

A Survey of the Critically Endangered Vultures of Gashaka Gumti National Park, Nigeria

Stephen Aina^{1*}, Somtochukwu Azugo², Nelly Joseph³, Elizabeth Gapkong⁴, Yohanna Saidu⁵, Kehinde Kemabonta⁶, Joseph Onoja⁷, Muhtari Aminu-Kano⁸

^{1,7,8}Dept. of Technical Programmes, Nigerian Conservation Foundation, Lagos state, Nigeria

^{2,3,4}Gashaka Biodiversity Support Initiative, Gashaka, Taraba state, Nigeria

⁵Wildlife Conservation Society, Abuja, Nigeria.

⁶Dept. Of Zoology, University of Lagos, Akoko, Lagos state, Nigeria

*Corresponding Author: stephen.aina@ncfnigeria.org, Tel.: +2348024148234

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Abstract— The traditional significance attached to the vultures has made the bird of prey objects of inquests and persecutions by local actors with nonconformist disposition to wildlife conservation in Nigeria. With the ascendancy of wildlife persecutions, vultures are now rare across landscapes and previous information about vulture distribution remain largely altered, outdated and insignificant to guide precise conservation action. Our paper focuses on advancing baseline population statistics for the critically endangered vultures of the project location. From the eight (8) survey routes objectively allotted for data collection, Route 3 (Pompo 2A – Mayo-Yum) had the highest record of 21 individuals (30%) of *Necrosyrtes monachus*, while Route 1 (Gashaka –GF/Kwano - Filinga), had 13 individuals (92%) of the *Gyps africanus* recorded during the inventory. Across all the survey routes, 71 and 14 individuals of *N. monachus* and *G. africanus*, respectively, were sighted and enumerated. Thus, an overall unadjusted count of 85 individuals from two (2) species of the Critically Endangered (CE) vultures were encountered and recorded within Gashaka Gumti National Park and the support zone communities. The Park has, therefore, great potentials for the conservation of vultures considering its vast landmass of about 6,730 sq.km, the spread of pastoral settlements and diversity of local tribes. However, due to the low sampling intensity (< 1%) and several exploratory sightings of unnamed species of vultures by locals, complementary surveys are required to update existing records of vultures in the park. The park is significant to upholding vulture biodiversity at the habitat-level in Nigeria.

Keywords— *Gyps africanus*, Vulture conservation, Protected Areas, Inventory, Abattoirs

I. INTRODUCTION

Nigeria is currently host to at least four (4) of the 11 different species of vultures that are native to the African continent. The populations of these vultures have continued to decline with total disappearance of some species in places that once held reasonably high numbers. According to [1], the Hooded Vultures have undergone global population declines estimated at 62% over the past half century. For Nigeria, vulture decline is reasonably close to about 85% in known areas. According to [2], [3], [4], vultures provide critical ecosystem services and also serve a useful purpose in human societies by helping clean the environment through consuming carrion and meat waste such as bones and skin. The ecological significance of the species therefore provides sufficient background for the investment of conscious efforts and finance towards the conservation of vultures in Nigeria.

Despite the past and current interventions, the knowledge-base of movements and distributions of vultures in Protected Areas (PAs) of Nigeria is outdated and or non-

existent. Thus, depriving conservation biologist the advantage of strategic and pre-emptive planning to outwit and deny wildlife profiteers access to the vultures. According to [5], [6], there is ample evidence of trans-border trade in wildlife species including vultures. The vagaries of anthropogenic stressors following intense land use modifications and vulture removals from landscapes are loading the odds against precision surveillance and adaptive conservation of the critically endangered vultures in PAs of Nigeria. This has led to a cut-and-fill regime in the distribution of vultures, and thus requiring continuous vulture inventory to accurately predict species presence and plan ahead of vulture traffickers.

The research, therefore, aims to provide credible baseline estimates of the populations and distribution of the Critically Endangered (CE) vultures of Gashaka Gumti National Park. The preliminary survey applied the indigenous knowledge of the rural people living in the support zone communities (SZCs) in designing sampling protocols, assigning survey personnel and implementing the survey plan. The conclusion of the survey will afford a

management yardstick to gauge successes or otherwise of future interventions targeted at recovering the populations of the reference species and a template for developing conservation blueprints for vultures in the park. Ecological monitoring should be a vital component of any conservation project so that the effects of management can be assessed [7], [8].

