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Community-Based Monitoring of Cross River Gorillas in South West Region, Cameroon

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Abstract: Straddling the Nigeria-Cameroon border region, the Cross River gorilla (CRG; *Gorilla gorilla diehli*), is the most threatened of all African ape species. Habitat loss and fragmentation due to increasing human pressure, especially outside of protected areas, has resulted in a significant population decline. Currently estimated at <300 individuals surviving within their range, approximately two-thirds of the population is under some form of protection within government recognized protected areas in Nigeria and Cameroon. The remaining population is found in unclassified and unprotected forest wherein communities acquire livelihood services including hunting, which further jeopardizes gorilla survival. The Gorilla Guardian (GG) is a community-based monitoring program initiated in 2009, to support Cross River gorilla conservation efforts outside protected areas. The program enlists the support of local people to monitor gorilla presence in their area. Since the program inception, 2,529 nest sites were visited, and 12,122 individual nests examined. Considering the average maximum number of nests at freshly constructed nest sites observed, possibly a minimum of 53 Cross River gorillas occur in forest sites where the Gorilla Guardian program is active. Between 2009 to 2017, the program expanded from six to twelve villages and currently working with 12 Gorilla Guardians and 15 forest users. Conservation education was initiated in 2013 to increase local awareness of the Gorilla Guardian program and more than half of the population has been exposed to information on best practices for managing their natural environment. Twenty-four villages and sixteen primary schools have so far been reached. Further, to ensure continuous community engagement, Village Forest Management Committees have been established in each participating community.

KEY WORDS: Cross River gorilla, Gorilla Guardian, Village Forest Management Committee

INTRODUCTION

The Cross River gorilla (CRG; *Gorilla gorilla diehli*) is listed as Critically Endangered (Bergl *et al.* 2016). About 250 - 300 individuals remain in the wild (Oates *et al.* 2008; Bergl *et al.* 2016), spread out in at least 14 areas in a landscape of c.12,000 km² on the rugged terrain across the Southeast Nigeria and Southwest Cameroon border (Oates *et al.* 2003; Sunderland-Groves *et al.* 2003; Bergl 2006). This landscape stretches from the Afi Mountains in the west to the Tofalla Wildlife Sanctuary in the southeast (Figure 1). The species has suffered a significant population decline due to habitat loss, fragmentation and hunting, especially outside of protected areas (Oates *et al.* 2003; Etiendem 2013; Dunn *et al.* 2014; Bergl *et al.* 2016). Throughout the landscape where Cross River gorillas occur, there are many human settlements (Figure 1), including 3 village enclaves within the Cross River National Park in Nigeria and 3 village enclaves within the Takamanda National Park in Cameroon. Increasing forest encroachment

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through farm expansion, exacerbated by the use of fire to clear land for dry season farms, and other infrastructural development activities especially those for ill-planned roads (Laurance *et al.* 2017), continue to threaten the integrity of Cross River gorilla habitat (Dunn *et al.* 2014). In the past two decades some of the key actions aimed at improving the survival prospects for these gorillas have included the creation and improved management of protected areas, connectivity planning, conservation education and sensitization, and research and monitoring to support conservation activities (Oates *et al.* 2007; Nicholas *et al.* 2010).

The creation of Takamanda National Park and Kagwene Gorilla Sanctuary in 2008 and Tofalla Wildlife Sanctuary in 2014, afforded legal protection to some Cross River gorilla groups in Cameroon, but a significant number continue to occur outside of protected areas. Within those areas hunting and habitat degradation are unregulated and overall Cross River gorilla habitat provides a variety of essential services such as bushmeat, non-timber forest products (NTFPs), medicine and timber for nearby communities, therefore exposing the gorillas to human activities thus making them more vulnerable (Dunn *et al.* 2014). It is unlikely that the government of Cameroon will agree to gazette more Cross River gorilla habitat given the relatively high number of existing protected areas in the region, and management limitations. Faced with these factors, there was need for a community-based approach to Cross River gorilla conservation in the region. Hence, the "Gorilla Guardian" community-based program was established as a means of involving the local communities in monitoring and conservation of gorillas (Nicholas *et al.* 2010). The aim of the Gorilla Guardian program is to engage the cooperation of community leaders with traditional rights over unprotected forest areas where Cross River gorillas are known to exist, and to collaborate with local forest users to gather information related to Cross River gorilla distribution, status, and threats. Furthermore, to work with the government and other stakeholders to conserve Cross River gorillas through information gathered to support Cross River gorilla conservation actions, awareness raising and conservation planning.

