"Preuss's red colobus Piliocolobus preussi in northern Korup National Park, Cameroon: A multi-faceted approach to understanding arboreal primate abundance and local reality in a protected area"

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Final Report to PSGB and the Born Free Foundation

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PROJECT TEAM

Above- The project team, including Mambo Peter, a guest botanist who spent a few days with the project team to identify trees (left to right- Mambo Peter, Aloysius, Alexandra, Roger, Daniel and Jonas). Photo taken at the edge of Ikenge village.

Alexandra Hofner (American) I am the principle investigator and organizer on behalf of the project. This research contributed to my dissertation for an MSc in Primate Conservation at Oxford Brookes University. I hope to continue this project in a PhD program in the next academic year, and continue to collaborate with the Korup Rainforest Conservation Society (KRCS) and the local communities in and around Korup National Park, Cameroon.

Aloysius (Cameroonian) is a long term member of KRCS from Mundemba Cameroon. He acted as the camp manager during the entire project. Aloysius is a dedicated conservationist and an extremely hard worker. He was an invaluable member of the team, managing all shopping, food preparation, porting, and campsite maintenance throughout the project.

Daniel (Cameroonian), a native of Ikondokondo, was a field assistant to both Dr Christos Astaras and Dr Joshua Linder during their PhD field work. Years ago, Daniel put down his gun for conservation, and today he proves time and time again to be a dedicated naturalist and conservation researcher with KRCS. Daniel participated in the primate monitoring and ethnographic data collection. He was an excellent delegator among local hunters and proved to be talented in wildlife identification and in field data collection.

Jonas (Cameroonian), also a native of Ikondokondo, is a long term KRCS member. Jonas was a member of the monitoring team and showed excellent wildlife identification skills. He is a dedicated conservationist, with experience in a variety of projects. Jonas is especially talented in primate call identification.

Roger (Cameroonian) is a hunter from Ikenge-Bakoko. During the project, he worked with the monitoring team, learning primate monitoring from seasoned KRCS members and maintaining local collaboration. Roger's knowledge of the forest and the distribution of monkey species helped me set up transects and photograph wild red colobus monkeys. Roger is now a member of KRCS (paid for by the project) and shows interest in working with future conservation projects.

Carolyn Jost Robinson (American) is an anthropologist and conservationist from the University of North Carolina Wilmington. She was the passion behind the beginning of the project and an important member of the team. Carolyn gave her time to introduce me to the village of Ikenge, teach me enthographic approaches to conservation, and mentor me throughout my time in Cameroon.

Introduction

To address complexities surrounding hunting, primatologists and conservation practitioners must draw on multiple theoretical and methodological approaches from socio-cultural anthropology, biological anthropology, critical animal studies, and geography (Riley, 2006; Fuentes, 2010; A'lveres *et al.,* 2011; Robinson *et al.,* 2011). Complex relationships between global/local bushmeat economics, subsistence practices, and cultural preferences for wild meat complicate the possibility of sustainable hunting regimes (Fa *et al*., 2003; Milner-Gulland and Bennett, 2003; East *et al*., 2005; Daspit, 2011). To adequately address this, we must develop a better understanding of prey population dynamics, human motives and land-use practices as a whole by shedding light on how humans conceptualize their relationships with the forest, its animal inhabitants, and a globalized discourse of primate conservation. With this study, I aim to frame ecological monitoring data with an ethnographic data set to create a nuanced understanding of the current status of an endangered primate.

Study site

Korup National Park (KNP) was first established in 1986 as the first park in Cameroon's humid forest zone (Figure 1). The development of KNP was largely related to the confirmed presence of *P. preussii* and the region's rich biodiversity (Oates *et al.,* 2004), potentially creating friction between conservation practice and Korup villages. The Korup Project and the original management plan (Gartland, 1984) represented a radical shift in park management practices at the time (Vabi, 1999) by fusing conservation management with sustainable development practices. Unfortunately the program failed, with lasting effects on the very local communities that the project was intended to support. Korup is now home to five village enclaves and serves as habitat to eight species of haplorrhine primate (Table 1), of which, the Cameroon red-eared monkey

(*Cercopithecus erythrotis camerunensis*), drill (*Mandrillus leucophaeus leucophaeus*) and Preuss's red colobus (*Piliocolobus preussi*) are species endemic to the Cross– Sanaga–Bioko forests (Linder, 2008). Some classifications place Preuss's red colobus as a subspecies of *badius* or *pennantii* and others recognize it as a distinct species *Piliocolobus*, following Groves (2007) (Mittermeirer et al., 2013; Oates and Ting 2015).

