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An Assessment of the Conservation Attitude towards Bats in Bamenda City, Northwest Region, Cameroon

Melle Ekane Maurice*[1], Olle Ambe Flaubert[2], Ekabe Quenter Mbinde[3], Chah Nestor Mbah[4]

[1]Department of Environmental Science, University of Buea P.O. Box 63, Buea, Cameroon

Abstract— *Throughout the world land dedicated to the conservation of wildlife is generally small in size due to extensive areas transformed to provide food, housing and other resources for human society. Consequently, the conservation of wildlife species like bats depends mostly on their capacity and flexibility to persist within this modified landscape, particularly in the rural environment. The objective of this research was to examine the attitude of the inhabitants of Bamenda city towards bats. The data collection was done by the use of questionnaires, administered to 525 inhabitants in the study area. The results of this survey revealed a positive correlation, R^2 = 0.874 at P < 0.05 on the national government encouragement for bat-watching. The age-class and bat-watching has shown a positive correlation, R^2 = 0.767 at P < 0.05. The score of 47.98% respondents has shown that so many people might be very much interested on the protection of bats population in Bamenda. Moreover, a respondent score of 54.44% was in favour of the protection of bats to enhance the conservation of fauna in the area. Furthermore, the study has shown a respondent score of 67.94% on the awareness of bats in Bamenda city, whereas 32.06% has shown unawareness. The awareness knowledge disparity might be based on the fact that some people in Bamenda city are visitors and might not have been in this city for long, hence their knowledge on the existence of bats in some areas of the city like the Up-Station neighborhood is lacking. This study recommends that an intensive conservation campaign be launched by the national government to profoundly enrich the bats conservation awareness and interest to the people of this area.*

Keywords— Wildlife species, Bat-watching, Environment, Inhabitants, Conservation.

I. INTRODUCTION

The attitudes and values of an individual person are the fundamental building blocks of a society's power to evoke a change. Public perception has an important effect on Government policy, and the management decisions of organizations working in that community. The collective attitudes and values of society can determine the success or failure of a conservation intervention and wide consensus exist that human attitudes and behaviour toward nature must be understood and often influenced in order to avoid further loss of biodiversity (Bjerke 1998). There are over 1000 species of bats, accounting for 20% of all mammal species globally. Of these 1000 species, almost a quarter are globally threatened (Mickleburgh *et al*. 2002). There are 167 species from the suborder Megachiroptera, often referred to as 'Old World fruit bats. In many cases bats account for a substantial proportion of a countries mammalian biodiversity, indeed in some oceanic islands, they are the only indigenous mammals and play a vital role as 'keystone' species in ecosystems (Mickleburgh *et al*.2002). The major global threats to bats are: habitat loss or modification, roost site loss or disturbance, health issues, persecution, lack of information, and over-exploitation for food (Mickleburgh *et al*. 2002). Pressure on vital resources due to increasing human population that lead to the loss or modification of foraging habitats and roosts is arguably the greatest threat to bat species. In addition bats frequently have a negative public image that influences people's responses to issues such as human health risk and conflict between fruit consuming bat species and fruit growers. The negative public image that bats frequently have, and the resulting persecution, can potentially be part attributed to people being ignorant to the life history of bats and their role in the ecosystem (Mickleburgh *et al*. 2002).

Bat populations are declining world-wide as a result of a growing number of factors, including habitat loss and fragmentation, disturbances to roosts, exposure to toxins, human hunting pressures and introduced predators (Racey, 1998; O'Donnell, 2000). This makes it difficult to draw general conclusions about bat conservation, which may require species-specific conservation plans (Fenton, 1995). Insectivorous bats are major consumers of nocturnal insects, many of which are economically important pests. This presents both ecological and economic rationales for their

