Medium (esp. Carnivora and Artiodactyla) and large mammals at the Kafa Biosphere Reserve

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Highlights

→ 25 species were recorded.

→ The presence of the endangered wild dog (*Lycaon pictus*) could not be confirmed; it is possible the species is locally extinct.

→ The presence of lion (*Panthera leo*) was confirmed; this is the flagship species.

→ Larger mammals are not useful as indicators of forest conservation status due to their very low densities.

→ Camera trapping returned very low capture rates, indicating abnormally low mammal density. This should be confirmed and investigated.

→ An additional survey six months later and on behalf of NABU revealed additional mammal species i.e. the leopard (*Panthera pardus*).

1. Introduction

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 higher in most other taxa. Still, endemic larger mammals include species such as the walia ibex, the Ethiopian wolf, the mountain nyala and the gelada. None of these are known to occur in the Kafa zone, but Kafa is known for other important species, such as lion and buffalo.

Several previous expeditions published mammal lists; the most recent is presented below (Yalden 1976, 1980, 1984, 1986; Hillman 1993 as summarised in EWNHS 2007):

Table 1: Checklist of mammals as summarised in EWNHS (2007)

Order	Family
Carnivora	**Mustelidae**
	Aonyx capensis Clawless otter
	Mellivora capensis Honey badger
	Canidae
	Canis aureus Common jackal
	Canis mesomelas Black-backed jackal
	Felidae
	Felis silvestris African wildcat
	Felis serval Serval
	Panthera leo Lion
	Panthera pardus Leopard
	Viverridae
	Atilax paludinosus Marsh mongoose
	Ichneumia albicauda White-tailed mongoose
	Herpestes ichneumon Egyptian mongoose
	Herpestes sanguineus Slender mongoose
	Civettictis civetta African civet
	Hyaenidae
	Crocuta crocuta Spotted hyena
Hyracoidea	**Procaviidae**
	Heterohyrax brucai Yellow-spotted hyrax
	Procavia capensis Rock hyrax
Lagomorpha	**Leporidae**
	Lepus habissinicus Abyssinia hare
Tubulidentata	**Orycteropodidae**
	Orycteropus afer Aardvark
Artiodactyla	**Hippopotamidae**
	Hippopotamus amphibius Hippopotamus
	Bovidae
	Kobus defassa Defassa waterbuck
	Redunca redunca Bohor reedbuck
	Sylvicapra grimmia Common duiker
	Syncerus caffer Buffalo
	Tragelaphus scriptus Common bushbuck
	Suidae
	Hylochoerus meinertzhageni Giant forest hog
	Phacochoerus africanus Common Warthog
	Potamochoerus larvatus Bush pig

We expected to confirm the presence of most, if not all, of these species. We were particularly interested in large carnivores, since these are usually the first species to become extinct in the gradual process of biodiversity erosion (MacDonald et al. 2010). We were particularly interested in the lion and the wild dog, two apex predators that are well known for their enormous home range, low density and propensity for conflict with humans, making them species of particular concern for conservation (Woodroffe & Sillero 2012; Bauer et al. 2015).

2. Materials and Methods

2.1 Study area

We focused on the following study sites:

- Boka/Adiyo (bamboo forest, highland forest)
- Kaka/Adiyo (lowland savannah)
- Wushwush (tea plantation and core zone forest)
- Gojeb Valley downstream (lowland, around the town of Gimbo)
- Gojeb Wetland upstream (wetland and Boginda/ Gewata core zone forests)

Additional camera trapping sessions were organised in May 2016, outside the scope of the biodiversity assessment. We report some of the results here, since some additional species were captured that should definitely not be omitted from the present study. Those sessions were as follows:

- 10 nights with 12 cameras (Bushnell Trophy Cam) in the Yecha valley around Boka Forest
- Nine nights with 10 cameras (Bushnell Trophy Cam) in the Yebita patch in Kumba Forest

