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Presence of Key Biodiversity Area trigger species in the Grand Kru Forests of Liberia

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Introduction

Tropical forests contain nearly three-quarters of global biodiversity and are some of the richest and most threatened habitats on the planet (Corlett 2018). The Upper Guinea Forest of West Africa is a biodiversity hotspot with a high endemism index (25% of vascular plants are endemics), of only 140,000 km² (15%) remains (CEPF 2000), IUCN and UNEP-WCMC 2013). Of this, 40% of the most intact blocks are located in Liberia. Various species of global and regional conservation concern are found in the forests centered around Liberia, such as the Western Chimpanzee (*Pan troglodytes verus*), Forest Elephant (*Loxodonta cyclotis*), and Pymgy Hippopotamus (*Choeropsis liberiensis*) (FFI 2016), among others. Liberia has become central to the conservation of these species, but a relatively young conservation sector, still growing protected area management network, and poor primary species data present challenges.

Liberia's protected area network requires accurate information on priority areas to ensure effectiveness for conservation of important species, as many parts of these forests are fragmented and interspersed with commercial concessions, and human structures such as roads. The connectivity of endangered species populations must be considered if the forests should be effectively managed for populations resilient to climate change. Urbanization and connectivity of roads across Liberia have caused the country's forests to be split two blocks. In Liberia's south-eastern forest block, Sapo National Park and Grebo-Krahn National Park, both have populations of regionally endangered flagship species. The actual ranges of wide-ranging species and that others with smaller or less-defined ranges must be accounted for in the designation of protected areas.

In 2016, BirdLife International created a database of areas across the world which qualify as essential for biodiversity (BirdLife 2017). The importance of these areas was decided as dependent on whether or not the sites host a substantial portion of global population of range-restricted, endangered, or congregatory species or contains a globally threatened habitat or watershed. In the absence of the requisite data, most Key Biodiversity Areas (KBAs) were designated based on information from previously existing Important Bird and Biodiversity Areas (IBAs) and areas of conservation concern. Due to their unprotected status, there is little species data available from the Grand Kru Forests and community forests, making it difficult to effectively plan conservation actions for Liberia's southeastern forest block outside of the two protected areas.

This report includes an account of complete project activities, outcomes, lessons learned, and implications for conservation planning of the results.

Aims of the Study

We assessed the presence of 39 species of birds and mammals listed as Critically Endangered CR, Endangered EN, Vulnerable VU, or Data Deficient DD (therefore potentially CR, EN, or VU) on the IUCN RedList. Their classification as such make them potential trigger species for Key Biodiversity Areas, under the criteria of hosting globally endangered populations of species. The information obtained here would provide some basis for further studies to determine population structure and size in the individual blocks and the landscape as a whole. All this information is needed to determine if these areas actually retain the characteristics for which they were designated as IBAs and subsequently as KBAs.

Methodology

The survey lasted 10 days (November 9th – 18th), and included a total of 16 communities, 5 in GKW and 11 in GKE. Despite the dry season, there were heavy rains on three of the ten days. Collection of field data was done in the mornings in selected forests where we were taken by hunters or other available guides, and in the afternoon during relocation treks between villages. In each community, at a general meeting, the purpose of the visit was explained as seeking a better understanding of the animals found in the area, through the hunters. With agreement, hunters identified by the town chief were asked to name some of the animals found in their forests. Then one or two hunters were selected to complete the survey of target species. In communities where there were two hunters available, the process was done separately from each other, but all hunters had some input from the gathered crowd (Image 1). After the survey, some basic information on hunting methods was reviewed with some of the hunters.



Image 1: Gathered crowd during one survey

Study Area

The field work was carried out in Grand Kru County, in the forest areas marked by the Protected Planet database as the limits of the Grand Kru Key Biodiversity Areas in the eastern (GKE) and western (GKW) parts of the county (Figure 1). The western unit is closer to the proposed Krahn-Bassa forest and Sapo National Park. The grand kru forests are separated partly by a motor road running from Grand Cess on the coast to Barclayville to

Kunea (Figure 1) and northward to Ganta in Nimba County (Figure 1). Both blocks are primary forest mixed with patches of young bush and farmland and many settlements, some of which are located deep in the forests. The Dugbe River flows along the southern edge of the GWK and along the north western edge of GKE, so some riverside forest was also included.