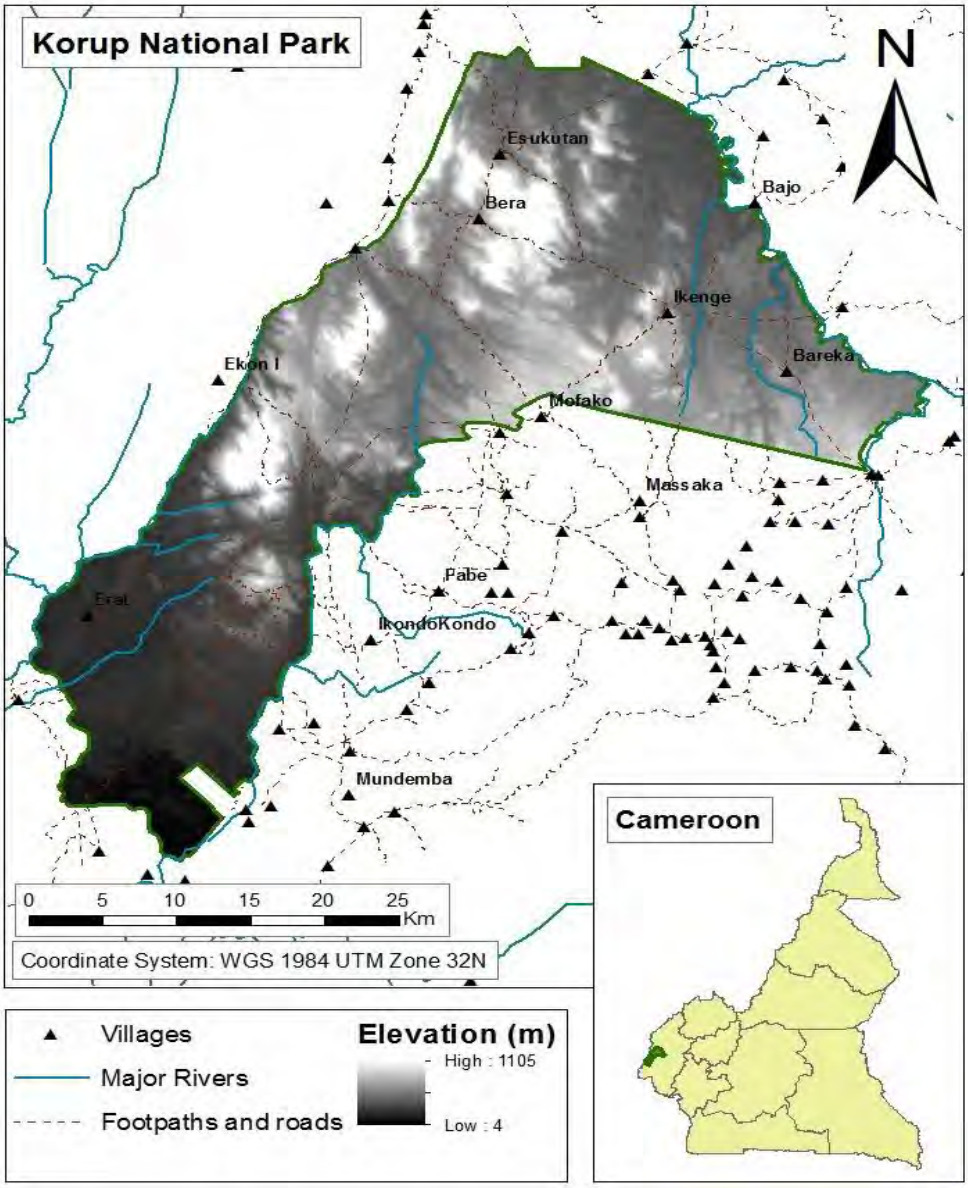

Figure 1. Map of Korup National Park, showing its southwest situation in Cameroon and the location of Ikenge.

Table 1. Anthropoid primates of Korup National Park. Species and Subspecies marked with a (*) are focal species in the ecological survey.

