

Progress Report

Okavango Crocodile Monitoring Programme.

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OKAVANGO CROCODILE
Monitoring Programme

Objectives

The objectives of this reporting period were as follows:

1. Conduct a Capture-mark-recapture survey combined with a spotlight survey
2. Tackle the issue of Problem Animal Control in response to Human-crocodile conflict in the Maun region

Progress during the report period

1. Spotlight Survey August 2016

The population density comparative study will allow us to understand the success (or failures) of previous conservation and management regulations. This will allow officials to remedy any shortfalls in regulation and policy around the management of this Keystone species. As a recently enlisted UNESCO World Heritage Site (2014), the government is also required to closely monitor wildlife species numbers and this study will provide the most comprehensive population data for any wildlife species in the Okavango. As our efforts are focused in UNPROTECTED areas of the Okavango, this study serves as a critical assessment of wildlife and human co-existence challenges.

The spotlight method of surveying crocodylians was standardized in 1977 and has proved to be a very successful and reliable method over the last three decades. Spotlight surveys are used to assess and monitor populations by providing the researcher with indices of population size and density. In order to improve the accuracy and overcome the biases of this technique, it is essential that an accurate correction factor (CF) be calculated for each crocodile study area. A correction factor was calculated by Bourquin (2008), and we will make use of this CF to re-assess the population 10 years after the first density study was carried out (2006).

Methods

The spotlight survey was therefore conducted from 23 – 29 August 2016, from Etsatsa Island, approximately 5 km downstream from Seronga Village in the south, to Shakawe Village near the Botswana/Namibia border in the north. Pre-determined transects, selected for accessibility (some channels, such as the kgala-Thoaga

channel, were completely blocked by Papyrus) and a minimum width of 30 m were travelled between 19h30 – 02h00. The team of observers consisted of Mr. Vince Shacks, Prof Lee Fitzgerald and Dr. Sven Bourquin. Observers were changed every hour in order to reduce the effects of fatigue. Bourquin and Shacks have been members of the research team since 2003 and have both been involved in all 4 of the previous spotlight surveys carried out in the Okavango Panhandle. Crocodiles were detected by means of a 1.5 million candlepower spotlight that illuminated the main water column and the water/vegetation ecotone. The crocodile has a reflective layer in the eye known as the *Tapetum lucidum* that reflects light back at the observer, and crocodiles of all sizes can be seen with equal ease at a distance of 120m or more. The crocodiles were assigned to classes based on total length (TL), estimated by the trained observers by multiplying the head-length by a factor of seven to estimate total length. The size-classes were: hatchlings < 34 cm, yearlings 34 – 77.9 cm, juveniles 78 – 129.9 cm, subadults 130 – 229.9 cm, adults >230 cm.

The panhandle was divided into 5 zones, based on levels of human disturbance and the nature of the river (Figure 1). These zones were: A – Seronga to the lower entrance of the Phillipa channel, B – the main channel between the lower and upper Phillipa entrances, C – the Phillipa channel, excluding the upper Phillipa, D – the main channel between the upper Phillipa entrance and Redcliffs, E – the main channel between Redcliffs and Shakawe, excluding the blocked Kgala-Taoga lagoons and upper channel. For each of the five zones, the densities of all size classes were calculated by dividing the number of crocodiles observed in each zone by the total distance of that zone.

Results

General population trend shows an increase in population

During the six nights of spotlight surveys, a distance of 265 km of the panhandle was covered. A total of 433 ($1.63 \text{ crocodiles.km}^{-1}$) crocodiles were observed, of which 71 (16%) submerged before size could be estimated. The remaining 362 crocodiles ranged in total length from 35 – 500 cm. Of these, 167 (39%) were yearlings, 53 (12%) were juveniles, 19 (4 %) were sub-adults and 123 (28%) were adults. The correction factor used for the estimation of total population size was 4.46 (from

Bourquin PhD Thesis, 2008), resulting in a total population estimate, excluding the panhandle north of Shakawe, the upper Phillipa channel and the Kgala-thaoga lagoons, of 1931 crocodiles.

This survey represents the 5th spotlight survey undertaken by the research team since 2004. The surveys in 2004, 2005 and 2006 were used to calculate a population estimate, which was calculated in 2006 as being 2629 crocodiles for the Panhandle of the Okavango. The spotlight surveys after that are used to analyse whether the population trend is either increasing or decreasing over time. The total numbers calculated from pure spotlight surveys (such as those conducted in 2008 and 2016) should not necessarily be used to represent a population estimate but rather to provide a baseline number to monitor trends. Based on the first pure spotlight survey, this baseline figure is 1793 crocodiles. Therefore, spotlight surveys carried out after this 2008 survey, will be able to tell us if the population is increasing or decreasing based on this figure of 1793.