II. RELATED WORK

There are published works on vulture populations and the related threats to their conservation in study areas such as game reserves [9], urban settlements [6], wildlife markets [10], and places outside protected areas [11], in Nigeria. However, there is a paucity of published data on vulture populations in protected areas under IUCN category II in Nigeria. Our research, therefore, addresses a cogent knowledge gap and its complementary of other publications on vultures in Nigeria.

III. METHODOLOGY

Study Area

Gashaka Gumti National Park (GGNP) was established in 1991 through the merger of Gashaka Game Reserve and Gumti Game Reserve located in Taraba and Adamawa states, respectively. GGNP is rich in species biodiversity and spots a blend of several unique ecosystem types. It is one of the last strongholds of vultures and had its pioneer vulture conservation project launched in 2017, through the BirdLife/BirdFair funded Young Conservation Leaders (project) Award.

It spots an assemblage of unique biological resources, ethnic diversity and rare species of flora and fauna, including the Nigeria-Cameroon chimpanzees, leopards, buffalos, vultures and pangolins. Elevation varies from 240 m to 2,400 m above sea level and is characterized by vast plains, floodplains and isolated hills in the northern sector and the southern sector is dominated by undulating relatively high lands, high mountains, and riparian plains [12]. GGNP spans across several local government councils (LGCs), including Gashaka, Sardauna and Toungo LGCs. It is bounded (as shown in Figure 1) by latitudes: 6.9699N – 8.0861N and longitudes: 11.1320E - 12.2085E; with a total landmass of about 6,730 sq. km [13].

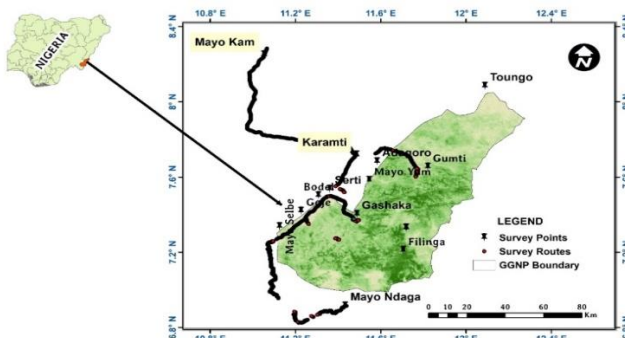


Figure 1: Map of Gashaka Gumti National Park showing some vulture survey routes and locations.

Methods

Inventory of vulture populations and abundance was conducted using a hybrid survey method similar to the method adopted by [14]. [14] used the road count and point count methods to survey populations of diurnal raptors in nine South American nations and related both species composition and relative abundance to gross features of the habitats. The road transect method adopted for the vulture inventory was implemented in six (6) spatially distributed secondary roads/trails and was complemented with the point count method using community abattoirs as the survey points (Table 1). The sampling intensity is significantly below 0.5%.

The point counts and observations of vulture activities were made between 8:30 am and 01:30 pm for a maximum of 60 minutes. The method will ensure that vultures in human modified environment, especially dumpsites and abattoirs are enumerated. The team of observers (made up of three individuals) implemented the road transect survey on a motorbike at a velocity not more than 35 km/hour. This is in agreement with the work of [15], who surveyed vulture populations at a travelling speed of 30-40 km/h. Since road networks are sparse and poor within the park, the choice of motorbikes allowed for easy access and enumeration in difficult terrains and narrow trails. Records of sightings were logged using datasheets. Surveys were implemented simultaneously, between March and April, at the pre-selected sites by trained volunteers, park rangers and the project team.

Data Analysis

The survey evaluated species diversity for all the surveyed sites using the Shannon-Weiner (H) diversity index as expressed below (Equation 1.1).

$$H = - \sum_{i=1}^s (p_i)(\log_2 p_i) \tag{1.1}$$

Where: *s* is the number of species and *p_i* is the proportion of total sample belonging to the *i*th species [16], [17].

