



**Large Carnivore Survey
Bwabwata National Park, Namibia, August 2017**



Mukwanyati male lion, Bwabwata NP

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INTRODUCTION

Knowing the size of large carnivore populations in protected areas is invaluable in guiding strategic conservation action and management decisions (Mills 1991). If repeated over time, surveys provide estimates of trends, which in large carnivore studies are often difficult to achieve, but are invaluable for conservation managers (Packer *et al.* 2005, 2011). Moreover, large carnivore density trends are a reflection of prey densities and anthropogenic influences and therefore serve as a useful indicator of ecological health and human impact.

The survey techniques chosen for large carnivores should ideally be cost effective, efficient and repeatable, especially if the goal is to achieve time series or trend data. Several studies have identified strong linear relationships between large carnivore density and track-based abundance indices derived from spoor transects (Stander 1998; Houser, Somers & Boast 2009; Funston *et al.* 2010; Winterbach *et al.* 2016). Thus spoor transects are a robust means to predicting large carnivore densities, especially in areas with suitable sandy substrate and provided suitably skilled trackers are available (Stander *et al.* 1997).

Following the first large carnivore survey of Bwabwata National Park (BNP) in July 2014, this second survey was conducted in August 2017 in a collaboration between Kwando Carnivore Project (KCP), Ministry of Environment and Tourism (MET), Panthera and the Kyaramacan Association (KA).

STUDY AREA AND METHODS

As part of the Kavango-Zambezi Transfrontier Conservation Area (KAZA TFCA) the BNP (6000km²) of Namibia forms a very important link connecting wildlife populations between Angola, Botswana and Zambia (Riggio *et al.* 2013, Funston 2014). The BNP includes the rivers and floodplains of the Kavango and Kwando rivers, and the sandy ridges and omurambas of the largely teak (*Burkea* spp) and mixed woodlands in between. Although the park covers approximately 6000km², the area surveyed was 5794 km². We did not survey west of the veterinary fence near Divundu due to it being heavily settled.

Data collection

The entire area included suitable substrate for counting tracks although care had to be taken to drive slowly and check for spoor more carefully on calcrete roads and newly made hunting tracks. The survey area was divided into thirty-nine 15x15km grids with transects being conducted within each grid (see Figure 1A - C).

The track surveys comprised driving along sandy tracks in the park with a tracker seated on a specially made seat on the front of the vehicles. Driving at an average speed of 10-15 km/h the trackers recorded all fresh (<24hrs old) carnivore tracks observed along the route, determined the sex and age of some of the species, and importantly tried to minimize the double counting of individuals that might have used that, or subsequent, transects more than once the previous night. This is particularly problematic for spotted hyaenas, and wild dogs.

Spotted hyaena walk such great distances at night that the probability of double or even triple counting the same hyaena (and thus inflating the estimate) is very real. This was factored into the estimate for both species by discounting the first sets of tracks on subsequent transects (i.e. transects that followed directly on from the previous transect).

Transects were driven in the morning and late afternoon. The typical start time was 07:00, generally completed by 11:00, whereafter the light for detection of tracks deteriorates. Afternoon tracking took place in the last hour and a half before sunset. Two teams operated at the same time, one mostly north of the tar road that bisects BNP, and the other mostly south thereof. On most mornings two transects were covered by each team, but on some occasions three transects were completed by a team. Spoor was recorded for all mammalian large carnivores (lion, leopard, cheetah, spotted hyaena and wild dog from which abundance estimates were derived (following Funston *et al.* 2010 and Winterbach *et al.* 2016). Spoor and live sightings of nine important prey species for the persistence of lions were also recorded. These are as follows: buffalo, eland, elephant, giraffe, kudu, roan, sable, wildebeest and zebra.

