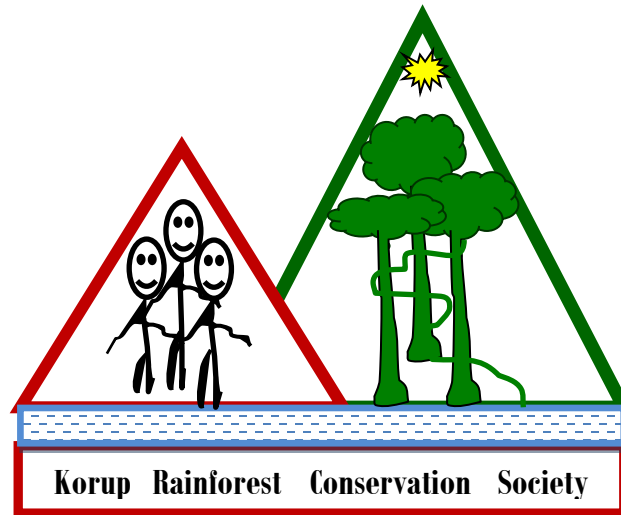# KORUP RAINFOREST CONSERVATION SOCIETY

Korup Rainforest Conservation Society

K.R.C.S.
…Involving Local People for a Greener Future.

2015 ANNUAL REPORT

Key Achievements

Hosting and organization of central/west African regional workshop on lessons learnt from our Anti-poaching design and evaluation project in KNP.

Secured a Bio-monitoring contract from the PSMNR for Wildlife surveys in KNP for 2 years

Programme adviser awarded a Scholarship for an MSc. in PA management at JCU, Australia.

Contact
C/O P. O. Box 36, Mundemba,
Korup National Park
S W R, Cameroon.
Email: krcs4all@yahoo.com
Tel: +237 33777520, 77109175, 70002798
Bankers: ECOBANK Kumba.

Compiled by:
Mosaki Emmanuel Motoase
Interim Programme Adviser, KRCS

Introduction

The Korup Rainforest Conservation Society was founded in September 2009 by a group of indigenes from the Korup National Park (KNP) area committed to collectively assist in addressing some apparently burning issues threatening the integrity of the rich biodiversity of the park. Through consultations with local communities, issues that had always been recurrent prior to 2009 included;

- Insufficient participation of locals in park management.
- Insufficient benefits of local people from park management.
- Wide communication gap between park Management and local communities.
- Antagonistic relation between park service and local communities.
- Vandalism on park property by local communities.
- Insufficient information flow and conservation education in local communities.
- Wide gap between park users (researchers, tourists etc.) with local communities.
- Disorganized and indiscriminate recruitment of research assistants/guides resulting to some assistants later going into the park as poachers.
- Absence of a reservoir of local service providers for conservation activities.
- Insufficient involvement of local civil society in the park management.
- High pressure on park resources due to the absence of alternatives to livelihood.

KRCS seeks to address some of these issues in its objectives and activities. This annual report is therefore reporting on our activities for the period of **January to December 2015**. So far, *positive strides are being made in the right direction* towards our resolve to building trust, mobilizing support from more followers and well-wishers from our target local communities as well as conservation and development partners, thereby making our impact felt. Our interventions and achievements are reported here under the six sections as per our objectives;

I. General Administration and Finance
II. Locals' involvement in park management and Training.
III. Sensitization through conservation advocacy and education in local communities.
IV. Conservation/development initiatives for livelihood improvement.
V. Local Capacity building
VI. Constraints, Conclusions and Recommendations

I - General Administration and Finanace

- Final project implementation and financial reports for the Darwin Initiative project; Antipoaching design and evaluation in KNP, were submitted and approved.
- Final implementation report for the US fish and wildlife acoustic monitoring project in the rumpi hills were also submitted and approved.
- A website was developed for the group with the generous assistance and fimacial support from Denis Kuptch from Gottingen University. The website address is www.korup-conservation.org. The KRCS facebook account created in 2014 is also still running and was regularly updated at koruprainforest@facebook.com .
- Five (5) general assembly meetings were held.
- Twelve (12) executive meetings were convened and held for monthly planning and discussions on thematic issues including the 2015 evaluation and 2016 activities planning.
- Interested members list stands at about seventy (105) with registered members increasing from 65 in 2012 to 105 in 2015 with members coming from over 20 out of 32 target communities.
- Though the two year mandate of the current executive expired in 2015, The general assembly voted to extend their mandate for 1 additional year until the Programme adviser returns from his scholarship programme in 2016.
- KRCS is still temporarily occupying the nearby rented location we moved in 2014 due to ongoing renovation work at the building donated to the group by the Korup park service at the tourist information centre.
- An equipment inventory was concluded in December 2015 and equipment included;

Equipment	Qty	State	Remark
Wooden tables	02	In use	
Wooden shelves	02	In use	
Wooden glass cupboard	01	In use	
Wooden bench	01	In use	
Metallic Notice board	01	In use	
Dell computer screen	01	Still good	
Dell CPU	01	Still good	
HP deskjet printer	01	Bad	KRCs funds
HP scanner/printer	01	Obselete	
Cannon Photocopier N6317	01	Still used	Problematic
Camtel fixed phone*	01	Obselete	Used as internet modem
SINGSUNG 24" TV*	01	Good	For videos in villages
VCD player*	01	Good	,,

Casio solar energy Calculator	01	Still good	
1500W Voltage regulator	01	Good	
Electrical distributors	02	Still used	
Staplers	02	In use	Giant, bad and Medium size still used
Nikon video camera + SD card*	01	Good	Still used
Canon Photocopier/printer	01	Problematic	Regular break downs
Complete HP destop	01	Still good	GIZ funding 2014
HP 3025 printer	01	Still good New	GIZ funding 2014
Benq Scanner	01	New Still good	GIZ funding 2014
UPS	02	Still good	GIZ funding 2014
Camtel internet modem	01	Still good	GIZ funding 2014
Workshop pin board	01	Still good	GIZ funding 2014
External hard drive	01	Still good	GIZ funding 2014

- The account established at Express union, Mundemba to avoid several expensive bank trips to Eco-bank, Kumba and the risk of cash handling by members is still in use.

- The volunteer Administrative and Financial Assistant (Mr. Sumbede Anthoine – BSc. Economics) who was recruited has maintain permanent presence at our office, provided clerical and accounting services and has also run our **outreach documentation project.**

- KRCS was invited and participated in the following meetings and workshops;

  - As from the 18th to 19th May 2015, Training on agricultural extension skills for rural agro-forestry administered by ICRAF and sponsored by PSMNR-SWR in Buea

  - 23rd May 2015, Workshop on integrating ecosystem health and socio economic changes in human dominated forest landscapes in Buea

  - On the 6th October 2015, KRCS participated in a training workshop on protected area monitoring and effective tracking tool (PAMETT) in Buea.

  - From the 10th to 11th December, KRCS participated a training workshop on the development of tree nursery and entrepreneurship in rural communities organized by the PSMNR in Buea.

- Above 20 of our members were co-opted as local service provider's by researchers and for other park activities and complied with payments of their Green contributions (constitutionally accepted contribution of 15% kept aside for funding small activities and office running).

