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Sourcing and Typology of Animals from the Wild for Bush Meat Economy of Central Cameroon (Tonga, West Region)

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ABSTRACT

Bush meat economic gains are taking strands in alternative protein-dependent communities of Cameroon portraying momentous swings from traditionally subsistent to modern market-driven hunting. An important and emergent such hot spot in Central Cameroon is Tonga (West Region) where the sources and offtake of animals harvested from the wild have significantly impacted the stakeholders and hunted animal species. This study in a purposeful methodology from February to June of 2017 made a survey and inventory of active and passive wholesalers and retailers in order to determine the periodicity and spatial trends of quantities and types of animals that have come to focus in this new community economic sector. Results thereof show that the Tonga bush meat exchange hub involves 13 localities of varied ecologies around Tonga and spanning inwards from the Yaounde-Bafoussam National Road which has widened the bush meat consumption sphere. Traded species were identified and classified into 10 taxonomy groups from 5989 carcasses being 849 primates, 1227 certartiodactyla (duikers including red river hog), 670 Pholidota (pangolins), 2328 Rodentia, 361 Carnivora (African civet and African palm civet) and 435 Squamata (Varanus, African Rock Python and other snakes). Amongst these were threatened species as pangolins (670 carcasses) and drill (130 carcasses) and most particularly African softshell turtle. Cartographic representation of spatial distribution and volume of trade not only showed hunting cluster areas but species-specific locations that could permit a guided wildlife conservation policy to preserve threatened species traded.

Keywords: Bush meat, hunting, offtake, bush meat trade, threatened species, Tonga.

INTRODUCTION

Wild meat is also increasingly becoming an important source of protein in most communities in Africa. Terrestrial wildlife has served as the main source of protein and livelihoods for millions of tropical forest inhabitants (Swamy & Pinedo-Vasquez, 2014). Such wildlife species are increasingly under threat of unsustainable over-hunting for bush meat or pet trade being a serious threat to biodiversity (Svensson & Friant, 2014). Ingram et al. (2015), observed that unsustainable exploitation of wild animals is a threat to biodiversity and millions of people such that the "bush meat crisis," threatens wildlife and the food security of indigenous and rural populations (Sarti et al., 2015) that is well documented in tropical forests (Carvalho et al., 2015) to be the main source of macronutrients. This explains why the scale of the current harvest is unprecedented and is growing rapidly (Carvalho et al., 2015) and remains an intractable issue (Wilkie et al., 2016) thus endangering many species in the wild. Million tons of

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wild animals are severally hunted as their meat is increasingly consumed as a delicacy in Central African forest countries (Ichikawa et al., 2017).

The government of Cameroon by Ministerial Order No 649/MINFOF of 18 December 2006 classified wildlife species into conservation classes (A, B and C) in which hunting is through permits. Those of Class A species are fully protected and may not be hunted except for provisions of Sections 82 and 83 (Djeukam, 2012). Animals of Class B are protected but may be hunted only with permits whereas Class C species shall be partially protected and any hunting is only liable to authorizations granted by the Ministry of Forestry and Wildlife (MINFOF). Sections 155 and 158 fines intruders into the wildlife sector. These measures are yet to deter poaching in forest and savanna zones of Cameroon for bush meat economy as logging roads increase accessibility into wild animal habitats of forest zones. Varied hunting gargets like guns and traps are increasingly being used rendering the clandestine operations complex. This gainful economy anchored on its choosy position between major urban hubs linked by a lone road serving as a mid-point for travels from North West, West, Littoral from Nkongsamba and Centre Regions. The Wildlife Trade Monitoring Network is trying to secure a Central African Bush Meat Monitoring System (SYVBAC) to establish the sources of traded bush meat. This study is a contribution to trace key source regions of this illegal wildlife harvesting and so make suggestions that can be a palliative to threatened wildlife species in Tonga, Cameroon.

MATERIALS AND METHODS

Tonga in the Nde Division, West Region of Cameroon (Fig. 1) is located between latitudes 4°54'0'' and 5°12'0'' North and longitudes 10°30'0'' and 10°42'0'' East of Greenwich Meridian. This position gives Tonga a near central position in Cameroon in its East West extension and North South ecological variation. It roughly corresponds to the midway journey along National Road 4 for traffic from the West/North West to the Centre Regions that habour large urban populations with relatively higher purchasing power to its north and south.

