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Cover Photo: Female jaguar with two cubs in the Gran Chaco, Bolivia
Photo: Daniel Alarcón, Bolivia

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Systematic survey efforts of the African golden cat – Part 2. Results from Uganda

The African golden cat *Profelis aurata* is a little known felid endemic to Africa's tropical forests. The golden cat is very poorly known but is currently the subject of two related studies in Uganda and Gabon, the first focused research efforts on the species. We conducted three systematic camera trap surveys in Kibale National Park, Uganda, and obtained 63 photographic captures of African golden cats at frequencies ranging from 0.53 to 1.35 captures per 100 trap days. We identified variation in capture rates between sites for golden cats and other species that warrants further investigation. These results will contribute to our ongoing research as we investigate golden cat ecology in the role of apex predator, intraguild interactions with other forest carnivores and responses to anthropogenic influences.

The African golden cat has never been the object of intensive scientific research, and its behaviour and ecology are poorly known (Ray et al. 2005). This medium-sized (5.3 – 16 kg) stocky cat is endemic to the African tropical forest belt where it is threatened by deforestation, clearing for agriculture, persecution and exploitation of its prey (Nowell & Jackson 1996, Hunter & Barrett 2011). The species is estimated by Ray et al. (2005) to have lost 44% of original range and it is currently classified as Near Threatened on the IUCN Red List (Henschel et al. 2008).

African golden cats are notoriously elusive. Even in research sites with constant researcher effort, they are very rarely observed by chance (T. Struhsaker & J. Lwanga pers. comm.), which partly explains a lack of data on the species. While their preference for dense forest presents challenges for monitoring, recent efforts to apply camera-trapping methodologies (Bahaa-el-din et al. 2011) have demonstrated potential in furthering our understanding of the golden cat.

Here, we report on the results of three systematic camera trap surveys undertaken for African golden cats in Kibale National Park (KNP), Uganda. This is the second of two articles presenting preliminary data from two Panthera-led studies currently underway in Gabon (Bahaa-el-din et al. 2011) and Uganda using camera-trap technology to investigate golden cat behaviour and ecology. The present study is part of a doctoral project by Mills, investigating the conservation biology of the African golden cat in KNP. In contrast to Bahaa-el-din's study sites in Gabon, the leopard is extinct in KNP and the golden cat is the apex mammalian predator present. Also in contrast to Gabon sites, bushmeat hunting in KNP rarely targets carnivores or primates. However, golden cats are incidentally killed in snares (e.g. a male in December 2010; Fig 1) and the impact of the bushmeat trade on the species in western Uganda is unknown.

In addition to producing the first detailed population data on the African golden cat from two separate sites, data from both studies will be compared to shed light on intra-guild relationships and the potential impacts of different human activities on the species. These results will be presented as two graduate theses and peer-reviewed papers; we present here some initial data and comparisons.

Fig 1. A male golden cat, captured in a snare set for bushmeat, December 2010. The cat was alive when the photo was taken and park personnel attempted to free it, but it died of its injuries (Photo Krief/Sebitoli Chimpanzee Project).

Study Area

The Albertine Rift is one of the most species-rich regions on earth (Plumptre et al. 2007). Kibale National Park (795 km^2; Fig. 2) is located in the northern part of the rift, where very high population density (300 people/km^2 in 2000; Struhsaker 2002) has created a highly fragmented landscape of tropical forest and cultivated land. Kibale NP is a mosaic of forest, colonizing bush, grassland and swamp. The surrounding land is dominated by agriculture (Struhsaker 2002).