- Our **financial accounts** for the year stood as follows:

REVENUE

Income	Amounts	Remark
Balance brought forwards from 2014	60000	
Membership Registration	27,000	Some members completing
Green Contibutions from members' salaries involved in service delivery	1,072,000	Members green contributions for participating Max Planck Chimps Research, Darwin Initiative Acoustic &Biomonitoring bushmeat price project (5% agreed since project conception), Gottengen university project (Denis kuptch) participation in Camera trapping and PSMNR biomonitoring
Donations	0	
Community outreach	653,000	Documentation +sales of materials+survenirs
Commitment Fee	0	
Service fees from PSMNR	540, 000	
TOTAL INOME (FCFA)	2,293,100	Cash only

EXPENDITURE

Expenditure	Amount	Remarks
Staff Salary	720,000	Salary for FAA for 12 months
Perdiem	155,000	For KRCS activities only
Refreshment	84,750	1st may, WED, post meetings etc.
Community outreach	525,100	Purchase of matrials, printing of 50 1st may Tshirts and tourists Tshirts
Repairs of equipment	412,000	Photocopier became problematic, TV and video player
Charity donation	59,400	Elepahant victim visit at Ikondo knodo 1 and Life line donation over Akpasnag river
Office running	131,000	**Transport, stationaries, bank trips, banking costs and communitcation, receipt production etc.**
Communication	86,000	
Rents	30,000	Paid in advance
TOTAL (FCFA)	2,203,250	
Balance carried forward	89,850	

Partner project funds managed and accounted for by KRCS in 2015

Partner	Balance from 2014	Received in 2015	Total	Spent[1]	Balance
US Fish and Wildlife Rumpi Hills Acoustics project	5,891,900	0	5,891,900	5,891,900	0
Max Plank Project Funds	4,28,000	0	428,000	428,000	0
PSMNR-SW Funds for Darwin Project	468,850	9,153,950	9,622,800	9,622,800	0
PSMNR CMT/CDT Korup	28,887	7,027,896	7,056,783	7,367,600	-310817[2]
Darwin Initiative Oxford University	1,616,000	28,950,000	29,566,000	29,566,000	0
Totals	8,433,637	45131846	52,565483	52,876300	-310817

[1] Partner funds were spent on field operations and supplies, salaries of field staff, insurance/labor taxes contributions, target community incentive schemes and bank to cash transactions cost.

[2]Excess expenses made on behalf of donor partners shall be reimbursed in the following year of the project continuation.

II – Locals involvement in Park activities and training (Research, tpurism and collaborative management activities).

➢ Between the 12th and 27th of May 2015, KRCS member where fully involved in the organization of the study abroad programme base on an MoU with Dr. Joshua Linder of James Madison University, Virginia, USA. This time the study abroad team was also accompanied by Dr. Carolyn Jost Rpbinson's team to continue on our ongoing cooperation project; Ecological health and human health in some target communities. Activities included;

- Presentation on the role of civil society in management of the Korup National Park and our 2012 CLP funded action for primates' project.

- A 10 days research inception trip to the park.

- A socioeconomic assessment of Meka village

- An appraisal visit to the Pamol plantation oil palm processing facility in Bulu camp.

- Ecological and human health data collection at Fabe, Ikenge and feasibiliby studies on sensitization on Ebola at Ekoneman Ojong.

KRCS received a consignment of conservation publications and text books from the visiting students.

➢ Since April 2013 Six (6) KRCS members are still being fully employed and involved in the Darwin initiative project focusing on collecting bio-monitoring data on the 4 permanent transect in Korup coordinated by Dr. Joshua Linder of James Madison University, collecting acoustic data using Acoustic recording units (ARUs), collecting bush meat price data from selected vendors in Mundemba

since November 2013 all as part of a three year project to help Improve in the design and evaluation of antipoaching patrols in African rainforest of KNP.

Our teams setup acoustic recording devices (ARUs)

➢ KRCS members have also been involved a 1 year human wildlife conflict research project involving in partnership with the University of Gottingen around Ikondo kondo I and surrounding areas with support from the PSMNR.
➢ As from March to May, about three (3) members of KRCS trained and have been fully involved in a study abroad related research project with the students from the Nature conservation programme of the Gottingen University, Germany.

➢ KRCS members have been involved involved in camera trapping for the Tropical ecology and assessment network TEAM camera trapping and the PSMNR sponsored camera trapping array in the Korup National Park coordinated by Kelly Boeke.
➢ Completion of field work and data collection on our 2 years collaborative project on ecoloagical influences on culture in Chimpanzees and Hominoids in KNP for the Max plank institute of evolutionary anthropology, Germany. The following have been results from this project;
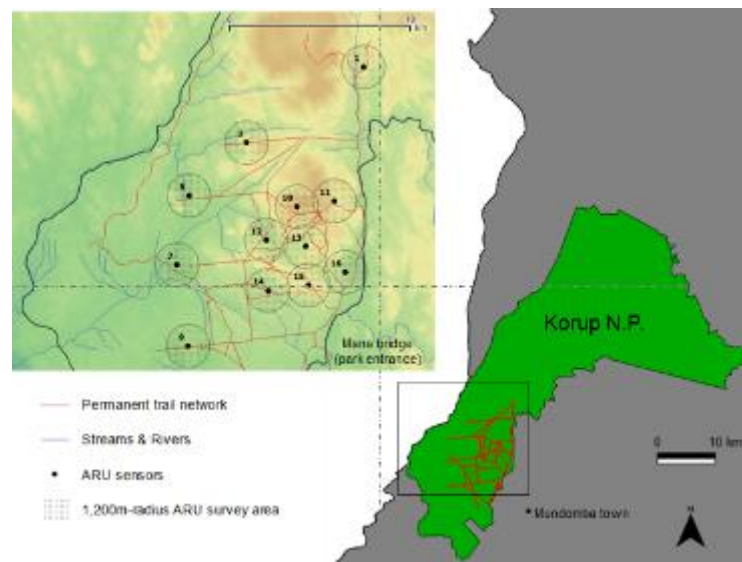

Scientific publication from Chimps project with KRCS as co-authors.

➢ The implementation of the Darwin initiative project came to an end in December 2015, preliminary analysis of data from various methods have shown the following key findings and results;
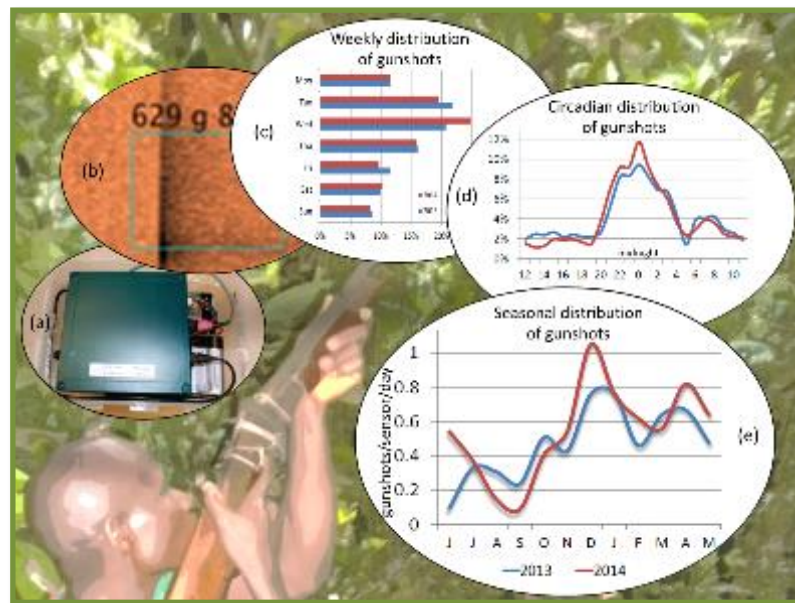
Acoustic monitoring

i.   Where gun hunting is prevalent, we argue that Law enforcement monitoring (LEM) should be divorced from anti-poaching activities and that assessing spatio-temporal changes in hunting patterns is best done by identifying where and when gunshots occur. We advocate for using passive acoustic monitoring (PAM) to revolutionize the resolution of LEM data and dramatically improve the ability to design, evaluate, and adapt anti-poaching strategies based on changing hunting patterns.

ii.   For two years (June 2013 - May 2015) more than 189,000 hrs of gunshots were recorded by our 12 units with 4,023 gunshots across the study area of 54 km^2 grid effective detection range.