Anthropoid Primates of Korup National Park	Common Name	Red List Category (IUCN 2016)
*Cercopithecus nictitans ludio**	Putty-nosed monkey	Least Concern
*Cercopithecus pogonias pogonias**	Golden-bellied crowned monkey	Vulnerable (A2cd)
*Cercopithecus erythrotis camerunensis**	Cameroon red-eared monkey	Vulnerable (A2cd)
*Cercopithecus mona**	Mona monkey	Least Concern
*Piliocolobus preussi**	Preuss's red colobus	Critically Endangered (A2cd)
*Cercocebus torquatus**	Red-capped mangabey	Vulnerable (A2cd)
Mandrillus leucophaeus leucophaeus	Drill	Endangered (A2cd)
Pan troglodytes vellerosus	Nigeria chimpanzee	Endangered (A4cd)

Focal study species

Endemic to western Cameroon and southeastern Nigeria, *P. preussi* (Figure 2) is one of the most endangered of all of the red colobus species, a taxonomic group of primates in Africa particularly vulnerable to hunting pressure and ecological change (Oates, 1996; Struhsaker 2005). The International Union for Conservation of Nature (IUCN) lists *P. preussi* as Critically Endangered since 2008. Though predation by chimpanzees may be a threat to the viability of some red colobus population (Watts and Amsler, 2013; Morgan *et al.*, 2013), the primary threats to *P. preussi* are from bushmeat hunting and deforestation, with bushmeat hunting driving declines within KNP.

Figure 2. Photos of *P. preussi*, taken by A. N. Hofner in June 2016 in Korup National Park.

Methods

I used standard line transect methods (Plumptre and Cox, 2006) to collect data on primate encounter rates and hunting pressure. Thirty, minimally, cut 1 km transects were created perpendicular to three main bush paths (each transect approximately 600 m apart), all emanating from the village of Ikenge. Following methods described in White and Edwards (2000), teams of at least two trained observers walked transects between 0700-1300h at a pace of 1 km/hr from June to July 2016. During each transect walk, observers documented direct detections of all mammals, visual and auditory (Fashing & Cords, 2000). Evidence of human activity, specifically hunting activity, was recorded along each transect as well as on bush roads. Ethnographic data and a hunter

offtake (1 month recall) survey were collected in the village of Ikenge during the month of July 2016 using semi-structured interviews, with all wildlife depicted using local tongue, common name and laminated photo cards (Figure 3).

Figure 3. Ikenge woman looking at a photo card of *P. pogonias* during a household interview.

Data analysis

Data collected during transect walks were transformed into both visual and acoustic encounter rates for each species. Encounter rates were then calculated for each species, as the number of social groups (including solitary individuals) sighted per km walked (Linder & Oates *et al.*, 2011). Because group sizes were estimates, and estimated group sizes in hunted forests are notoriously unreliable (Ferrari *et al.*, 2010), only group encounter rates were calculated. Differences in

detection methods and differences between species and transects were analyzed using a Mann-Whitney U test or Kruskal-Wallis H ($p > 0.05$) where appropriate. All data were analyzed using SPSS.

Observations of hunting signs were converted into a hunting sign encounter rate to be used as a proxy measure to quantify the relative intensity of hunting in the survey area (Linder & Oates, 2011). Catchment data were examined in association with transect data in order to address Ikenge hunting pressure in relation to current arboreal monkey encounter rates. The results of semi-structured interviews were examined qualitatively and using descriptive statistics to examine the conservation status of *P. preussi* and consider the perceptions of the Ikenge people to generate a nuanced understanding of the current status and future conservation of *P. preussi.*

Results

All species of KNP arboreal monkey (abbreviated: *C. nictitans, C. pogonias, C. erythrotis, C. mona, P. preussi,* and *Cb. torquatus*) were encountered (both visually and acoustically) at least once during the survey period. In total, forty-five primate groups were encountered visually across all transects (60.14 km) resulting in an average visual encounter rate of 0.75 groups/km. Forty-seven primate groups were encountered acoustically, resulting in an overall mean encounter rate of 0.78 groups/km. Table 2 summarizes overall primate sightings and auditory data derived from pooling all encounters across transects.

Table 2. Total and mean encounter rates (groups/km) of all species of arboreal monkey across all transects, presenting results from both direct visual encounters and auditory encounters during transect walks (60.14 km survey effort). Deviation from the mean is represented using standard deviation.

