

Site report: Kafa Biosphere Reserve and adjacent Protected Areas

Part of the NABU / Zoo Leipzig Project

'Field research and genetic mapping of large carnivores in Ethiopia'



Hans Bauer, Alemayehu Acha, Siraj Hussein and Claudio Sillero-Zubiri

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Implementing institutions and contact persons:

The Nature and Biodiversity Conservation (NABU)

Svane Bender-Kaphengst

Head of Africa Program

Charitéstraße 3

10117 Berlin, Germany

Tel +49 (0)30 284 984-1711

Email: Svane.Bender@NABU.de

www.NABU.de

Zoo Leipzig GmbH

Frank Oberwemmer

Conservation Officer

Pfaffendorfer Strasse 29

04105 Leipzig, Germany

Tel +49 (0)341 5933515

Email: foberwemmer@zoo-leipzig.de

www.zoo-leipzig.de

Associate implementing partner:

Dr. Hans Bauer

Lion Conservation Coordinator West and Central Africa

Wildlife Conservation Research Unit (WildCRU), University of Oxford

Office: Ministry of Education, room 317. PO Box 80522, Addis Ababa, Ethiopia

Mob +251 (0)910 904032, Tel +251 (0)111 552713, Fax +251 (0)111 552681

Email: hans.bauer@zoo.ox.ac.uk

Co-authors:

Alemayehu Acha, Ambo University

Siraj Hussein, Kafa BR, Bonga

Claudio Sillero-Zubiri, WildCRU

Preamble

The Nature and Biodiversity Conservation (NABU) and Zoo Leipzig and joined forces in order to assess the status of large carnivores (e.g., lions, leopards, cheetah and African wild dogs) in three important regions of Ethiopia, and in addition to clarify the genetics of Ethiopia's lions. In the field, they will be supported by Hans Bauer from the University of Oxford. Hans is a leading expert on carnivores in Ethiopia who works with Mekelle University to implement student projects, especially on lions and spotted hyaenas. The project was reviewed from the original concept and now covers Gambella and Kafa.

Introduction

Ethiopia has a rich carnivore community. Lion, cheetah, leopard and wild cat (family Felidae), African wild dog and Ethiopian wolf (family Canidae), spotted hyaena, striped hyaena and aardwolf (family Hyaenidae) and other small carnivores like genets and mongooses are found in the country. However, their current distribution, status, and the processes and interactions that affect their distribution remain contentious. Additionally, in all of Ethiopia threats to wildlife are increasing with the growing human population but their impacts are not being investigated fully. The lack of such important baseline knowledge complicates and hinders effective planning, execution, and monitoring of any conservation efforts. Therefore, this study proposes to collect data on the presence and habitat use of the African lion (*Panthera leo*), leopard (*P. pardus*), cheetah (*Acinonyx jubatus*) and the African wild dog (*Lycaon pictus*).

Originally, the study areas were defined as Babile Elephants Sanctuary (BES), Kafa Biosphere Reserve (KBR) and the Bale Mountains National Park (BMNP). However, in response to unforeseen developments we decided to maintain KBR but shift other activities. First, the project anticipated a wider funding base with contributions from another institution, but this has is no longer the case and under the present conditions the study in BES is no longer part of the project's expectations. Furthermore, the NGO Wildlife Act recently started an extensive study in Haremma Forest of BMNP that we were unaware of, and we do not want to duplicate their efforts. We decided to have Gambela National Park (GNP) as a second site instead. Our objective was to contribute to conservation strategies, and these are being developed in KBR and in GNP, so that our findings and capacity exchange contribute to ongoing processes.

Objective

The overall objective is:

To determine genetic status, presence, distribution and habitat use of lions, leopards, cheetahs and wild dogs in Kafa BR and their connectivity to nearby Protected Areas.

More specifically, we aimed to confirm the presence and describe the distribution of lion, leopard, cheetah and wild dog, in the context of their ranging patterns and habitat requirements. Since prey densities are low in Kafa, carnivore populations are small and an important component of their viability is potential connectivity to other populations, in particular Chebera Churchura NP (CCNP) and Omo NP (ONP). Note that we did not carry out research inside either national park, but examined habitat connectivity outside these areas (therefore we did not require specific permission to work inside protected areas from EWCA).