Darwin initiative acoustic monitoring/Line transects project area.

iii.   Our data showed that 68.6% of gun hunting took place at night when patrolling was mostly inactive (see figure below). Gun hunting was more prevalent on Tuesday through Thursday and intensified in the dry season (Nov-Feb) peaking during the weeks leading to Christmas and New Year's. Based on a 73.9% gunshot kill rate, derived from our concurrent surveys of 30 hunters who detailed the outcomes of 17,401 gunshots over a year, we calculated 37,918 animals poached annually in KNP.

(a) We deployed the autonomous recording units enclosed within a plastic container for additional protection from elements and wildlife, and powered them for ~3 months of continuous recording using six 6V alkaline lantern batteries (Energizer max 528); (b) sound signatures of putative gunshots were reviewed using the Raven Pro v1.4 sound analysis software; (c) weekly distribution of gunshots during the study period (Saturday is the local market day); (d) 24-hr gun hunting activity pattern during the study period (percent of total gunshots per year); (e) annual distribution of gun hunting intensity during the study period (mean of all sensors' monthly mean of gunshots recorded per day

iv.   LEM could be used to assess the impact on hunting of a broader range of conservation interventions, such as educational programs, alternative income earning initiatives and, importantly, large development projects. For instance, we advocate the adoption of LEM by sustainability certifications (e.g., Forest Stewardship Council, Roundtable on Sustainable Palm Oil) to evaluate the impact of their members' activities on gun hunting pressure.

Bush meat surveys in Mundemba and hunters/household surveys in 3 villages

Bushmeat price and availability surveys – we surveyed three bushmeat bulk sellers (midi-women) twice per month (as well as local eateries and general stores) to assess temporal changes in bushmeat prices relative to other protein sources. We also did Hunter surveys – we interviewed monthly ten hunters in each of three villages surrounding KNP to assess offtake, gun hunting success rate, and hunting frequency and finally we performed household surveys – we interviewed ten heads of households (HHs) in each of three villages surrounding KNP to assess food consumption patterns, and especially the role of bushmeat consumption in the local diet. For each survey, we provided compensation for participating hunters, households and villages. Our trained team successfully completed the data collection.

Trained team of data collectors.

<u>Hunter Surveys</u>

The data were collected for a period of 2 years. Here we present only the summary results from the Jan. to Dec. 2014 period, as the 2015 data input in a digital database remains incomplete. It is a priority of the DI project to complete the analysis of both years soon.

All the hunters were males between the age of 20 and 56, with no education beyond primary school, mostly married, and heads of their households (except 1 hunter from Ikondokondo). The age distribution of hunters was similar among the three villages, as well as the mean years of hunting experience reported by each participant. All hunters also owned farms. The Ngenye hunters however owned less bush-huts and hunting dogs, andoverall they were characterized as less full-time hunters than the participants in other villages. In fact, we struggled to get 10 people who identified as hunters in the village.
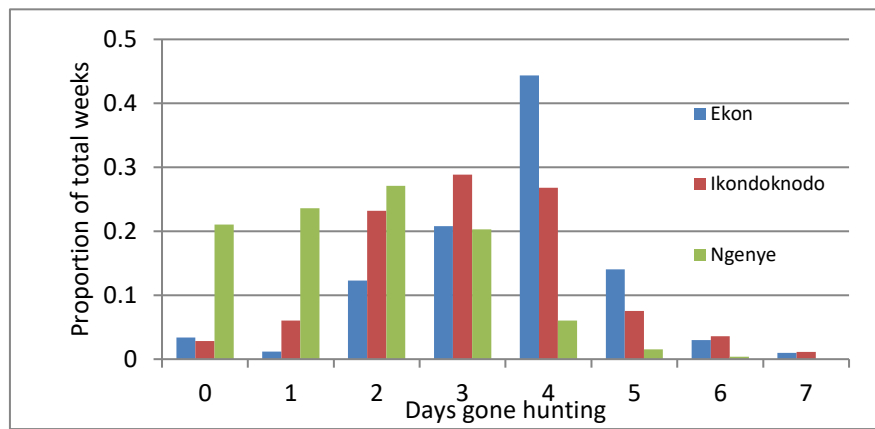
Table of Summary of hunter survey participants' key background data

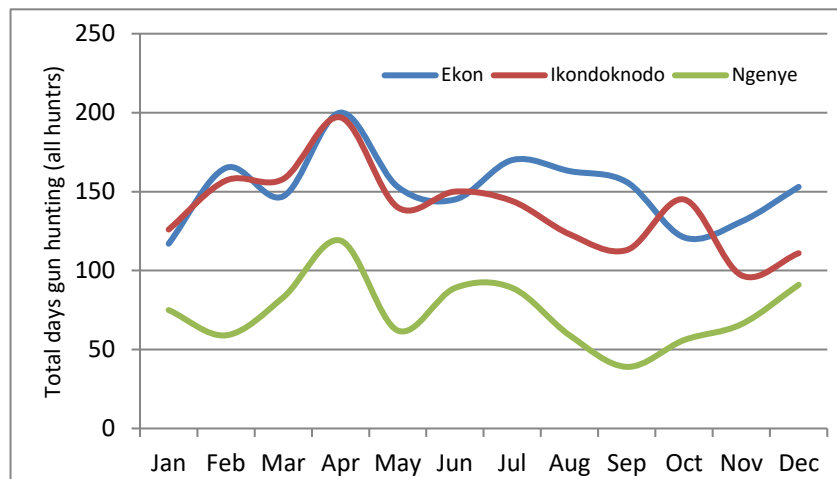| Village	Age (years)			Married	Hunting exp. (years)	Own farm	Own a bush-hut	Own hunting dog
	<25	25-39	≥40					
IKK*	1	7	1	9	13±7	9	9	7
Ekon I*	1	5	3	9	10±9	9	9	5
Ngenye	1	6	3	7	16±8	10	2	1

*   Background data for one of the hunters was lost/not available, so the figures above are for only 9 of the 10 participants in Ekon I & Ikondokondo.

In total, we got 1,548 week-long data on hunting activity by the 30 hunters (97.5% response rate; mean 51.5 weeks per hunter – only 8 hunters did not provide full 53 weeks due to illness or travel).

There was a marked difference in the gun hunting frequency (days/week) between Ngenye village and IKK/Erat I hunters. Ngenye hunters did not report going gun hunting for 21% of the weeks, and hunting for 4 or more days in only 8% of the weeks. In contrast, IKK and Ekon I reported hunting for 4 or more days in 39% and 62% of the weeks respectively.There was a noticeable seasonal pattern in gun hunting intensity across the year with a peak in April and a decline over the rainy season (July – September).