Parameter	Sighting Encounters	Auditory Encounters
Total distance (km)	60.14	60.14
Total groups detected	45	47
Mean groups detected per transect (all species)	0.01 ± 0.02	0.01 ± 0.02
Mean Encounter Rate (grps/km) overall	0.75	0.78
95% Confidence Interval	0.31	0.33

Cercopithecus nictitans was the most commonly observed species (0.22 groups/km), followed by *C. pogonias* (0.20 groups/km) and *C. mona* (0.18 groups/km). *Cercocebus torquatus* was only observed visually only once during transect walks, though it has not been documented on transects in the region in previous years (Linder and Oates 2011). Acoustic encounter rates also significantly varied across species (Kruskal Wallis One-Way ANOVA, X^2 = 37.33, 5 df, p > .000). *Cercopithecus nictitans* was also heard more often than any other species followed again by *C. pogonias* (0.12 groups/km) and *C. mona* (0.15 groups/km). *Piliocolobus preussi* and *Cb. torquatus* were encountered the least overall. Figure 4 represents both sighting and acoustic encounters between species.

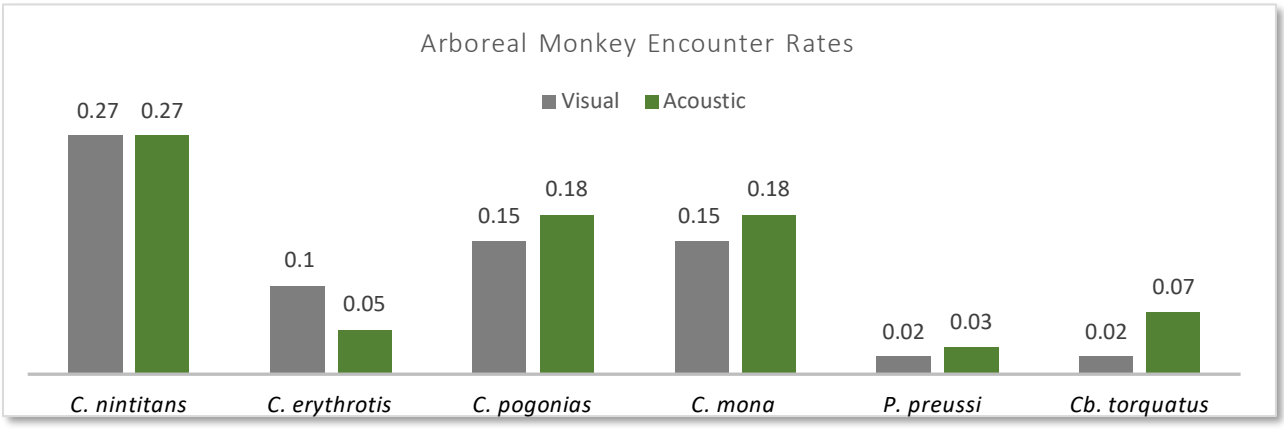

Figure 4. Overall encounter rates for each of the Korup National Park arboreal monkeys (both by sight and sound) during the 2016 survey. Encounter rates represent groups per kilometer.

Hunting sign encounter rates over the entire study area were calculated using the first walk on each major bush path leading to transects and on each transect **(**n= 83.2 km). Used shotgun cartridges were the most frequently encountered hunting signs during the survey, followed by wire snares, gun shots, hunting trails and hunting camps (Figure 5). The total hunting sign encounter rate for the forest was 1.21 signs/km.