Description of the study site

Kafa Biosphere Reserve

Ethiopia is known for high levels of biodiversity and endemism, especially in the highland areas. This is also true for mammals, although levels of endemism are probably higher in other taxa. Still, among the endemic larger mammals we count species such as Walia ibex, Ethiopian wolf, mountain nyala and gelada baboon. None of these are known to occur in Kaffa zone, but Kaffa is known for other important species, such as lion and buffalo. Several previous expeditions published mammal lists, the most recent one, with a few additions from this survey is given in Annex 1 (Yalden, 1976, 1980, 1984, 1986; Hillman, 1993 as summarised in EWNHS, 2007).

The main threat to the top flagship species, the lion, is undoubtedly conflict. Previous studies (Beraki, 2013; Gebresenbet et al., in prep) have demonstrated that livestock depredation is a common phenomenon and that the lions of Kafa BR derive a substantial portion of their dietary requirements from livestock depredation. Due to the tolerant nature and the immense respect for lions in the local culture this has so far led to very limited retaliatory killing, but since the population is small it is very sensitive; one single targeted poisoning event could potentially wipe out all lions. That risk, as well as the risk of genetic impoverishment, would be substantially reduced by connectivity to another lion population. This mission focused on two nearby lion populations in CCNP and ONP.

Chebera Churchura NP

CCNP is located very near to KBR. It is known to host various large mammal species, including lion, elephant and buffalo. A masters study in 2012 showed that human lion conflict around CCNP is high (Alemayehu, 2011; Datiko et al., 2013). The number of lions in CCNP is not known, but it is certainly larger than KBR and is probably viable; connectivity between KBR and CCNP appears possible and is important.

CCNP is located in Southern Nation, Nationalities and Peoples' Regional State of Ethiopia between the Dawro zone and Konta special Woreda; it has one warden, three experts and 48 scouts. It was created in 2005 in a savannah landscape covering 1,250km². at an altitude from 550-2000m a.s.l. (Datiko & Bekele, 2013; Timer, 2005).The vegetation cover of the area is categorized into four major types. These are wooded Grassland (62.5%), woodland (8%), Mountain Forest (29.5%) and Riverine Forest (3%) (Ademasu, 2006). Thirty seven large mammals including African elephant (*Loxodonta africana*), African buffalo (*Syncerus caffer*), hippopotamus (*Hippopotamus amphibious*), leopard, lion, spotted hyaena, African wild dog and three species of primates, and 237 bird species have been recorded in different habitats of CCNP (Timer, 2005).

During our visit, we observed elephant, buffalo, giant forest hog, warthog and duiker. Most of the park is inaccessible by car, there are only two roads: the northern boundary (which is the Jimma-Sodo road and passes by the Gibe III dam) and the western boundary, going to the construction site of Gibe IV dam on the Omo river. The Gibe IV dam construction has only just started, and the road is currently being upgraded but already being used by heavy traffic of very large trucks.

Omo NP and the adjacent Tama Reserve and Mago NP

ONP was established in 1966; it is home to some of Ethiopia's native tribes which are the Dizi, Me'enit, Mursi, Gnyangatom and Surima. It is also home to many mammals, including buffalo, cheetah, common eland (*Tragelaphus oryx*), elephant, giraffe (*Giraffa camelopardalis*), plains zebra (*Equus quagga*), leopard and lion. It is a bit further away from KBR, so lion population connectivity is less likely, but it is worth investigating because the ONP and the associated larger Omo Valley landscape potentially holds the largest Ethiopian lion population. No data are available, but the sheer size of the ecosystem (>10,000km²) suggests that the lion population must be well over a hundred.

Methodology

We visited the area from 4 – 16 April 2016. We used the following methods:

Camera trapping

Annex 2 gives all the exact camera locations (coordinates, description, habitat, etc.). Overall, we had:

- 10 nights with 12 cameras (Bushnell Trophy Cam) around Boka Forest (Adiyo woreda)
- 9 nights with 10 cameras (Bushnell Trophy Cam) around Komba Forest (Gimbo woreda)

Callups

While the equipment was available we chose not to use it due to potential risks associated with calling large carnivores in areas with high human population densities.

