mean temperature during the wet season is about 30 ºC and drops to about 28 ºC during the dry season being affected by the north east harmatan winds. Rainfall is a major climatic element in the reserve being responsible for vegetal growth and the hydrology of the rivers. The mean annuals rainfall is about 1200mm. The rainfall amount increases to the southeast from Borgu towards the Niger valley. This is due to leeward nature of the reserve site being east of the Yoruba hills. Individual rainstorms are often short and stormy, with high rainfall intensities. The number of rainy days averages about 200 days increasing eastwards to the Niger valley (Ecological Survey of KLNP, 2004).



Map 1. Map of Kainji Lake National Park
Source: Google

3. METHOD OF DATA COLLECTION

Both primary and secondary data sources were used to collect data in this study, the primary data source comprised the use of questionnaire, personal field observation and interview. Two sets of questionnaire (50 copies each) were purposely administered, on some selected rangers of the park, both Zugurma and Borgu sector, while other set of the questionnaire (50 copies) were administered on road transport workers(Wawa to Lumma branch and New Bussa to Ibbi branch) union. This was augmented with information gathered from personal ground observation and interview.

Two major roads that traverse inside the study area (New Bussa – Lumma and New Bussa – Ibbi) were visited, in the first four days of every month from February – June, 2017. The secondary data on the other hand are related reports on wild animal road kills in the park.

Descriptive statistics in form of frequencies, percentages, pie chart, and bar chart was used for data analysis.

4. RESULT

Table 1, indicates the major range of age of the road transport workers is 21-40 with (39%) while the least are 0-20 and 50 and above having (18%). With respect to this same table, their major occupation is driving having (52%). More so, most of the respondents are married men with (50%) while (18%) are divorcee. The table also indicates that majority of the respondents are school cert holders (82%) and non formal education had (18%).

Table 1. Demographic Characteristics of Respondents (Road Transport Workers) in the Study Area

Variables	Frequency	Percentage (%)
Age		
0 – 20	8	18
21 – 40	17	39
41 – 50	11	25
50 and above	8	18
TOTAL	**44**	**100**
Occupation		
Driver	23	52
Trader	11	25
Farmer	10	23
Total	44	100
Marital Status		
Single	10	23
Married	22	50
Widow	4	9
Divorce	8	18
Total	44	100

Educational Status		
No-Formal Education	8	18
Primary/Secondary Certificate	36	82
Tertiary education	0	-
Total	44	100

Table 2: reveals that the miles of road that range 41-80 km is more sincerely considered to be the highest distance in the park with (48%) while 161-400 km has the least percentage having (2%). The speed limit of the park as it varies in the park sector 40mph was recorded as the highest percentage with (52%) were 10-20 mph was significantly zero as proven by this research. More also the rate of traffic volume of the two major routes, as 100-200 VPD has the highest percentage with (43.8%) then 200-400 VPD followed with (33.3%) while <100 VPD has the least percentage with (22.9%). Fig. 1: reveals the availability of reports of road kills, where (79%) of the respondents agreed, while (21%) disagree. Fig. 3: reveals the means through which road related kills are reported, with park rangers/law enforcement having the highest percentage with (30%) and visitors, the lowest percentage (68%). Fig. 4: shows the report on wild animals majorly killed where reptiles had the highest percent with (69%) while large herbivore and amphibian had the lowest percent having (4%) each. Table 3: highlight the issues that significantly affect wild animals in the park with human habituation recorded having the highest (60%), road mortality (27%) and habitat fragmentation (13%).