Proportional breakdown of weekly <u>gun</u> hunting days by village (annual data)

Total monthly gun hunting days by all ten hunters of a village in 2014
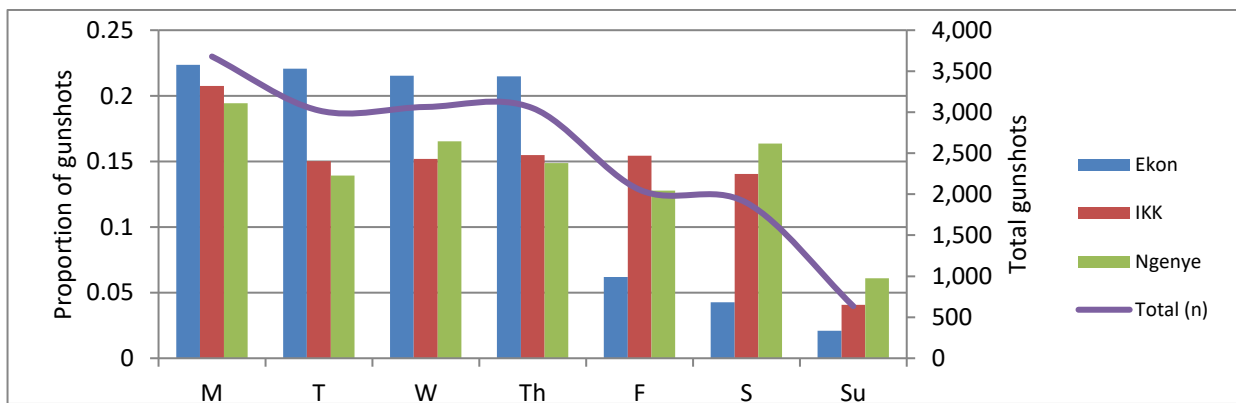
The individual variation in hunting patterns was pronounced among hunters within and across villages. Overall however, hunters of all villages hunt most days at (or at least also at) night and make multiple gunshots in days that they went gun hunting (village mean range 2.5 – 5.4 shots/hunting? day). Although IKK and Ekon I hunters hunt on average more days per year and shoot more times per day, the kill success rate is comparable across all hunters. The hunter's years of hunting experience was not a good predictor of his success rate per gunshot. The success rate did not vary significantly by month either. This may reflect the similar years of experience of hunters across villages, and the fact that all hunters use similar criteria as to when to shoot. This is not surprising given the significant cost per cartridge (~500 CFA).

There was only a small positive correlation between the success rate of a hunter and the number of shots they made per year (r=0.16). However, there was high negative correlation between the number of gunshots made that year and the standard deviation that a hunter had in his weekly gunshot success rate (r=-0.62). In other words, hunters who fired more often were not more accurate overall, but more consistent in their kill success rate).

Village	Hunting Days/Year	Night hunting/Total hunting days	Mean # gunshots/day	Mean success rate (kills/shot)
IKK	166 ± 37	82 ± 17%	5.4 ± 2.2	79 ± 9%
Ekon I	182 ± 22	57 ± 22%	3.3 ± 1	73 ± 12%
Ngenye	89 ± 33	72 ± 9%	2.5 ± 0.7	75 ± 12%

Weekly hunting pattern reported by the hunters was similar to that observed in the gunshots extracted from the acoustic data which hints that the hunter data are reliable at least to some extent. Specifically, there is a peak in gunshots in the Monday-Thursday period with a sharp decline towards the weekend when the local market in Mundemba is held (and hence when bushmeat is to be made available for selling). However, when examining the data per village, we can see that the overall pattern reflects most the pattern of Ekon I village, where as the other two villages have a sharp decline on Sunday only, which could be culturally related (Sunday being church going day) than market driven. Given that the market-driven hypothesis is the one that best fit the acoustic data gunshot pattern, we could deduce that a) Ekon I hunters are especially represented within the hunters operating in the DI acoustic grid area, and/or b) that similarly market-driven hunters operate in the DI grid area. Either way, this is important information to keep in mind when trying to dissuade those hunters from continuing to hunt there – they are professional and not occasional hunters, and therefore will need very strong disincentives (whether economic or risk of arrest) for desisting to continue hunting within KNP.

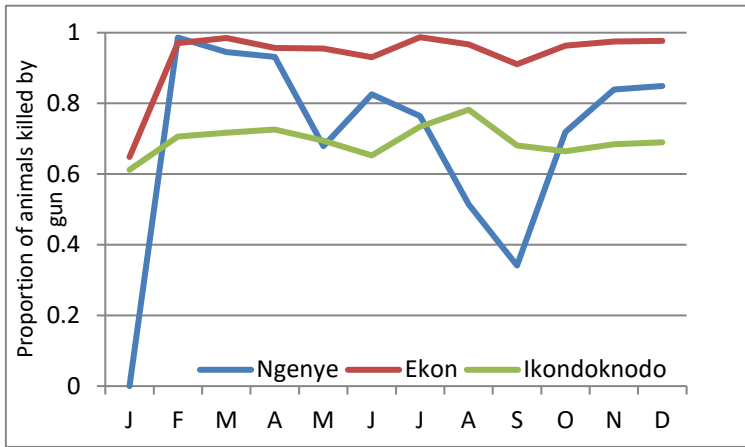*Weekly pattern of gunshots made over the year by the surveyed hunters (n=17,401 gunshots).*

The hunters reported making 17,408 gunshots in the 12 months of the survey, with a mean number of 582 ± 373 SD (range 84-1,616). Noticeably, the two most active hunters of IKK made more gunshots in a year than all 10 hunters of Ngenye village (n=2,347). It is clear that hunters making as many as 1,616 gunshots per year are in effect professional hunters and that the village of Ngenye has overall moderately active hunters compared to the hunters in the other two surveyed villages.
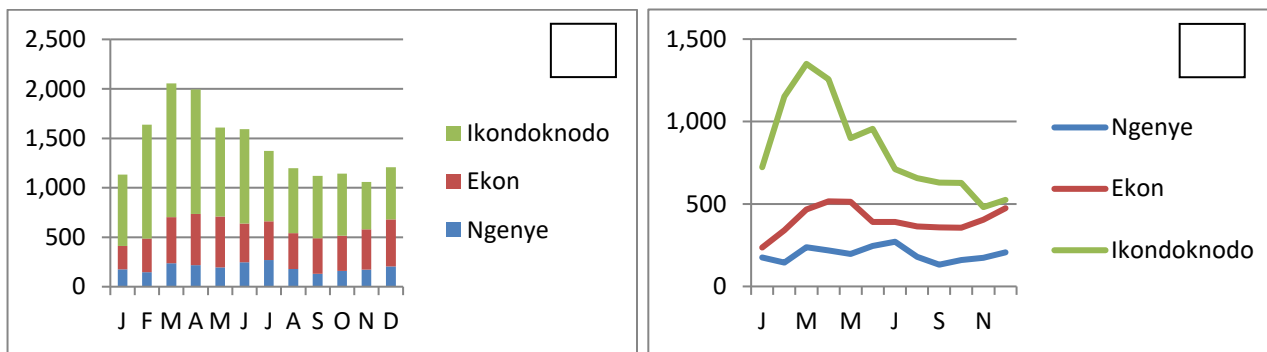
The 30 hunters killed in total 16,770 animals using all methods of hunting (gun, snares, others e.g. dogs/machete). Of these, 12,868 we killed by gun (76.73%). The mean ratio of gunshot killed animals to all killed animals was 0.78 ± 0.2 SD (range 0.29 - 1). So, there are some hunters who hunt almost only with guns, and other which are only occasional gun hunting. Ekon has primarily gun hunters (0.92 mean annual ratio for the 10 hunters), followed by IKK (0.72) and then Ngenye (0.69). Not surprisingly, the hunters who kill mostly animals using guns, are more successful with guns (r=0.36) and more consistent with their success rate (r=-0.56).