Transects

Habitat and signs of any wildlife were investigated on two major potential connectivity corridors:

- Kafa – Chebera Churchura NP (on foot from Delba to Chetta-Diya)
- Kafa – Omo NP (by car, from Bonga to Kuraz)

Secondary information

Sources include co-authors' archives of previous visits,

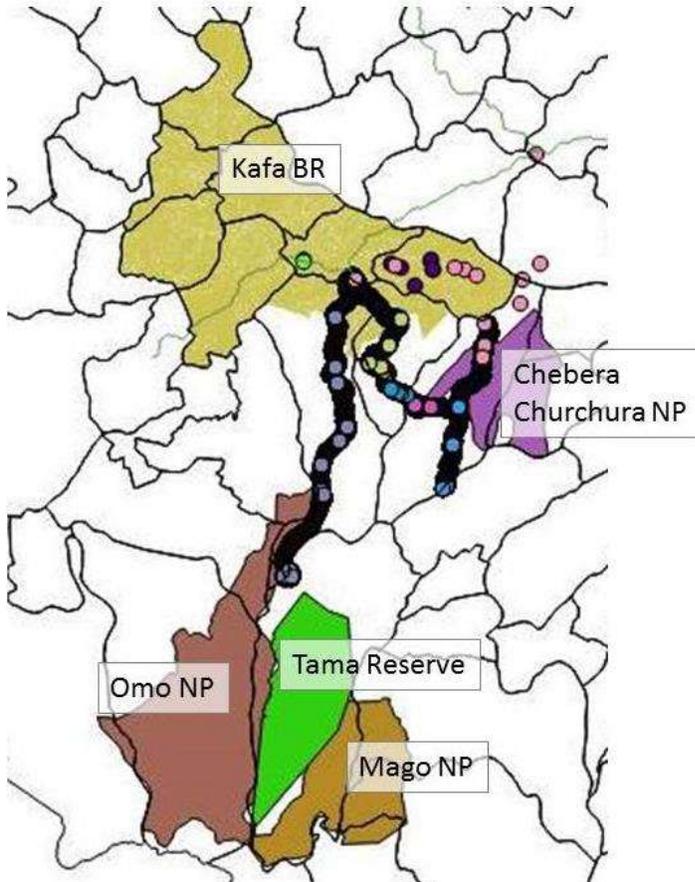


Figure 1: Map of the Protected Area complex, and tracks and waypoints during this mission

Results

Mammals

The camera trap survey was more intensive than the survey during the NABU biodiversity assessment; we had more cameras, more nights and improved experience and knowledge of strategic locations. As a result, we had more success and had photos of 18 different species (Table 1).

During previous trips, and again during this trip, the correct identification of the smaller antelopes remained unresolved. This time, rather than speculating on the exact species names, we sought advice from the world's leading experts in this field, the co-chairs of the IUCN SSC Antelope Specialist Group,

Dr. David Mallon and Dr. Philippe Chardonnet. The antelope that we observed and photographed in Chebera Churchura NP and had tentatively identified as an oribi (*Ourebia ourebi*) was identified as a female bushbuck (*tragelaphus scriptus*) – although oribi is also likely to occur in the area and was indeed observed in Omo NP. The antelopes on the camera trap pictures were all identified as duikers, but two different species: Weyns’ duiker (*Cephalophus weynsi*) for all individuals with a black facial and/or dorsal stripe, and Harvey’s duiker for uniformly coloured individuals (*C. harveyi*). These species were not officially recorded in Ethiopia before and these observations will therefore be used as documentation to extend the known range of these species in Africa. Further assistance in photo identification was provided by Holger Meinig, Mehretu Yonas and Katrina Schell, members of the former NABU biodiversity assessment mammal team, who confirmed the following species: De Brazza’s monkey (*Cercopithecus neglectus*), common genet (*Genetta genetta*), woodland dormouse (*Graphiurus murinus*).

Table 1: Results of camera trapping, pictures of a species taken within 5 minutes were counted as one, after an interval of more than 5 minutes a picture was counted as a new event. Details on camera trap location in Annex 2, scientific names in Annex 1.

Camera trap	Animals photographed, in chronological order
HB1	Baboon, warthog
HB2	Leopard
HB3	Warthog, baboon, genet, leopard, civet, porcupine, warthog, porcupine, hyrax, warthog, bushpig, civet
HB11	--
HB12	Duiker, vervet, duiker, duiker, duiker, duiker
HB13	Giant forest hog, baboon, giant forest hog, giant forest hog, giant forest hog, duiker
HB14	--
HB15	De Brazza’s monkey, giant forest hog, hyrax
HB16	Baboon
HB17	Duiker, buffalo, dormouse, civet, dormouse, baboon, duiker, baboon
HB18	--
HB19	Buffalo, baboon, unidentifiable, bushpig
NB1	De Brazza’s monkey, baboon
NB2	--
NB3	--
NB4	Genet, genet, genet, baboon, ibis, slender mongoose, genet, slender mongoose, genet
NB5	Baboon
NB6	Baboon
NB7	Duiker, baboon, duiker, baboon
NB8	Baboon
NB9	Baboon
NB10	Not functional

