

## Cat Project of the Month - October 2005

The IUCN/SSC Cat Specialist Group's website ([www.catsg.org](http://www.catsg.org)) presents each month a different cat conservation project. Members of the Cat Specialist Group are encouraged to submit a short description of interesting projects. For application use this [standardised form](#) (an editable word document)

### Census and monitoring of the Zakouma lion population, Chad



The Zakouma Lion Study is a multidisciplinary lion research project and started in March 2003 in the Zakouma National Park, South-Eastern Chad. It aims at acquiring a better knowledge of the Zakouma National Park lion population and its chances of survival in the park.

#### Nathalie Vanherle

Nathalie Vanherle is a veterinarian (PhD) specialised in wildlife management. She is the project leader of the Zakouma Lion Study since April 2003 (on the photo together with capture specialist B. Chardonnet).

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Photo: P. Poilecot

#### Conservation problems

Formerly widespread across Europe, the Middle-East, Asia and Africa, the lion (*Panthera leo*, L. 1758) is today mostly confined to sub-Saharan Africa, while a small relict population of 250 still survives in the Gir forest of western India. The traditional "King of Beasts" is today considered a Vulnerable species by IUCN and described as "regionally endangered" in West Africa. Two recent surveys covering the entire African continent underlined the medium and longer term threats to this species' survival. With numbers estimated between 950 and 2,800 according to Bauer and Van Der Merwe (2004) or, more optimistically, between 3,000 et 4,900 according to Chardonnet (2002), the Central and Western African populations are the most endangered.

While the small size and geographical isolation of some populations contribute to the precariousness of the lion's future in the sub-region, one of the main current causes of population decline in West and Central Africa is the growing conflicts between the predator and the human communities.

Human population growth, concomitant development of cattle breeding and agriculture, and consequential diminution of natural habitats has led to a significant increase of aggressive interactions between human beings and lions, such as lion attacks on livestock and people on one hand, and destruction of lions (by poisoning and poaching) on the other hand.



Village at the border of Zakouma National Park (Photo N. Vanherle)



The Zakouma National Park at the beginning of the rainy season (Photo N. Vanherle).

### The Zakouma lion population

Thanks to the effective conservation of the Zakouma National Park ecosystems and to low human demography in the peripheral zone of the park, the Zakouma lion population is among the least threatened populations of West and Central Africa

Although, the main threats facing this population are :

- Its small population size (about 120 individuals) if ever the park becomes disconnected from its surrounding areas
- Increasing demography, habitat conversion and replacement of prey with livestock in the peripheral zone of the ZNP.

### The Zakouma Lion Study

The Zakouma Lion Study was launched in April 2003 as part of the CURESS project ("Conservation and Sustainable Use of the Soudano-Sahelian Ecosystems", project financed by the European Union), which aims to improve the sustainable management of the natural resources of the Zakouma National Park and its surrounding area. The Zakouma Lion Study overall objective is to contribute to lion conservation in Central Africa. Its specific objective is to obtain a detailed description of the lion population and a more precise estimation of their chances of survival in the Zakouma National Park.

For this it focuses on the following targets :

- Identification of the ZNP lion population ;
- Analysis and comparison of the spatial distribution of the lions and their prey species in the ZNP ;
- Collection of data regarding the health status of the lions ;
- Analysis of human - carnivore conflict in the ZNP peripheral zone ;
- Training of an assistant, recruited among the local communities, in lion population monitoring.

### Study area

The Zakouma National Park (ZNP) was created in 1963 and rehabilitated in 1989, thanks to a financial support of the *European Development Fund*. The park (c. 305,000 ha), straddles the Salamat and Guéra prefectures, between 10°34' and 11°03' North and 19°21' and 20°00' East, approximately in the centre of the Chad basin. The climate is typically Soudano-Sahelian, with seasonal rainfall from March to November, estimated at a yearly average of 853 mm at Zakouma station during the 1996-1998 period (Dejace, 2002).