The 2016 survey results are indicated in table 1 below. The total estimate for the survey was 1931, **which represents an increase in population since 2008.**

Table 1. Comparison of spotlight survey population estimates and size class breakdowns since 2004. A drastic decline in the number of sub-adult crocodiles encountered was calculated and the reasons for this decline need to be established.

SIZE CLASS	2004		2005		2006		2008		2016		TRENDS
	NUMBER	%	Number	%	Number	%	NUMBER	%	NUMBER	%	
ADULT	696	26	649	25	667	25	119	30	123	28	
SUB-ADULT	582	21	410	15	535	20	72	18	19	4	!
JUVENILE	602	23	466	18	613	23	53	13	53	12	
YEARLING	776	29	1 061	40	806	31	93	23	167	39	
HATCHLING	20	1	43	2	8	1	0	0	0	0	
UNKNOWN							65	16	71	16	▲
TOTAL	2676		2 629		2 629		402		433		▲
Average density - Low water (croc/km)					1.94		1.52		1.63		
POPULATION ESTIMATE							1 793		1 931		

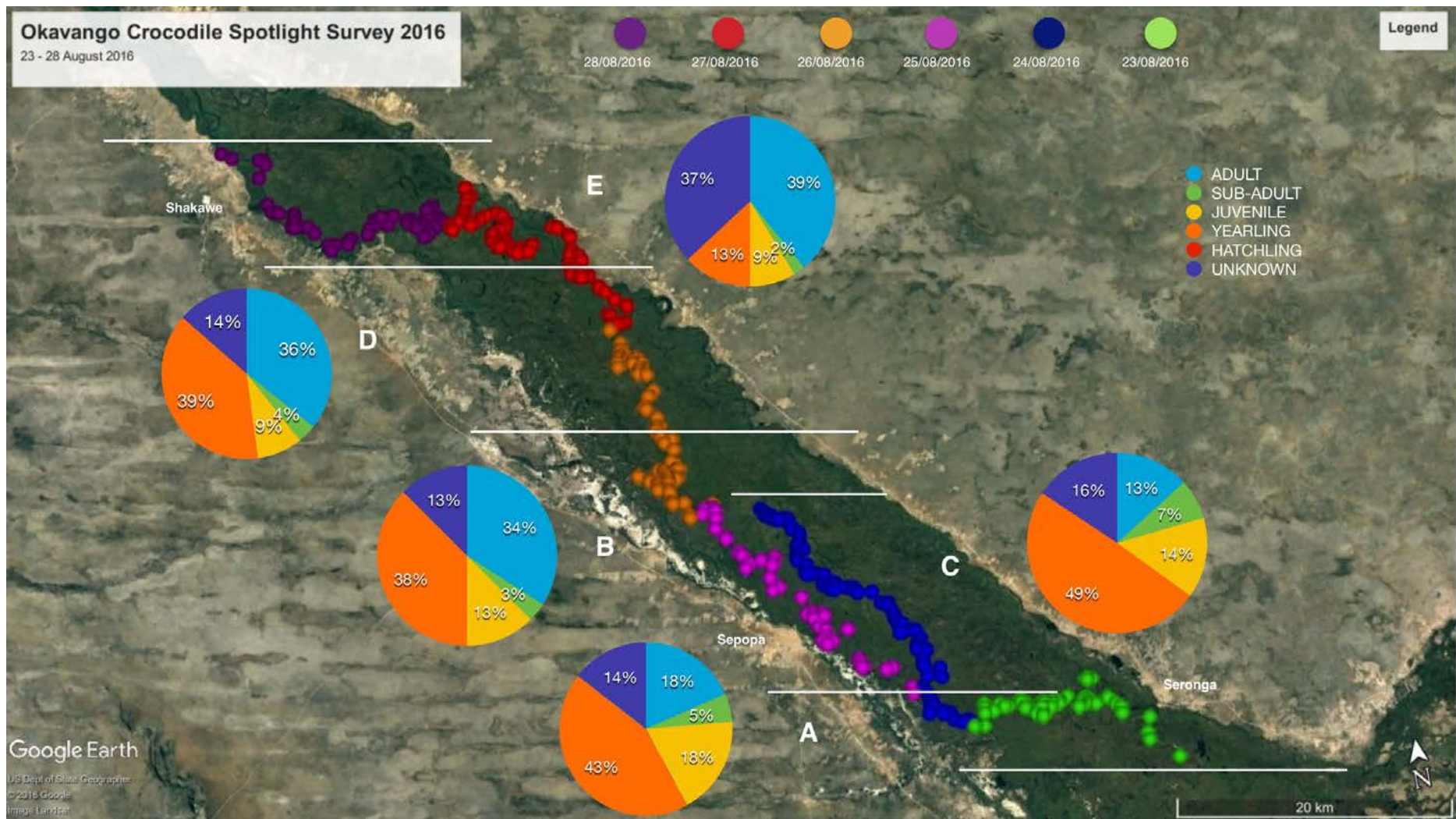


Figure 1. Results of the 2016 spotlight survey results. Each section was assessed individually to show the population breakdown in each region