Large carnivores

Lion – definitely present, they have been observed at several occasions, though not during the present trip. Lions are territorial and not migratory, that means their abundance is limited by lean season prey biomass. From the resident prey biomass, we speculate that lion density is likely to be <1 lion per 100 km² in KBR and possibly higher in CCNP and ONP.

Spotted hyaena – definitely present. We have seen live specimens on previous visits, during the present trip we only observed indirect signs. Spotted hyaena occurs widely across Ethiopia, both in lowland and in highland (Yirga et al., 2015); there is no reason to assume they are threatened.

Leopard – definitely present, caught on camera trap. This species is famously elusive and it is impossible to speculate about numbers, but considering that this species is fairly adaptable to mixed natural and human landscapes, it probably occurs widely across the entire region.

Cheetah – we have not made any direct or indirect observation of this rare large carnivore, but various informants are confident that they occur in CCNP and ONP, the warden of CCNP observed cheetah twice over the years. Cheetahs do not occur in KBR (NABU, in press).

African wild dog - we have not made any direct or indirect observation, and information from various informers was unconvincing. Local people and scouts claim it is present in the CCNP and ONP; the warden of CCNP reported observing a pack of seven wild dogs, but there is no evidence such as pictures, skins or footprints.

Connectivity

KBR – CCNP

The shortest distance between these two protected areas is in the North, from Kaka (north-eastern tip of KBR) to Amaya (north western tip of CCNP; Fig. 1). The gap is about 20km, but the landscape in between is heavily used by people and it is highly unlikely that there is connectivity across this divide. A new road is under construction from Amaya to Bonga, the road does not pass through Kaka but goes around the southern edge of the Boka Bamboo forest. We hypothesized that, if there is connectivity, it would have to be to the South of this road.

We set out to walk a transect from Delba in CCNP to Diya in KBR (see Fig. 2). We had very little information and, although we didn't know what to expect, we decided to follow a local guide from Delba who claimed to know the way. The trip was 53km cross-country, there was no track and we had to cross several rivers and mountains. The first two days we did not meet any person, at the end of the second day we arrived in Amesh (on the outskirts of KBR / Chetta woreda), from where it was a 1500m climb on foot to reach Diya, where the car picked us up around noon on the third day. The transect was physically challenging, but gave the desired result: the habitat and prey populations all along the

transect were intact, and it is highly likely that the lion populations of KBR and CCNP are connected via this corridor. To document the integrity of the habitat I took a picture every hour, these are available upon request and were not added to this report because they are uninformative, just showing featureless green savanna. On the way, we observed a small herd of approximately 20 buffalo and a duiker, all with a flight distance of about 70m.

We did not observe anyone, but the guide and the scouts were permanently alert to the possible presence of people from the Mursi ethnic group. Reportedly, these people roam the entire region and often kill people to steal their possessions; originally they focused on cattle theft but they are said to kill indiscriminately now. Apparently, they get firearms by trading against ivory from elephant poaching, but this needs to be confirmed. Although this is a significant security threat, it does not appear to affect the corridor's permeability for wildlife and they also do not appear to target lions.

According to the map (fig. 2), Delba is the southern boundary of CCNP. However, we drove to the end of the road, to the construction site of Gibe IV, passing through various kebeles of Koysya. The area around Delba is human dominated, but the rest of the landscape is mixed and there is no perceivable boundary of CCNP, indeed informants close to Gibe IV said they regularly observe leopards and lions, but not cheetah or wild dog. The wildlife populations of CCNP can therefore be considered to extend all the way South to the Gibe river.