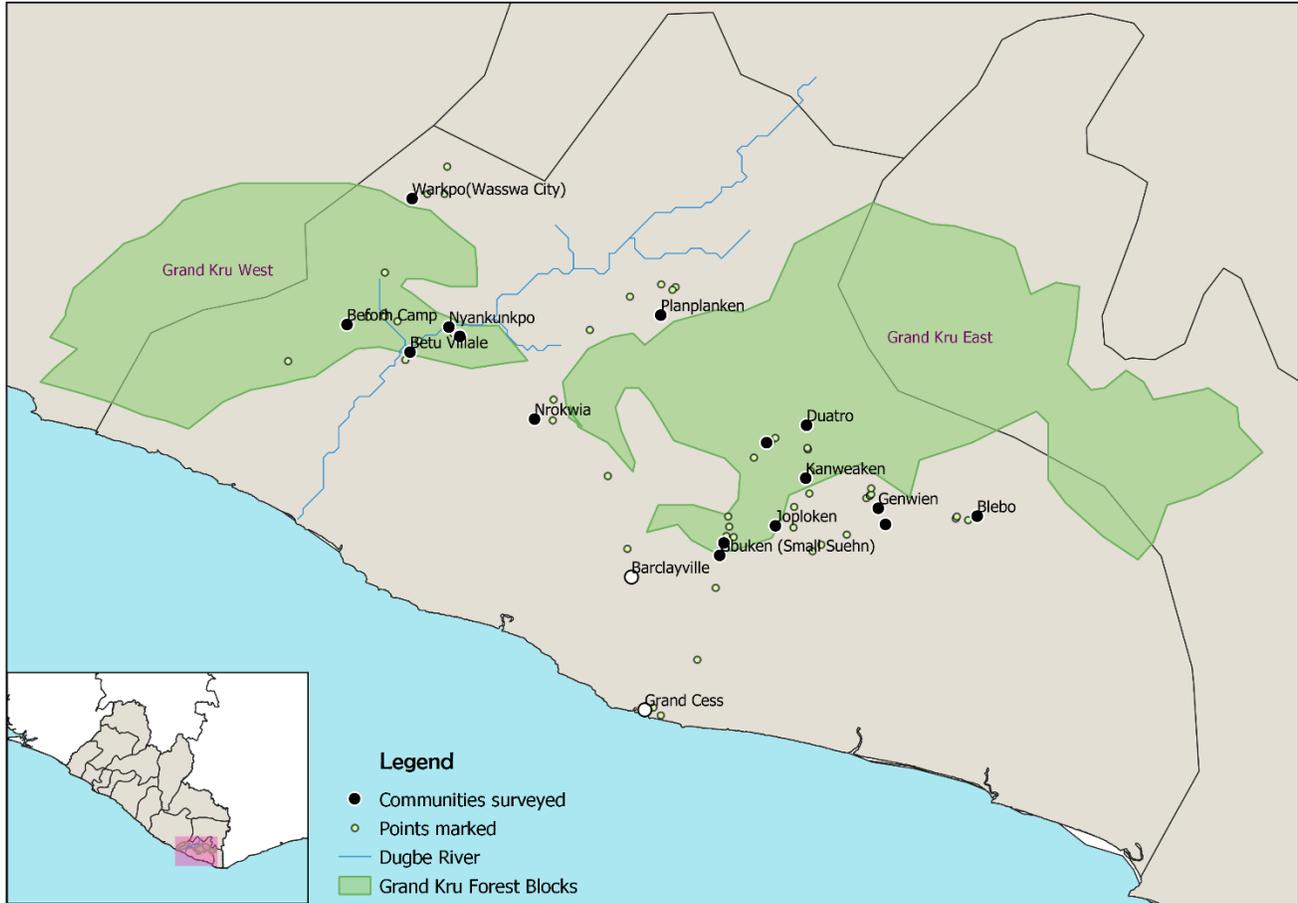


Figure 1: Map of the study area showing borders of Grand Kru forest blocks and sites visited

Target species

The 39 targeted species can be grouped into birds and mammals, the former including raptors and owls (5), other large birds (5), and small birds (4), and the latter including ungulates (4), pangolins (3), primates (5), cats (5), bats (5), and small mammals (3). In order to provide some comparison or means of judging hunter effectiveness in species identification, species which do not occur in the region were also added in some of these groups, including a Bontebok with the ungulates, Mandrill with the primates, Painted Woolly Bat with the bats, Bateleur with the raptors, Shoebill with the medium-sized birds, and Golden-backed Bishop and Greater Honeyguide with the small birds. The images used for species are available upon request.

Results

Species occurrence in the area is represented by a rate, calculated as a percentage based on the total number of positive hunter responses divided by the total number of hunter responses. Most of the target species were judged to be present in the region by over 20% of hunters (Table 1), with the exception of the Horseshoe bats. Decoy species were also mostly identified as present, based on similarities to other species not included on the list.

Raptors

The three distinct owl species were lumped as the same by many of the hunters. Rufous Fishing Owl was indicated to be present by 86% of hunters in the eastern block and 100% of hunters in the western block, Shelley's Eagle Owl as most prevalent in the eastern block (91%) than the western (60%), and Maned Owl had the lowest confirmation rate, with 55% of hunters in the eastern block recognizing and confirming its presence and only 20% doing so in the western block. Martial Eagle and Tawny Eagle were both confirmed as present by over 80% of hunters in both blocks, and both with slightly more confirmations in the eastern than the western. They were also frequently lumped together. The Bateleur* was identified as present by 36% and 40% of hunters in the eastern and the western blocks.