There is a strong seasonal pattern in this gun killed animals ratio for Ngenye hunters, with an increase on the proportion of animals killed with other methods (primarily snares) in the rainy season, which is a pattern that was historically reported as occurring in the area (dry season → gun hunting / wet season → snaring). Hunters from the other two villages seem to be consistently high across the year, with little seasonal variation in the ratio. It should be noted that the high proportion of gun-killed animals must in part be explained by the fact that there was emphasis given in selecting hunters for the surveys that do at least some gun hunting. This may have reduced the probability of snare hunters being represented in the surveyed sample of hunters.

Proportion of animals killed by gun out of all animals killed (per village) Note that the January sharp decline for Ngenye village to zero is because most hunters did not hunt on that month due to NY celebrations and travelling.

Regardless of hunting method used, there is a pronounced seasonal pattern in the overall number of animals killed with a marked decline in the rainy season. While there is a December peak in the number of animals killed (compared to animals killed in November/January), the annual peak is in the March-April period.
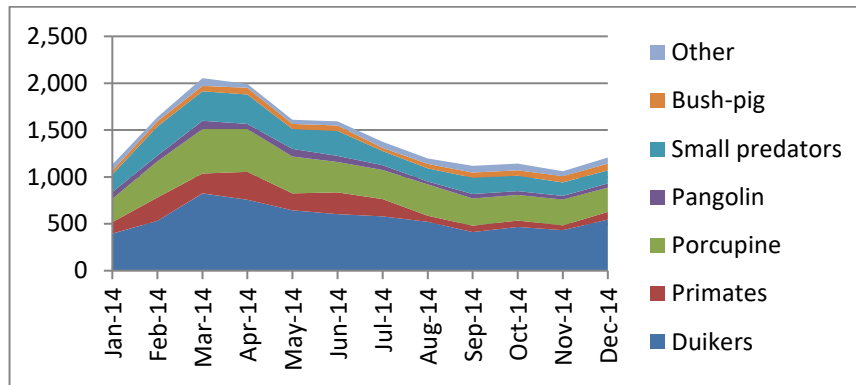

Total animals killed per month (all methods) per village; a. cumulative across villages – b. per village.

What is being killed?

The great value of undertaking concurrent hunter surveys during the DI project is that a) we can obtain the success rate per gunshot which is needed for converting gunshots detected in the acoustic sensors to actual animals killed, and b) we can understand what animals are being killed in the passive acoustic monitoring grid. The hunter surveys therefore may not have the spatial/temporal resolution of acoustic sensors in terms of monitoring hunting patterns, but they are key for interpreting the acoustic gunshot data.

Figures below summarize per animal group the hunters' bushmeat offtake. Duikers (all spp.; 39.2%) and rodents (e.g. porcupines; 26%) account for 2/3 of all animals killed annually, and pangolin ~3.9%. We have not estimated the biomass contribution of each animal group, but given the size of duikers, ~50% of the bushmeat biomass harvested is from them. Primates vary in their proportion of total carcasses killed across the year, ranging from ~26% in March-April to 6% in the peak of the rainy season (annual mean 10.6%). The lower representation of primates in the carcasses then may reflect the switch to snaring (to which primates are less susceptible to, since most species are primarily arboreal) and/or a shift to night hunting. According to the hunter survey data, 287 critically endangered Preuss's red colobus (*Piliocolobus preussi*) were killed in 2014

by the 30 surveyed hunters alone. If the species is to survive, there need to be species-specific conservation and anti-poaching initiatives developed to target the hunting, trading and local recognition of the species. The remaining animals are small mammals incl mesopredators (e.g. herpestids – viverids), various birds and reptiles.

Total reported kills (all methods) by the 30 surveyed hunters – break down per animal group

Household surveys

In total, we recorded 13,271 meals in the four 2-months periods (Jan.-Feb. 2014, July-Aug. 2014, Jan.-Feb. 2015, July-Aug. 2015) that we undertook HH surveys. The mean number of meals recorded per HH/month was 58 ± 3 SD.

All HH respondents were women between the ages of 17 and 65, with no higher education than primary school (2 in IKK and 3 Ngenye had no schooling), mostly married (except 3 widows in Ngenye village) with children. The age distribution of HH ladies was similar among the three villages. All women in IKK and Ngenye mentioned receiving assistance (in money or food) from relatives and friends outside the village (e.g. from people in Mundemba or further afield). This was not reported by women in Ekon I. This may reflect the position of the village (near the Nigerian

border) where assistance may be difficult to reach, or even a question comprehension discrepancy among respondents. All women own farms where they grow food crops, and the majority had a hunter within the HH.

Table summarising HH survey participants' key background data

Village	Age (years)			Married	Own farm	Primary school education	Hunter's HH	Food assistance received by people beyond the community
	<25	25-39	≥40					
IKK	3	4	3	10	10	8	9	10
Ekon I*	2	6	1	9	9	9	5	1
Ngenye	1	4	5	7	10	7	8	10

* Background data for one of the HH respondents was lost for this village, so the table information is based on n=9.

On average across the survey periods and villages, three out of four meals (75.5%) had some protein in addition to carbohydrates. Non-seafood/fish bushmeat was included in 17.5% of meals (23.2% of meals with some protein). The weekly variations in these measures were modest across the seasons. There is however a non-significant trend for lower protein and bushmeat consumption in 2015 compared to 2014. Having only data from two years, it is not easy to know if this is a worrying long-term trend reflecting potential nutritional and/or food security issues in the future. We suggest that the trend is monitored with additional similar surveys in the future.

Survey period	% of meals with protein	% of meals with bushmeat	% of protein meals with bushmeat
Jan – Feb 2014	85.2 ± 4.3	20.6 ± 4.6	24.1 ± 4.9
Jul – Aug 2014	74.7 ± 2.6	18.7 ± 1.2	25.0 ± 1.1
Jan – Feb 2015	77.7 ± 4.8	17.3 ± 3.5	22.1 ± 3.1
Jul – Aug 2015	68.8 ± 3.0	15.1 ± 2.0	21.8 ± 2.1

The proportion of non-livestock protein in the HHs' meals however is more than that of bushmeat if we consider fish (harvested or bought), snail, and crayfish protein sources. Overall, livestock and eggs accounted for the protein in only 16.2% of the animal protein-containing meals. An additional 6% of meals had beans in them, but for purposes of the surveys we included it in the "carbohydrates/plant" category although it undoubtedly is a significant source of protein for locals.