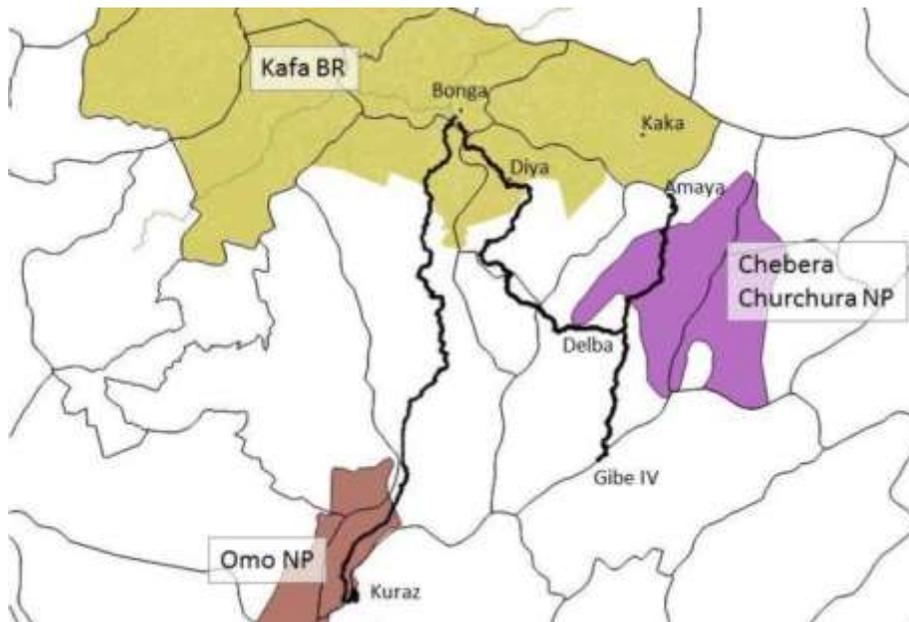


Figure 2: Detailed map of the transects (thick black line).

KBR-ONP

The second transect was done by car, which is a 4-hour drive so the return trip, with stops for observations and interviews with local people took a full day. From Bonga, the first hour is evergreen afromontane forest, typical of KBR habitat and with occasional lion sightings and depredation incidents reported by local people, lions here are probably transient, not resident. The road descends into the

lowland; dry African acacia-savanna which is dominant for the next (second) hour. This savannah appears intact with very little human disturbance, except a few relatively small commercial farms which are a recent development. The few people we met had not observed lions, but we speculate that lion dispersal across this part of the landscape must be possible. The last two hours of the drive, human presence was increasingly observed, with several herds of cattle and sheep/goats. The people are mostly indigenous communities of ethnic groups known as Bodi and Me'etit, with very traditional lifestyles. When asked about the presence of lion, they answered: 'the lion is our enemy, it doesn't occur here anymore'. This is an obvious indication that lion killing in this part of the transect indiscriminate and intensive. Whether that means that dispersal between KBR and ONP is entirely impossible could not be determined and requires further investigation. The entire drive is a gradient, the partitioning into sections of one hour's drive each is somewhat arbitrary and it is impossible to give specific transition waypoints. The transect ended at the Omo river, also the boundary of Omo NP, where a sugar factory is under construction (see Annex 4). Construction workers told us that lions are very regularly observed on the riverbank, which confirms that they occur across ONP, up to the edges.

Conclusions

Human population expansion is a major cause of species decline and biodiversity loss which is resulted from the natural habitat degradation. Large carnivores are specifically vulnerable to human encroachment because they often come into conflict with people (IUCN, 2006; Woodroffe, 2000; Treves & Karanth, 2003). In places where carnivores and people co-exist, challenges for conserving the carnivores are significant and include indiscriminate killing by local communities (Treves, 2007). The killings could be retaliatory or defensive, regardless; they contribute to the carnivores' population decline.

The situation in KBR is very particular, since depredation is in the same order of magnitude as almost any comparable area, but the tolerance by people is remarkably high. Even after repeated livestock losses, communities do not retaliate (Gebresenbet et al., *subm.*). As a consequence, the anthropogenic threat to this population is small, which creates favourable conditions for population persistence. However, the prey base is very small, with low densities of small prey and patchy occurrence at very low densities of larger prey, leading to the assumption of a lion population size of around 20 across the entire KBR, probably with very large individual home ranges. Under such conditions, viability of the lion population is severely restricted by genetic and demographic stochasticity and environmental variation; viability of such populations is typically increased by exchange with neighbouring populations, even if these events are rare (one or two dispersing individuals per year). This appears to be the case, and this is important information to be taken into account in the conservation strategy of KBR and that of CCNP.

Acknowledgements

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Churchura NP Mr. Adhane, and Mr. Workneh. Dr. Holger Meinig, Dr. Mehretu Yonas, Dr. Katrina Schell, Dr. David Mallon and Dr. Philippe Chardonnet provided assistance in species identification. The Born Free Foundation and Robertson Foundation support Hans Bauer position at the University of Oxford.