Other large birds

Both hornbill species were lumped into one by many hunters interviewed. Hunter responses indicated the Yellow-casqued Hornbill is present across the entire region, with apt descriptions of the sexually dimorphic species. The Brown-cheeked Hornbill was often mistaken for the Yellow-casqued male, but closer inspection by hunters yielded positive responses from 68% of hunters in the eastern block and positive responses from 100% in the western block. Yellow-headed Picathartes were confirmed as present by 77% and 70% in the western and eastern block, and large rock formations were noted along several of the forest paths, in support of the presence of this species. White-breasted Guinea fowl were confirmed as present by 77% of hunters in the eastern block and 100% in the western block, and Timneh Parrots were confirmed as present in 77% and 80% in the same. The Shoebill* was positively identified by 40% of hunters in both blocks.

Small birds

Many of the species were confused for other species, as follow up questions attempted were met with descriptions of weaver behavior and sunbird feeding habits, or insistence that the species occurs in young bush for certain proven forest specialists such as the Gola Malimbe. Gola Malimbe was indicated as present by 64% and 90% of hunters in the eastern and western forest blocks. Yellow-bearded Greenbul was confirmed as present by 86% and 80%, Black-headed Rufous Warbler 91% and 90%, and Sierra Leone Prinia by 95% and 100% of hunters in the eastern and western blocks respectively. Both decoy species Golden-backed Bishop and Greater Honeyguide were confirmed as present by between 40% and 64% of hunters in those areas.

Pangolins

Hunter responses indicate that all three pangolin species are present all across the region, with only some 10% of hunters in the western block marking Giant Ground Pangolin as absent. All hunters seemed familiar with the species, and described their behavior accurately.

Ungulates

Hunter responses indicate there are more frequent encounters with Zebra duikers and Pygmy Hippopotamus in the western than eastern, while there are more with Forest Elephant and Jentink's Duiker in the eastern GK block than the western one. Based on these estimates, elephants are relatively rare in the western block, with only 20% of hunters confirming the presence there. The Bontebok* was judged to be present by over 50% of hunters in both blocks.

Primates

Hunter responses indicate presence of Western Chimpanzee in both blocks, and nearly the same for Diana Monkey besides one negative response in the eastern block. Olive Colobus and Western Red Colobus were judged to be more prevalent in the western block than the eastern, while King Colobus was shown to be the least common primate species with only 73% of hunters indicating presence in the eastern block and less than half that in the western block. King Colobus was mistaken for Diana Monkey on several occasions, but all other species seemed to be very well known. Mandrills* were judged to be present by less than 15% of hunters in each block, the lowest occurrence of all the decoy species.

Cats and cat-like species

Hunter responses indicate the presence of all queried species in this group, with African Golden Cat judged to be present by 50% and 40% of hunters in the eastern and western block, and Leopard judged to be present by 86% and 80% of the same. King Genet, Bourlon's Genet, and West African Oyan were judged to be present by over 80% of hunters interviewed. Visible differences between the images of species shown were often dismissed, and lumped together as the same species by hunters. Genets were therefore likely misidentified as one another or any of the other four possible and more common genet species which may occur here: *Genetta genetta*, *Genetta johnstoni*, *Genetta pardina*, or *Genetta theirryi*.

Small mammals

Liberian Mongoose was judged as widely present in the area with over 95% confirmations in both blocks. Pel's flying squirrel was also confirmed to be present over 95% in the eastern block, and 60% in the western. Nimba Otter Shrew was indicated to be present by 70% of hunters in the western block and 85% in the eastern one. The Nimba Otter Shrew was frequently mistaken for a porcupine, and corrections were unsuccessful since the species lacks any striking features. While the species was stated as present in many parts of the region (see image 2.13 below), the mistaken identity means these results cannot reliably reflect new recorded range of the range-restricted Nimba Otter Shrew.

Bats

Of the bat species shown, Isabelline White-winged Serotine was the most often confirmed as present (91% in the eastern block and 100% in the western). Rosevear's Serotine was judged as present by 68% of hunters in the eastern block and only 30% in the western. Horseshoe bats were not distinguished from one another, and were judged as completely absent in the eastern block and recognized as present by only 10% of hunters in the western block. Aellen's Roundleaf Bat was identified positively by 23% of hunters in the eastern block and by 10% in the western block. The Painted Woolly Bat* was identified as present by 45% of hunters in the eastern and 20% in the western block.