Species Mingling Index (SMI) a non-spatial measure of competition among different species of vultures at feeding/roosting sites was calculated with the estimator in Equation 1.2:

$$M = \frac{1}{n} \sum_{j=1}^n m_{ij}, m_{ij} = \begin{cases} 1 & \text{if species } j \neq \text{species } i \\ 0 & \text{otherwise} \end{cases} \tag{1.2}$$

M is the species mingling index, while *i* stands for a reference species, *j* refers to closest neighbour species, species mingling index has a minimum value of 0 when a reference species and its nearest neighbour species are the same [18].

HV – Hooded Vulture; *AWBV* – African White Backed Vulture; *UV* – Unidentified Vulture]

IV. RESULTS AND DISCUSSION

Results

Biological information is a basic requirement for evidence-based conservation of biodiversity in the protected areas of Nigeria. Two (2) species of the CE vultures were identified to type in the study area, with the identity of the third species unknown. These species are the Hooded Vultures (HVs) and the African White Backed Vultures (AWBVs). All the pre-selected survey sites and routes had records of the HVs, while only 25% (2 of the 8 survey sites) had contagious evidence of the AWBVs. A total unadjusted count of 85 individuals of the named CE vultures was recorded for GGNP; with the HVs constituting about 83.5% of the total sightings. GGNP has a direct record of 14 individuals of the AWBVs (16.5%) as shown in Figure 2. Multiple species were noticed only in two (2) of the eight (8) locations retained for the survey (see Table 1), each with an average SMI of 0.25.

abattoirs for the preceding years. The abattoirs had noticeable presence of *Corvus albus* (Pied Crow) and *Cairina moschata* (Muscovy Duck).

All HVs sighted were adults (Figures 4 and 6), while two (2) juveniles were recorded among the AWBVs (Figure 6).



Figure 3: Adult *Gyps africanus* sighted in the study area.

Table 1: Individual records of the CE vultures sighted in the pre-selected survey sites.

S/N	Survey Route/Location	GPS Coordinates	Method	Population
1	German Fort-Gashaka-Filinga	N7.3662, E11.4884 N7.3725, E11.4693	Road count	6 HV, 13 AWBV
2	Gembu - Serti – Bali (Abattoirs)	N7.5002, E11.3694	Point count	13 HV
3	Pompo 2A - Mayo-Yum	N7.5193, E11.4277	Road count	21 HV, 1 AWBV
4	Goje - Mayo Selbe	N7.2732, E11.3864 N7.3884, E11.2491	Road count	9 HV
5	Toungo	-	Road count	4 HV
6	Adagoro - Gumti	11.700 7.734	Road count	6 HV, 1 UV
7	Mayo-Ndaga - Mambilla	N6.9290, E11.428	Road count	7 HV, 1UV
8	Karamti (along River Kam)	N7.7178, E11.4860	Road count	2HV

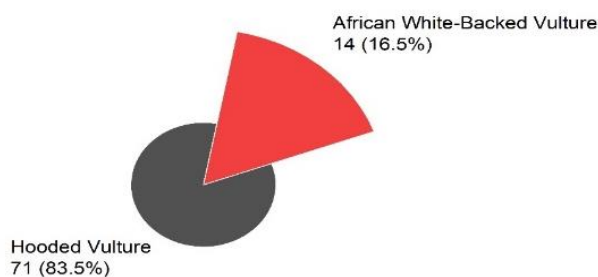


Figure 2: Percentage distribution of the CE vultures in Gashaka Gumti National Park.



Figure 4: A committee of Hooded Vultures in Gashaka community.

Vulture biodiversity was highest in Gahaka -GF/Kwano - Filinga route (Shannon H = 0.6237), while Pompo 2A - Mayo-Yum had the peak species dominance index (D=0.9132) due to the large numbers of HVs enumerated along the survey route. Among the community abattoirs visited and surveyed, Serti/Baruwa showed high potentials for vulture conservation with a record population of 13 HVs.



Figure 5: A Juvenile African White-Backed Vulture recorded in the park.