Concerning decline in sub-adult crocodiles in Panhandle

A very important component of this assessment is the size class breakdown of the population within this total population estimate. When comparing the 5 spotlight survey assessments, one can clearly see that a similar population breakdown is noted for each of the size classes between the various years of surveys (eg. Adults always fall between 25 -30% of total crocodiles encountered). It is critical to the health of the system that these size class breakdowns remain consistent as that indicates a certain degree of population stability.

Figures 1 (2008) and 2 (2016) indicates the population size class breakdown for each of the survey years. These groupings have remained fairly constant over the 12 year period that these surveys have been carried out in (2004 – 2016). **One very concerning figure however, is the extreme decline in sub-adults encountered in the most recent 2016 spotlight survey.** This survey showed a 74% decline in the amount of sub-adult crocodiles encountered in the Panhandle (figure 3). In 2008 sub-adults made up 18% of the crocodiles encountered while in 2016 they made up just 4% of the crocodiles encountered. Conditions between the surveys remained fairly constant with surveys taking place within the same 4 week period (21 August – 19 September). Two of the three researchers on the team were exactly the same personnel (Vincent Shacks and Sven Bourquin). The same techniques were used for the surveys and the exact same transects were surveyed. The difference in water level between the two surveys is estimated to be less than 10cm.

● ADULT ● SUB-ADULT ● JUVENILE ● YEARLING ● HATCHLING ● UNKNOWN

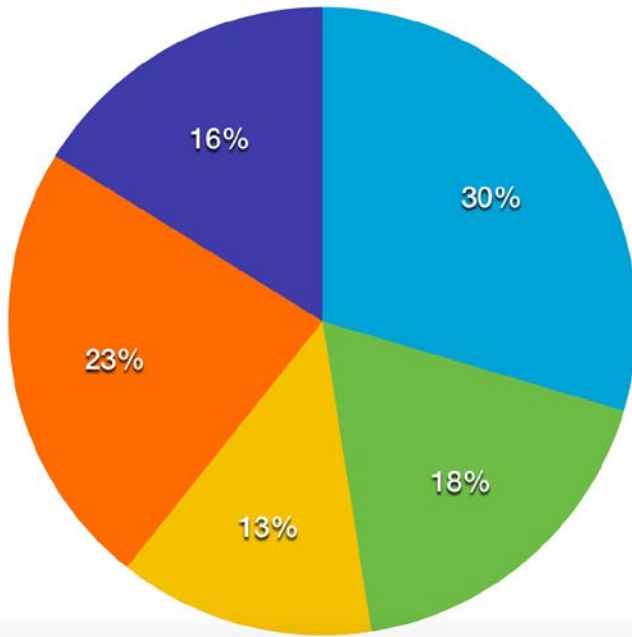


Figure 2. Population size class breakdown in 2008

● ADULT ● SUB-ADULT ● JUVENILE ● YEARLING ● HATCHLING ● UNKNOWN

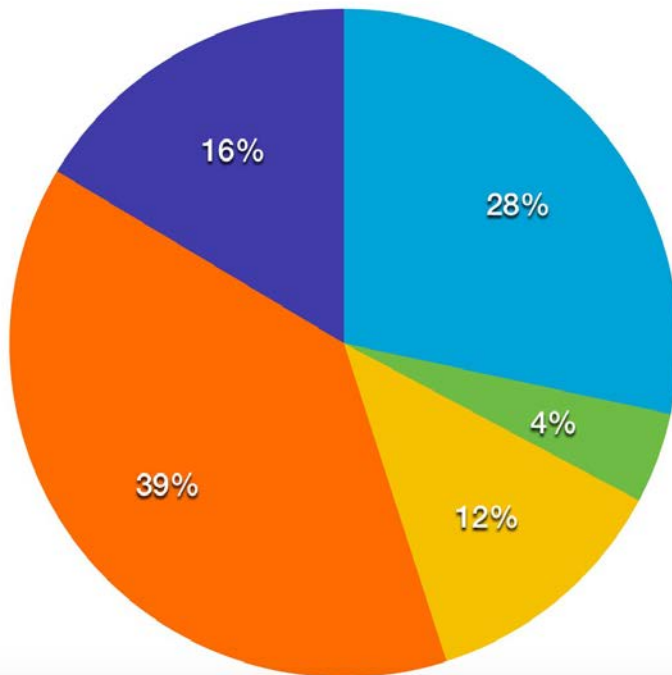


Figure 3. Population size class breakdown in 2016. A large decline in the percentage of sub-adults encountered was noted.