Livestock						Non-livestock			
Goat	Beef	Pork	Chicken	Egg	Dog	Bushmeat	Fish	Crayfish	Snail
1.8%	1.5%	2.1%	6.2%	3.5%	1%	23.1%	27.6%	20%	6.8%

The importance of freshwater resources as source of protein for the people in the three surveyed communities is really evident, with almost half of the protein meals containing fish or crayfish. Crayfish is an important source of protein almost exclusively in Korup (Ekon I, IKK) villages where it was consumed in all months, multiple times, by all households. In contrast, in Ngenye only two HHs consumed crayfish more than 1-2 times across the survey period. This is a cultural difference/preference in the diet that needs to be recognized, as the village is equally near water resources as the other two villages. Also, dog meat was consumed only in Korup villages and in only 6 HHs more than in 1-2 meals across the survey period. Snails were consumed in all three villages and by all but one of the HHs surveyed, but it was much more commonly reported in the Korup villages, and the same pattern holds for egg consumption. Beans were also more frequently used in Korup village meals.

Among livestock, beef and pork was almost exclusively reported in IKK village meals which is not surprising since IKK women go weekly to sell/buy things in the Mundemba market where beef/pork meat is available for sale. Chicken was eaten mostly in Korup villages across the seasons. Fish was eaten across all HHs but with twice as high frequency in the Korup villages. On the contrary, non-seafood/snail animal protein (i.e. bushmeat) was significantly more frequently consumed in Ngenye.

So, there are considerable variations in the protein source of the three villages, with the biggest differences being observed along ethnic (i.e. Korup / Oroko) rather than individual village level.

When we examine the village level patterns in protein and bushmeat consumption levels, it becomes apparent that the Korup villages consume overall more protein but it is more from freshwater (fish/crayfish) or market bought livestock origin. Specifically, the mean % of meals with any type of animal protein was $93 \pm 6.4\%$ in Ekon I HHs, $82.5 \pm 13.3\%$ in IKK and significantly lower at $49.1 \pm 10.4\%$ in Ngenye. That would fit well with the reported hunting intensity in the two Korup villages (see earlier section on hunter survey results) – those villages with more active hunters would be expected to see more protein in the community meals. However, surprisingly the % of protein meals that contain bushmeat (i.e. non-fish/crayfish/snail) was significantly higher in Ngenye village ($32.7 \pm 9\%$) compared to either of the two Korup villages (Ekon I: $8.9 \pm 4.9\%$; IKK: $12.1 \pm 5.7\%$). So, Korup villages hunt more but seem to be selling the meat for cash, and then they buy the HHs protein (fish/beef/pork) which is in line with a commercial driven hunting pattern. Ngenye on the other hand seems to follow more of a subsistence hunting economy, with hunters being much less active, but bushmeat accounting for 1/3 of all protein meals.

Interestingly, when we examined across villages whether "Hunter HHs" had significantly more bushmeat or overall protein in the HH's meals, we saw practically no difference in overall % of protein meals in the two types of HHs and an on average lower but not significant % of meals with bushmeat within protein containing meals. Non-hunter HHs also had higher – but again not significantly so - % of protein meals containing crayfish. The difference was not as obvious for fish meals.

HH	% meals with protein	% of protein meals with bushmeat	% of protein meals with fish	% of protein meals with crayfish
H-HH	74.7 ± 21.2	19.8 ± 12.7	25.9 ± 8.8	15.8 ± 12.9
NH-HH	75.3 ± 22.0	12.8 ± 10.7	29.6 ± 9.7	23.3 ± 17.3

At the current moment we have not examined the overall amount of protein contained in each meal to see if the portion sizes per person are different in hunter and non-hunter HHs. Although the data are not clearly recording how many people ate in each given day at the HH, we could theoretically pursue such an analysis in the future by considering the overall number of HH dependents – information which was recorded at the on start of the surveys.

Bushmeat diversity

There were records of ~35 species consumed in the surveyed HHs, but the most frequent bushmeat types were ungulates and rodents (porcupine/giant pouched-rat). There were significant differences in the frequency of primate, pangolin and "other" meat in the three village's HH meals. Specifically, IKK HHs consumed less frequently ungulates (duikers) and more frequently primates than other villages. Ngenye HHs overall seemed to consume in more frequently commercially valued pangolin meat and to have lower proportion of less common species in their meals when compared to Ekon I HHs which had low levels of primate/pangolin meat (priced species) and more (1/4 of bushmeat meals) with "other" (potentially less commercially valued) species. This pattern would fit the observed sell-for-cash pattern that we have already suggested that exists in Ekon I vs. a hunt-to-eat in one in Ngenye – IKK being somewhere in between.

Village	Ungulates	Rodents	Primates	Pangolins	Other
Ekon I	60.8%	11.8%	0.5%	1.6%	25.3%
IKK	40.2%	19.0%	15.0%	9.7%	16.2%
Ngenye	52.7%	16.1%	6.2%	15.1%	9.9%

Carbohydrates

The most common carbohydrate food item was cassava which in tuber, fufu, or gari format was present in 1/3 of meals, followed by bananas (20.2%), rice (14.2%) and cocoyams (13.5%). All meals (100%) has at least one type of carbohydrate.

Cassava (all forms)			Banana	Rice	Cocoyam	Plantain	Yam	Pap	Potato
Tuber	Fufu	Gari							
8.6%	11.3%	12.3%	20.2%	14.2%	13.5%	9.6%	5.9%	2.8%	2.6%

Bushmeat price surveys

In total we recorded the price of 1,161 bushmeat pieces from Sept. 2013 to May 2015. For the analysis reported here however we will focus on the 761 bushmeat pieces recorded in 2014 (Jan. – Dec.) of which 60.7% were directly observed by our data collectors – the rest had been sold up to a week ago and the information on them was "recalled" by the sellers. The three bushmeat bulk sellers differed significantly in the overall number of carcasses they traded in 2014. The seller based in Manja (MJ1) – a suburb of Mundemba – traded overall fewer carcasses (n= 104; mean monthly 8.7 ± 4.5). One of the Mundemba based sellers (MV1) accounted for 63.9% of all the recorded carcasses (n=486; mean monthly 40.5 ± 19.6) and together with the second Mundemba seller (MV2; n=171; mean monthly 14.3 ± 9.5) showed the more pronounced seasonal patterns in the bushmeat volume traded.

The seasonal peaks echo the patterns in hunting intensity reported by the hunters (peaks in March-April and Nov-Dec periods) and lower trading in the rainy season. There is however a noticeable peak in August followed by a decline in September for the MV1/MV2 sellers which probably reflects the shake up in the region's bushmeat trade with the bushmeat market closures in Nigeria in early August 2014 when the Ebola virus arrived in Nigeria and the state cracked down on bushmeat selling nationwide for approximately a month. The peak in August almost certainly reflects that reported returns of hunters from Nigeria with all their bushmeat being unsold due to the market closure, and the subsequent supplying of it in the Cameroonian/Mundemba market. By the end of August however, it was becoming clear that there was an overall reduced demand for bushmeat (esp. across the border) – which is clearly seen in the acoustic gunshot and the hunter survey data. So, hunters hunted less and therefore had less number of carcasses to push to the bulk sellers in September 2014. The acoustic gunshot data show a very pronounced increase in the hunting pressure in Korup NP in the October-December period (higher than in 2013); this pattern is clearly seen in the