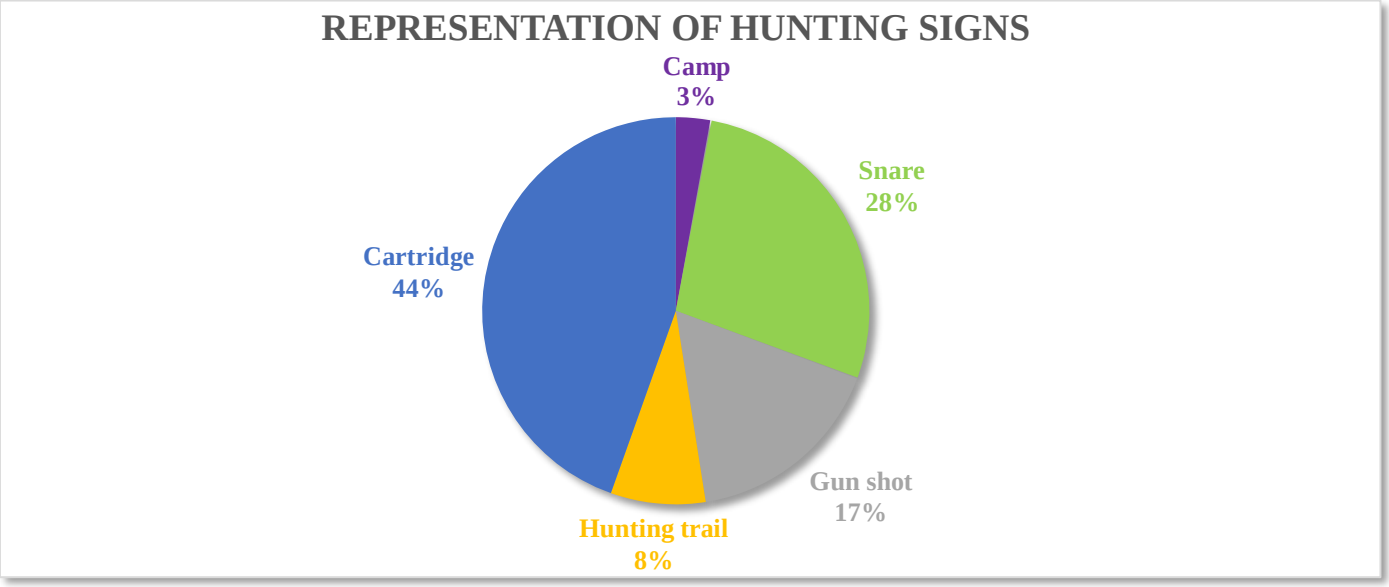

Figure 5. Percent representation of hunting signs throughout the survey area (83.2 km survey effort).

Bushmeat offtake survey

During the month of June 2016 hunters (n= 32) reported a total of 824 total kills. Eighty-seven percentage of off-take consisted of forest ungulates, porcupines, pangolins, and other small mammals. Species of diurnal monkeys represent only 13% of hunter off-take (Figure 6). Brush-tailed porcupine (*Atherusus africanus*) was the most represented species with 199 kills and the blue duiker (*Philantomba monticola*) with 196 kills, followed by 90 Ogilby's duikers (*Philantomba monticola*) and 54 pangolins (*Phataginus tricuspis / Uromanis tetradactyla*). The

most commonly killed primate species was *C. nictitans* followed by *C. mona*, *C. pogonias*, *C. erythrotis*, and *P. preussi* (Figure 7). *Cercocebus torquatus*, *Pan troglodytes* and *Mandrillus leucophaeus* were not reported in hunter off-take surveys.

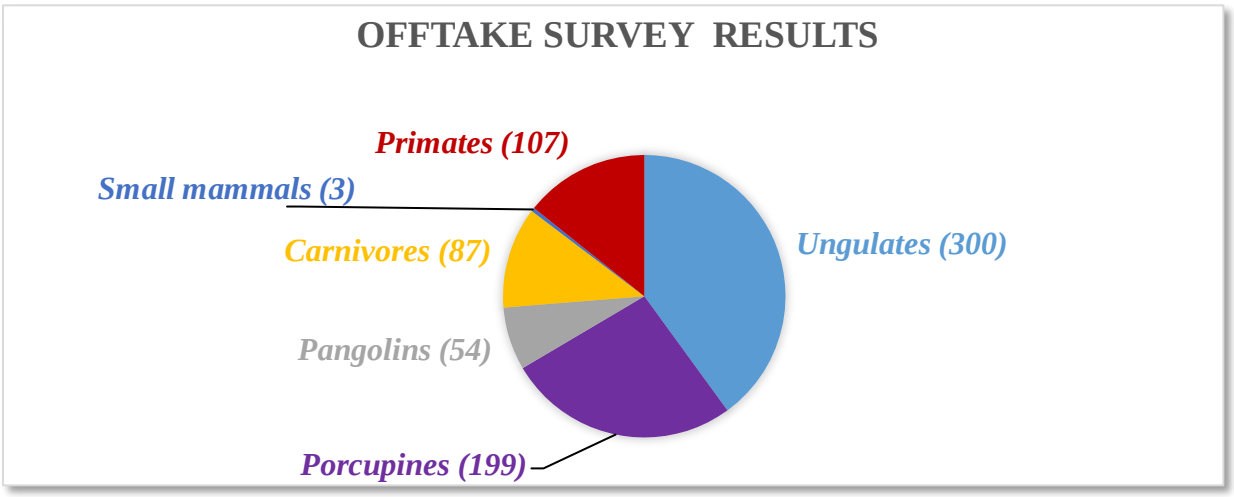

Figure 6. Actual numbers represented in the offtake survey in Ikenge in 2016.