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protection (Pierson, 1998). Bats may transfer significant amounts of nutrients in ecosystems as guano accumulates at roosts and is spread across the landscape while bats forage (Pierson, 1998). Bats are also important components of cave environments, where the accumulation of guano supports a diverse invertebrate community. Some bat assemblages may be useful indicators of habitat disturbance and quality (Medellin, *et al*.2000). Like most conservation efforts in North America, bats conservation has focused primarily on rare and endangered taxa (Pierson, 1998). However, because of their potential role in controlling insect populations and distributing nutrients across landscapes, Pierson (1998) argued that widespread, abundant, species may be the most ecologically and economically important. In the UK, recent attention has been directed towards a national landscape-level bat conservation and management plan (Racey, 1998). The broad strategies gleaned from this effort have centred mainly on data collected from the Common Pipistrelle (*Pipistrellus pipistrellus*), one of the most widespread and abundant bats in Europe (Racey, 1998).

However, the most widespread reason for bat hunting, by far, is for consumption; all 167 species that are hunted are, at least in part, wanted for their meat as a source of protein. Bat meat ranges in value from a highly sought-after delicacy served at special ceremonies and traditional celebrations like *Pteropus mariannus* in the Mariana Islands, (Mildenstein 2012). Elsewhere, it provides an alternative source of protein for local people for whom meat is an expensive commodity (Jenkins and Racey 2008) and in extreme cases, bats are consumed as starvation food (Goodman 2006). Hunting bats for food is common in West and Central African states where it can be a major threat to their populations (Mickleburgh *et al*. 2009; Kamins *et al.* 2011). Frequent bat hunting is recorded from Benin Republic, Ghana, Guinea, Liberia and Nigeria (Kamins *et al.* 2011; Dougnon *et al.* 2012) as well as in Cameroon, Congo Republic, Democratic Republic of Congo (DRC), Equatorial Guinea and Gabon. High levels of hunting have also been reported in the past from islands off Africa, the Comoros, Madagascar, Mauritius and Rodrigues and São Tomé and Príncipe as well as Pemba Island, Tanzania (Jenkins and Racey 2008; Carvalho *et al*. 2014), although conservation efforts have reduced this pressure in some of these islands (Trewhella *et al.* 2005). While occasional bat hunting occurs in Mali and Zambia, there is almost no hunting in East Africa, except eastern Uganda, and bat hunting is rare in South Africa (Mickleburgh *et al*. 2009). Bats are also persecuted because of negative perceptions in Ethiopia (Mickleburgh *et al*. 2009) but that is not the focus of this chapter. In bat meat is a traditional delicacy in some parts of Cameroon, the reason for the two most common species *Coleura afra and Rousettus aegyptiacus* are widely and intensively hunted. Hence, this study is focused on the assessment of the attitudes of the inhabitants of Bamenda city towards the conservation of bats.

II. MATERIALS AND METHOD

Description of the study area

Bamenda is the capital of the North-west Region of Cameroon, with a population of approximately 400 thousands, it is located between latitude 4°50’ - 5°20’N and longitude 10°35’ - 11°59’E. The altitude ranges between 950-1500 m above sea level, with flat woody lowland in some areas (Fig.1). The drainage system is very rich with streams and springs emanating from the northern belt. The zone has two seasons, the dry and wet seasons ranging from November - April and May– October respectively. The mean annual rainfall is about 2200 mm with July, August and September registering the highest rainfall and December the lowest. Also, the mean annual temperature is about 20.67°C with January and February registering the highest and July, August and September the lowest temperature (Yuninui, 1990). Unsustainable farming practices have largely destroyed the forest vegetation to an extent and depleted soil fertility. Similarly, years of overgrazing, burning of grasses, and increasing herd size, has severely degraded the remaining patches of grasslands. According to Yuninui, (1990), the vegetation of this region is both natural and cultivated. The cultivated vegetation consists of planted trees like cola nut, eucalyptus, raffia palm and other fruit trees. The wildlife species in this area is dominated by birds, rodents and bats.