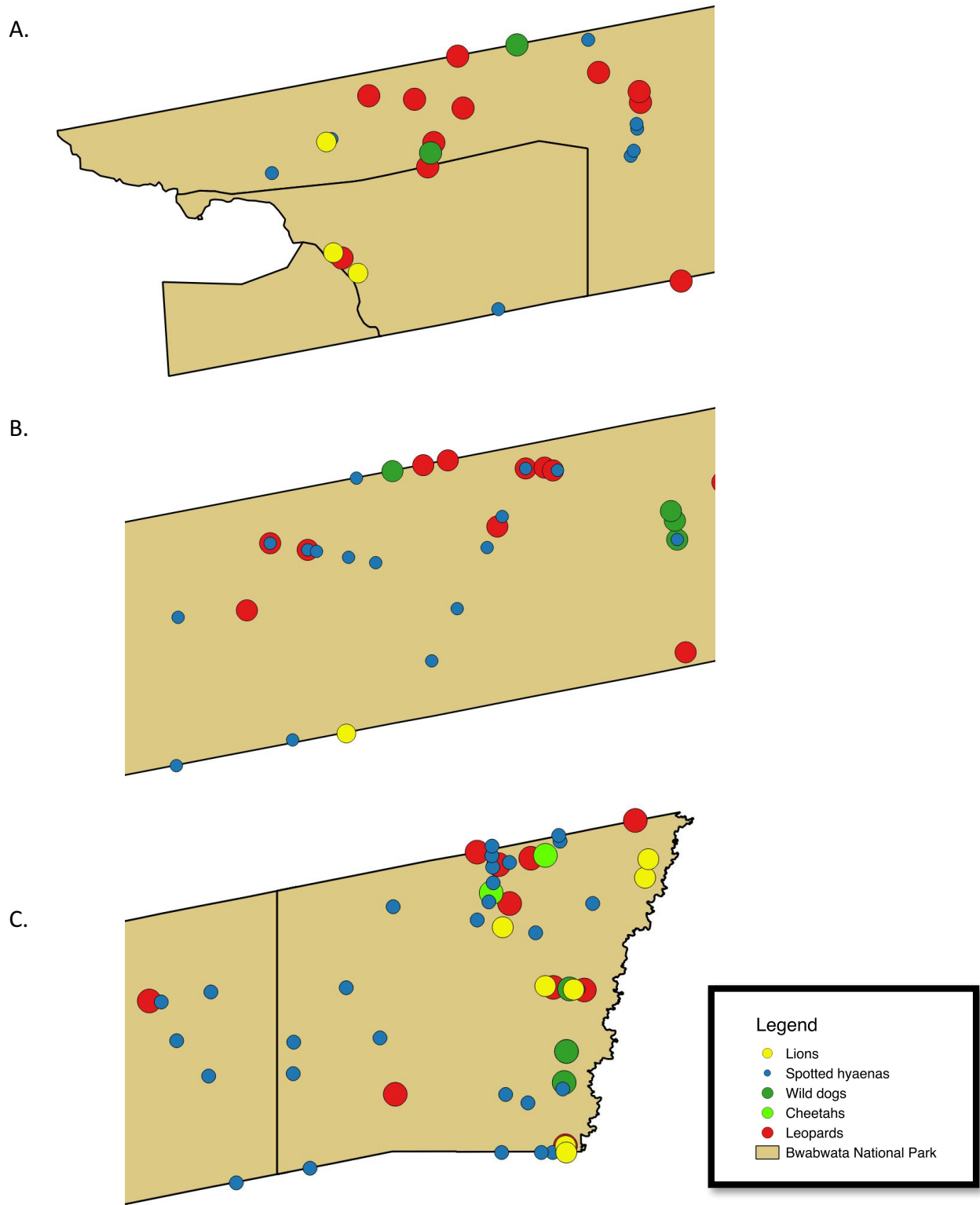


Figure 1. The areas surveyed (A = Buffalo Core Area; B = Multiple use Area; C= Kwando Core Area) during the July 2017 spoor surveys of Bwabwata National Park, Namibia, depicting transected distribution of large carnivore spoor.

Occupancy modelling will be used to show probability of occurrence for these species in the survey area as opposed to using distance sampling to derive population estimates as sighting and spoor observations of herbivores in BNP fall below the minimum threshold required for accuracy. The occupancy modelling analysis is in process and an amended report will be circulated. All data was recorded using Cybertracker software on Trimble GPS handheld computers and backed up on data sheets. Transects were track logged by GPS and all mapping was done in Quantum GIS.

Data analysis

For each transect the number of track observations for each species was noted, and calculated as “track frequencies”, i.e. the number of tracks per 100 km of transect. As large carnivore track density is strongly and positively correlated with large carnivore population density in any given area (Funston *et al.* 2010; Winterbach *et al.*; 2016), average track frequencies were transformed into population densities using the following equation $x_i = (t_i - 0.4)/3.15$, where x_i is carnivore density and t_i is carnivore track frequency (Funston *et al.* 2010).

RESULTS

During the survey a total of 54 transects were conducted, with an average transect length of 11.0 km (range 2.0 to 19.0 km), covering a total of 572 km. Each transect was driven only once and the survey took eight days to complete.

During the survey lion tracks were recorded in the Kwando and Buffalo Core Areas and south of Omega 1 in the multiple-use area (MUA), resulting in a population estimate of 22 (range 10 – 34) lions. By comparison 23 leopard tracks were recorded throughout BNP, resulting in a population estimate of 80 leopards. These data, and the density estimates for the other large carnivores, are summarized in Table 1.