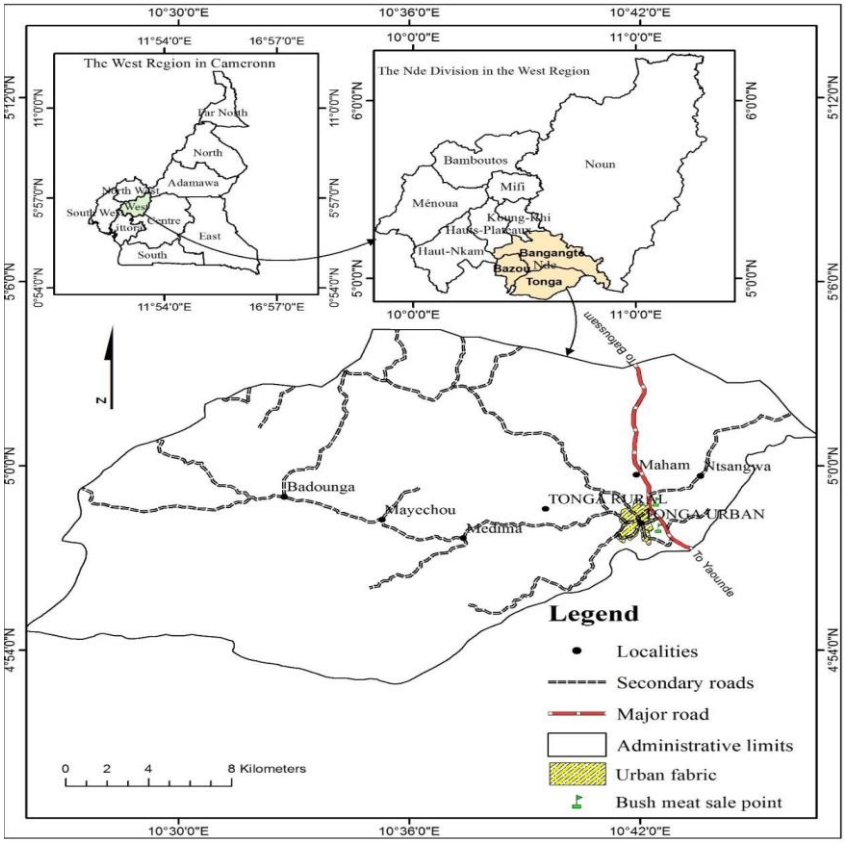

Figure 1: **The study area**

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The study adopted a four-fold methodological approach involving sampling and data collection, species identification, delineation of ecological zones and spatial distribution of recorded wild species and data analysis. Sampling and data collection was carried out in five months from February to June of 2017 that was a typical hunting period in the study area. A general survey of destination point was made for the animal species hunted brought to the town. Inventory was made in such a way as to avoid double counting between bush meat supplied to wholesalers and the one passed on to the retailers. The count was divided into wholesalers (15 in number chosen in 11 quarters (being Quarters 03, 04, 05, 07, 08, 10, 15, 18, 19, 21 and 22) and 01 village (Badounga). A weekly inventory of supplied bush meat was then done using a detailed wildlife species sheet (Table 1). With the help of each bush meat wholesaler, the source of each collected carcass was recorded accordingly. Biological data inventory (species identification) used a proper identification of species proceeded with preliminary field observations and recording of hunted species traded by wholesalers. At this early stage, common names were attributed to species as due. An in-depth scientific species identification and naming (taxonomy classification) was then enhanced with the help of the International Union of Conservation of Nature's (IUCN) species assessment records using parameters like distributed ranges of species, presently occurring countries and zonal occurrences and distribution of species. Equally, the existing literature on Cameroon's biodiversity, IUCN assessments, wikipedia and field observations, a final species identification list was established (Table 1.). Using online sources of IUCN and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) the current conservation status of recorded bush meat was established for the study (Table 1). Ten (10) taxa classes (order) were identified and inventoried.

Table 1: **Traded wildlife species, IUCN Red list and CITES checklist**

Recorded traded species			IUCN	CITES checklist
English name	**Scientific name**	**Pidgin name**	**Redlist**	**(Appx)**
Species	**Primates**			
Greater white nose monkey	*Cercopithe cusnictitans*	White nose	LC	II
White -collared mangabey	*Cercocebus lunulatus*	Gendarme	EN	II
Mona monkey	*Cercopithe cusmona*	Monkey	LC	II
Red-eared monkey	*Cercopithe cuserythrotis*	Monkey	VU	II
Drill	*Mandrillus leucophaeus*	Sumbu	EN	I
Golden potto	*Arctocebus aureus*	Bush baby	LC	II
Allen's galago	*Sciuro cheirusalleni*	Bush baby	LC	II
Preuss's monkey	*Cercopi thecuspreussi*		EN	II
Chimpanzee	*Pan troglodytes*		EN	I
	Cetartiodactyla			
Blue duiker	*Philantom bamonticola*	Frotambo	LC	II
Bay duiker	*Cephalo phusdorsalis*	Sleeping deer	NT	II
Ogilby's duiker	*Cephalophus ogilbyi*	Bush deer	LC	II
Red river hog	*Potamo choerusporcus*	Bush pig or swine	LC	
Bush buck	*Tragela phusscriptus*	Antelope	LC	II
	Pholidota			
Tree pangolin	*Phatagin ustricuspis*	Catahbeef	VU	I
Pangolins Long-tailed pangolin	*Phatagin ustetradactyla*	Catahbeef	VU	I
Giant Pangolin	*Smutsia gigantea*	Catahbeef	VU	I
	Rodentia			
Brush- tailed porcupine	*Atherurus africanus*	Tchuku-Tchukubeef	LC	
Cane rat	*Thryonomys swinderianus*	Cutting grass	LC	
Giant rat	*Criceto mysemini*	Grum beef	LC	
Rats Brown rat	*Rattus Norvegicus*	Red grum beef	LC	
African giant squirrel	*Protoxe russtangeri*	Squirrel	LC	
Squirrels Red footed tree	*Funisciurus pyrrhopus*	Squirrel	N/A	

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squirrel				
	Carnivora			
African palm Civet	*Nandi niabinotata*	Bush pussi	LC	
African civet	*Civetticti scivetta*	Bush dog	LC	III
Forest genet	*Genetta victoriae*	Bush pussi	LC	
	Hyracoidea			
Treehyrax	*Dendrohy raxdorsalis*	Stone beef		
	Squamata			
Gabon viper	*Bitis gabonica*	Viper		
Black mamba	*Dendroa spispolylepis*	Black snake	LC	
Green mamba	*Dendroa spisviridis*	Green snake	LC	
African rock python	*Python sebae*	Boma snake	N/A	II
Monitor lizard	*Varanus*	Ngombe	N/A	N/A
	Crocodylia			
African dwarf crocodile	*Osteolae mustetraspis*	Crocodile	VU	I
	Testudines			
African spurred tortoise	*Centro chelyssulcata*	Trokey	VU	II
African softshell turtle	*Trionyx triunguis*		VU	II
	Galliformes/Psittaciformes			
white-throated francolin	*Peliper dixalbogularis*	Bush fowl	LC	
Parrot	*Psittacines*	Parrot	N/A	N/A

Explanation: EN=Endangered, VU=Vulnerable, NT=Near threatened, LC=Least concern, I=Appendix I (most endangered species threatened with extinction)), II=Appendix II (species not necessarily threatened with extinction), III=Appendix III (include species protected in at least one country), N/A (note assessed in the study).