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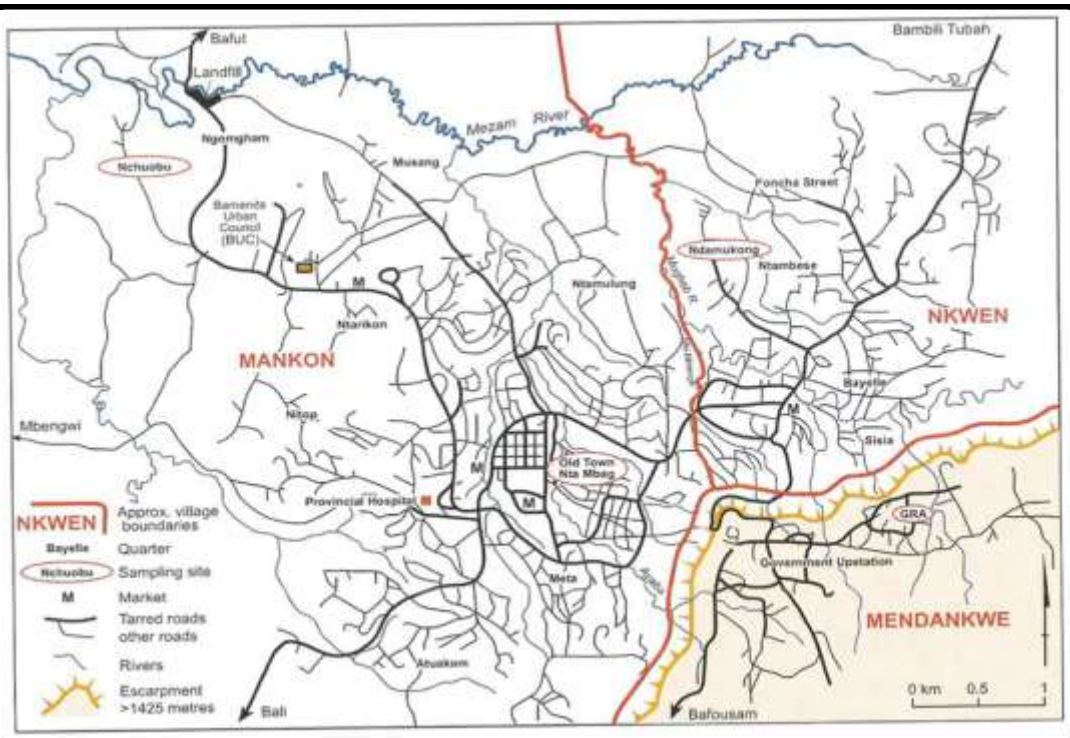

Fig.1: The map of Bamenda city

Source: Bamenda City Council (2011)

Data Collection method and analysis

Data collection consisted of two sampling techniques: Purposive sampling and simple random sampling. Purposive sampling was used to allocate communities targeted for the study (Ajabji *et al.*, 2008). The communities selected for questionnaire administration was based on their proximity to bats roosting sites (Ajabji *et al.*, 2008). The language used in administering the questionnaires was English, spoken by almost all the inhabitants of the city. A planning meeting was organized in each of the target communities prior to the questionnaire administration programme. This facilitated the clarity and knowledge on the purpose of the study and also encouraged respondents to open up during questionnaire administration. An oral interview was done alongside the questionnaire administration to the respondents in the selected communities for the survey during the sampling. The survey was also conducted on a one-on-one interview in which the interviewer filled the questionnaire based on the respondents' answers, especially for the illiterate respondents. This approached helped to minimize misunderstanding of questions by the respondents, hence increasing the reliability of collected information. A total of 525 questionnaires were administered to respondents selected systematically for the exercise. The data collected was analyzed by using chi-square and correlation statistical analysis and results displayed on bar charts and tables.

III. RESULTS

The results of this study has shown a positive correlation, $R^2 = 0.874$ at $P < 0.05$ in table 1. The role played by the national government in encouraging bats watching is beneficial to the conservation of wildlife. The consumption of bats in Cameroon is well known and common, but this human behaviour of late has been met with fear because of the awareness of zoonotic epidemic outbreaks that could afflict the human people.