volume traded by the MV1 trader (who seems to be responding to market availability much more clearly than the other sellers) in Oct – Dec 2014.
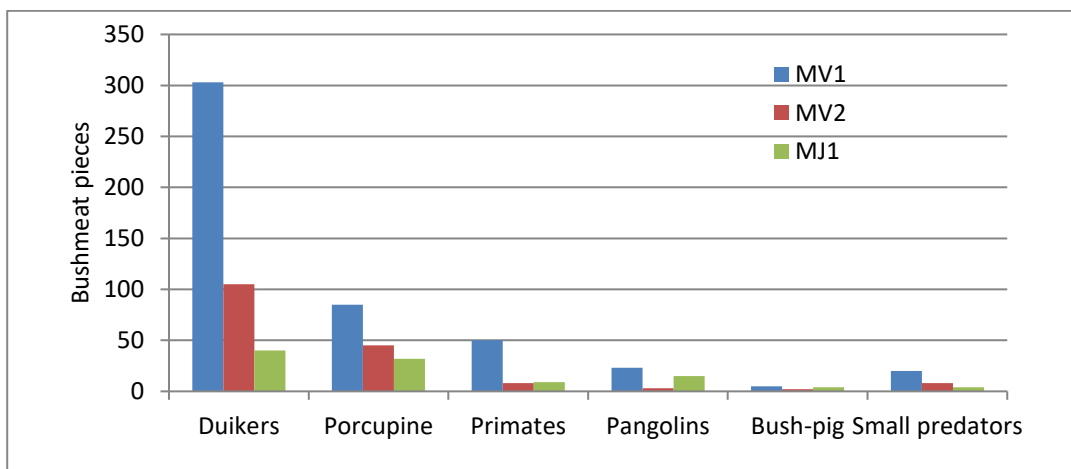

Monthly number of carcasses (observed and recalled) traded by the three bulk sellers surveyed in 2014

From the examination of these patterns it becomes apparent that the trading nature of the three bulk sellers is different: one (MJ1) is selling a limited number of bushmeat pieces per month probably as a supplement to alternative income sources, whereas the two Mundemba based traders seem to reflect better the demand-supply of the trade (and especially so MV2 who probably has bushmeat trading as her primary income source judging by the number of carcasses traded per month). Overall however, it needs to be recognized that the total bushmeat volume "moved" by the three bulk sellers is only a fraction of what we know from hunter surveys and the acoustic gunshot data to be trader in the broader Korup region. So, there are almost certainly many more bulk sellers in Mundemba town, more bulk sellers in the region, and – as reported by hunters in previous studies – most of the bushmeat is taken to sell across the border in Nigeria.

Of all the bushmeat recorded, 90.3% was in smoked condition. In fact, practically the only seller trading fresh carcasses was the MJ1 (Manja / low trading volume) seller. Fresh bushmeat accounted for 64.4% of the pieces she traded. There was no seasonal pattern in the condition of the bushmeat pieces sold. The fresh state of this seller's bushmeat and overall low trading volume suggests that she is buying from local hunters and sells for local consumption.

Wildlife species traded

Not surprisingly, duikers and porcupines accounted for the majority of the total bushmeat pieces recorded (80.2% combined; 58.9% duikers and 21.3% porcupine) but their overall proportion is higher than that reported harvested by the hunters. This supports the common knowledge that these two categories are popular bushmeat with the local population. The pangolins (5.4%) were available at slightly higher frequency than reported in hunter surveys and primates (8.8%) at slightly lower frequency. Red and blue duiker pieces were approximately in equal proportion within the "duiker" group.

Breakdown by seller of the proportion of each animal group's representation in the traded bushmeat pieces.

Bushmeat price

Based on the weight of the observed smoked pieces, we calculated the price per piece and kilo of the most commonly traded species. The mean weight of pieces of all animal categories reported in range from 1.9 (primates) to 2.9 (red duiker) kg/piece with considerable variation. There was overall great variation in the price of pieces among and within species/categories both in terms price per piece and price/kg. The price per kilo was similar among all categories, with the mean price being a bit higher for primates. All bushmeat categories were cheaper per kilo than alternatives sources of meat being sold in the eateries, but only for larger pieces of meat as the smaller pieces were significantly more expensive – assumingly because they were more selected cuts/had fewer bones etc. The negative relation of piece weight and price/kg was similar for all other bushmeat categories. It is therefore apparent that it is difficult to quickly compare bushmeat and non-bushmeat prices without taking into account the "cut" of the meat. This is a point to be taken by any future studies or when comparing prices across sites/species/time/cultural settings.

There were no significant price fluctuations throughout the year.

KRCS *Data collector on weight of bush meat carcasses.*

Table of Price per piece and kilogram of the most commonly traded bushmeat categories (smoked)

Species	Price/piece (mean CFA ± SD)	Mean price (CFA/kg)
Blue duiker	4,557 ± 576	1,936 ± 764
Red duikers (2 spp.)	5,282 ± 1,052	1,879 ± 770
Pangolins (2 spp.)	3,667 ± 373	1,889 ± 764
Porcupine	4,746 ± 936	1,931 ± 762
Primates (*Cercopithecus spp.*)	4,400 ± 1,064	2,330 ± 1,448

Meat prices at eateries - stores

Although we monitored the prices in the local eateries, we do not believe that in the end they were very informative, given that we were unable to weigh the size of the "slice" (piece) included in each meal sold. The customers order some soup or carbohydrate meal and pay separately for the cost of any protein added (fish, livestock meat, bushmeat) as and when available. The price of a piece of meat remained constant at 500 CFA throughout the study period, but there are reports that the size of the pieces may have changed (or in fact that they may differ significantly per type of meat). Therefore, we report the values here only for future reference, recognizing the limitations in their interpretation.

Tabele of Mean price (CFA) of popular carbohydrate and meat dishes in the 8 eateries surveyed bi-weekly in 2014. The variations in the prices were minimal.

Food item	Price (CFA)
Rice (plate)	193
Fufu (serving)	205
Beans (plate0	122
Fish (piece0	195
Beef (piece)	219
Chicken (piece)	500
Pork (piece)	500
Red duiker (piece)	478
Blue duiker (piece)	412
Porcupine (piece)	468
Bush-pig (piece)	479
Pangolin (piece)	471
Dwarf crocodile (piece)	500
Primate (piece)	414

Similarly, there was no significant fluctuation during the survey period (in 2014 or beyond) in the price of non-bushmeat meat available in Mundemba stores/market or the staple foods. We report the values here for

future reference. The only noteworthy point to make is that beef/pork/chicken are typically more expensive per kg than larger pieces of bushmeat, but less expensive than "prime cuts" of bushmeat.

Food item	Price (CFA)
Frozen mackerel (kg)	1,318
Frozen chicken (kg)	2,700
Beef (kg)	2,636
Pork (kg)	2,476
Rice (cup)	215
Beans (cup)	112
Egg	88
Kumba bread (large loaf)	300
Kumba bread (small loaf)	125

Recommendations – Take away message from Hunter and household surveys

This summary report of the survey results (hunter, household, bushmeat prices) collected during the Di project were a very welcome addition both for the study and future conservation initiatives in the region. There is a lot more "depth" in the analysis that can be undertaken, especially for the household and hunter survey data. We would encourage future projects and organizations operating in the area to consider continuing collecting the same data using the same protocol (so as to facilitate comparisons over time) especially for hunter/HH surveys.

The hunter surveys were especially instrumental in helping us interpret better the patterns observed in the gun hunting patterns observed in the Korup NP based on the analysis of the acoustic monitoring data. Without the hunter survey data we would have been unable to estimate the number of animals killed in the park based on the gunshots heard (we needed the kill success rate) or have information on the species makeup of the hunted animals.