Sources: Fieldwork (2017), the IUCN Red List of Threatened Species. Version 2017-3. <www.iucnredlist.org>. http://checklist.cites.org (accessed on the 12/01/18).

Appendices I, II and III to the Convention are lists of species afforded different levels or types of protection from over-exploitation (CITES, 2017). CITES appendices rank species according to the conservation/protection priority concerns.

In order to delineate ecological zones and game habitats in the study area, remote sensing techniques were used. An 11 bands Sentinel-2 imagery of the European Space Agency (ESA) of 2018 was acquired from the United States Geological Survey website (https://earthexplorer.usgs.gov/). With the help of open source GIS (QGIS), a 10m composite image comprising of band 2 (10m), band 3 (10m) and band 4 (10m) was created for supervised image classification. Complete ground truth field investigations completed this computer-based classification of land cover/use. Once the land cover/use map was created, natural regions comprising of vegetation formations and specific hydrological characteristics were extracted to produce the eco-hydrological map showing species habitat and/or hunting locations. GIS techniques and field data (frequency of harvested game species per site) were use to spatialize the occurrence and distribution of traded game species within the zone. Using overlay analysis in GIS, hydrology of the area could be superimposed on the ecological zone to produce an eco-hydrological map for the study. Statistical analysis for the study was achieved with the help of an open source spreadsheet software program; LibreOffice Ver. 5.4.4. Emphasis was given on threatened species with global conservation and game trade concerns.

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RESULTS AND DISCUSSION

Traded bush meat types and periodicity of game hunt/abundance in Tonga

Traded bush meat species in Tonga belongs to ten (10) taxonomy groups including primate, certardiodactyla, pholidota, rodentia, carnivora, hyracoidea, squamata, crocodylia, testudines and galliformes accounting for a total of 5989 carcasses (Fig. 2).

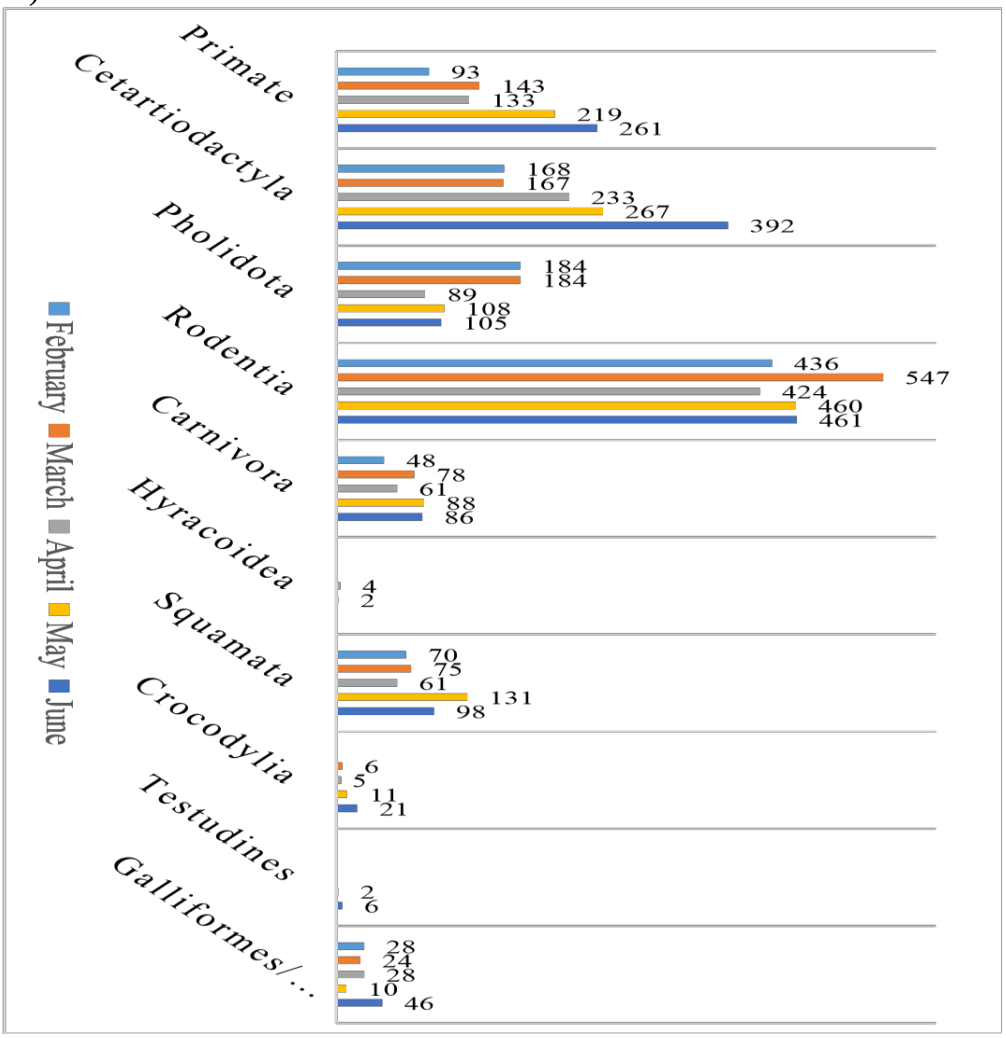

Figure 2: **Bush meat taxa group types traded in Tonga in 2017**
Source: **Fieldwork (2017)**

In total 849 primates, 1227 certartio dactyla (duikers including red river hog), 670 pholidota (pangolins), 2328 Rodentia, 361 carnivora (African civet and African palm civet) and 435 squamata (including varanus, African Rock Python and Gabon Viper) carcasses were recorded. Hyracoidea (Tree hyrax), Crocodylia (crocodile), Testudines (tortoise) and Galliformes/ Psittaciformes (francolin and parrots) were the least traded species.