Table 1: Results on target species in the region by forest block

Group	Common name	Scientific name	Local name	IUCN Status	GKE	GKW
Raptors	Rufous Fishing Owl	<i>Scotopelia ussheri</i>	Owl	Vulnerable	86%	100%
	Maned Owl	<i>Jubula lettii</i>	Owl	Data Deficient	55%	20%
	Shelley's Eagle Owl	<i>Bubo shelleyi</i>	Owl	Vulnerable	91%	60%
	Martial Eagle	<i>Polemaetus bellicosus</i>	Eagle	Endangered	100%	80%
	Tawny Eagle	<i>Aquila rapax</i>	Eagle	Vulnerable	91%	90%
	Bateleur*	<i>Terathopius ecaudatus</i>		Endangered	36%	40%
Other large birds	Yellow-casqued hornbill**	<i>Ceratogymna elata</i>	Hornbird	Vulnerable	100%	100%
	Brown-cheeked hornbill	<i>Bycanistes cylindricus</i>	Hornbird	Vulnerable	68%	100%
	White breasted guineafowl	<i>Agelastes meleagrides</i>	Clear-head	Vulnerable	77%	100%
	Yellow-headed Picathartes	<i>Picathartes gymnacephalus</i>		Vulnerable	77%	70%
	Timneh Parrot**	<i>Psittacus timneh</i>	Chicken Hawk	Endangered	77%	80%
	Shoebill*	<i>Balaeniceps rex</i>		Vulnerable	41%	40%
Small birds	Gola Malimbe	<i>Malimbus ballmanni</i>		Endangered	64%	90%
	Yellow-bearded Greenbul	<i>Criniger olivaceus</i>		Vulnerable	86%	80%
	Black-headed Rufous Warbler	<i>Bathmocercus cerviniventris</i>		Data Deficient	91%	90%
	Sierra Leone Prinia	<i>Schistolais leontica</i>		Endangered	95%	100%
	Golden-backed bishop*	<i>Euplectes aureus</i>		Least Concern	64%	50%
	Greater Honeyguide*	<i>Indicator indicator</i>		Least Concern	59%	40%
Ungulates	African Forest Elephant**	<i>Loxodonta cyclotis</i>	Elephant	Vulnerable	68%	20%
	Zebra Duiker	<i>Cephalophus zebra</i>	Mountain Deer	Vulnerable	95%	100%
	Jentink's Duiker	<i>Cephalophus jentinki</i>	Elk (Air) Deer	Endangered	95%	80%
	Pygmy Hippopotamus	<i>Choeropsis liberiensis</i>	Hippo	Endangered	91%	100%
	Bontebok*	<i>Damaliscus pygargus</i>		Vulnerable	55%	60%
Pangolins	Black-bellied Pangolin	<i>Phataginus tetradacyla</i>	Antsbear	Vulnerable	100%	90%
	White Bellied Pangolin	<i>Phataginus tricuspis</i>	Antsbear	Endangered	100%	100%
	Giant Ground Pangolin	<i>Smutsea gigantea</i>	Wild Antsbear	Endangered	100%	100%
Primates	Diana Monkey	<i>Cercopithecus diana</i>	Color Monkey	Endangered	95%	100%

	King Colobus	<i>Colobus polykomos</i>	White tail monkey	Endangered	73%	30%
	Olive Colobus	<i>Procolobus verus</i>	Monkey	Vulnerable	55%	70%
	Upper Guinea Red Colobus	<i>Piliocolobus badius</i>	Red Monkey	Endangered	73%	80%
	Western Chimpanzee**	<i>Pan troglodytes verus</i>	'Baboon'	Cr Endangered	100%	100%
	Mandrill*	<i>Mandrillus sphinx</i>		Vulnerable	14%	10%
Cats	African Golden Cat	<i>Caracal aurata</i>	'Lion'	Vulnerable	50%	40%
	Leopard	<i>Panthera pardus</i>	Leopard	Vulnerable	86%	80%
	King Genet	<i>Genetta poensis</i>	'Raccoon'	Data Deficient	82%	100%
	Bourlon's Genet	<i>Genetta bourloni</i>	'Raccoon'	Vulnerable	100%	100%
	West African Oyan	<i>Poiana leightoni</i>	'Raccoon'	Vulnerable	91%	80%
Small mammals	Pel's flying squirrel	<i>Anomalurus pelii</i>	Tohnoh	Data Deficient	95%	60%
	Liberian Mongoose	<i>Liberiictus kuhni</i>	Doo	Vulnerable	95%	100%
	Nimba Otter Shrew	<i>Micropotamogale lamottei</i>	'Porcupine'	Vulnerable	86%	70%
Bats	Aellen's Roundleaf Bat	<i>Hipposideros marisae</i>	Bat	Vulnerable	23%	10%
	Guinean Horseshoe Bat	<i>Rhinolophus guineensis</i>	Bat	Endangered	0%	10%
	Ziama Horseshoe Bat	<i>Rhinolophus ziama</i>	Bat	Endangered	0%	10%
	Isabelline White-winged Serotine	<i>Neoromicia isabella</i>	Bat	Data Deficient	91%	100%
	Rosevear's Serotine	<i>Neoromicia roseveari</i>	Bat	Endangered	68%	30%
	Painted Woolly Bat*	<i>Kerivoula picta</i>		N. Threatened	45%	20%