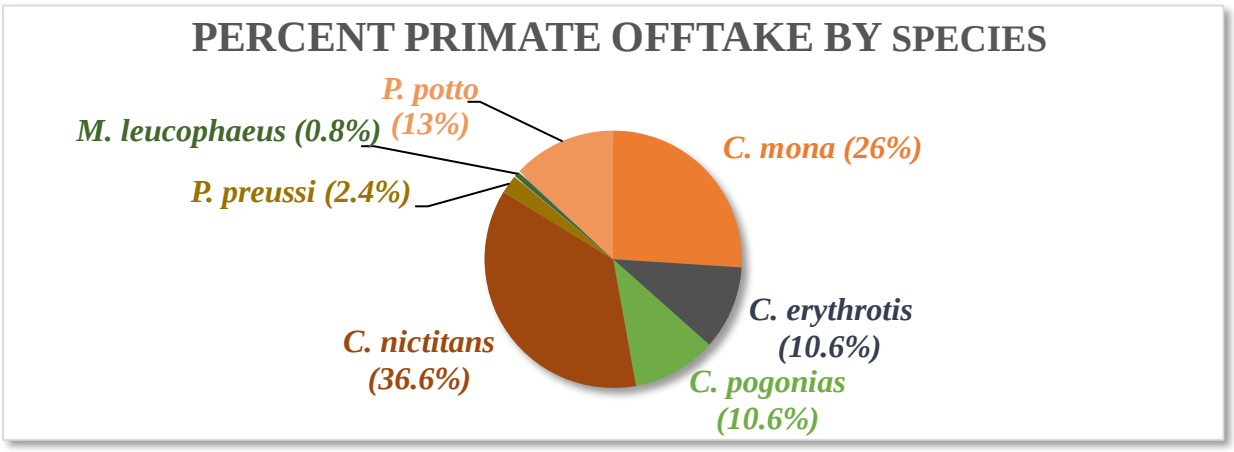

Figure 7. Percent offtake of each of the local primate species. Notice that no species of bush baby were reported killed, nor the angwantibo (*Arctocebus calabarensis*), chimpanzee (*Pan troglodytes*), or red-capped mangabey (*Cercocebus torquatus*).

Of the people interviewed, I found that the primary source of income for Ikenge men and women comes from hunting and farming. Often, even as a supplemental form of income to farming, meat remains an important source of money ranging from 10,000-150,000 CFA (about 17.00 – 256.00 USD) monthly for each man. Of the men interviewed, twenty-three (72%) identified themselves specifically as "hunters." The men who did not refer to themselves as a "hunter" did so because they either do not own a gun or had never learned how to use one. When asked if he was a hunter, one participant insisted that he was not a hunter, saying, "No, no I am not a hunter man, since I have been born I don't carry a gun. I never shoot a gun." In the same conversation he told me that he had killed more than fifteen "frutambo" or blue duiker (*Philantomba monticola*) in a single month. When I asked him how he had killed so many blue duikers, he said that he had set his wire traps (snares) in the areas around his farm (Figure 8). Five gun hunters commented that they did not usually shoot monkeys, leaving only 20 of the participants as 'monkey hunters.'

Figure 8. Blue duiker (*Philantomba monticola*) caught in a wire (snare) trap. Photo by A. N. Hofner

When asked if there was any monkey that people did not like to kill, most people said that all monkeys were good to eat and good to kill. A few villagers did tell me that "*some don't like Mberi* [red colobus] *for chop* [to eat] *because of the*

odor." A few men and women even expressed that people did not like to eat red colobus because they were similar to humans, having "five fingers and five toes" or a "face like a human." Almost all of the women who had reported to have seen red colobus in the forest, smiled as they told me that they liked to see them play and care for their babies in the forest. Some hunters even described their behavior to me, and said that if they did not have a gun with them, they like to sit behind a tree and watch them "tilt their heads to see them better" or "feed their young at the breast." Others were simply indifferent, having very little to say about them at all.