Since its inception, Gorilla Guardians have been working in collaboration with local forest users to record gorilla sightings, indirect signs and nest sites. This has provided updated information on the distribution of gorillas annually within each site (Figure 1). Gorilla Guardians act as liaisons between their communities, conservation organisations

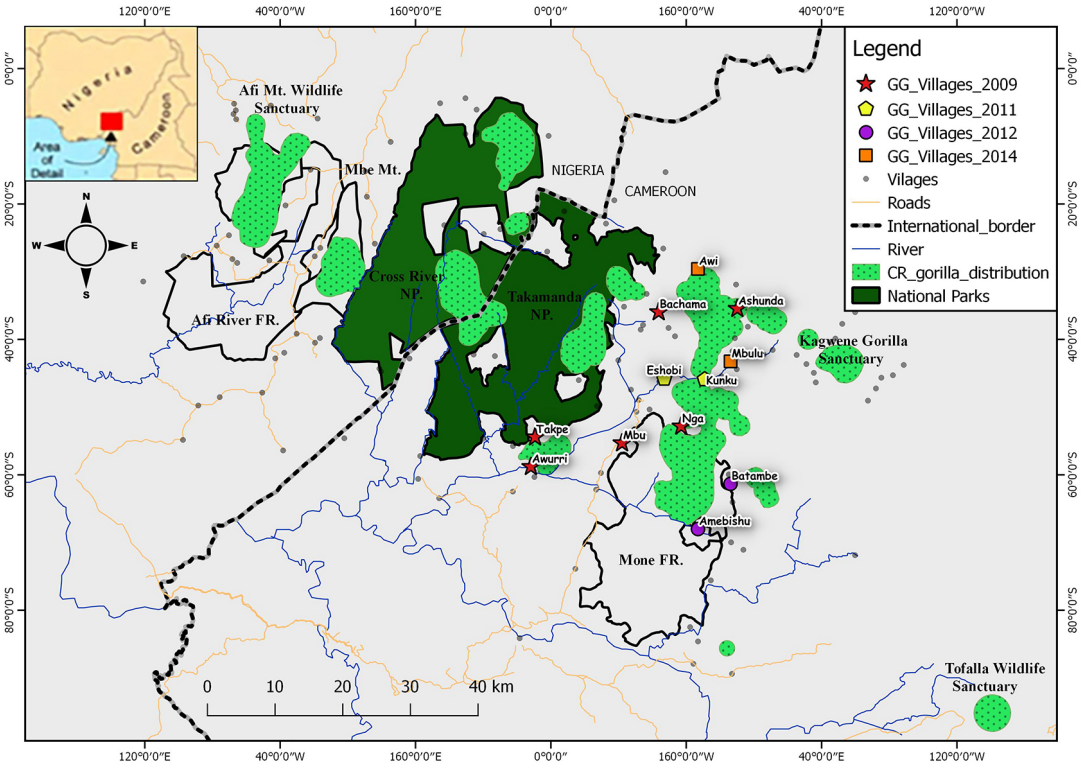

Figure 1. Cross River Gorilla Landscape, showing the location of Gorilla Guardian villages (adapted from (2015) data WCS-TMLP).

and the government to gather vital data, forming a network for sharing information and raising awareness. The program was established in January 2009 (Nicholas *et al.* 2010), with the selection and training of the first six Gorilla Guardians from the villages of Ashunda, Bachama, Awuri, Takpe, Mbu and Nga in the Takamanda-Mone landscape Akwaya sub-division in the Southwest region of Cameroon. In 2011, two communities, Eshobi and Kunku were added to the program. In 2012, two additional communities, Amebisu and Batambe were added and lastly in 2014, Mbulu and Awi were added (Akenji 2015), bringing the total number of communities involve in the program to twelve (Figure 1).