The Makerere University Biological Field Station maintains three research sites in Kibale. A permanent research presence has been maintained in the Kanyawara area in the northwest since 1970, and in the nearby Ngogo region in the centre of the park since 1972; both have constant research activity and an extensive trail network. Sebitoli in the north is bisected by a busy highway. It is currently being developed for research, though the research presence here is less constant and it lacks a well-developed trail network. The east-central part of the park, Kanyanchu, is devoted to chimpanzee tourism. The rest of the survey area has no organized activity. Snare removal teams (Kibale Snare Removal Project unpublished data) and Uganda Wildlife Authority patrols suggest that poaching activity is common throughout the park; however, poachers apparently avoid the research areas of Kanyawara and Ngogo because of constant researcher presence. We surveyed

the Kanyawara and Ngogo research areas (inclusive of the non-research area between them), Sebitoli in the north and the Kanyanchu chimpanzee tourist area to the south.
The golden cat is locally known as *omwaga* and is occasionally reported to prey on goats. However, crops rather than livestock form the main source of income for people directly adjacent to the park, so resources are typically focused on deterring elephants and baboons rather than carnivores (C. Mackenzie, pers. comm.).

Results

Three camera trap surveys were undertaken between October 2010 and January 2012 in Kanyawara-Ngogo, Sebitoli and Kanyanchu. We used Deercam (n = 55, Non Typical Inc, Park Falls, Wisconsin, USA) and Camtracker (n = 15, Forestry Suppliers Inc, Jackson, Missouri, USA) 35 mm film camera traps. During the Kanyawara-Ngogo survey (the first survey, which acted as a pilot), we used mostly single camera stations (single = 39, pairs = 17) in order to extend our survey area. We used a pair of cameras at all Sebitoli and Kanyanchu camera stations. Cameras were placed on maintained research trails or well-used game trails spaced approximately 1 km apart. They were initially checked after one week and thereafter they were checked every 2 to 3 weeks depending on capture rate. Batteries were changed every 3 to 4 weeks or at each change of film.
Capture rates of African golden cats varied between sites and were highest in the research areas and lowest in the tourist area. As experienced in Gabon, individual identification was difficult due to the small and easily concealed areas of spotting (lower sides and inner legs) on golden cat bodies. However, as we did not use infrared (IR) cameras, we avoided the problems associated with grayscale images and we were able to assign identity to a greater proportion of individuals. In the Kanyawara-Ngogo and Sebitoli surveys, we identified 64% and 72% of 33 and 23 captures respectively (13 and 10 individuals). The Kanyanchu survey produced only 6 captures, some of which were not easily identifiable and we were unable to confirm any recaptures.
Although we were generally more successful identifying individuals than in Mikongo, Gabon, our results do not permit a precise estimate of density. A comparison of results from Kanyawara-Ngogo, Sebitoli, Kanyanchu and the Gabon survey is given in Table 1.