References

- Ademasu, M. (2006) History and Status of the population of African elephants (*L. Africana*, Blumenbach, 1979) and human-elephant conflict in Chebera-Churchura National park, Ethiopia. MSc thesis, Addis Ababa University, Addis Ababa, Ethiopia.
- Alemayehu Acha (2011) An Assessment of Human-wildlife conflict, particularly large carnivores in and around Chebera-Churchura National Park, Southern Ethiopia. MSc. Thesis, Mekele University.
- Beraki Brhane (2013) Economic impact and peoples' perception on conservation of lions (*Panthera leo*) in Kafa, South west of Ethiopia. MSc Thesis, Mekele University, Ethiopia.
- Datiko, D. & Bekele, A. (2013) Conservation challenge: Human-carnivore conflict in Chebera-Churchura National Park, Ethiopia. *Greener J. Biol. Scie.* 3 (3), 108-111.
- EWNHS (2007) Rapid Biodiversity Assessment in Kaffa Zone. FAO, Rome.
- Fikirte Gebresenbet, Brhane Beraki, Gidey Yirga, Claudio Sillero-Zubir, Hans Bauer (subm.) A culture of tolerance: large carnivore coexistence in the Kafa highlands, Ethiopia. *Oryx*.
- IUCN (2006) Regional Conservation Strategies for the African Lion in West and Central Africa. IUCN World Conservation Union, Gland, Switzerland.
- Timer, G. (2005) Diversity, Abundance, Distribution and Habitat Association of large mammals in the Chebera Churchura National Park, Ethiopia. MSc thesis, Addis Ababa University, Addis Ababa, Ethiopia.
- Treves, A & Karanth, K.U. (2003) Human-Carnivore Conflicts and Perspectives on Carnivore Management worldwide. *Conserv. Biol.* 17, 1491-1499.
- Treves, A. (2007) Balancing the needs of People and Wildlife: When Wildlife Damage Crops and Prey on Livestock. Land Tenure Center, Nelson Institute of Environmental Studies, University of Wisconsin, Madison, USA.
- Woodroffe, R., Thirgood, S & Rabinowitz, A. (2005) The impact of human-wildlife conflict on natural systems. In: *People and Wildlife: Conflict or Coexistence?* (EDS R. WOODROFFE, S. THIRGOOD & A. RABINOWITZ), Cambridge University Press, UK, pp.1-12.
- Gidey Yirga, Hans H. De longh, Herwig Leirs, Kindeya Gebrehiwot, Jozef Deckers, Hans Bauer (2015) Food base of the spotted hyaena (*Crocuta crocuta*) in Ethiopia. *Wildl. Res.* **42**(1) 19-24.

Annex 1: Mammal list for the Kafa ecosystem

Information available from literature (Yalden 1976, 1980, 1984, 1986; Hillman, 1993 as summarised in EWNHS, 2007), and observations during this survey:

Order Carnivora

Family Mustelidae

Aonyx capensis Clawless Otter
Mellivora capensis Honey Badger

Family Canidae

Canis aureus Golden Jackal
Canis mesomelas Black-backed Jackal

Family Felidae

Felis silvestris African Wild Cat
Felis serval Serval
Panthera leo Lion
Panthera pardus Leopard

Family Viverridae

Atilax paludinosus Marsh Mongoose
Ichneumia albicauda White-tailed Mongoose
Herpestes ichneumon Egyptian Mongoose
Herpestes sanguineus Common Slender Mongoose
Genetta genetta Common Genet
Civettictis civetta African Civet

Family Hyaenidae

Crocuta crocuta Spotted Hyaena

Order Hyracoidea

Family Procaviidae

Heterohyrax brucei Bush Hyrax
Procavia capensis Rock Hyrax

Order Lagomorpha

Family Leporidae

Lepus habessinicus Abyssinian Hare

Order Primates

Papio Anubis Olive Baboon

Cercopithecus neglectus De Brazza's Monkey
Chlorocebus aethiops Grivet Monkey

Order Tubulidentata

Family Orycteropodidae

Orycteropus afer Aardvark

Order Cetartiodactyla

Family Hippopotamidae

Hippopotamus amphibious Hippopotamus

Family Bovidae

Kobus ellipsiprymnus Waterbuck
Redunca redunca Bohor Reedbuck
Sylvicapra grimmia Common Duiker
Cephalophus weynsi Weyns' duiker
Cephalophus harveyi Harvey's duiker
Syncerus caffer Buffalo
Tragelaphus scriptus Bushbuck