No vulture was sighted in the animal slaughter houses (abattoirs) in Gembu and Bali communities within the survey periods. However, there are oral evidences and affirmations from stakeholders of vulture presence in the



Figure 6: Two adult *Necrosyrtes monachus* sighted near Serti community

Discussion

Avian inventory is one of the key tools required for the optimization of biodiversity management and conservation strategies. The results documented from the vulture population inventory furnish credible baseline statistics and evidence to support management by objective and improve the search radius for vulture biodiversity conservation in the study area. According to [19], counting animals to estimate their population sizes is often essential for their management and conservation. Hence, our survey adventure is a pilot test that should attract further in-depth population assay and investments towards vulture conservation in the study area.

Over the past years, conservation practitioners have alluded to the possible disappearance of the AWBVs from Nigeria's soil. For example [20], in one of the most comprehensive action plans ever produced for the African-Eurasian vultures, concluded that the species may be extirpated in Nigeria and hanging on in a few strongholds in Ghana and Niger. BirdLife International's factsheet on *G. africanus* citing Phill Hall (2016) also reported that there have been no recent sightings in Nigeria in the last stronghold of Yankari Game Reserve, nor anywhere else, and it is probably extirpated from the country. However, recent evidence from the preliminary survey of the species (Figure 3) is contrariwise to the above assumption and nominates the project location as among one of the last strongholds of vultures in Nigeria.

Vultures are drawn to the pastoral settlements of the local tribes in Support Zone Communities (SZCs) of the study area due to the nourishment from parturition residues and livestock carcasses. Therefore, the direct observation of about 85 individuals from the two named CE species of vultures reckons GGNP as an important bird area (IBA) to stimulate civic actions and rural outreaches towards vulture conservation in Nigeria. The sighting of juvenile AWBVs also confirms breeding successes of the species within the park. Although, breeding success was established from the sightings of two juvenile AWBVs, it still remains unclear if all the AWBVs sighted were resident or distant migratory species.

With community abattoirs accounting for only 18.31% of the total individuals of the HVs encountered, communities are also vitally important to the conservation of the HVs in the study area. Nevertheless, the absence of conservation interventions in most abattoirs is reported to be responsible for the low vulture counts recorded during the survey. On the average, species diversity is low in GGNP when compared to the numbers of vultures indigenous to West-Africa, including the Lappet-faced and the White-headed vultures often sighted as carcasses in Nigeria's wildlife markets.

The presence of *Corvus albus* and *Cairina moschata* in some community animal slaughterhouses (Bali and Gembu) ought to have been complementary to the ecological services rendered by the obligate scavengers; although it is not immediately clear if the interplay would be symbiotic. It is, however, a case of complete service substitution in some of the abattoirs surveyed.

V. CONCLUSION AND FUTURE SCOPE

The global awakening on the vultures and their specialist ecological role towards mankind and the environment highlights basic progression by man towards biodiversity conservation. The challenges confronting vulture conservation are complicated by the economic incentives derived from the commerce of vultures and its parts in Nigeria. The large-scale removals of vultures from areas of predominance and the attendant adaptive local migration of vultures to areas with lesser threat place urgent demands on conservation practitioners for continuous vulture inventory especially in the protected areas of Nigeria. Therefore, biodiversity monitoring is central to conservation biology, allowing the evaluation of the conservation status of species or to assess biological responses to environmental changes such as climate change [21, 22] and habitat disturbance. More conservation-oriented inventories should, hence, be commissioned to accurately unveil the true spatial richness and taxa of vultures for precise management actions in protected areas of Nigeria.

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AUTHORS PROFILE

Mr. Stephen AINA is a research scientist (with special interest in GIS/wildlife metrics) and a nature enthusiast with credible degree of knowledge and experience spanning several years in leading conservation interventions at the landscape and community levels. He has a postgraduate background (M.Sc) in Forest Biometrics and Remote Sensing, with over 15 published research and editorial articles. He is the principal investigator of the BirdLife-BirdFair Young Conservation Leaders Project Awards (in Nigeria), a fellow of the Neville Shulman Award (NSA) from EarthWatch Institute, Oxford and one of the Top 100 Young African Conservation Leaders for 2021. He is driven by the passion for evidence-based conservation practices and an advocate for environmental justice. Mr. Aina is endeared to big waterbirds and other birds of prey, including the vultures of Nigeria.