Table 2. Estimate of Road Km in the Park, Speed Limit of the Park and the Average Traffic Volume on the Main Road in the Park

Variables	Frequency	Percentage (%)
Road Kilometers		
0-20 Km	3	6
21-40 Km	2	4
41-80 Km	23	48
81-160 Km	19	40
161-400 Km	1	2
Total	48	100
Speed Limit		
Less than 10 mph	-	-

10-20 mph	3	6
21-40 mph	20	42
40 mph or faster	25	52
Total	48	100
Traffic Volume		
≤100 VPD (Low)	11	23
100-200 VPD (medium)	21	44
200-400 VPD (High)	16	33
400 and Above VPD (very high)	-	-
Total	48	100

Table 4: shows the factor, that contribute most to road – related mortality of wild animals with (4%) indicating weather condition while (65%) believe that it was due to over speeding and (31%) views that is mostly caused by nighttime driving / poor visibility. In table6: (84%) believed that measures are been put in place to reduce the rate of road kill but fewer of the respondent disclaimed that no techniques that are used to reduce such occurrences. The availability of mitigation measures on road kill were revealed in table5, 56.3% of the respondents indicate no mitigation measures.

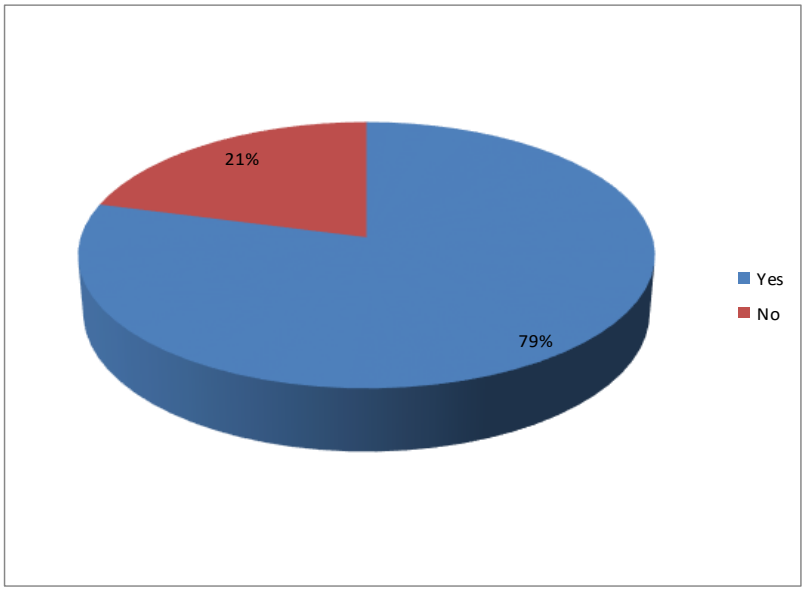


Fig. 1. Awareness of Road Kills in Kainji Lake National Park

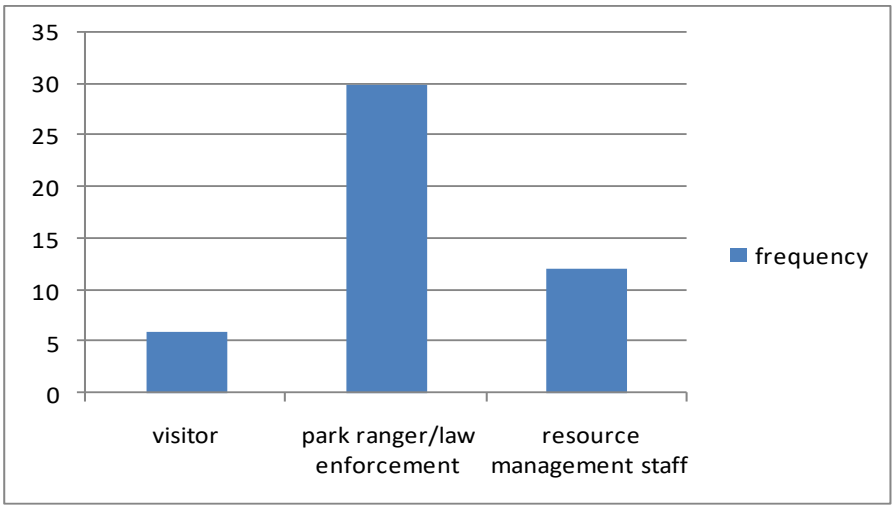


Fig. 2. How wild animals kill are reported in the study area

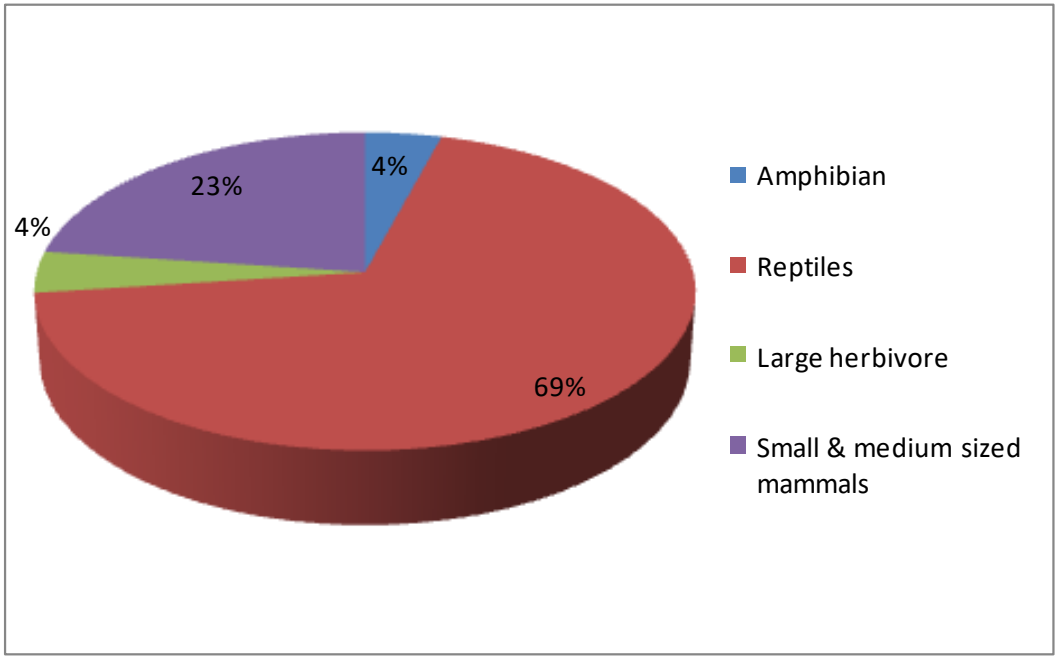