The hunting of these species is reflective of seasons that determines the availability of food (feeding patterns) and habit needs. Primates and duikers were the most caught at the onset of the wet season indicative of the presence of animal food (fresh grasses for duikers and ripening of crops like maize preyed upon most primates). The savanna fires of the dry season (January-February) destroys the habitat of duikers and their food sources. When new shoots of grasses sprout with the early rains in March, duiker and cane rat numbers increase (Fig. 3).

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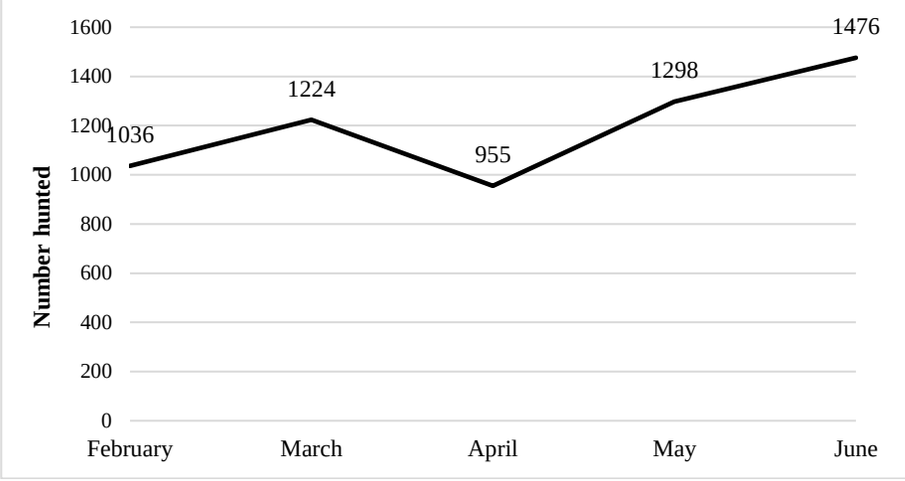

Figure 3: **Bush meat hunt trend in Tonga in 2017**
Source: **Fieldwork (2017)**

Rodents (porcupines, cane rats, giant rats and squirrels) and ungulates (duikers, particularly bay and blue duikers) are the most hunted and traded species conforms other West African findings (Ntiamoa-Biadu, 1998; Cowlishaw et al., 2005; Swensson, 2005) just as in the villages and neighborhoods of Tonga that comprises of forest, forest-savanna mosaic, savanna to swamp and lowland forest areas. There are thus eleven hunting and pools within the Nde Division while two (02) others, (Noun Forest Reserve and Yabassi Forest) are out of the Nde Division (Fig. 4 and Fig. 5).

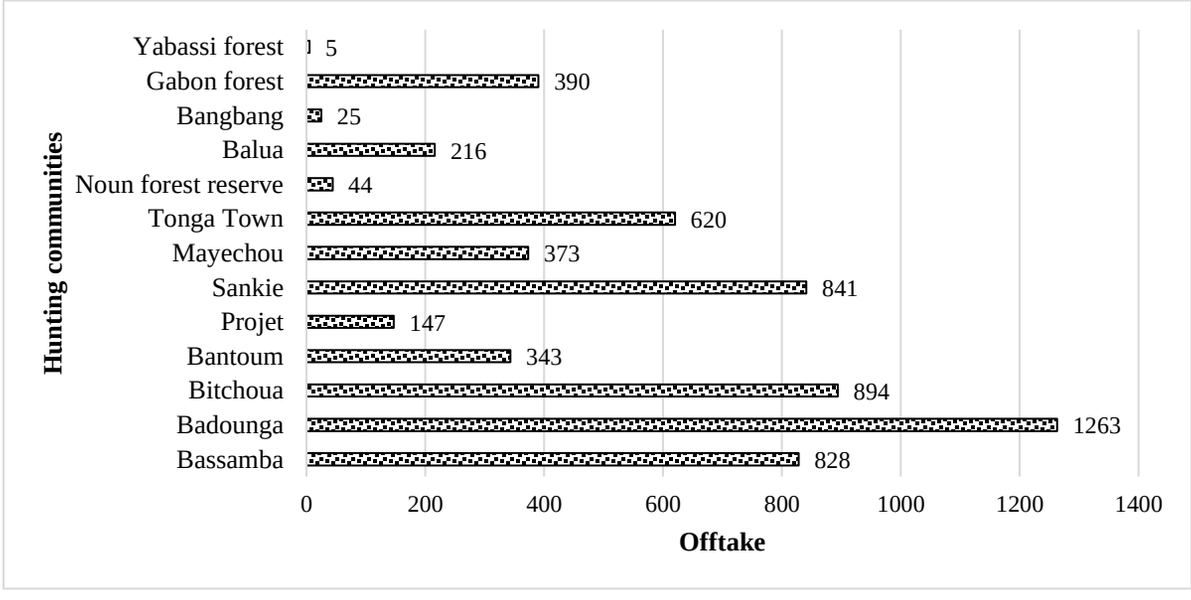

Figure 4: **Distribution of hunting source regions in Tonga**
Source: **Fieldwork (2017)**

Badounga is the main supplier of bush meat with 1263 carcasses, then Bitchoua (894 carcasses), Sankie (841 carcasses), Bassamba (828 carcasses) and Bantoum (343 carcasses) in nearby Bangangte subdivision. In all, 3161 carcasses out of 5989 from nearby villages of Tonga Town including Badounga, Bitchoua, Mayechou, Balua, Gabon Forest and Bangang (Fig. 4, 5 and 6). Hunting within the rural forested area of Tonga recorded 620 carcasses (mostly rodents).