The area is fairly flat and reaches its highest point (415 metres above sea level) near the village of Zakouma. The Eastern part of the park is crossed by a succession of rivers, running from North to South. The south-eastern part of the park rests on vertisols flooded during the rainy season, between July and September.

The vegetation varies according to the rainfall gradient, from: *Acacia* savannas in the North, drier, to Combretaceae and Caesalpinaceae savannas in the more humid central and southern regions. Unlike many other parks across Western and Central Africa, the ZNP still offers strong and healthy populations of big mammals, such as elephants, buffaloes, giraffes, roans, hartebeests and topis. The study area chosen for the Zakouma Lion Study covers a surface area of 150 000 ha, i.e. the eastern half of the ZNP. This zone, chosen for its accessibility (the western half of the park has very few roads or tracks), includes the great majority of swamps and rivers to be found in the ZNP and is home to virtually all the park's fauna during the dry season.



Location of the Zakouma National Park in south eastern Chad (maprom Dejace, 2002).

## Methods

The number of lions living in the Zakouma National Park is being assessed through two separate census : a total count, based on the individual recognition method described by Pennycuik and Rudnai (1970) and a sample count based on the "call-in method" described initially by Smuts *et al.* (1977). The first technique uses natural (and artificial) marks of lions, and in particular their whisker spot pattern (unique in each individual), for individualizing animals. The second method, widely used for recording major African carnivores, involves attracting the target species by broadcasting the calls of one of its prey species along with calls of various carnivores (in our case: distress call of a buffalo calf and calls of lions, hyenas and jackals).



Monitoring of a female lion immobilised for radio collar fitting (Photo N. Vanherle).

Five lions, three adult females and two adult males were captured in the Zakouma National Park in May 2004. Their movements are being monitored by radio-tracking throughout the dry season from a four-wheel drive vehicle and occasionally from a ULM aircraft. The health status of these five lions has been assessed through blood sample analysis.

The abundance and distribution of lions' potential prey is assessed through seasonal aerial counts carried out by the CURESS project.

Data on Human – predators conflicts in the Zakouma National Park periphery are collected in the framework of socio economic surveys undertaken by development projects working in the ZNP area.

A local assistant was recruited from the village of Zakouma and took part in all the activities carried out as part of the Zakouma Lion Project. He is being trained in the techniques of identifying lions and nocturnal census using the call-in method.

## Preliminary results

### *Characterisation of the Zakouma lion population*

The field activities carried out by the Zakouma Lion Study during the 2003-2005 period enabled the identification of 53 lions (adults, sub-adults and juveniles) and the observation of 22 lion cubs and one non identified juvenile in the eastern zone of the ZNP. At this phase of the project, the lion population in this zone of the park is therefore estimated at 76. The sex ratio is 1.4 females per male, established on the basis of a 46% share of adult individuals

The average size of groups encountered during the 2003-2005 is  $2.68 \pm 0.30$  ( $n = 127$ ,  $P = 0,05$ ) lions.

By comparing this average to the data from elsewhere in French speaking Africa, (Bauer *et al.*, 2003), we note that the average size of groups of lions observed in the ZNP is higher than those reported in the National Parks of Niokolo Koba in Senegal and Waza in Cameroon (1.9 and 1.5 lions per group respectively). It is close, however, to the numbers observed in the Pendjari National Park in Bénin where it is estimated at 2.3 lions.

The field work carried out to date also enables us to put forward the hypothesis of the existence, in the eastern zone of the Park, of at least six groups of lions, using different habitat zones.



Remote tracking equipment fitted on a ULM aircraft (Photo P.Poilecot).

**Table 1.** Comparison of the size of groups of lions observed in the ZNP, the Pendjari National Park (Bénin), the Niokolo Koba National Park (Senegal) and the Waza National Park (Cameroon).