*species which do not occur here and were included as decoys to determine hunter reliability

**species which were also recorded in the field



Image 2: The hunter survey in progress

Field Survey

Species were recorded in the field using sightings, calls and signs, and hunter trophies (photos included in the Appendix of additional relevant photos). A total of 146 bird species were identified in the study area, as well as 9 mammal species, and 8 Lepidoptera species (Table 2). Four of these were target species (See Table 1). Hunters guiding us through the forests identified the dung and signs of a few of the species signs we encountered.

Table 2: Species recorded in the field

Common Name	Scientific Name	GKE	GKW
Afep Pigeon	<i>Columba unicincta</i>	X	
African Black Swift	<i>Apus barbatus</i>		X
African Emerald Cuckoo	<i>Chrysococcyx cupreus</i>	X	X
African Green Pigeon	<i>Treron calvus</i>	X	X
African Harrier-Hawk	<i>Polyboroides typus</i>	X	X
African Palm Swift	<i>Cypsiurus parvus</i>		X
African Pied Hornbill	<i>Lophoceros fasciatus</i>	X	X
African Wood Owl	<i>Strix woodfordii</i>		X
Ahanta Francolin	<i>Pternistis ahantensis</i>	X	X
Ansorge's Greenbul	<i>Eurillas ansorgei</i>		X

Barn Swallow	<i>Hirundo rustica</i>	X	
Black Bee-eater	<i>Merops gularis</i>	X	X
Black-and-white Mannikin	<i>Lonchura bicolor</i>	X	
Black-and-white Shrike-flycatcher	<i>Bias musicus</i>		X
Black-and-white-casqued Hornbill	<i>Bycanistes subcylindricus</i>		X
Black-headed Oriole	<i>Oriolus larvatus</i>		X
Black-necked Weaver	<i>Ploceus nigricollis</i>	X	X
Black-throated Coucal	<i>Centropus leucogaster</i>	X	X
Black-winged Oriole	<i>Oriolus nigripennis</i>		X
Black-winged Red Bishop	<i>Euplectes hordeaceus</i>	X	
Blue Malkoha	<i>Ceuthmochares aereus</i>	X	
Blue-billed Malimbe	<i>Malimbus nitens</i>	X	X
Blue-headed Wood Dove	<i>Turtur brehmeri</i>	X	X
Blue-spotted Wood Dove	<i>Turtur afer</i>	X	X
Blue-throated Brown Sunbird	<i>Cyanomitra cyanolaema</i>	X	X
Blue-throated Roller	<i>Eurystomus gularis</i>		X
Bristle-nosed Barbet	<i>Gymnobucco peli</i>		X
Bronze Mannikin	<i>Lonchura cucullata</i>	X	
Brown Illadopsis	<i>Illadopsis fulvescens</i>	X	X
Brown-eared Woodpecker	<i>Campethera caroli</i>		X
Buff-spotted Woodpecker	<i>Campethera nivosa</i>		X
Capuchin Babbler	<i>Phyllanthus atripennis</i>	X	X
Cassin's Flycatcher	<i>Muscicapa cassini</i>		X
Cassin's Hawk-Eagle	<i>Aquila africana</i>	X	
Chestnut Wattle-eye	<i>Platysteira castanea</i>		X
Chestnut-breasted Nigrita	<i>Nigrita bicolor</i>		X
Chestnut-winged Starling	<i>Onychognathus fulgidus</i>		X
Chocolate-backed Kingfisher	<i>Halcyon badia</i>		X
Collared Sunbird	<i>Hedydipna collaris</i>	X	X
Common Bulbul	<i>Pycnonotus barbatus</i>	X	
Common Sandpiper	<i>Actitis hypoleucos</i>		X
Common Whitethroat	<i>Sylvia communis</i>	X	
Copper-tailed Starling	<i>Hylopsar cupreocauda</i>		X
Crested Guineafowl	<i>Guttera verreauxi</i>	X	
Diederik Cuckoo	<i>Chrysococcyx caprius</i>	X	
Fanti Saw-wing	<i>Psalidoprocne obscura</i>	X	X
Fire-bellied Woodpecker	<i>Chloropicus pyrrhogaster</i>		X
Forest Robin	<i>Stiphrornis erythrothorax</i>	X	X
Forest Scrub Robin	<i>Cercotrichas leucosticta</i>	X	X
Fork-tailed Drongo	<i>Dicrurus adsimilis</i>	X	
Giant Kingfisher	<i>Megaceryle maxima</i>		X