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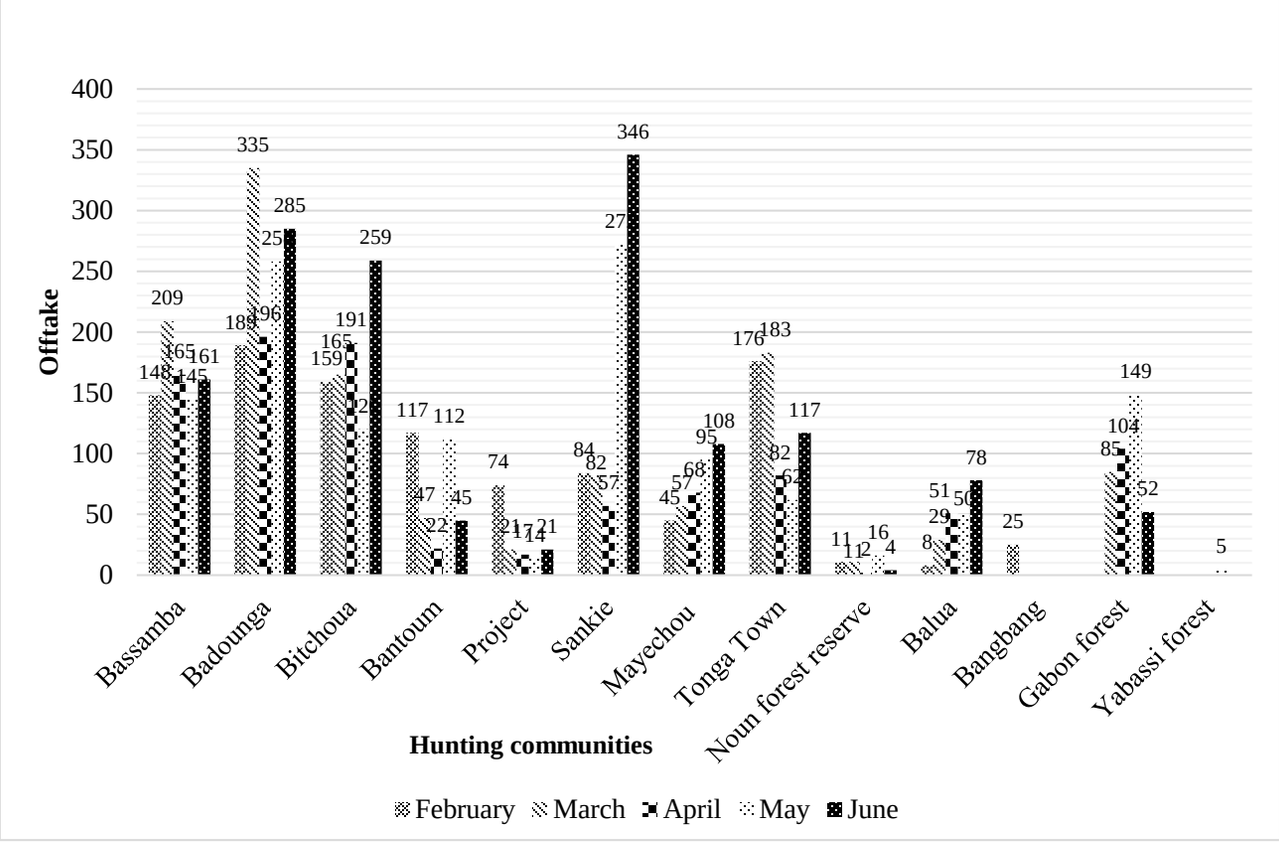

Figure 5: **Monthly totals of bush meat traded in Tonga**
Source: **Fieldwork (2017)**

This sourcing of bush meat was enhanced by the construction of the National Road 4 through Tonga linking up the source regions and trading corridors (Fig. 6).