The comparison of the HH and Hunter survey data helped elucidate the clear differences among the local communities in terms of the nature of bushmeat hunting and the role of bushmeat in the local communities as a source of income and for food security. We encourage more in depth studies on these patterns and the development of clear community-fine-tuned conservation initiatives. It is clear that there is need for different disincentives to hunting for professional hunters than subsistence ones. The actual amount of money that can be made by professional hunters is also staggering and an eye opener regarding the complexity of rural development initiatives in the area that claim to deliver conservation (combat reliance on hunting). We strongly caution against such projects as it is clear that the personal gains of full-time hunters are very unlikely to be matched in any significant proportion by community based initiatives that will have only trickle down benefit towards individuals. It may well be that the most proficient hunters will need to be identified and truly full time employed in any alternatives (incl. possibly all their family members).

Finally, we caution about the overall short term value of bushmeat price surveys. They are certainly informative to some extent, but they would probably be more relevant if only the most active bushmeat bulk-sellers were surveyed. Two out of three sellers surveyed were probably only part-time involved supplementing

other income. As such, they did not show the seasonal fluctuations that we could observe in the hunter surveys and the acoustic monitoring.

Naturally, the data from the surveys are available for review and we look forward to collaborations for further analyzing the existing data, comparing them with other datasets in the broader region or beyond, and assisting in the design in future similar surveys.

➢ KRCS completed implementation of the USFWL acoustic monitoring in the Rumpi hills;

From Nov. 2014 to Nov. 2015 we monitored wildlife and gun hunting activity within the Rumpi Hills Forest Reserve (southwest region of Cameroon). The project was funded by the USFWS (E14AP00503) and coordinated by Joshua Linder (James Madison University), with co-PIs Christos Astaras (University of Oxford), and Peter Wrege (Cornell University). The goal of the project was to demonstrate how the passive acoustic monitoring protocol (PAM) developed in Korup National Park (just a few kilometers away) could be "exported" in new sites, providing insight on wildlife status and human activities within protected areas which are currently totally unmonitored, so as to help develop the momentum needed to make these "paper parks" actually managed/monitored.

Importantly find was the detection of the species-characteristic male Preuss's guenon "boom" call in several sensors, confirming the persistence of the endangered primate within RHFR. We are currently developing an automated detection algorithm for the species that will facilitate rapid acoustic surveys in other forest fragments within the historical range of the species in Cameroon and Nigeria. Our acoustic data also showed that RHFR is under significant gun hunting pressure, and that – especially if the Wildlife Sanctuary status considered for the site is to be pursued as discussed for years now – some level of patrolling and monitoring needs to be introduced at the site.

Preuss's guenon photo

➢ On Dec. 10-1, 2015 in Buea, Cameroon, we hosted and organised the final workshop of our project at the Ministry of Forest and Wildlife's (MINFOF) regional headquarters.

The workshop was attended by representatives of government agencies and protected areas in Cameroon's/Nigeria's rainforest region (Korup NP, Cross River NP, Mt Cameroon NP, Takamanda NP, Banyang Mbo WS, Rumpi Hills FR, Kagwene GS, Dja Biosphere, Campo-Ma'an NP) as well as wildlife conservation organizations (WCS-Cameroon, WCS-Nigeria, WWF-CFP, ZSL, KRCS, EFRP). Darwin Inititative partners presented results from our project, and discussed with participants the advantages and challenges of implementing an acoustic monitoring protocol as part of protected area management strategies in their area.

Participants get a feel of the ARUs.

Workshop participants

III. <u>Sensitization through Conservation advocacy and education</u>

- ➤ 7<u>TH Jan 2015,</u> Visit to the DDMINFOF-NDIAN. Presentation of new year wishes and arrangement for an MoU of MINFOF with KRCS
- ➤ On the 2nd of February KRCS ran a Campaign on world wetlands day in schools around Mundemba using posters and talks on the importants of wetlands.
- ➤ 10th Jan 2015, Visit to the conservator. Presentation of new year wishes and arrangement for an MoU of KNP with KRCS
- ➤ 29th Jan 2015, attended the annual tribal gathering of the BICUD and sensitised more than 25 local communities on the some basic users right in the exploitation of some forest and wildlife products based on the Cameroonian forestry law.
- ➤ A match past for the environment for organized during the last labour day (1st May) celebrated in Mundemba.
- ➤ On a daily basis wildlife documentaries are used to sensitize visitors to our office at the KNP information centre.
- ➤ 22nd May, World biodiversity day commemorated with a general assemble sensitiastion meeting at our head office in Mundemba.

➢ 6th June 2015, Sensitization on environmental issues during the world environmental day in three primary schools; G.S Mundemba Town, P.S. Mundemba Town and Reference bilingual primary school Mundemba

Kids and teachers participate in EE outreach activities in schools.

IV. Local Capacity building

• Continuation of training of team member in wildlife monitoring data collection using line transects/recee and in Acoustic deployment and analysis of data from acoustic monitoring units using gunshot detection software (RAVEN) by our Darwin project partners from Cornell University, USA.

KRCS field teams are trained on gunshot detection and recognition.

- The KRCS programme adviser also received a scholarship from the Australian Awards to complete a 2 years Master's degree in Protected area management from James cook Uniersity in Australia (2015 to 2016)

Orume Robinson (KRCS programme adviser) undergoing studies.

- One KRCS member was trained on agricultural extension skills for rural agro-forestry administered by ICRAF and sponsored by PSMNR-SWR in Buea
- From the 10th to 11th December, one KRCS member participated in training workshop on the development of tree nursery and entrepreneurship in rural communities organized by the PSMNR in Buea.

V. Conservation/Development initiatives for livelihood improvement

➢ The sum of two million francs (2000,000 FCFA) was donated as in 2014, by KRCS as part of the Darwin initiative project through support from the PSMNR-SWR as community contribution to the three (3) target communities for their participation in the 10 household and 10 hunters' surveys in each village. Villages used these contributions for community development projects/interventions such as roofing sheets (Ekon village community hall), plastic chairs for community halls (Ikondo kondo 1 and Ngenye village) and benches for community school classrooms.

VI.   Constraints, Conclusions and Recommendations

- Prolonged rainy season and its associated impacts such as poor roads and flooding of rivers.

- Long distances and means of communication with very remote target villages.

- Limited funds also limiting our ability to intervene in other priority conservation issues in the area.

- Hesitant attitude of some villagers due to unmet expectation from other projects and the government.

However, inspite of the above mentioned constraints, our activities especially the Darwin Innitiative and USFWL projects in KNP and Rumpi hills have been very successful thanks to our devoted field teams and our commitment to transparency and team work.

The training and recruitment of community members into our field teams and conservation eduction interventions have so far been successful with apparent positive behavioral change from villagers. We also recorded achievements in other respect such as increase in number of registered members (mostly local villagers), fund raising, awareness and recognition mostly from our partners especially the PSMNR-SWR. However, we do not need to relent our efforts. We need to extend to more villages, fish more members and funds so as to have even greater impact in the area and meet our objectives. We also need to improve our collaboration with other partners working around the park in identifying and promote reliable alternatives to livelihood. For 2016, our strong resolve is to mobilize continue to improve on our public image both locally and internationally and also enhance environmental education and literacy programs in our target communities.