Awareness of wildlife laws and hunting restrictions was more widely recognized as a reason for not hunting colobus. In fact, many villagers explained that someone could go to prison for killing a red colobus. Although villagers explained to me that no man can be arrested while inside the village because, "they will not accept it." And while wildlife protection laws were well known among villagers, I would often receive cries of concerns that if the government does not allow Ikenge people to kill animals, villagers would have nothing to eat, and there would not be enough money for families. In fact, patterns of red colobus hunting more often reflect economic/subsistence concern and legal ramifications of hunting, rather than deep seeded negativity towards conservation, despite the role the red colobus played in changing land-tenure in Ikenge.

Conclusions

Figure 9 compares visual encounter rate data across three sampling periods including the present study and earlier research reported in Edwards (1992) and Linder and Oates (2011). Among visual encounters, we see an increase in *C. nictitans*, *C. pogonias* and *C. mona*, likely due to higher ecological flexibility compared to *Cb. torquatus* and *P. preussi* (Rovero *et al.*, 2006). The *P. preussi* encounter rate has remained consistent between Linder and Oates (2011), and this was the first survey conducted in the Ikenge region to have documented visual encounters of *Cb. torquatus.* Encounters with *Cb. torquatus* in this study were within the northwest region of the survey site, an area that neither previous survey covered, as both Edwards (1992) and Linder (2008) walked permanent KNP Ikenge transects, to the north east and south of Ikenge.

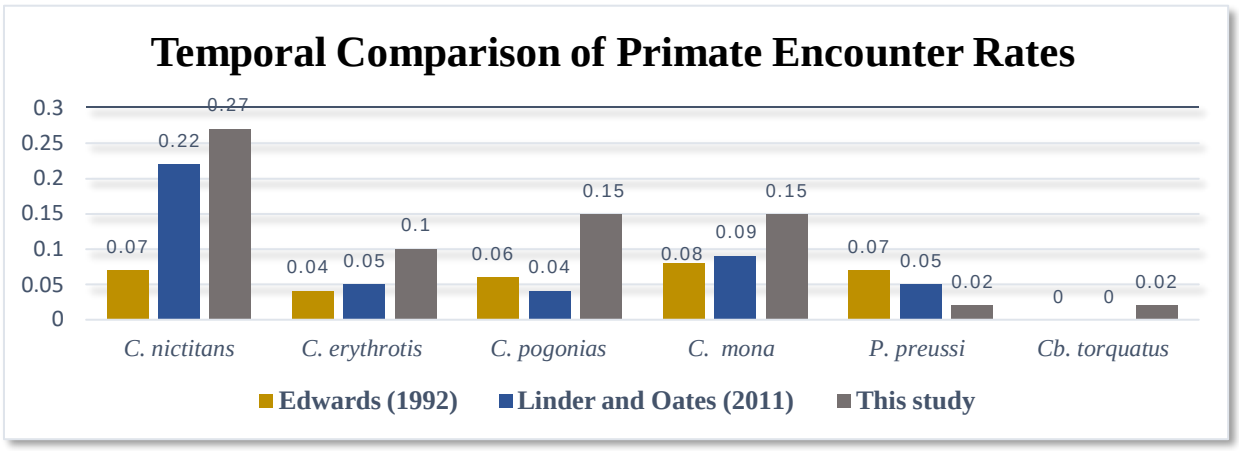

Figure 9. Encounter rates of the six Korup arboreal monkeys from 1990 (Edwards, 1992), 2004-2005 (Linder and Oates 2011), and 2016 (this study).

Hunting sign encounter rates in this study are similar to those reported by Linder (2008) on permanent Ikenge transects, where he reported 1.13 signs/km (96.63 km surveyed). Infield (1988) reported *P. pennantii* to account for 34.5% of carcasses killed by Ikenge hunters, making it the most commonly killed primate. Linder (2008) found that *C. nictitans* was the most common

monkey killed, making up 33.5% of Ikenge offtake, and *P. preussii* to be second most common, making up 22.7%. I found that of 107 primates killed by Ikenge hunters, I found that *C. nictitans* made up the highest portion of hunter offtake, followed by *C. mona*. *Pioliocolobus preussi* represented only a small percentage of the offtake (2.8%) (See figure 7).