Family Suidae

Hylochoerus meinertzhageni Giant forest hog
Phacochoerus africanus Common Warthog
Potamochoerus larvatus Bushpig

Order rodentia

Hystrix cristata Crested Porcupine
Graphiurus murinus Woodland Dormouse

Annex 2: Camera trap positions

Kaffa BR-Camera Trap (Adiyo)													
#	CTID	W/P	Area	Date	Time	Lat	Long	Elev	Slope	Vegetation	Dist to Humans	Dist to water	weather
1	NB3	669	Yebito	04/06/2016	10:15	731185	3636071	1866	no	forest	3km	200m	sunny
2	NB4	673	Yebito	04/06/2016	10:32	731301	3607862	1848	steepy	forest	4km	5m	sunny
3	NB4	674	Yebito	04/06/2016	10:43	731323	3607783	1855	gentle	forest	5km	onwater	sunny
4	NB5	677	Yebito	04/06/2016	11:00	731265	3607725	1898	steepy	core forest	4km	1.5km	sunny
5	NB6	679	Yebito	04/06/2016	12:00	730933	3608303	1969	steepy	forest	3.5km	100m	sunny
6	NB7	681	Yebito	04/06/2016	12:05	730814	3608258	1999	gentle	forest	4km	1km	sunny
7	NB1	682	Yebito	04/06/2016	12:20	730619	3608360	1991	gentle	forest	5km	200m	sunny
8	NB9	685	Yebito	04/06/2016	12:32	730570	3608429	1972	no	wetland	5km	150m	sunny
9	NB10	686	Yebito	04/06/2016	12:48	730464	3608599	1971	gentle	forest	3km	250m	sunny
Kaffa BR-Camera Trap (Gimbo)													
10	HB17	661	Yecha	04/05/2016	02:56	731058	3649846	1751	steepy	forest	2km	3km	sunny
11	HB18	663	Yecha	04/05/2016	03:12	731188	3649858	1732	steepy	forest	1km	1km	sunny
12	HB19	664	Yecha	04/05/2016	03:27	731355	3649920	1737	steepy	grassland	1km	1km	sunny
1	HB11	648	Boka	04/05/2016	10:30	713658	3626859	2740	Gentle	forest	3km	2km	sunny
2	HB12	649	Boka	04/05/2016	11:20	724022	3644377	2711	Gentle	forest	3km	1km	sunny
3	HB13	651	Boka	04/05/2016	11:26	724111	3644511	2710	Gentle	forest	2km	1km	sunny
4	HB14	652	Boka	04/05/2016	11:50	723925	3645094	2619	steepy	bamboo forest	5km	10m	sunny
5	HB15	653	Boka	04/05/2016	12:00	724116	3645155	2614	Gentle	bamboo forest	5km	2m	sunny
6	HB16	654	Boka	04/05/2016	12:07	724018	3645205	2618	Gentle	bamboo forest	5km	2km	sunny
7	HB3	658	Yecha	04/05/2016	02:21	730669	3649985	1775	steepy	forest	8km	On water	sunny
8	HB1	659	Yecha	04/05/2016	02:30	730784	3649982	1782	no	grassland	3km	2km	sunny
9	HB2	660	Yecha	04/05/2016	02:44	730954	3649915	1778	no	grassland	3km	3km	sunny

Annex 3: Camera Trap photos

Note that these cameras use American date notation, mm-dd-yyyy



Olive Baboon



De Brazza's Monkey



Common Warthog



Crested Porcupine



04-09-2016 07:42:15

Mongoose (spp.)



04-08-2016 22:28:31

African Civet



Common Genet



Common Genet



Duiker (spp.)



Buffalo



Giant forest hog



Hyrax



04-07-2016 21:27:21

Leopard

Annex 3: Other photos



Lion skins, adult female and sub-adult male, killed by scouts during an operation to mitigate a series of lion attacks in which five humans were killed.



Omo river, around Kuraz III sugar factory (under construction).



Agricultural investment on the way from KBR to Omo.



View over Chetta woreda forests.



Bushbuck (female), observed during transect.



Buffalo, observed during transect.



Natural honey collected during transect walk.



Gibe IV dam construction site.



Camera trap.