Fig. 3. Rates of Road Kill on Different Wild Animals Group in the Study Area

Table 6: presents the effectiveness of the mitigation practices, with (50%) of the respondent indicating they are well effective, (6%) viewed that there is need for development of monitored plan while (23%) disagreed with the availability of the monitoring plan. Fig. 4: shows the measures used to reduce road kill in the study area, where wildlife signage recorded the highest percentage (41%) followed by speed limit and cancellation of the road from the park

with the same percent (20%) and avoidance of night driving has the least with (19%). Fig5: General monthly view of wild animals killed by road in the study area.

Table 3. Factors that Affect Wild Animals Population in the Study Area

Variables	Frequency	Percentage (%)
Road mortality	13	27
Habitat Fragmentation	6	13
Human habitation/Animal Feeding	29	60
Total	48	100

Teble 4. Factors that Contributed to Most Road Kill in Kainji Lake National Park

Variables	Frequency	Percentage
Weather Condition	2	4
Speeding	31	65
Nighttime driving/poor visibility	15	31
Total	**48**	100

Table 5. Availability of Mitigation Measures on Road Kill in Kainji Lake National Park

Varibales	Frequency	Percentage (%)
Mitigations Practices		
Yes	20	41.7
No	27	56.3
None	1	2.1
Total	48	100
Monitoring Techniques		
Animal Passage	2	4
Road sign	13	27