Table.1: The encouragement of bat watching by the National Government

Correlation Tests					
		Value	Asymp.Std Error[a]	Approx. T[b]	Approx. Sig. (2-sided)
Interval by Interval	Pearson R -	.028	.042	- .612	.541[c]
Ordinary by Ordinal	Spearman Correlation	.007	.044	-.158	.874[c]

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Linear-by-Linear Association					
N of Valid Cases		496			

a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.
c. Based on normal approximation.

The age-class and bat-watching has shown a positive correlation, $R^2 = 0.767$ at $P < 0.05$ in table 2. Interestingly, all the age-classes have shown an uncommon pleasure in the watching of bats at the roosting sites for leisure. Nevertheless, this acknowledgement might be momentary since those seen on bats roosting sites were rather for bats killing and not watching as claimed. Age has also been found to influence attitude in a similar way to male and female differences, although this has been postulated as a cohort effect as opposed to a maturational one (Kellert & Berry 1987) due to life-long attitudes and behaviour decisions toward wild animals being based on childhood experiences (Mulder, 2009).

Table.2: Age-class and bat-watching

Correlation Tests

		Value	Asymp.Std Error[a]	Approx. T[b]	Approx. Sig. (2-sided)
Interval by Interval	Pearson R	.013	.045	.296	.767[c]
Ordinary by Ordinal	Spearman Correlation	.013	.045	.296	.767[c]
Linear-by-Linear Association					
N of Valid Cases		496			

a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.
c. Based on normal approximation.

The score of 47.98% respondents has shown that so many people are very much interested in the protection of bats population in Bamenda (fig.2). The reasons might be that this would attract conservation projects from NGOs which definitely would reduce unemployment in the country. On the other hand the local and international tourists would be attracted to this region, a possibility for money to flow into the local economy. However, 32.39% of the respondents have rejected the idea of bats conservation in order to increase their population. The reasons for this might be due the conservation legislations that would go with heavy penalties on poaching victims whenever caught killing these bats for consumption. Other reasons might be based on the nuisance of the bats, especially in the night at their roosting sites where they are believed to often create a noisy and smelling environment in human residential areas. However, it should also be noted that the protection and conservation of bats is facing enormous challenges, based on the loss of natural or semi-natural habitats and the introduction of new land uses have had profound impacts on faunal assemblages in countries throughout the world. Such impacts on the native fauna have been particularly pronounced in agricultural environments because of the extent of habitat loss that has occurred and the intensity of new land uses that have been imposed (Harris and Woollard, 1990; Warkentin *et al*., 1995; Fuller *et al*., 1997). In addition, changes in the quality of remaining natural habitats (Daily *et al*., 2001; Ford *et al*., 2001), and their pattern in the landscape (Luck, 2003) also influence the status of the fauna. The capacity of species to persist in rural landscapes varies greatly and is influenced by the degree of dependence of different taxa on natural habitats for resources, such as for foraging and breeding, and by their ability to use modified habitats or new land uses that occur in the environment.

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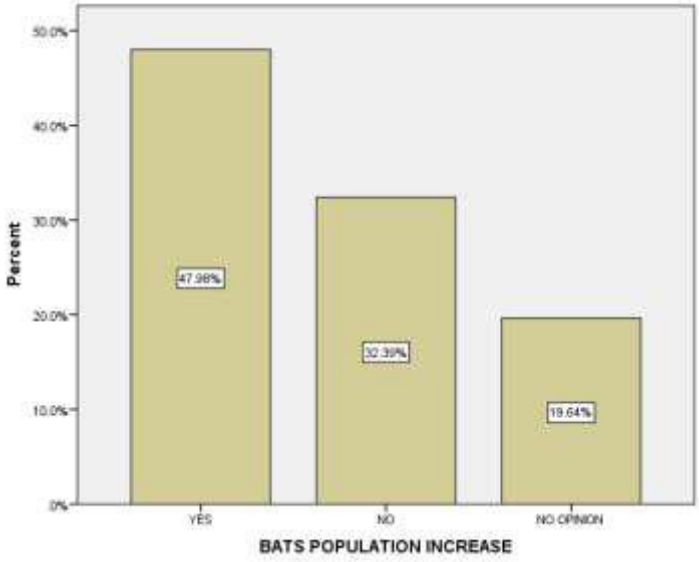