In all twelve Gorilla Guardian villages, conservation education to sensitize communities on the importance of conserving natural resources was initiated as part of the community-based monitoring program. An evaluation of the information on Cross River Gorilla status, distribution and range collected from the Gorilla Guardian program indicated that gorillas live in close proximity to threats within their fragmented habitat (Ikfuingei 2013; Akenji 2015). To further improve the survival prospects of Cross River gorillas, in 2013 Village Forest Management Committees (VFMC) were established to help facilitate forest management and protected species conservation within the Gorilla Guardian villages bringing together communities, government and local conservation practitioners. The committees have been encouraged by the government to be representative organs of the local population and a link between the communities and government. Over seven years of implementation, this paper examines the activities and impact of Community-based monitoring on Cross River gorillas through the Gorilla Guardian program. The objectives of this paper are to (1) describe the selection process of the Gorilla Guardians, their roles, responsibilities and functionality, and (2) describe the evolution of the Gorilla Guardian approach, highlight its success, challenges, and suggest some ways to improve on the approach and conservation of the Cross River gorilla.

METHODS

Gorilla Guardian Selection, Data Collection and Conservation Education/Sensitization

Communities were selected based on their proximity to unclassified Cross River gorilla habitat. Gorilla Guardians were selected in each community with the help of the Traditional Councils, based on a good moral standing in the community and with other neighbouring communities. Each Gorilla Guardian was trained on monitoring techniques required to identify gorilla sign (feeding trails, nests), the use of a GPS unit and other hand held devices and Cameroon wildlife laws and related legislation (Ikfuingei 2014). Usually forest users who moved through the selected forests during NTFP collection, trapping and farming were asked to report any sightings of ape nests to the Gorilla Guardian; details such as species (if known), freshness of site, and approximate location (recorded on a map) were noted by the Gorilla Guardian (Nicholas *et al.* 2010). Every three months, an external field staff of the Wildlife Conservation Society (WCS) Takamanda-Mone Landscape Project visits each Gorilla Guardian community. The field visit is made up of a team, which constitute a forest user (mostly hunters), a Gorilla Guardian, and the WCS field staff. While in the field, the team conducts a guided survey led by the forest user, who leads the team to physically examine and verify reported nest sites (Figure 2) and further search for nest sites along feeding trails. At each nest site, data were verified on whether the nest had been constructed by a gorilla or a chimpanzee, the age of nest site and human activities such as wire snares and signs of hunting, which were recorded on a Trimble or Nomad (TDS) Cyber tracker unit (Bergl *et al.* 2009). Nest sites are defined as gorilla or chimpanzee if the animal was directly observed, or feaces, knuckle prints or hair were present. If no evidence of an ape species was obvious, sites were recorded as simply 'tree' or 'great ape' nest sites.

To complement the monitoring program, Village Forest Management Committees were established to facilitate consultation, negotiation and participation

Figure 2. Gorilla Guardians from Bachama and Ashunda villages recording Cross River gorilla nest site information during a verification visit (©WCS/TMLP 2010).

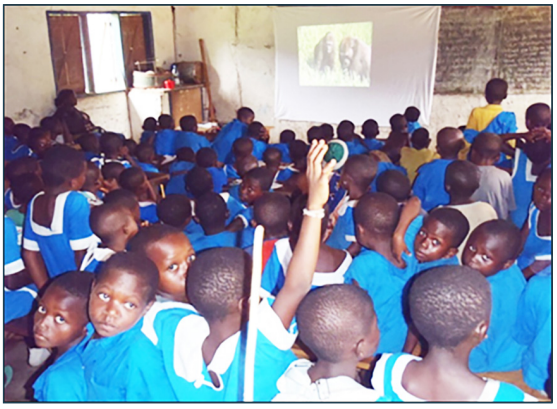

Figure 3. Primary school pupils participating in an interactive film at a conservation education lesson (©WCS/TMLP 2013).

of the local people in the management of natural resources. These Committees are composed of representatives of the younger generation, women, elites, farmers, forest users, and the chief who serves as the committee head (MINEF 1999). The committee is a separate body from the Traditional Council, which is the government, mandated governing body of the village, with a strict focus on natural resource management. Working in collaboration with the Gorilla Guardian, they coordinate sustainable harvesting of NTFPs and other related forest products. The Village Forest Management Committee members receive rigorous training on the Cameroon Forestry and Wildlife laws (no. 94/01 of 20th January 1994) and forest and wildlife management regulations. They are functional and well sensitized on their role and function in the communities. The Village Forest Management Committees works together with Gorilla Guardians to organize meetings, handle cases of illegal activities, and provide reports to the government and WCS.