Golden Greenbul	<i>Calyptocichla serinus</i>	X	X
Great Blue Turaco	<i>Corythaeola cristata</i>	X	X
Green Hylia	<i>Hylia prasina</i>	X	X
Green Sandpiper	<i>Tringa ochropus</i>		X
Green-backed Camaroptera	<i>Camaroptera brachyura</i>	X	
Green-headed Sunbird	<i>Cyanomitra verticalis</i>	X	
Green-tailed Bristlebill	<i>Bleda eximius</i>	X	
Grey Longbill	<i>Macrosphenus concolor</i>	X	X
Grey Parrot	<i>Psittacus erithacus</i>	X	X
Grey-backed Camaroptera	<i>Camaroptera brevicaudata</i>	X	X
Grey-headed Bristlebill	<i>Bleda canicapillus</i>	X	X
Grey-headed Nigrita	<i>Nigrita canicapillus</i>	X	X
Hadada Ibis	<i>Bostrychia hagedash</i>	X	
Honeyguide Greenbul	<i>Baeopogon indicator</i>	X	X
House Sparrow	<i>Passer domesticus</i>	X	
Icterine Warbler	<i>Hippolais icterina</i>		X
Johanna's Sunbird	<i>Cinnyris johannae</i>	X	X
Klaas's Cuckoo	<i>Chrysococcyx klaas</i>	X	X
Levaillant's Cuckoo	<i>Clamator levaillantii</i>		X
Little Bee-eater	<i>Merops pusillus</i>		X
Little Green Sunbird	<i>Anthreptes seimundi</i>	X	X
Little Greenbul	<i>Eurillas virens</i>	X	X
Little Grey Greenbul	<i>Eurillas gracilis</i>		X
Lizard Buzzard	<i>Kaupifalco monogrammicus</i>	X	
Long-tailed Hawk	<i>Urotriorchis macrourus</i>	X	
Lowland Sooty Boubou	<i>Laniarius leucorhynchus</i>	X	X
Northern Fiscal	<i>Lanius humeralis</i>	X	
Northern Grey-headed Sparrow	<i>Passer griseus</i>	X	X
Olive Long-tailed Cuckoo	<i>Cercococcyx olivinus</i>	X	X
Olive Sunbird	<i>Cyanomitra olivacea</i>	X	X
Olive Woodpecker	<i>Dendropicus griseocephalus</i>	X	
Olive-bellied Sunbird	<i>Cinnyris chloropygius</i>	X	X
Olive-green Camaroptera	<i>Camaroptera chloronota</i>	X	X
Orange Weaver	<i>Ploceus aurantius</i>	X	
Orange-cheeked Waxbill	<i>Estrilda melpoda</i>	X	
Palm-nut Vulture	<i>Gypohierax angolensis</i>	X	X
Pied Crow	<i>Corvus albus</i>	X	X
Pin-tailed Whydah	<i>Vidua macroura</i>	X	
Piping Hornbill	<i>Bycanistes fistulator</i>	X	X
Red-bellied Malimbe	<i>Malimbus erythrogaster</i>	X	
Red-bellied Paradise Flycatcher	<i>Terpsiphone rufiventer</i>	X	X

Red-billed Dwarf Hornbill	<i>Lophoceros camurus</i>	X	X
Red-billed Helmetshrike	<i>Prionops caniceps</i>		X
Red-chested Cuckoo	<i>Cuculus solitarius</i>		X
Red-eyed Dove	<i>Streptopelia semitorquata</i>	X	X
Red-fronted Antpecker	<i>Parmoptila rubrifrons</i>		X
Red-headed Malimbe	<i>Malimbus rubricollis</i>	X	X
Red-rumped Swallow	<i>Cecropis daurica</i>		X
Red-rumped Tinkerbird	<i>Pogoniulus atroflavus</i>	X	X
Red-tailed Greenbul	<i>Criniger calurus</i>	X	X
Red-vented Malimbe	<i>Malimbus scutatus</i>	X	X
Rock Firefinch	<i>Lagonosticta sanguinodorsalis</i>		X
Rufous-winged Illadopsis	<i>Illadopsis rufescens</i>		X
Senegal Coucal	<i>Centropus senegalensis</i>	X	
Sharpe's Apalis	<i>Apalis sharpii</i>	X	
Simple Greenbul	<i>Chlorocichla simplex</i>	X	
Slender-billed Greenbul	<i>Stelgidillas gracilirostris</i>	X	X
Speckled Tinkerbird	<i>Pogoniulus scolopaceus</i>	X	X
Splendid Starling	<i>Lamprotornis splendidus</i>	X	X
Spotted Greenbul	<i>Ixonotus guttatus</i>	X	X
Square-tailed Saw-wing	<i>Psalidoprocne nitens</i>		X
Superb Sunbird	<i>Cinnyris superbus</i>		X
Swamp Palm Bulbul	<i>Thescelocichla leucopleura</i>	X	X
Tambourine Dove	<i>Turtur tympanistria</i>	X	X
Tawny-flanked Prinia	<i>Prinia subflava</i>	X	
Tessmann's Flycatcher	<i>Muscicapa tessmanni</i>	X	X
Trumpeter Hornbill	<i>Bycanistes bucinator</i>		X
Variable Sunbird	<i>Cinnyris venustus</i>	X	
Velvet-mantled Drongo	<i>Dicrurus modestus</i>	X	X
Vieillot's Black Weaver	<i>Ploceus nigerrimus</i>	X	
Village Weaver	<i>Ploceus cucullatus</i>	X	X
Violet-backed Starling	<i>Cinnyricinclus leucogaster</i>	X	
Western Bearded Greenbul	<i>Criniger barbatus</i>	X	X
Western Bluebill	<i>Spermophaga haematina</i>	X	
Western Bronze-naped Pigeon	<i>Columba iriditorques</i>	X	X
Western Nicator	<i>Nicator chloris</i>	X	X
Western Oriole	<i>Oriolus brachyrynchus</i>	X	X
Whistling Cisticola	<i>Cisticola lateralis</i>	X	
White-crested Hornbill	<i>Horizocerus albocristatus</i>	X	X
White-faced Whistling Duck	<i>Dendrocygna viduata</i>	X	
White-tailed Alethe	<i>Alethe diademata</i>	X	X
White-throated Bee-eater	<i>Merops albicollis</i>	X	X