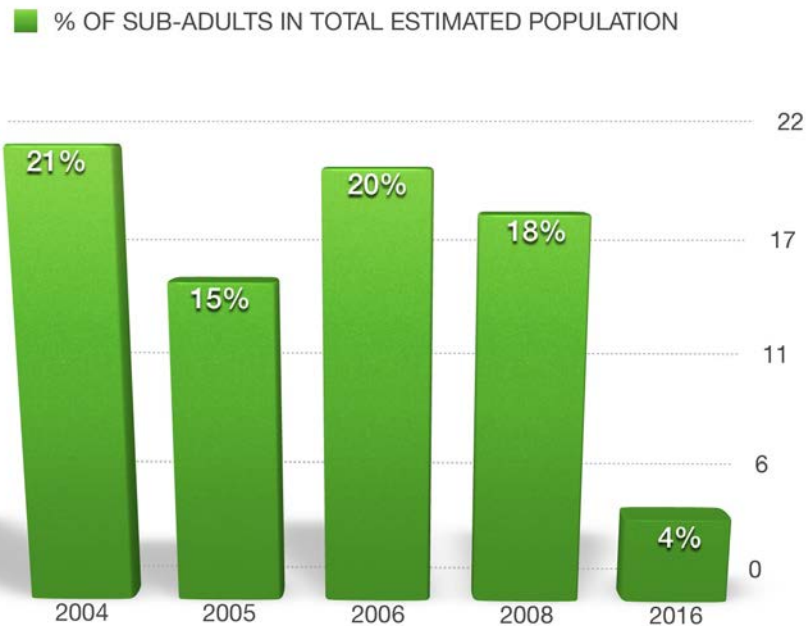


Figure 4. A comparison of the percentage representing sub-adults for each of the 5 surveys conducted since 2004. The 2016 numbers showed a drastic decline in the percentage of sub-adult crocodiles encountered.

Discussion

An increase in population trend is encouraging but the drastic decline in sub-adults requires attention.

The increase in the calculated population trend is encouraging and a good sign for this population. While the increase is not substantial, it is certainly a good enough indication that the population is stabilizing and possibly even showing signs of increasing. The crocodile density on the surveyed portion of the Okavango river has increased from 1.52 to 1.63 crocodiles per kilometer.

Drastic declines in fish numbers and diversity of lagoon systems in the Okavango Panhandle.

The research team have been carrying out nocturnal surveys in the Okavango Panhandle for the past 13 years. Over this period, we have been able to informally assess fish numbers and diversity in the lagoons using our spotlight. Many of the species occupying these lagoon systems are nocturnal feeders which means that observations of the species are better at night. During the 2016 survey our team surveyed crocodiles in 31 lagoons of varying sizes. Our team noted a drastic decline in both total numbers and diversity of fish in these lagoons. This decline is concerning

for the crocodile population as well as the natural fish resource of the Okavango. As noted in the survey results above, there was a drastic decline (74% decline) in the number of sub-adult crocodiles encountered on this survey. This size class of crocodile has been shown to be heavily reliant on fish for its diet. The noted decline in fish observed in the lagoon systems over the 7day survey correlates with the decline in sub-adult crocodiles encountered on this survey. There is every possibility that the sub-adult crocodiles have moved out of the Panhandle due to the lack of fish present in these lagoon systems. If this is indeed the case, this impact will have further impacts on the species as it will affect movement, energy expenditure and possibly the success of these crocodiles surviving to adulthood. This suggested decline in fish stock is also hugely problematic for the entire aquatic food chain as well as the subsistence fishery sector.

Nocturnal fishing activities and increased commercial boat presence.

During the 7day survey our team noted three separate incidents where fishermen were either setting or clearing gill nets in lagoons at night using lights. The fishermen were on aluminum motor boats which suggests that they were commercial fisherman. The region around Redcliffs and Ngarange channel showed very intensive gill netting in most of the large lagoon systems. A very large increase in the amount of commercial fishing boats was noted at Ngarange village. It is our opinion that the commercial fishing activities taking place in the Okavango Panhandle are unsustainable and have resulted in the decreased numbers and diversity of fish in the lagoon systems. This decline in fish numbers could very well have resulted in the large decline of sub-adult crocodiles observed in this survey. Anecdotal reports from recreational fishermen, lodges and residents in the region support the notion that fish catch rates have decreased substantially. Reports of large scale commercial fishing for export markets has been suggested as the reason for this.

Work planned for next reporting period

The research team plan to carry out a nesting survey along the length of the Okavango Panhandle in December 2016. We will report on this survey in our final research report in December 2016.