Conservation Education was initiated in the Gorilla Guardian villages in 2013. The program was designed to sensitize communities and schools on key conservation issues (illegal logging, hunting, poor farming practices, bush fires and grazing) through films, posters, flyers, door stickers, flash cards, calendars and presentations (Figure 3). The education program is implemented at the village level by the WCS Conservation Education officer.

Data Analysis

Data collected in the field were formatted, edited, and analyzed in Microsoft Excel (v. 2007). Maps were drawn in ESRI ArcGIS 10.1. We used Kruskal-Wallis test to compare trend in hunting activities recorded before and after the creation of Village forest Management Committees. All tests were two-tailed and performed in R (v 3.2.5; The R Development Core Team 2013).

RESULTS

Cross River gorilla monitoring

Between 2010 and 2017, working with 12 Gorilla Guardians and 15 forest users, we visited and recorded 2,529 ape nest sites, and examined 12,122 individual nests (Table 1). The average group size of fresh (1-2 days old) gorilla nests recorded at each site indicated the possibility of a minimum of 8 gorillas in Takpe-Awuri, 9 in Mbu-Nga, 6 Batambe, 7 in Amebisu, 12 Eshobi-Kunku, 6 Ashunda-Bachama and 5 in Awi-Mbullu, with an overall total of 53 individuals. We cannot discount that potentially more gorillas are present with reports from forest users that gorillas move outside of the estimated range previously described; as reported in 2013, when a gorilla was sighted in Bancho a village between Mbullu and Kunku (Ekinde *et al.* 2013).

CRG nests were recorded in all six forest areas of the 12 Gorilla Guardian villages. Nests group size ranged from 1-24 with 1 – 10 being common and 5 the most common number of in all sites (Figure 4).

The distribution of nest sites show that Cross River gorilla maintained a permanent and restricted range over the study period (Figure 5).

Village Forest Management Committee Participation

During this study period, 12 Village Forest Management Committees were created in all Gorilla Guardian villages, a total of 96 members—eight per village. Each received training on sensitization, and information sharing. They also participated in the elaboration of strategic plans for forests adjacent to communities, participated in the execution of sustainable activities in the forest, surveillance and control. Village Forest Management Committee in collaboration with Gorilla Guardian of the villages report illegal activities occurring in and around the communities. In all communities, we observed a significant decrease in hunting activities (χ^2=10.762, df=16, p=0.824) both empty cartridges (χ^2=8.155, df=13, p=0.833) and wires snares (χ^2=6.195, df=10, p=0.799) after the Village Forest Management Committees were created (Table 2). The Village Forest Management Committee of Takpe and Awuri which occupies the Mawambi Hills (Figure 1) has practically placed a ban on trapping in the forest and are in the process of restitution for the finalization to

Table 1. Summary of results from community-based monitoring program, great ape nests between, 2010-2017.

Forest area	Species	No. of nests sites recorded	No. of individual Nests counted per site	Maximum no. of nest of the same age per site	Minimum no. of nests of the same age per site
Mbu-Nga	Gorilla	421	2,116	19	1
	Great Ape	69	288	9	1
	Chimpanzee	1	10	10	10
Batambe	Gorilla	142	740	14	1
	Great Ape	119	358	10	1
	Chimpanzee	2	13	7	6
Amebisu	Gorilla	169	844	15	1
	Great Ape	255	893	12	1
	Chimpanzee	4	15	6	1
Takpe-Awuri	Gorilla	290	1,825	19	1
	Great Ape	88	375	12	1
	Chimpanzee	9	39	7	1
Kunku-Eshobi	Gorilla	102	537	24	1
	Great Ape	302	1,444	24	1
	Chimpanzee	44	285	13	1
Ashunda-Bachama	Gorilla	365	1,628	13	1
	Great Ape	111	482	9	1
	Chimpanzee	18	88	8	1
Mbullu-Awi	Gorilla	12	104	11	5
	Great Ape	4	28	9	4
	Chimpanzee	2	10	6	4
Total	Gorilla	1,501	7,794	115	1
	Great Ape	948	3,868	85	1
	Chimpanzee*	80	460	57	1

* Data for chimpanzee nests represents confirmed chimpanzee nest with clear evidence.

create a Community Forest in the area to protect the gorilla habitat and sustainable collection of forest products.