White-throated Swallow	<i>Hirundo albigularis</i>		X
Woolly-necked Stork	<i>Ciconia episcopus</i>		X
Yellow-bearded Greenbul	<i>Criniger olivaceus</i>		X
Yellow-billed Barbet	<i>Trachyphonus purpuratus</i>	X	X
Yellow-billed Kite	<i>Milvus aegyptius</i>	X	X
Yellow-billed Turaco	<i>Tauraco macrorhynchus</i>	X	X
Yellow-browed Camaroptera	<i>Camaroptera superciliaris</i>	X	X
Yellow-casqued Hornbill	<i>Ceratogymna elata</i>	X	X
Yellow-mantled Widowbird	<i>Euplectes macroura</i>	X	
Yellow-rumped Tinkerbird	<i>Pogoniulus bilineatus</i>	X	X
Yellow-spotted Barbet	<i>Buccanodon duchailui</i>		X
Yellow-throated Tinkerbird	<i>Pogoniulus subsulphureus</i>	X	X
Yellow-whiskered Greenbul	<i>Eurillas latirostris</i>	X	X
Mammals			
Brush-tailed Porcupine (sign)	<i>Atherurus africanus</i>	X	X
Forest Buffalo (remnant)	<i>Syncerus caffer</i>	X	
Forest Elephant (dung)	<i>Loxodonta cyclotis</i>	X	
Genet spp. (remnant, prints)	<i>Genetta spp.</i>	X	X
Putty nosed Monkey (seen)	<i>Cercopithecus nictitans</i>		X
Red River Hog (dung)	<i>Potamochoerus porcus</i>	X	
Small Pangolin spp. (sign)	<i>Phataginus spp.</i>	X	X
Slender-tailed Squirrel (seen)	<i>Protoxerus aubinnii</i>	X	
Western Chimpanzee (remnant)	<i>Pan troglodyte verus</i>	X	
Insects			
African Plain Tiger	<i>Danaus chrysippus alcippus</i>	X	
Black bush brown	<i>Bicyclus martius</i>	X	
Black-tufted White-spots	<i>Osmodes lindseyi</i>		X
Comet moth spp.	<i>Eudaemonia argus</i>	X	
Common Ringlet	<i>Ypthima doleta</i>	X	
Guineafowl	<i>Hamanumida Daedalus</i>	X	
Variable Diadem	<i>Hypolimnas antedon</i>		X
White-banded Babul Blue	<i>Azonus isis</i>	X	

Hunter knowledge

Hunters responded gladly to the surveys, to the best of their knowledge, and with input from other community members including market women and elders. Many hunters identified decoy species included as present in the area. An often-present tell that this was a mistaken species was that there was no local name known for the species and additionally, no remnant parts were available from even the most iconic of species, such as the Mandrill and Shoebill. The relationship between hunter familiarity to species body size is an obvious one, and accounts for a lot of the doubt and mistaken identities observed during the survey, as often smaller species were skimmed over without much thought. This relationship extends in part to

whether or not the species are hunted for meat (those that are were generally larger and given to closer observation).



Image 3: Hunter and locals reviewing image of Martial Eagle and Yellow-casqued Hornbill

Certain species which have received more conservation attention, have immediately garnered more focus from hunters. Similar species whose images were placed close to another often resulted in all receiving the same rating, before prompts to look carefully, but species which were separate were also lumped in with other similar species, indicating a limit to differentiation of non-iconic species.