Table 2: Locations of camera traps (CT) and other important waypoints are indicated below

Area	Site	Code	Habitat	Object	Alt. (m)	Lat. (N)	Long. (E)
BONGA	Bamboo forests	BA	Bamboo forests dominated by *Arundinaria alpina*				
BONGA	Alemgono Wetlands	GO-wet	Wetlands				
BONGA	Boka Forests	BK	Montane forests	CT, porcupine scat	2597	7.24094	36.45224
BONGA	Boka Forests	BK	Montane forest	CT, jackal scat, hare	2508	7.2631	36.45378
BONGA	Boka Forests	BK	Lowland	Interviews	1600	7.26233	36.647
BONGA	Awurada Valley (Gummi River, PFM sites)	AW	Montane forests/ riverine vegetation				
BONGA	Alemgono	AG	Wetland				
BOGINDA	Gojeb Wetlands	GO-wet	Wetland	Buffalo and waterbuck tracks	1567	7.55372	36.04739
BOGINDA	Gojeb Wetlands	GO-wet	Wetland	CT, leopard picture	1562	7.55154	36.04663
BOGINDA	Gojeb River	GO-riv	River/floodplain forests	CT	1604	7.56214	36.02321
BOGINDA	Boginda Forests	BO	Montane forests	CT	2086	7.5072	36.11194

Area	Site	Code	Habitat	Object	Alt. (m)	Lat. (N)	Long. (E)
BONGA	Wushwush forest core area	WW-F	Montane forests	CT	1795	7.27848	36.19352
BONGA	Wushwush tea plantation	WW-T	Tea plantation	CT, duiker picture	1828	7.36835	36.12787
BONGA peri-urban	Outskirts of town	PU	Mixed use	CT, hippo tracks	1731	7.31785	36.24127
BONGA peri-urban	Outskirts of town	PU	Mixed use	Call-up	1694	7.30169	36.23618
GOJEB Bridge	Bridge on main road to Jimma	GB	Lowland	Interviews	1430	7.43676	36.36898
GOJEB Bridge	Bridge on main road to Jimma	GB	Lowland	Interviews	1322	7.46678	36.35624
BOKA	Yecha Valley	BK	Forest, midland	CT, leopard picture	1780	7.30784	36.49982

2.2 Sampling methods

Our methods consisted of camera traps, direct observations, transect walking, scat analysis, tracks and signs (footprints, calls) and interviews with key informants based on a guidebook with pictures of all African mammals (Kingdon 2004).

2.3 Data analysis

Camera trap pictures were identified by the author, after consultation with other group members in case of doubt. Group members working on other taxa reported opportunistic encounters with mammals, and these reports were included. We attempted to use calling stations to assess hyena density (e.g., Bauer 2007), but this was unsuccessful.

The chapter on primates provides a detailed explanation of DNA analysis procedures and protocols, as well as our supporting institutions and experts.

During this and previous trips, the correct identification of the smaller antelopes went unresolved. We recently 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 we had observed and photographed 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 the nearby Omo National Park. We also confirmed the occurrence of common duiker (*Sylvicapra grimmia*) from a DNA sample. The antelopes on the camera trap pictures were all identified as duikers, but from two different species: Weyns's duiker (*Cephalophus weynsi*) for all individuals with a black facial and/or dorsal stripe, and Harvey's duiker (*C. harveyi*) for uniformly coloured individuals. These species have not been previously officially recorded in Ethiopia, and these observations will therefore be used as documentation to extend the known range of these species in Africa. In our tentative field report, we misidentified some pictures as dik-dik and klipspringer; the presence of these species is unlikely, and they should not be included in the checklist of the Kafa BR mammals.

3. Results and Discussion

Medium and large mammals live at very low densities compared to other species; therefore, the number of observations is low, making quantitative assessment fundamentally difficult. Despite 56 'trapping days/nights' (number of days or nights x number of cameras), we only collected 15 animal pictures. Data are too scarce to conduct any statistical analysis or make firm statements, but a success rate this low would generally indicate densities far below natural levels, i.e., indicative of severe human disturbance.