Conservation Education

A total of 24 communities and 16 schools (Table 3) were covered during this period with conservation education lessons within the Gorilla Guardian program including villages neighboring the Gorilla Guardian villages that use the same forest. Of the 8,421 people (NISC 2010) living in 24 villages, 5,605 individuals participated in conservation education lessons resulting in a total coverage of 67% of the population. When analysis was restricted to the 12 Gorilla Guardian villages, 68% of the population participated. A total of 16 schools were visited and conservation education lessons taught to 1,636 out of 1,857 pupils (88%). During lessons, Cross River gorilla leaflets and door stickers, and posters of the common large mammals inhabiting the landscape and their legal conservation status were distributed in all communities visited.

DISCUSSION

The Gorilla Guardian community-based monitoring program has led to positive progress

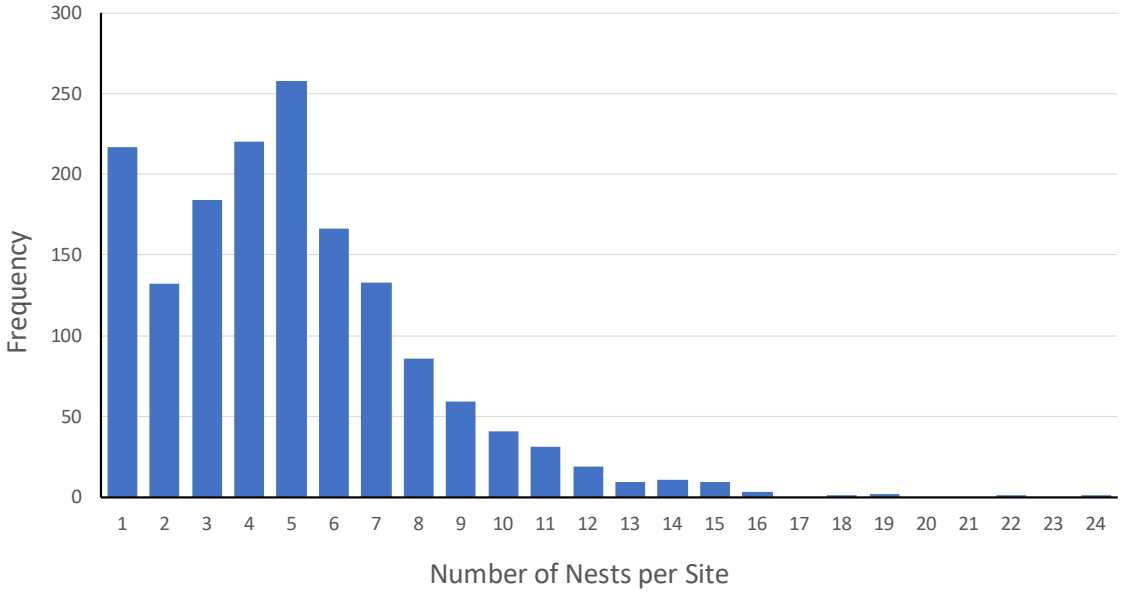

Figure 4. Cross River gorilla nest group size.

with more regular monitoring data on great ape status and distribution generated in a cost-effective manner and, over time the role and responsibilities of Gorilla Guardians are increasingly accepted within their communities as they assist to protect their gorillas. Gorilla Guardians have assisted to generate significant nest site locations which is important as it helps to further define the areas used by Cross River gorillas in unprotected forest sites. This has implications by improving ecological understanding of Cross River gorilla numbers, distribution and range over time. For example this study has shown that there is high similarity in nesting group patterns of the Cross River gorillas in the Gorilla Guardian sites and other Cross River gorilla sites (McFarland 2007; Sunderland-Groves 2008; Sunderland-Groves *et al.* 2009; De Vere *et al.* 2010; Sawyer 2012; Etiendem 2013; Akenji 2014). Sunderland-Groves in 2009 reported how gorillas reuse nest sites in Kagwene. Based on this assumption, we estimated the average maximum number of fresh nests at each site of same age to be minimum number of Cross River gorillas existing in these areas. The location of Cross River gorilla nest distribution has provided us with an insight of possible connectivity between different sites (Bergl *et al.* 2008). These data support