I suggest that the steep population decreases of certain primate species, like *P. preussi* (see Linder and Oates, 2011), may have led to Ikenge hunters targeting more abundant primate species. The steadily declining populations of *P. preussi* throughout the Korup area may have resulted in competitive release, leading to higher populations of more ecologically flexible species like *C. nictitans* and *C. mona,* as has been seen in similar situations across tropical forests (Peres and Dolman, 2000; Baker and Olubode, 2007; Rist *et al*., 2009). This possible scenario was first suggested by Waltert *et al.* (2002) in the periphery zone of KNP, later by Linder and Oates (2011) throughout KNP, and is supported by this research. Changes in arboreal monkey composition and the overall loss in species richness, through persistent climbing of common species populations, can account for why we see an increasing encounter rate across species, even in areas with a persistent high level of human hunting (Linder and Oates, 2011).

In landscapes like Korup National Park, where human livelihoods are integrally connected to wildlife, species conservation, cannot exclude communities. In the case of Preuss's red colobus, the inclusion of local attitudes and current hunting practices is crucial. To adequately address issues of sustainability, we must develop a better understanding of prey population dynamics and human motives and land-use practices, specifically with regard to hunting. This may mean thinking beyond traditional definitions of "hunter" and "prey." For instance, Jost Robinson (2012) suggests

that, “looking within the categories of hunters and prey species,” to who is hunting and what is hunted, “allows us to gain a deeper understanding of the practice of and motivation behind hunting as a subsistence and income strategy.” (p. 57)

Though species of wildlife most often hunted include ungulates, such as duikers (*Cephalophus* spp.), and primates, primarily arboreal monkeys (Fa & Brown, 2009), preferred hunting strategies of local hunters affect catchment proportions. Many Ikenge men preferred to save energy by setting wire traps while farming rather than actively hunting with a gun. When asked about monkey hunting specifically, answers were about on the difficulty of hunting monkeys with firearms compared to wire trapping for primarily terrestrial species. By better addressing who is hunting and what they are hunting, we can move beyond limited examinations that perpetuate western expectations wildlife-based economies. A more rigorous ethnographic examination of hunting in Ikenge shows us the perceptions of hunters by conservation researchers does not match the lived experienced of hunters. Hunters, hunted, and hunting methodologies are shaped by and are shaping the hybrid nature of ecosystems and conservation practice (Haraway, 2003; Jost Robinson, 2012).

Within the scope of conservation, hunters are often overlooked, when they may be an asset to conservation. Following Gibson *et al*. (2001) we must move conservation beyond negative hunter stereotypes, and focus on their dynamic relationship with the environment. Ikenge hunters identify as hunters only if they carry a gun, but not if they catch wildlife using traps. This is a departure from the way that conservation practitioners have and would describe the category of “hunter.” The overarching problem with the application of categories, like hunter, stems from the dilution of the heterogeneity implicit within these categories (Jost Robinson, 2012). How Ikenge men identify themselves is a clear example of the need for closer examination of perceived homogenous

human categories (i.e. “hunter”) that might have serious implications for primate conservation practice. By understanding these preferences, we can move forward with constructing conservation plans that work with communities, and have the ability to be adapted based on the needs of that community.

Future research

I hope to continue this study as a PhD project. I aim carry out semi-structured interviews with *both* conservation professionals *and* forest residents, in order to shed light on how each group conceptualizes their relationship to the forest, its animal inhabitants, and a globalized discourse of primate conservation. By observing and participating in the everyday life of Korup’s villages over this extended period, I seek to understand what motivates people to engage in activities that hinder or promote the conservation of biodiversity, particularly in the context of bushmeat hunting. And how local people’s livelihood strategies, social priorities, belief systems, and constructions of morality shape their interaction with conservation initiatives. Moreover, my research demonstrates that hunting is a persistent livelihood strategy throughout within the park. As such, I will continue to monitor wild primates by using a modified approach, tailored to forests plagued by heavy hunting. The methodology will be geared toward overcoming hurdles of wildlife monitoring in hunted forests in general. With a focus on Preuss’s red colobus, methodology will involve traditional approaches to population counts, as well as occupancy modelling to determine primate abundance and to explore factors affecting the probability of primate presence throughout the Korup forest. All data will contribute to park management regimes and conservation action plans for Preuss’s red colobus while answering important questions necessary for creating a successful foundation for integrated, community-sensitive and effective wildlife monitoring schemes by bridging the gap between primatology, conservation ecology and cultural anthropology.

P. preussi **(photo by A. N. Hofner)**

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