3.1 Interview and photo identification in four different local communities

Table 3: Results from interviews and photo identification in local communities

	Kaka (Adiyo lowlands) (1)	Duma/Gojeb Wetlands and Gewata/Boginda forest (non-exhaustive) (2)	Gojeb town (Gimbo lowlands) (3)	Wushwush and Bonga Forest (non-exhaustive) (4)
Porcupine	+			
Hyena	+	+	+	+
Jackal	+	+	+	+
Warthog	+	+	+	+
Bushpig	+	+	+	+
Common duiker	+		+	
Klipspringer	+			
Bushbuck	+		+	
Rock hyrax	+			
Civet	+		+	+
Caracal	+			
Honey badger	+			
Lion	-	Occasionally	-	Historical, not at present
Wild dog	-	Historically present, present status uncertain	-	-
Leopard	-	+	+	
Cheetah	-		-	
Serval	-		-	
Genet	-		+	
Buffalo	-	+	-	
Giraffe	-			
Defassa waterbuck		+	Uncertain	
Hippopotamus			+	
Clawless otter			+	
Bohor reedbuck			+	
Weyns' duiker (*Cephalophus weynsi*)			+	
Harvey's duiker			+	

1: very little natural habitat in this ecosystem, very heavy agricultural encroachment
2: rich natural habitat in this ecosystem, only slightly used for unsupervised grazing
3: very little natural habitat in this ecosystem, very heavy agricultural encroachment
4: rich natural habitat patches in the tea plantation, though the natural Bonga Forest appears rather degraded

3.2 Synthesis: mammal presence confirmed

Table 4: Occurrence of mammals confirmed during the field study

Common name	Scientific name	Observation during assessment
Olive baboon	*Papio anubis*	Common everywhere
Guereza	*Colobus guereza*	Common everywhere
Grivet	*Chlorocebus aethiops*	Common everywhere
Spotted hyena	*Crocuta crocuta*	Heard almost everywhere, DNA
African wolf and/ or common jackal	*Canis lupaster* and/or *Canis aureus*	CT and scat Boka
Common genet	*Genetta genetta*	CT Awurada
Rusty-spotted genet	*Genetta maculata*	DNA
Lion	*Panthera leo*	PC: resident in Adiyo, transient elsewhere
Leopard	*Panthera pardus*	Skull and picture in Gojeb, DNA, CT Boka
Wild dog	*Lycaon pictus*	PC: possibly in Gewata/Gojeb, elsewhere recently extirpated
Clawless otter	*Aonyx capensis*	Obs and scat Gojeb
Civet	*Civettictis civetta*	Roadkill Bonga, DNA
Slender mongoose	*Herpestes sanguineus*	CT Boka
Rock hyrax	*Procavia capensis/ Heterohyrax brucai*	CT Boka, DNA
Hare	*Lepus* sp.	CT and Obs Boka and Gojeb, common everywhere
Crested porcupine	*Hystrix cristata*	Tracks and scat Boka, DNA
Hippopotamus	*Hippopotamus amphibius*	Tracks in Gojeb Wetland, skull in Gojeb town, heard in Bonga, DNA
Warthog	*Phacochoerus aethiopicus*	Tracks Gojeb
Bushpig	*Potamochoerus larvatus*	Tracks Gojeb, DNA
Bushbuck	*Tragelaphus scriptus*	Obs Bonga
Duiker Grey	*Sylvicapra grimmia*	CT Boka, DNA
Weyns's duiker	*Cephalophus weynsi*	CT Boka
Harvey's duiker	*Cephalophus harveyi*	CT Boka
Defassa waterbuck	*Kobus ellipsiprymnus*	Track, scat and horns Gojeb
Bohor reedbuck	*Redunca redunca*	PC Adiyo
Buffalo	*Syncerus caffer*	CT Boka, Tracks Gojeb