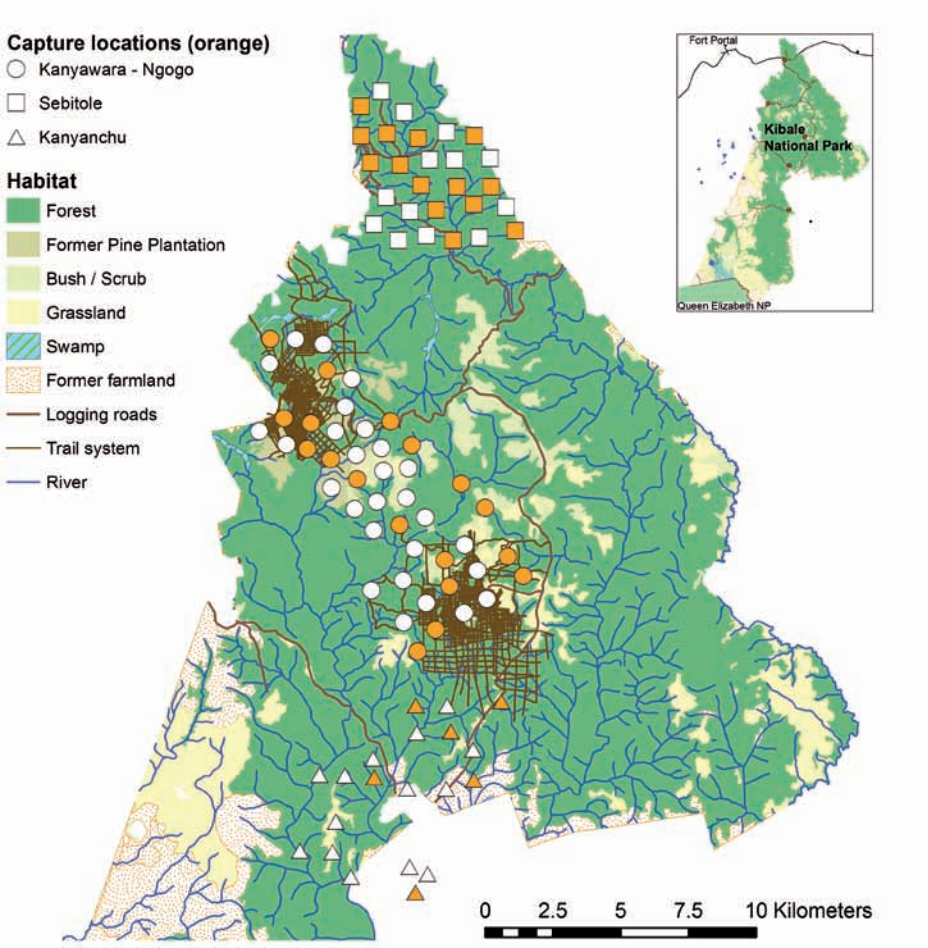

Fig 1. Map of Kibale National Park, western Uganda, showing locations of the 3 surveys with camera trap sites and the capture locations for African golden cat.

Capture rates of other species varied between sites (Table 2). The African civet *Civettictis civetta* was captured more frequently than golden cats in the Kanyawara-Ngogo survey and never in the Sebitoli survey. Red duiker *Cephalophus weynsi*, bushbuck *Tragelaphus scriptus* and bush pig *Potomochoerus larvatus* capture rates showed declines between Kanyawara-Ngogo and both Sebitoli and Kanyanchu. Blue duikers *Philantomba monticola*, a potentially important prey source for golden cats (Hart et al. 1996, Ososky 1998, Ray & Sunquist 2001), were captured less often in Kanyanchu than at other sites.

Table 1. Comparison of several survey parameters between three survey sites in Uganda and one survey site in Gabon. Capture rate (RAI) is the number of captures per 100 trap days. MMDM is the mean maximum distance moved of individuals between captures. Day, dawn/dusk and night are defined respectively as (8:00 - 18:00, 6:00 - 8:00 / 18:00 - 20:00 and 20:00 - 6:00) when animals were captured.

	Uganda (Kanyawara)	Uganda (Sebitoli)	Uganda (Kanyanchu)	Gabon (Mikongo)
Trap Days	2527	2237	1350	2634
Survey Area	52.9 km^2	21.8 km^2	29.9 km^2	21 km^2
Land Use	Research	Some research	Tourism	Research/Tourism
Capture Rate RAI	1.35	1.07	0.53	1.44
Minimum # individuals	13	10	N/A	6
MMDM	1677 m	1364 m	N/A	2160 m
Day	13 (38%)	5 (22%)	3 (50%)	21 (57%)
Dawn/Dusk	9 (26%)	4 (17%)	1 (17%)	6 (16%)
Night	12 (35%)	14 (61%)	2 (33%)	10 (27%)

Fig 3. All photographed individuals in Kibale showed minimal spotting compared to many Gabon individuals (Bahaa-el-din et al. 2011). Picture left typical grey phase, picture right typical red phase.