Protected areas	Frequency and percentage of observations of lion group size							Mean group size
	1	2	3	4	5	6	7-10	
Zakouma	39 (31%)	32 (25%)	22 (17%)	17 (14%)	8 (6%)	4 (3%)	5 (4%)	2,68
Pendjari	24 (36%)	21 (31%)	16 (24%)	1 (1,5%)	1 (1,5%)	2 (2,9%)	2 (2,9%)	2,3
Niokolo Koba	8 (38%)	10 (48%)	1 (5%)	1 (5%)	1 (5%)			1,9
Waza	43 (65%)	16 (24%)	5 (8%)	1 (2%)	1 (2%)			1,5

**Nocturnal census**

A nocturnal census based on the call-in method was deployed in the east of the Park. 43 call stations set up along tracks at five kilometre intervals enabled the observation of 42 lions (Fig. 1). Given the fact this zone covers virtually all the rivers and permanent water spots in the Park, the total number of lions present in the ZNP as a whole should not be much higher than the number present in this zone. Calibration of the technique for adaptation to the ZNP ecosystem must now be carried out in order to extrapolate these results to the entire study zone. This calibration was begun during this season and will be continued next season. If we use average values used elsewhere in Africa when calibration has not been established (call range of 2.5km and response rate of 50%), the lion population present in the east of the Park would be approximately 120 individuals.

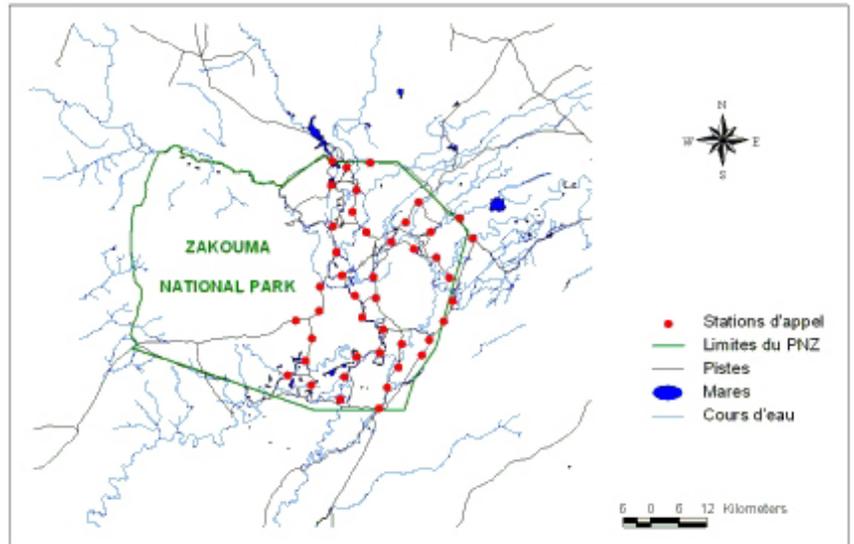


Fig 1 - Positions of the 43 operational stations in the eastern zone of the Zakouma National Park during the nocturnal observations for the 2005 campaign.

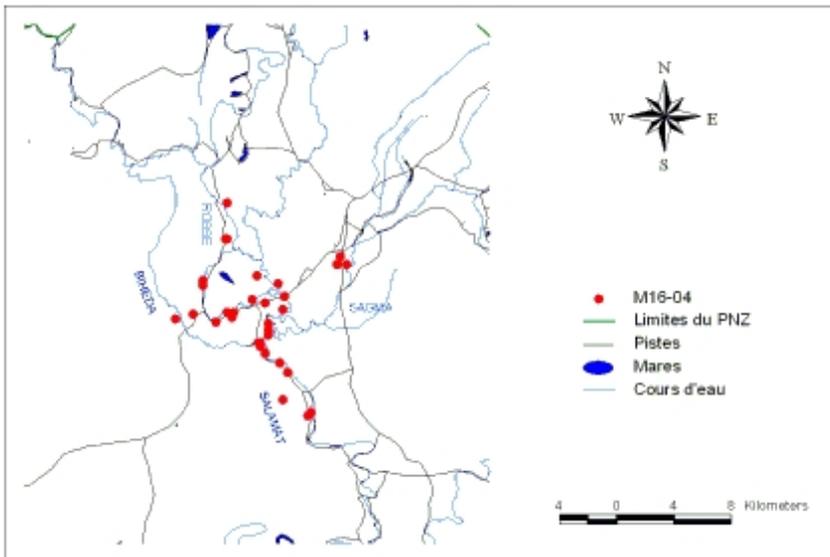


Fig. 2 - Radio locations of a male in the Zakouma National Park.