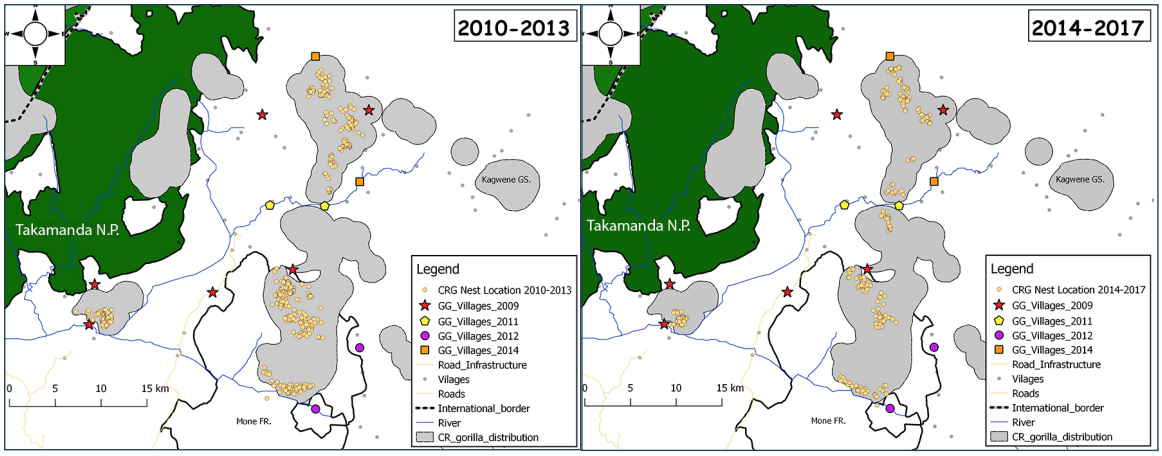

Figure 5. Geographic distribution of Cross River gorilla nest sites recorded by Gorilla Guardians between 2010 to 2013 (A), and 2014 to 2017 (B).

Table 2: Comparison of hunting activities recorded before and after the creation of Village forest Management Committees.

Community	Before VFMC (2012-2013)			After VFMC (2014-2015)		
	Empty cartridge	Wire snare	All Hunting Activity	Empty cartridge	Wire snare	All Hunting Activity
Tapke/Awuri	105	67	172	25	0	25
Mbu/Nga	87	92	179	30	20	50
Ashunda/ Bachama	123	267	390	50	11	61
Eshobi/Kunku	88	233	321	31	23	54
Amebisu	91	100	191	12	14	26
Batambe	102	71	173	31	23	54
Totals	596	830	1426	179	91	270

Table 3: Summary of Conservation Education Coverage within the Gorilla Guardian program.

Villages	Estimated Pop.	Village Participant	Percentage covered (%)	School Pop.	School Participants	Percentage Covered (%)
Mbu*	800	568	71.0	120	112	93.3
Akwa	1,000	630	63.0	225	185	82.2
Nga*	400	326	81.5	21	21	100
Eshobi*	250	180	72.0	-	-	-
Tava	500	387	77.4	170	160	94.1
Bandolo	300	265	88.3	-	-	-
Ote	400	248	62.0	-	-	-
Bachama*	550	376	68.4	187	165	88.2
Kakpenyi	375	265	70.7	-	-	-
Amebisu*	870	423	48.6	156	123	78.8
Mantoh	325	205	63.1	-	-	-
Batambe*	311	265	85.2	54	50	92.6
Kunku*	200	123	61.5	64	63	98.4
Bancho	280	152	54.3	-	-	-
Mbulu*	150	115	76.7	65	65	100
Takwo	140	93	66.4	-	-	-
Tambu	110	98	89.1	-	-	-
Ashunda*	200	163	81.5	120	120	100
Olulu	300	189	63.0	105	105	100
Awi*	120	95	79.2	85	85	100
Okpambe	300	139	46.3	82	57	69.5
Awuri*	40	28	70.0	-	-	-
Assam	250	107	42.8	81	30	37
Takpe*	250	165	66.0	38	37	97.4
TOTAL	8,421	5,605	66.6	1,573	1,378	87.6

**Gorilla Guardian Villages*

in planning future conservation actions to protect gorillas, chimpanzees and other endangered species in these areas.