DISCUSSION

Large carnivore population estimates and distribution in the park were similar to the result for 2014, which suggests some stability in most populations, with only lions showing a minor increase from 16 to 22 individuals. The estimate of 22 lions is in line with our own personal observations. There are no resident lions in the multiple use area, but lions are known to use the MUA during the wet season when ephemeral pans in Omurambas contain water and prey disperses into the area. Currently there is not a permanent pride within the Kwando Core Area as the Horse Shoe pride has shifted its home range to northern Botswana. There is, however, one lioness from the pride currently resident in the Horse Shoe area with three large cubs. All

18 lions (in five different groups) that periodically utilize the Kwando Core Area, have parts of their range that either extend south into Botswana or north into Angola, or both.

Table 1. Summary of the results for large carnivores from the spoor survey of Bwabwata National Park, Namibia in August 2017.

Metrics	Lions	Leopards	Cheetahs	Spotted hyaenas	Wild dogs
Number tracks recorded	9	23	2	27	16
Track frequency	1.21	4.15	0.25	4.56*	3.33
Mean density	0.37	1.27	0.08	1.4	1.02
Population estimate (range)	10 - 34	58 - 95	1 - 8	70 - 98	23 - 99
Total population estimate	22	80	5	80	61

*corrected for double counting on subsequent transects

A single female lion was reintroduced into the Buffalo Core Area in October 2015 by MET (Piet Beytell, *pers.comm.*). She and her four large cubs live mainly within the core area. The adult males from the Mahango Core Area regularly swim the Kavango River as they are shared between the small Buffalo and Mahango prides of one adult female each (Piet Beytell *pers. comm.*).

There are currently no adult male lions living permanently inside BNP, but there are some maturing subadult male coalitions: the three 'Angola males' are now about five years of age and the two Mukunyati males are about three and a half years of age. The Kwando Core Area thus has the potential to become an important source population of lions, which can disperse and repopulate conservation areas in Angola.

In contrast to the low number and restricted distribution of lions, three of the large carnivore species occur widely and throughout the BNP. Estimates suggest a population of about 80 leopards and a similar number of spotted hyaenas. With a consistent estimate of about 60 wild dogs, BNP is a very important component of the range of the regionally endangered African wild dog and connects important populations within KAZA from northern Botswana with those

within southern Angola. Four packs of wild dogs that occasionally split to form smaller packs continue to use BNP as part of their home range (Hanssen *et al.* 2015). Comparisons between population estimates from 2014 and 2017 can be seen in Table 2. As expected the estimate for cheetahs is the lowest of the large carnivores in BNP, with no more than 8 cheetahs estimated to occur in the park.

Table 2. Comparison of 2014 and 2017 spoor survey results for Bwabwata National Park, Namibia.

Metrics	Lions		Leopards		Cheetahs		Spotted hyaenas		Wild dogs	
	2014	2017	2014	2017	2014	2017	2014	2017	2014	2017
Track frequency	1.42	1.21	6.09	4.15	1.10	0.25	4.24*	4.56*	4.26	3.33
Mean density	0.32	0.37	1.18	1.27	0.22	0.08	1.22	1.4	1.23	1.02
Population estimate	16	22	90	80	11	5	70	80	61	61

Considering the importance of BNP for an endangered species like the African wild dog, more needs to be done to slow traffic in key areas throughout the park. During 2017 thus far one adult male cheetah, one adult female hyaena, one sub-adult hyaena, one adult male lion, and a three-months old lion cub were killed by speeding motor vehicles along the national road.

This survey follows on from a baseline survey of large carnivores that took place in BNP during 2014. A survey of Luengue-Luiana National Park using the same methodology took place during 2015 and 2016 (Funston *et al.* 2017), and in Sioma-Ngwezi National Park in 2015 (Young *et al.* 2017). In collaboration with MET, Walking for Lions will use this method to carry out the first baseline survey for large carnivores in Nyae Nyae conservancy in late 2017. This growing body of knowledge will contribute to a standardized monitoring system for large carnivores for the KAZA TFCA.

Three species of large carnivores are periodically hunted as trophy animals with BNP; lion, leopards and spotted hyaena. Elsewhere Hanssen (2011) has argued against the trophy hunting of any spotted hyaenas within BNP stating that resident clans mainly occur within the core areas, that these clans are still recovering from persecution in the past, and that losing alpha or high ranking females is extremely destabilizing for the clans and their recovery. Weighed up

against the achieved trophy the hunting of spotted hyaenas in BNP cannot be justified. Similarly, there are no resident full grown adult male lions within BNP, and lions should thus remain off the quota for now. In 2018 we will conduct a camera trap survey to assess with greater detail how the leopard population is functioning and whether there are any noticeable effects of trophy hunting.

This survey should be repeated every two to three years to build up an estimate of population trends. At a cost of about N\$60,000, this survey method is scientifically sound, cost effective and repeatable, and employs the traditional tracking skills of the community residing in the park. It can be completed in less than two weeks.

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