Speed reduction	7	15
Wildlife signage	16	33
Public education	10	21
Total	48	100

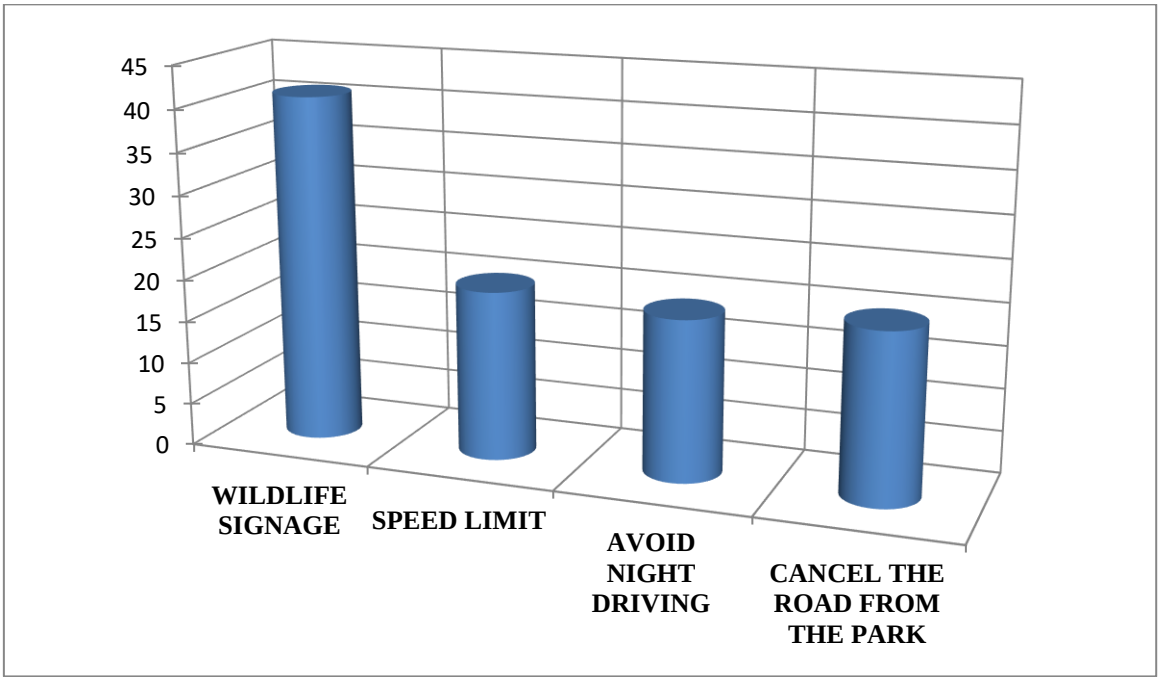


Fig. 4. Techniques that Can Be Used to Reduce Road Mortality in Klnp

Table 6. Effectiveness of the Mitigation Measures and Practices in the Study Area

Variables	Frequency	Percentage
Monitor		
Yes	24	50
No	11	23
Monitor plan developed	3	6
Not sure	10	21
Total	48	100
Judge to be Effective		