CT= caught on camera trap

PC= personal communication from local community

Obs= live specimen observed by team member

DNA= scat analysis

4. Conclusions and Recommendations for Conservation and Monitoring

Because of their low densities, larger mammals make very poor indicator species. Probability of detection is low, and intensive research would be necessary to detect changes over time. Therefore, none of the listed species qualify as indicator species. However, many of the larger mammal species qualify as flagship species. Undoubtedly the most enigmatic among them is the lion ('vulnerable' on the Red List; Bauer et al. in press), but primates and large ungulates like hippopotamus and buffalo are also candidates.

The main threat to the flagship species, the lion, is undoubtedly conflict with farmers. Previous studies (Brhane Beraki 2014; Gebresenbet et al. in press) have

demonstrated that livestock depredation is a common phenomenon, and that the lions in the Kafa BR derive a substantial portion of their dietary requirements from livestock depredation. Due to the tolerant nature of the locals and the immense respect for lions in local culture, this has so far led to very limited retaliatory killing. However, since the population is small it is also very sensitive; a single targeted poisoning event could potentially wipe out all lions.

Through PhD research conducted by Fikirte Gebresenbet, University of Oklahoma, supervised by Hans Bauer, University of Oxford, and conducted with the full support and collaboration of NABU, we expect there to be sufficient research and monitoring effort in the short and medium term. However, NABU is advised to develop a long-term strategy for the sustainable management and monitoring of lions in the Kafa BR. The highly endangered wild dog may be locally extinct. This species is not popular with locals and the general public, and therefore not considered a great loss by the uninformed layman. However, for a zoologist, the disappearance of the species with the highest demands on habitat quality rings an alarm bell. The processes that have led to this situation may only affect this sensitive species at first, but other species may be similarly affected over time. It is therefore important to conduct further research into the status of the wild dog, how it is threatened and on the potential mitigation of those threats.

5. References

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6. Appendix

6.1. Photos

Figure 1: Camera trap: common duiker (*Sylvicapra grimmia*), montane forest – bamboo forest, Boka (BK) (photo: Hans Bauer)

Figure 2: Camera trap: hare (*Lepus sp.*), montane forest – bamboo forest, Boka (BK) and Gojeb (GO) (photo: Hans Bauer)

Figure 3: Camera trap: Weyns's duiker (*Cephalophus weynsi*), montane forest – bamboo forest, Boka (BK) (photo: Hans Bauer)

Figure 4: Camera trap: common jackal (*Canis aureus*), montane forest – bamboo forest, Boka (BK) (photo: Hans Bauer)

Figure 5: Buffalo (*Syncerus caffer*), scat, Gojeb Wetland (GO) (photo: Hans Bauer)

Figure 6: Buffalo (*Syncerus caffer*), camera trap, Boka (BK) (photo: Hans Bauer)

Figure 7: Spotted hyena (*Crocuta crocuta*), footprint, montane forest, Komba (KO) (photo: Hans Bauer)

Figure 8: Hippopotamus (*Hippopotamus amphibius*), skull, Gojeb Wetland (GO) (photo: Hans Bauer)

Figure 9: Leopard (*Panthera pardus*), skull, Gojeb Wetland (GO) (photo: Hans Bauer)

Figure 10: Leopard (*Panthera pardus*), camera trap, Boka (BK) (photo: Hans Bauer)

Figure 11: Waterbuck (*Kobus defassa*), horns, Gojeb Wetland (GO) (photo: Hans Bauer)

Figure 12: Waterbuck (*Kobus defassa*), scat, Gojeb Wetland (GO) (photo: Hans Bauer)

Figure 13: Lion (*Panthera leo*), bamboo forest (photo: Bruno D'Amicis)

Figure 14: Lion (*Panthera leo*), bamboo forest (photo: Bruno D'Amicis)