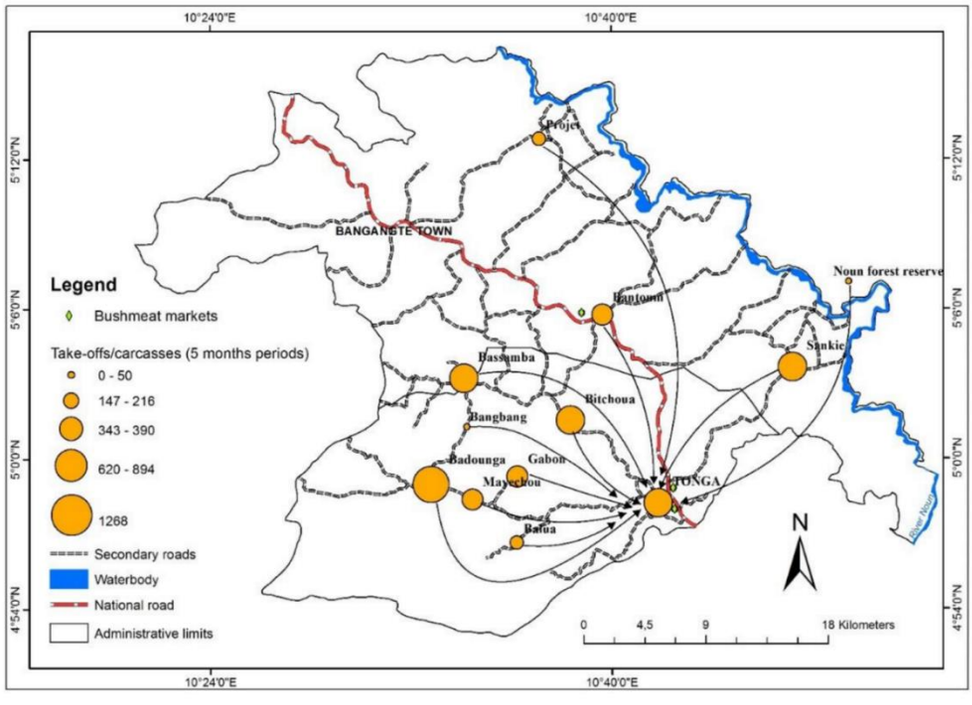

Figure 6: **Tonga bush meat hunting volume and trade from source regions**

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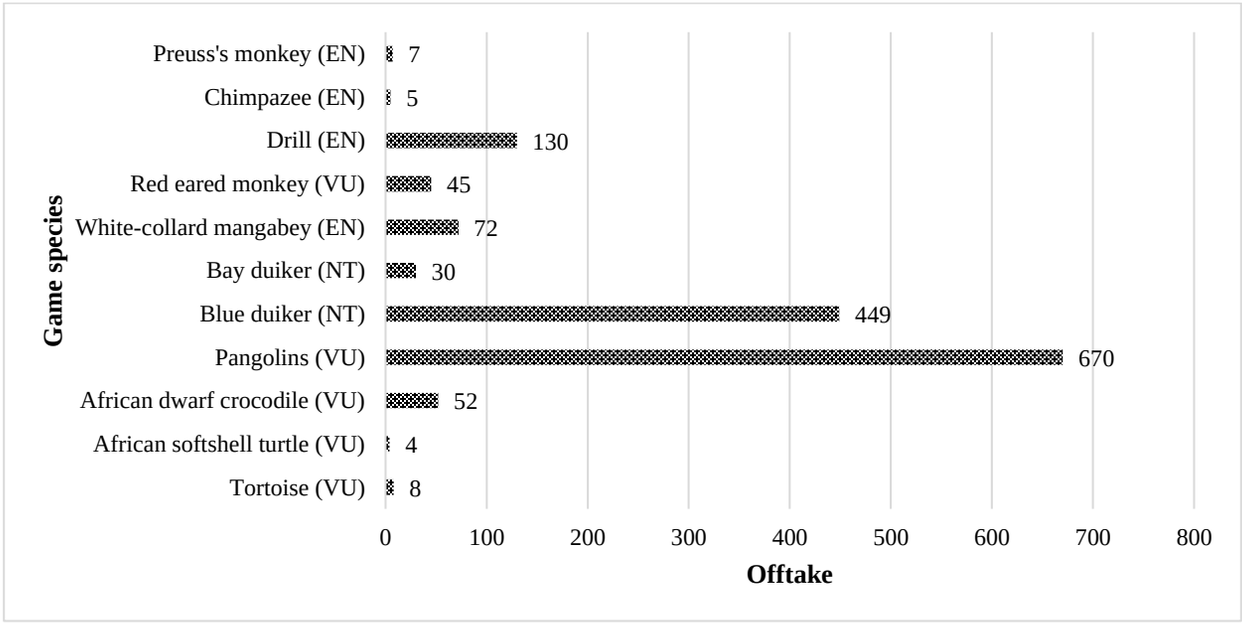
Roadside bush meat is traded in varied forms (cooked and freshly caught) and sold by young and middle age women at various spots that have sprouted between Bantoum village in Bangangte Sub-Division and the entrance of Tonga town. The high traffic along the Bafoussam-Yaounde National Road offers an attractive stop point at the road junction of Tonga.

The environmental status of animal species status traded at Tonga

Commercialisation of animals from the wild is regulated according to communities and national policies. While in most communities in Cameroon, commercialisation of the animals of the wild is permitted for reasons of subsistence, the situation in Tonga has quickly grown into a capitalist community hunting activity. Trading on protected threatened species in the villages of Tonga have become more of a norm rather than an exception (Fig. 7 and 8). A total of 1352 carcasses of internationally threatened species were recorded. These comprise of the white collard mangabay (72), red-eared monkey (45), drill (130), chimpanzee (05), Preuss's monkey (07), bay duiker (449), yellow-black duiker (30), pangolins (670), African dwarf crocodile (52) and 08 tortoise and 04 African softshell turtle (Fig. 7).



N.B: Abbreviation are according to IUCN red list status for the species

Figure 7: **Threatened species traded in Tonga**

Source: **Fieldwork (2017)**

These species are hunted from across the thirteen (13) source regions of the bush meat hunting and trade ecological triangle (Fig. 8). Primates and duikers were more common in forest and forest savanna mosaic ecosystem source regions like Bassamba, Badounga, Bitchoua and Sankie (Fig. 8, 9 and 10). These are communities in which the dominant activities is farming. Pangolins are mostly supplied from other source regions. African dwarf crocodiles are hunted from wetland ecologies of Bassamba, Badounga, Sankie, Noun Forest Reserve and Balua. Tortoises are in three main source regions being Badounga, Sankie and Balua that have wetland swamps. Though tortoise is not an important traded game species in Tonga, Morcatty & Valsecchi (2015) observed that the tortoise trade was found to primarily supply nearby urban centres.