Fig.2: The increase of bats population

According to fig.3, a respondent score of 54.44% favoured the protection of bats to enhance the conservation of fauna. This group of people strongly believed there would be a long term benefit if the fauna conservation is enhanced. In countries throughout the world, land dedicated to the conservation of biodiversity is generally small in size compared with the extensive areas transformed to provide food, housing and other resources for human society. Consequently, the conservation of many species depends on their capacity to persist within modified landscapes, particularly rural environments dominated by production of livestock, crops and other agricultural products. A mosaic of natural, semi-natural and newly-established habitats typically occur in such landscapes, including patches of forest or woodland, tree plantations, hedgerows or fencerows, roadside and riparian vegetation, wetlands, gardens, and scattered or isolated trees within the farmland matrix (Verboom and Huitema, 1997; Daily *et al*., 2001). A pressing challenge is the need to understand which components of the flora and fauna can (and which cannot) persist within these landscapes, what factors influence their persistence in particular landscape elements, and how the land mosaic can be most effectively managed for biodiversity conservation within the context of agricultural production. Bats can be successfully used to promote the conservation of remnant vegetation Bats can be successfully used as a focus for extension activities to promote the importance of remnant vegetation in rural environments. Bats are poorly known within the general community and, being nocturnal, are seldom seen by landholders. However, most people find them fascinating when they have the opportunity to learn more about them and see them close-up.