The effectiveness of hunter knowledge for information gathering and species monitoring have been explored in Europe and Asia, specifically for hunted species (Parry & Peres 2015), and for game birds (Christensen et al 2017; FACE 2017) and small mammals such as pangolins (Newton et al. 2008). Smaller species and those which lack distinct behavior or features can likely not be surveyed effectively using hunter knowledge.

With sufficient preparation and awareness, hunters can be used to monitor species in the further reaches of Liberia, especially in community forests where species knowledge is not well organized. This can be accomplished by preparing hunters for participation in species surveys, and providing well-designed and adaptable surveys.

Conservation Implications

The Grand Kru forests appear to be mostly similar in terms of KBA trigger bird species. Only 3 out of the 14 bird species and 4 out of 25 mammals included in the questionnaire had significant (over 30%) difference in occurrence between the eastern and the western block, a

loose indicator of mostly similar occurrence of the target species in both blocks. This could be taken to mean that one block is representative of the other, and vice versa. Recent actions by conservation bodies in the South-east indicate a focus on the gazettement of the western Grand Kru forest block and RiverGee immediately north of it as a single unit (the Grand Kru-River Gee PPA), with no plans as yet for the eastern block. The planned gazettement of the forest block and management as separate unit is due to the major road and river and accompanying settlements which separate them.

Many species which have been the focus of conservation action in the area and country are more widely known and therefore remembered than others, and this introduced an additional measure of bias into the survey, as some of these were also included. The reactions garnered during the surveys, however, can be partly used to judge community's interactions with species. For example, the lack of recognition often observed towards the Timneh Parrot indicates that most people are not familiar with the species, and therefore, that the species, while relatively abundant (recorded three times during survey), is not traded in this region. The additional questions posed to hunters yielded responses which indicate an awareness of the negative effect of indiscriminate traps in their forests and an overall opportunistic culture of hunting.

Lessons learned

The necessity to tailor data collection methodology to the target group remains, and to that effect, lessons learned from the just completed survey are outlined below. These include recommendations for follow-up questions and suggestions for types of species to include.

More detailed questions

Over the course of the survey, some details of species behavior and description were incorporated in order to lessen confusion with other more common species, or to verify correct ID. This added another layer of information, and can allow the surveyor to determine how well the speaker knows the species, or to determine which other species this might be mistaken for. Pel's Flying Squirrel's unusual mode of travel was highlighted by nearly every hunter who gave a positive ID, as was some hunting behavior of African Grey Parrot. A bit of doubt was understandable when some hunters noted no distinct behavior of Yellow-headed Picathartes, indicating confusion with another species, likely the White-breasted Guinea fowl.

Target species

Small species receive much less attention from hunters and community people than large ones, which in addition to being more clearly visible, are also often caught and closely observed. Species such as the Martial Eagle and Tawny Eagle were met with recognition by hunters, simply due to their body size, and some hunters even presented trophies from an indistinct eagle species. For lesser-known species with several occurring in the region, such as genets, bats, and many of the bird species included here, the details provided are dangerous to consider as true due to mixed reactions and inaccuracies from the hunters who participated in the survey. Various species of genets were not distinguishable from one another, and therefore cannot be surveyed using this method, unless skins and other remnant parts can be incorporated into the survey, which is at the whim of hunters. The method may not be effective for especially rare species, which are often seen at night. Species which this

method are especially effective for are those which are large and unmistakable, those which are hunted for food, those which have unusual behavior and those which are traded often.



Image 4: Genet species and other cat responses

Next steps

Following the verification of presence of some 36 of the 39 KBA trigger species with reasonable surety, and of those 12 with certainty, the next steps in validation of a Key Biodiversity Area is the establishment of a population estimate for the blocks. This will be used to compare to global population estimates and determine if the area holds a significant portion of the world's remaining individuals.

Appendix 1 Species photos from project



Eagle wing, chimpanzee skull, and forest buffalo skull



Small carnivore spp.

Appendix 2 Financial summary

Objective	Item	Budget £	Spent £
1. Hunter survey. Information on species to be obtained from hunters in the Grand Kru area, to determine presence and absence between two forest blocks	Internal flight	693.9	693.9
	Ground transportation	771	407.1
	Accommodation	173.5	174.2
	Per diem	578.3	593.7
	Image printing	520.4	370.1
	Incidental (stationery, field materials, etc)	197.5	159.9
2. Knowledge transfer. Dissemination of knowledge to stakeholders in area and information provision on species	Internal flight	-	231.3
	Ground transportation	-	84.7
	Accommodation	-	34.7
	Per diem	-	57.8
	Image printing	51.5	178.6
Total		£ 2986	£ 2986

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