Yes	21	43
No	12	25
Do not know yet	5	10
Not sure	11	22
Total	48	100

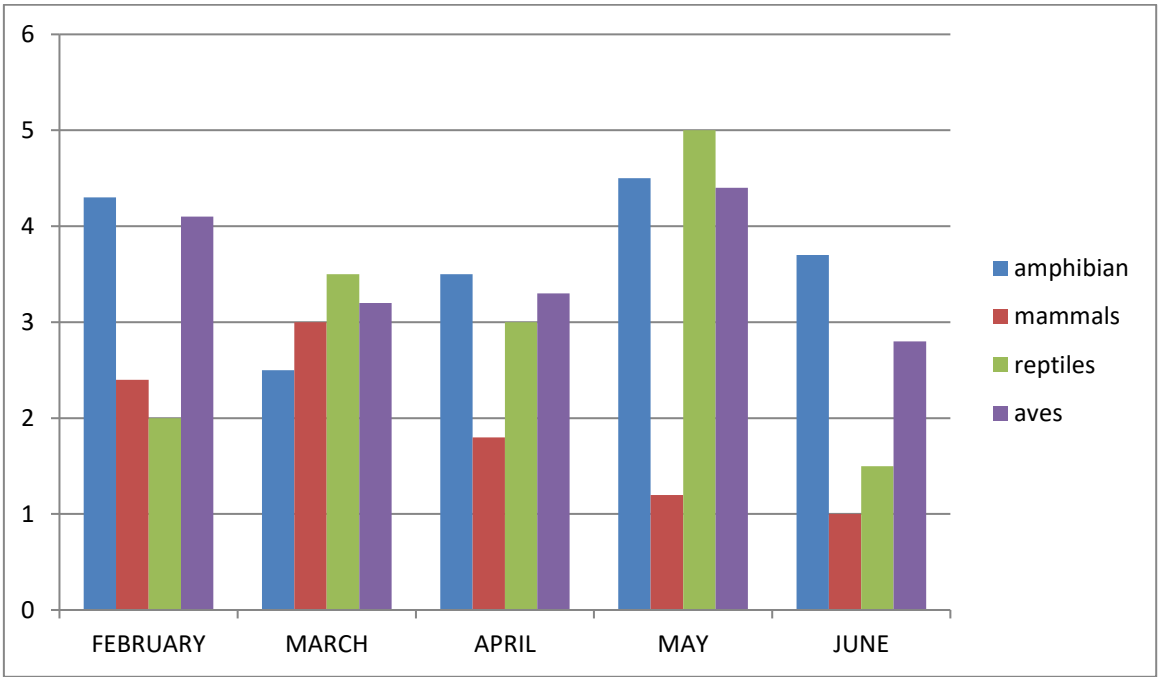


Fig. 5. General Monthly View of Wild Animals Kill in Two Major Routes of the Study Area

5. DISCUSSION

From the study it was observed that the reptiles are the most road kills in both Kainji to Ibbi and Kainji to Lumma with 69%. This is an agreement with Jones, (2009) in his work of major wildlife species in Kainji Lake National Park that monitor lizard are abounding in Kainji Lake National Park. From the literature it was discovered that Animal Feeding/Human Habituation is the major problem in wildlife conservation in most of our National Park, Most especially Kainji Lake National Park. This study in addition to the above revealed that road kills especially Reptiles and Small Size Mammals were also a major problem in the two major routes of Kainji Lake National Park. This was ascertained by Kaltumi (2014) in her work of challenges of Kainji Lake National Park Management.

Reptiles are the most populated animal species been kill by motorist in the study area. This is in line with Kertth *et al*. (2009) For example, a road acts as a barrier when certain

individuals overtly avoid crossing or coming near the road. Alternatively, when individuals are susceptible to mortality as a consequence of crossing a road, the road acts as a filter to movement. Road related mortality is the most visible and direct effect of roads. It has the potential to significantly affect the dispersal or immigration and emigration rates of wildlife populations as individuals attempt to move across the landscape. The study shows that, installation of overpass, underpass, and wildlife signage will serve as a good measure of preventing road kills in the area. This is in accordance with Trombulak and Frissell (2005). It is common practice for corridors to be fitted with wildlife crossing structures. These structures are designed to link critical habitat, increase landscape permeability, and provide safe movement of animals across transportation corridors. Among the few studies that have examined the performance of crossing structures, all have shown that their use is species specific, and frequency of use is site specific. In instances where crossing structures have been implemented for a target species and assessed, many other species have been unable to use them. Thus, if mitigation measures are to be effective and cost efficient, it is essential that crossing structure designs and configurations achieve stated objectives and goals. Important aspects of crossing structures such as size, position, and distribution along transportation routes should be put in place so as to achieve the targeted goal.

6. CONCLUSSIONS

Given the park's mandate to both protect wildlife and provide access for the enjoyment of visitors, It was understand that in majority of cases, the management of wildlife-road conflicts is based on assumptions and perceptions, not on analyses of data that are systematically collected. Road-related mortality and habitat fragmentation effects by roads are quantifiable causes of loss to wildlife populations, but yet minorities of the park unit's measure, mitigate, and monitor these impacts on their wildlife populations, including species listed under the Endangered Species Act.

In the light of this research, it was concluded that for the park to be able to enjoy it wildlife resources, systematic approach should be used to develop, monitor and measure a standardized mitigation technique that can help in the reduction of road kill on the existing roads in the park. More also, this research finding, was able to identify a variety of opportunities for wildlife sensitive roadway mitigation for the park transportation system's planning, design and implementation.

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