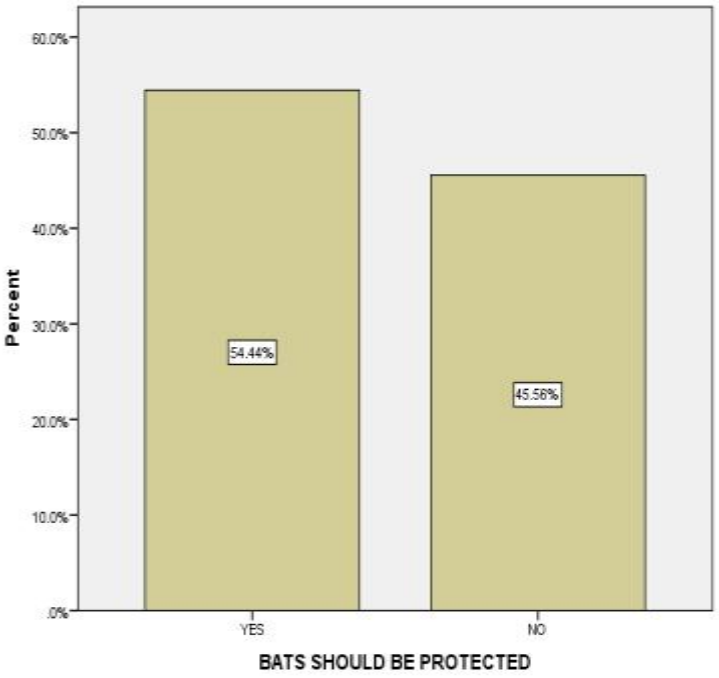

Fig.3: The protection of bats

The study has shown a respondent score of 67.94% on the awareness of bats in Bamenda city, whereas 32.06% has shown unawareness (fig.4). The knowledge disparity might be based on the fact that some people in Bamenda city are visitors and might not have been in this city for long, hence their knowledge on the existence of bats in some areas of the city like the Up-Station neighborhood is lacking. People are generally aware of bats present near their local communities. Bats are not cryptic animals, especially fruit bats that aggregate in large numbers by day using conspicuous roosting sites, and they often forage at night in fruiting and flowering trees on farms and in residential areas. Hence, local people's knowledge of bats often surpasses that of outside biologists, especially with respect to bat roosting locations, foraging habits, seasonal behaviours, and even threats, local community members' awareness of subtle seasonal changes in fruit bat, Mildenstein and Mills (2013). It is, therefore, surprising how little is known about bat conservation status in these same areas. Population size and growth trends tend to be unknown by biologists and managers, much less by the non-scientific members of the local community. So, even though local people are aware of the disturbance they may be causing, they often have no idea of the severity of population-level consequences.

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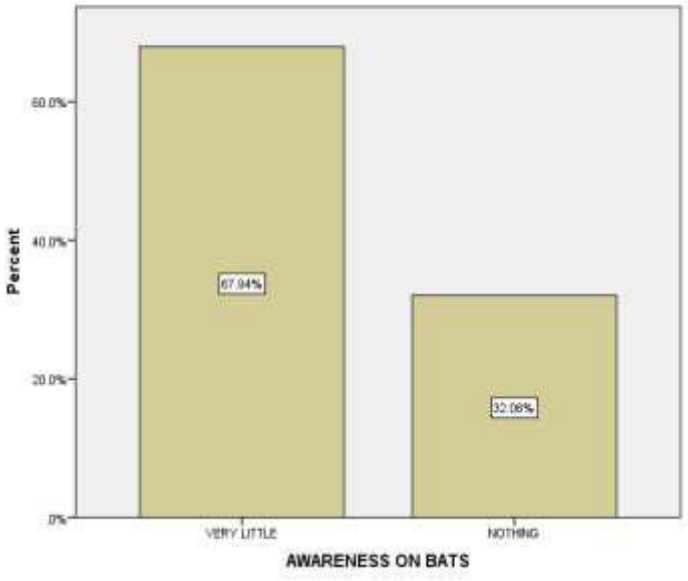

Fig.4: The awareness of bats existence

IV. DISCUSSION

Bat populations are declining world-wide as a result of a growing number of factors, including habitat loss and fragmentation, disturbances to roosts, exposure to toxins, human hunting pressures and introduced predators (Pierson, 1998; Racey, 1998; O'Donnell, 2000). This makes it difficult to draw general conclusions about bat conservation, which may require species-specific conservation plans (Fenton, 1995). Insectivorous bats are major consumers of nocturnal insects, many of which are economically important pests. This presents both ecological and economic rationales for their protection (Pierson, 1998). However, because of their potential role in controlling insect populations and distributing nutrients across landscapes, Pierson (1998) argued that widespread, abundant, species may be the most ecologically and economically important. Bats appear to be less severely affected by changes in land use than some other vertebrate groups such as birds and reptiles (Bennett *et al*., 1998). Small remnants and scattered trees in farmland have lower value as habitat for some other species, because the area may be too small for even a single territory, too small to sustain a population, subject to higher predation rates, or because land-use practices such as grazing by stock have degraded the habitat (Major *et al*., 1999; Watson *et al.*, 2003). There are a number of factors that contribute to bats being less severely affected. First, the scale of movement undertaken by bats allows them to move widely through the landscape and obtain resources from multiple landscape elements.

There are many threats to the conservation of microchiropteran bats throughout the world (Racey and Entwistle, 2003). While some species may be threatened by natural processes, such as cyclones (Rodríguez-Durán and Vázquez, 2001), the vast majority of threats are the result of human activities. These may be direct threats, such as disturbance to cave roosts, removal of trees used for roost sites and foraging habitat, or hunting and persecution. Indirect threats to bats include predation or competition by introduced species, and secondary poisoning from pesticides and other pollutants (Pierson, 1998; Racey and Entwistle, 2003). Human intervention is required to ameliorate the impactof these threats if we are to ensure the long-term conservation of our native fauna. To do this we need a sound information base on which to formulate policy and management decisions. One of the major threats to bat populations worldwide is the loss, modification and fragmentation of natural habitats due to agricultural development (Racey and Entwistle, 2003).