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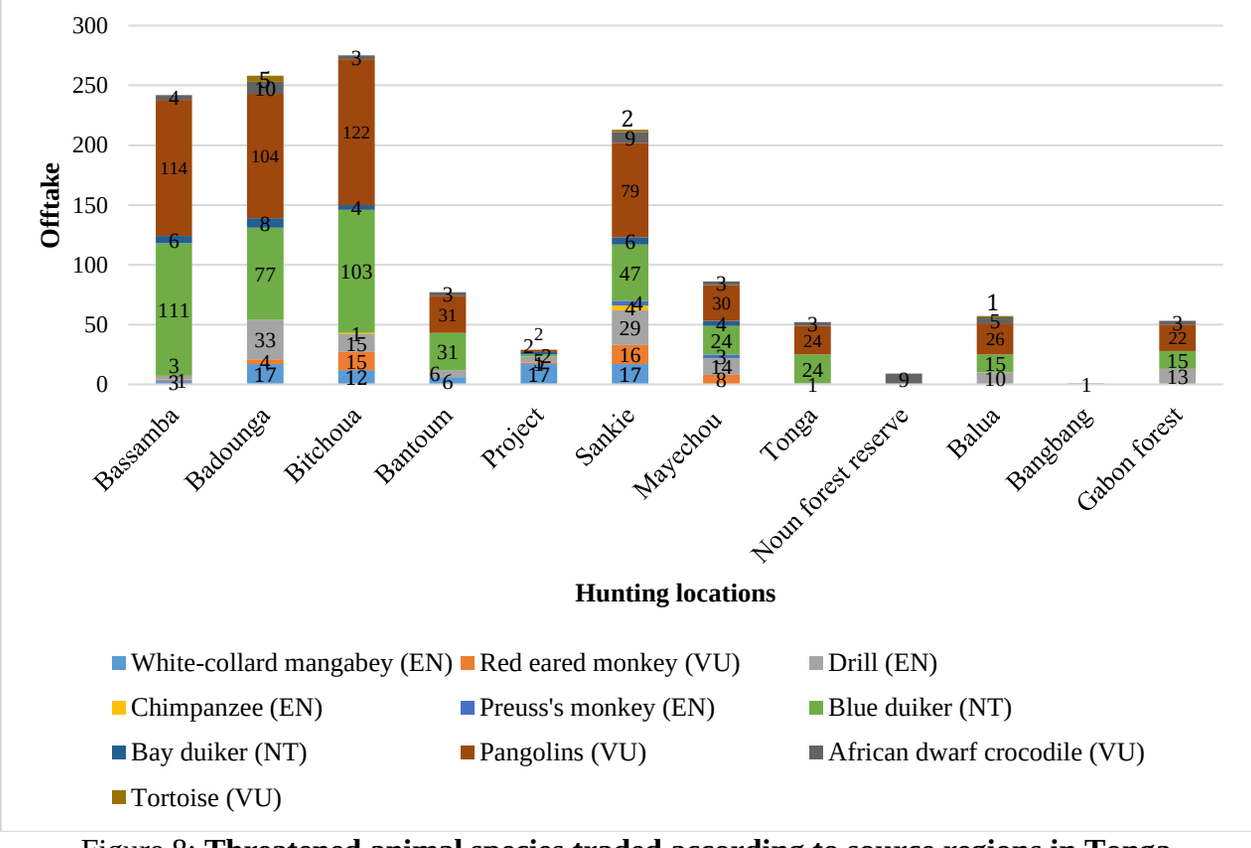

Figure 8: **Threatened animal species traded according to source regions in Tonga**
Source: **Fieldwork (2017)**

The hunting of pangolins (Plate 1) in Tonga is multifaceted. In the first place, it is hunted for bush meat trade (a retail chunk of Pangolin is 700 FCFA as against 500 FCFA for others) and its scales are exported.

Plate 1. Variety of some traded pangolins and ungulates

Source: **Fieldwork (2017)**

Pangolins are globally categorized as vulnerable by the IUCN and placed under Appendix I of CITES (the most endangered species threatened with extinction). Krishnasamy and Shepherd (2017) reported that important quantities of African pangolins are smuggled abroad through Malaysia. Drill is another most threatened hunted and traded

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primate within the area. These species are not only threatened by poaching and wild trade but also habitat destruction link to settlement related activities like encroaching farmlands, logging and settlement expansion. Roadside bush meat consumers are mostly travels crossing the town to the West and North West Regions or to the Centre and South Regions of Cameroon.

Even though trade in sea and aquatic turtle species is prohibited under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), illegal trafficking persists in Tonga. There is increase catch of African softshell turtle from nearby rivers of the hunting zone. The sustainability of this freshwater African softshell turtle is threatened as local fishermen increasingly identify attractive baits for trapping it. This lucrative trade in illegal game species is facilitated by the roadside sale of bush meat eating complement (Plate 2.) mainly as roasted plantains and yams and beer parlours.

Plate 2. Cooked game meat and complements at the Tonga bush meat hub

Source: **Fieldwork (2017)**

Albeit the environmental threatened status, the consumption of bush meat has health related concerns in the like of the *ebola* crisis that stroke parts of the Congo Basin in 2014-2016 transmitted by wild animals especially primates (chimpanzees, gorillas, and monkeys), fruit bats, forest antelopes and porcupines of the type hunted and consumed in Tonga. Early 2018, the Ministry of Public Health, Cameroon, reported the outbreak of monkey-pox, which is a zoonotic disease in some parts of the neighbouring South West and North West Regions through human-animal contact (Hu & Cohn, 2018). Poor and unguided dissection and cooking of African Rock Python generates cumulative health hazards.

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The Tonga bush meat hunting zones of traded game species

The land cover/use of the bush meat hunting and trade hub is varied. Forest, forest-savanna transition and grasslands characterise the landscape of Tonga (Fig. 9.).