Discussion

The preliminary results of our camera trap surveys suggest that Kibale contains a healthy population of African golden cats and that the species occurs throughout the northern half of the park. Although we avoided identification problems associated with infrared (IR) cameras (Bahaa-el-din et al. 2011), we were unable to identify every individual due to the difficulty of discerning small, easily concealed spotting. Indeed, unlike in Gabon, no individual in KNP was heavily spotted, supporting the suggestion of van Mensch & van Bree (1969) that cats in the eastern part of the range are less spotted than those in the west (Fig 3a, b). Although we were unable to estimate densities with our preliminary data, we are currently using Panthera cameras which will potentially yield higher quality images.

As in Gabon, our data suggest that golden cats are cathemeral (Bahaa-el-din et al. 2011). Except for a lull in activity during the middle, hottest part of the day, we found no clear patterns and the effect of disturbance or human activity was not apparent. We captured photographs at 14 of 27 camera stations at Sebitoli despite the site being bisected by the busy Fort Portal-Kampala road and reportedly suffering higher poaching rates than at Kanyawara and Ngogo. Their persistence in this area may suggest that given sufficient forested habitat, golden cat populations are tolerant of elevated human activity, but this requires further investigation.

The lower capture rates of several species at Kanyanchu are concerning. Aronsen (2010) first published photographs of golden cats in Kibale in this region in 2008. He suggests that due to the presence of preferred prey and the mosaic habitat in Kibale, the golden cat population in the area could be maintained even in areas close to human habitation. However, our capture rates of golden cats and preferred prey species (blue duiker and red duiker in particular) were much lower in this area than others. During our survey in this area, we encountered poachers (Fig. 4), dogs or snares ten times, compared to twice in Sebitoli and never in Kanyawara or Ngogo. This site is the location of a well-known chimpanzee tourist site and benefits from the consistent presence of wildlife rangers, guides and tourists. Despite this, our results suggest that both poacher activity and concomitant effects on golden cats and prey in this region of the park may be a reason for concern. We recently pictured an individual that escaped from a snare (Fig. 5).

Table 2. Capture rates (captures per 100 trap days) from each survey area for selected larger mammals including ungulate species important to the bushmeat trade.

	Kanyawara	Sebitoli	Kanyanchu
African golden cat	1.35	1.07	0.53
African civet	2.22	0.00	0.53
Red duiker	15.2	3.76	1.90
Blue duiker	4.31	5.68	2.89
Bushbuck	3.32	0.49	0.23
Bush pig	2.06	0.04	0.08

The question of mesopredator release will be an interesting aspect of this study. As mentioned earlier, a key difference between the Gabon and Uganda sites is the absence of leopards in Kibale. The measurable effects of mesopredator release in Kibale may include a shift in diet toward larger bodied prey such as red duikers and monkeys and a shift in activity patterns. In future, we will compare diet of golden cats and other forest carnivores in Kibale as well as between Gabon and Uganda by collecting and analyzing carnivore scat (Brassine & Barker 2012). We will also investigate diet shifts associated with changes in medium sized prey density (duikers) as suggested by the capture rates in this study. These results will be compared with similar shifts associated with human hunters where leopards are also present in Gabon (Bahaa-el-din et al. 2011, Henschel et al. 2011).

As we continue to investigate the behaviour, ecology and conservation needs of African golden cats in Uganda, we will use data from these and future surveys to shed light on habitat preferences and population responses to various anthropogenic influences. We will apply occupancy modeling to investigate the effects of habitat, human activities and prey distribution on golden cats (Burton 2012). We have also initiated radio-telemetry to study habitat preference and home range use in greater detail, and to elucidate relationships among the carnivore guild; as of this writing, we have collared African civet and African palm civet *Nandinia binotata*. We will investigate the role of golden cats as the apex predator in Kibale and integrate our results in to long-running projects on primates and forest regeneration in Kibale to gain a better understanding of golden cats and the carnivore community in a tropical rainforest setting.

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Fig 4. Illegal hunting for bushmeat is widespread in the park, typically with the use of snares and domestic dogs.

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Fig 5. African golden cat with healed snare wound.