People are generally aware of bats present near their local communities. Bats are not cryptic animals, especially fruit bats that aggregate in large numbers by day using conspicuous roosting sites, and they often forage at night in fruiting and flowering trees on farms and in residential areas. Hence, local people's knowledge of bats often surpasses that of outside biologists, especially with respect to bat roosting locations, foraging habits, seasonal behaviors, and even threats Mildenstein and Mills (2013). It is, therefore, surprising how little is known about bat conservation status in these same areas. Population size and growth trends tend to be unknown by biologists and managers, much less by the non-scientific members of the local community. So, even though local people are aware of the disturbance they may be causing, they often have no idea of the severity of population-level consequences. Because bats appear to be numerous, popular belief is that humans can have only minimal impact on their populations.

Bats roosting in buildings, caves and mines are particularly vulnerable to human disturbance and exclusion. Human disturbance to roosts, including the activities of researchers, can have deleterious effects on resident bat populations (Tuttle & Stevenson, 1982). For example, Tuttle (1975) reported that disturbances to Gray Bat (*Myotis grisescens*) maternity colonies can result in heavy mortality of the young, who may be abandoned by fleeing females. Bats roosting in caves and mines are also vulnerable to environmental disturbance, floods and structural collapse. With some foresight, structural collapse and floods may be avoided, although providing protection for all roosts is probably not feasible. Caves and mines supporting large

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populations or high species diversity should be assessed at a state-wide level and given special concern. Bats that roost in buildings are often perceived as a nuisance and are vulnerable to exclusion and eradication attempts (Williams & Brittingham, 1997).

Bats are particularly vulnerable to the effects of hunting for a number of reasons. They are long-lived for their body size (Racey 2015) and reproduce slowly, with generally one young per year. They have a slow rate of fetal growth and long gestation periods (Racey and Entwistle 2000). Females and young bats are thus sensitive to hunting disturbance during a large portion of the year. Bats are nocturnal, making them susceptible to hunting at their roost sites by day when humans can easily find them. This is especially a concern for the highly sought-after fruit bats in the Old World, which tend to roost conspicuously, aggregating in large numbers in the forest canopy (Mildenstein *et al*. 2008). Whether roosting colonies are in caves, cliffs, or trees, hunting at the roost site is likely to affect the entire colony. Finally, bat colonies are characterized by high roost site fidelity (Banack 1996; Brooke *et al.* 2000; Gumal 2004; Stier and Mildenstein 2005). Hence, bats may be reluctant to leave when hunting starts and may find it difficult to find alternative roost sites after fleeing hunters. Because bats are likely to eventually return to the preferred roost site, they are predictable prey for hunters. The overall effect of hunting at roost sites is reduction of bat population densities to a fraction of local carrying capacity (Mildenstein 2012).

V. CONCLUSION

The conservation of bats was not granted research attention in the time past, for the simple reason that its population was never thought to be threatened, however, its alarming population decline of late in Cameroon as a result of agricultural, hunting, and other similar related anthropogenic activities, there is a consideration upon the bats conservation enhancement. The uncontrolled killing of bats across the entire nations for food neglecting the ecological role played in forest regeneration as any other wildlife species has quested a research interest on its population structure, ecological distribution, and most importantly the conservation knowledge for effective management. The media campaign launched by the national government on public education awareness on the possibility of zoonotic disease outbreaks from bats eating is considered to also play an important conservation role. The fear of contracting a viral infection like Ebola from bats has seemed to discourage the bats consuming population to a large extent, though many people doubts and are ignoring this research claim arguing that it is not true, nonetheless, the previous long standing traditional inherent excitement on bats consumption would however systematically reduce with time.

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