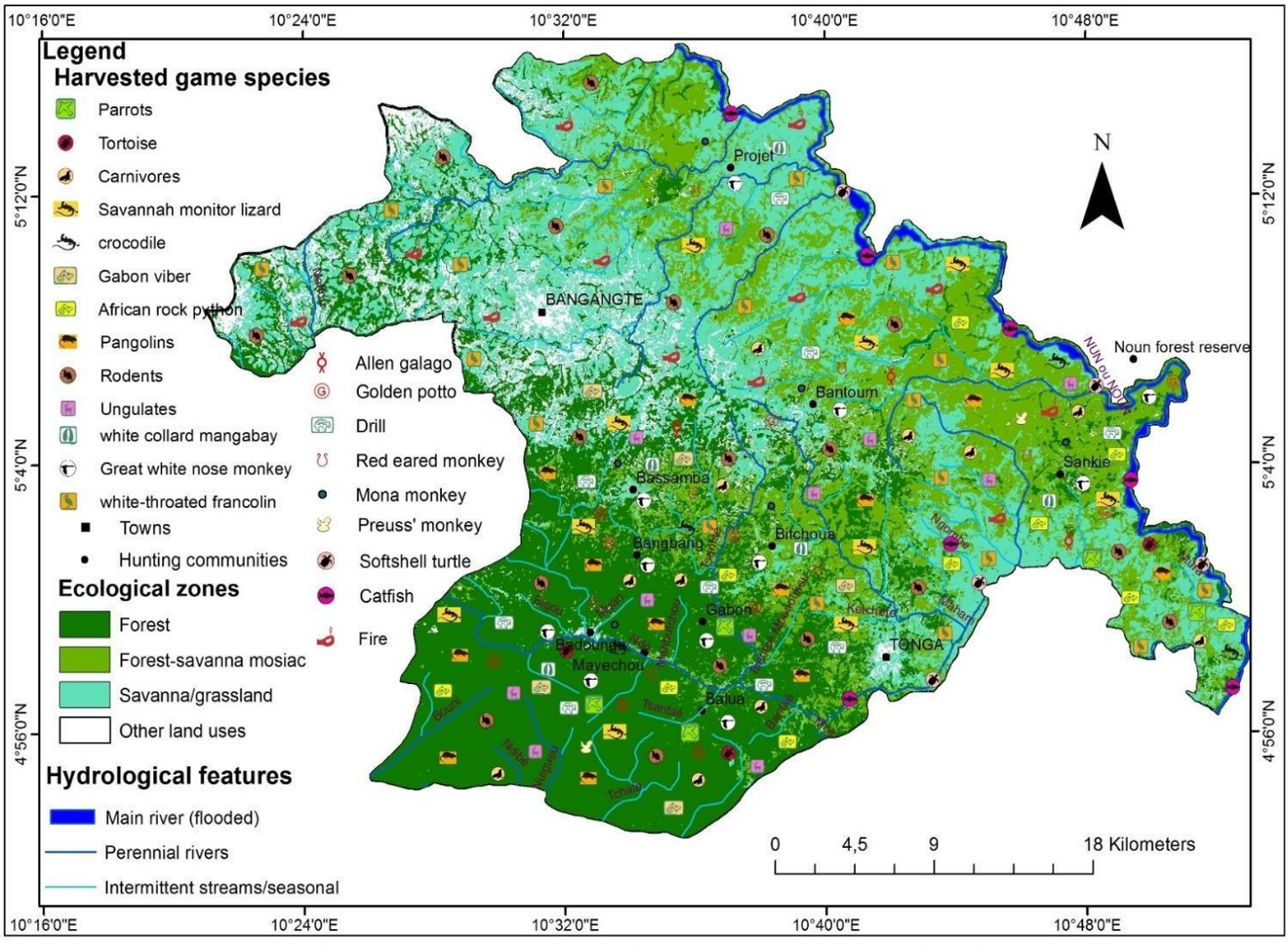

Figure 9: **Distribution of reported major hunted game species within the ecolgical traingle**
Sources: **Fieldwork & Figure 6 (2017), classified composite Sentinel-2 imagery at 10m spatial resolution (ESA, 2018), and geodatabase of Administrative limits of Cameroon (NIC, 2016)**

A remote sensing image classification was made and reveals that much of the Tonga grassland has been burnt. This is a stakeholder dry season strategy to catch game species especially rodents like cane rats, and to also enable fresh grass shoots appear fast considering the warm-wet climatic condition of Tonga. This is to attract grass eating ungulates like blue duikers. The period wherever these grasslands are burned is often matched with increase hunt catch of cane rats and some cattle grazers in search of fresh grass for their herds. The forest-savanna transition area that is a blend of double climatic conditions, constitutes preferred habitats for most hunted game species. There is an abundant biodiversity (Plate 3) of not only mammals but reptiles to birds permitting a flourishing game harvesting and trade on which many livelihoods are now being sustained.

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Plate 3. Commonly hunted reptiles and fish species in Tonga

Source: **Fieldwork (2017)**

This ecolgical traingle is rich in some endemic species such as the African softshell turtle, hunted by fishermen from Rivers Ngombe, River Nde and Noun. These rivers suggestive of specific ecogeographic zones harbouring some rare species of fishes like the giant catfish that could weigh as much as 25kg for the species caught.

CONCLUSION

The bush meat hunt and commercialisation is an income generating activity for forest dependent rural households in forested zone of Cameroon. Tonga hunting zone shows a high concentration of game animals within the forested south western and eastern areas at an intensity that beats current legislation on the matter. The locational position of Tonga has given the bush meat economy a high level of stakeholder involvement with rippling effects beyond the West Region. The traditional subsistence bush meat hunting has thus progressed to a modern market-driven bush meat harvesting, raising important concerns about the environmental sustainability of the activity in the light of national and international legislation. This study that has made a contribution to identify zones of high susceptibility to being endangered reveals the urgent need for a targeted sensitization of local populations on the importance of protecting threatened species. This study displays the necessity to incorporate local communities in the mainstream of the conservation policy anchored on a well-designed bush meat hunting and trade monitoring platform that is robust enough for a sustainable wildlife conservation in Cameroon and at the same time commensurate with the Man and the Biosphere ecosystemic approach to non-timber forest resources management within forest ecoregions.

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