Mr. Somtochukwu AZUGO studied Agronomy and Ecological Management at Enugu State University of Science and Technology and thereafter worked with the Nigerian Conservation Foundation as a graduate intern.



He is an awardee of the BirdLife-BirdFair Young Conservation Leaders in Nigeria. He is passionate about pertinent environmental matters and has written numerous environmental articles and publications on Nigeria's wildlife, vultures and Eco-tourism. He is very keen about the role of youth participation, engagement and leadership in nation building. Somtochukwu is committed to helping people get engaged in environmental subjects by encouraging youth participation in developing and strengthening institutions for biodiversity conservation.

Ms. Nelly JOSEPH bagged her B.Sc. (Botany) in 2016 from the Taraba State University, Jalingo, Nigeria. She is currently pursuing a postgraduate degree in conservation biology from the Federal University Lokoja, with special research



interest in the conservation of forest ecosystems and avian species. She has participated in several avian-based surveys including the annual data collection for the Nigeria Bird Atlas Project. Miss Joseph is currently a volunteer with the Gashaka Biodiversity Support Initiative.

Ms. Elizabeth GAPKONG had her NCE in Biology (2013) at the Federal College of Education, Yola and B.Sc. in Zoology (2018) from the Taraba State University, Jalingo, Nigeria. She is a native of one of the Support Zone Communities of Gashaka Gumti National Park and has over 5 years of experience in rural community engagement and education. Her in-depth knowledge of more than three (3) of the native languages makes her an incredible conservation educator. Ms. Gapkong is currently a volunteer with the Gashaka Biodiversity Support Initiative.



Mr. Yohanna SAIDU is a seasoned conservation practitioner with more than 30 years of working stint and experience with the National Park Service in Nigeria. He rose through the ranks, mostly as a researcher, to become the Conservator-of-Park in 2017, shortly before his decorated retirement in 2019. He has a postgraduate background in Environmental Biology and numerous other scientific publications to his credit, famous among such are his works on “A survey on the status and distribution of the lion (*Panthera leo*) in Nigeria” and “Traditional medicine trade in vulture parts in northern Nigeria”. He is currently putting his decades of work experiences to good use with the Wildlife Conservation Society, Nigeria as the Project Manager under the “Combatting Illegal Wildlife Trade programme of the organization.



Dr. Kehinde KEMABONTA had her PhD (Entomology) in 1995 from the University of Ibadan. She is currently a Professor of Entomology with the Department of Zoology, University of Lagos, Nigeria. She has well over 25 years of teaching and research experience in conservation biology, environmental toxicology and entomology with more than 50 publications in both local and international journals to her credit.



Dr. Joseph ONOJA is currently the Director, Technical Programmes of the Nigerian Conservation Foundation (NCF), where he oversees the conservation programmes of the Foundation. He holds a PhD in Conservation Biology from the University of Jos, during which he assessed the extent and impact of anthropogenic activities on birds and large



mammals of Yankari Game Reserve Bauchi, Nigeria’. He has participated in numerous expeditions and surveys, and has several scientific publications in his bag. Dr. Onoja has over 17 years of active conservation experience and engagements with local, national and intergovernmental panels on policy formulations, conflict resolution, poverty alleviation, forest restoration and species conservation. He is currently the deputy regional representative for the Key Biodiversity Area (KBA) conservation programme in West Africa and coordinator of the National Coordination Group for KBAs in Nigeria.

Dr. Muhtari AMINU-KANO is an experienced natural resources management expert with more than thirty-years cumulative experience in management, advocacy and research in the fields of protected areas management, climate change, humanitarian work and poverty reduction in Nigeria, Africa and globally. He has considerable experience in NGO management and Government-NGO partnerships, and policy formulation and implementation through national, regional and international works. He is on the board of several national and international organizations and a member of international committees and Panels such as IUCN-Niger Delta, Biodiversity Technical Advisory Group (BTAG), etc. He is currently the CEO of the Nigerian Conservation Foundation and also a board member of Gashaka Biodiversity Support Initiative.