The local people (GG and VFMC) over time have been empowered by training on basic gorilla ecology and sampling techniques to record information annually. This has further built capacity of Gorilla Gaurdians making them very useful in supporting research and surveys within the surrounding Parks and forest. Conservation education lessons have successfully raised awareness within these communities although this can be difficult to quantify. More than half of the population in the communities visited have engaged in conservation education lessons and a continuation of this program will enhance understanding of a greater proportion of the popoulation in relation to sustaianable natural resource management. The Village Forest Management Committees have been very effective in coordinating and reporting cases of illegal activities and it is envisaged that the these can be strengthened further through building capacity and involving them in quarterly monitoring and patrol programs within these sites.

We have also achieved a better understanding of the type and level of threats faced by gorillas at the sites. Gorilla hunting is one of the major threat to this species (Oates *et al.* 2007), but reports confirm that hunting activities are still observed elsewhere within the Cross River gorilla range. Although gorillas live in close proximity to threats (Ikfuingei 2014; Akenji 2015), the hunting of Cross River gorillas has not reportedly occurred frequently in the Gorilla Gaurdian sites, hopefully as a result of increased community sensitization and participation in the community-based monitoring program. Only two cases of gorilla killings were reported to have occurred during the 7 year period from 2012 to 2015, in Bachama and Amebisu respectively which is very small number as compared with prevoius reports (Oates *et al.* 2007). Both cases were reported by the Gorilla Guardian immediately, though the Ministry of Forestry and Wildlife poorly handled the prosecution of the suspects due to limited means.

We have experienced several challenges whilst implementing this program, and though gorillas have not been reportedly hunted for the past 2 years, hunting of other species is still common within their habitat exposing them to threats. These incidents are reported on by the Village Forest Management Committee, which is a positive sign. Over the years, Cross River gorillas have continued to lose their habitat through illegal logging, agricultural encroachment, incursion by cattle herders and human development activities including road construction, that causes habitat fragmentation of gorilla subpopulations (Oates *et al.* 2003; Sunderland-Groves 2008). In some areas, farms are very close to gorilla habitat and several cases of gorilla crop raiding in farms have been reported in Gorilla Guardian villages, most noteably Nga, but no animal has been reportedly harmed. This may change in the near future should this type of human-gorilla conflict worsten or persist. Overall, one of our greatest challenges is securing long term funding to continue protection measures and initiate new strategies and programs to support the community-based approach to Cross River gorilla conservation. Many villages are willing to join this community-based initiative, but expansion is limited due to funding constraints.

Moving forward to further build on our encouraging results, planning includes a continuation of the conservation education activities within all Gorilla Guardian villages to improve general understanding of wildlife laws and the importance to conservation. It is suggested that the government of Cameroon and other NGOs should incorporate this program into long-term community-based conservation strategies with a focus on forest and wildlife management at a national level. These strategies will assist in maintaining connectivity between core Cross River gorilla sites and other endangered species. Overall it is envisioned that Cross River gorilla sites within the Gorilla Guardian program will be under some form of management and control through the creation of Community forests in Mawambi Hill (Takpe and Awuri), Upper Mbulu (Ashunda, Bachama, Awi and Mbulu) and Northern Mone (Eshobi, Kunku and Nga) working in close collaboration with the Village Forest Management Committee. This will empower the communities to design controlled management systems including community patrols and Spatial Monitoring and Reporting Tool (SMART) to monitor illegal activities, enforce laws and potentially encourage gorilla tourism that will provide income.

CONCLUSION

The community-based Gorilla Guardian monitoring approach has proven to be an effective way of monitoring Cross River gorilla in unprotected forest areas. It has provided reliable information of the status and distribution from the monitoring program field visits. The approach has raised awareness to committees on Cross River

gorilla conservation by involving local people in the monitoring program. Capacity building has been a continuous process for the Gorilla Guardian but more capacity will enable them advance in their ability to monitor and provide reliable information to/from the communities.

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