**Lion spatial distribution**

The five lions fitted with VHF transmitter collars in April and May 2004 were successfully located by radio tracking throughout the 2004-2005 field season enabling the identification of their predilection area.

Figure 2 presents the various positions of an adult male (M16-04) in the east of the Park since May 2004.

#### *Analysis of human - carnivore conflict in the ZNP peripheral zone*

Two surveys, independent of the Zakouma Lion Study, were undertaken by the IEFSE (Interactions between breeding and wild fauna and the environment in the protected zones of south-east Chad, project financed by the French World Environment Fund FFEM) and CURESS projects amongst local populations in the periphery of the ZNP. In addition to the data collected, information was recorded concerning human - carnivore conflicts. On the basis of the results of our field activities and the surveys carried out by the IEFSE project, the presence of lions in the peripheral zone of the Park would appear to be diminishing in parallel to the increase in human demographic pressure. However, socio economic surveys carried out within the framework of the CURESS Project highlighted the fact that the populations around the ZNP have a persistently very negative perception of lions as a predator.

#### *Prey abundance and lion predatory behaviour*

Aerial census of the large mammals in the ZNP was carried out by the CURESS project in March 2005. With populations of 5082, 3885 and 845, buffalo, elephants and hartebeest were among the most abundant species in the Park. These three species are also apparently the most hunted by the lions in the Park. We also noted a very high level of predation by lions on the Defassa waterbuck during the transition period between the dry and rainy seasons.

#### *Collection of data regarding the health status of the lions*

Analysis of the blood samples collected from the five immobilised lions for collar fitting revealed that they were not contaminated by Feline Leukemia Virus (FeLV), Feline Immunodeficiency Virus (FIV), Feline Infectious Peritonitis (PIF), panleucopenia, calicivirus, rhinotracheitis, distemper or Erlichia.



Field results have enabled us to put forward the hypothesis that elephants are among the prey species contributing most to the lion prey biomass in the Zakouma National Park (Photo N. Vanherle).

#### **Next steps**

The activities initiated in the previous campaigns (lion census by random search, analysis of the population's social structure, remote tracking of lions with VHF collars and training an assistant) will be pursued in the 2005-2006 campaign. For this we will focus our attention on studying the social structure of particular group of lions. The calibration for the nocturnal tracking used during the last season will also be continued into the next season in order to establish a more precise estimation of the number of lions present in our study zone and in the ZNP. Special attention will also be paid to the diet of the lions in the ZNP. We envisage extended tracking of one or several groups of lions to this end.

Finally, fitting of 10 lions with GPS-ARGOS collars is envisaged in order to monitor the ZNP lion distribution and movements in the park and its peripheral zone throughout the year.

#### **Bibliography**

- Bauer, H., De longh, H.H., Di Silvestre, I. 2003. Lion (*Panthera leo*) social behaviour in the West and Central African savannah belt. *Mammalian Biology*, 68 : 239-243.
- Bauer, H. et Van Der Merwe, S. 2004. Inventory of free ranging lions (*Panthera leo*) in Africa. *Oryx*, 38 : 26-31.
- Chardonnet, P. (ed.). 2002. Conservation of the African Lion : Contribution to a status survey. *International Foundation for the Conservation of Wildlife, France & Conservation Forces, USA*.
- Dejace, P. 2002. Zakouma. *Direction de la Protection de la Faune et des Parcs Nationaux. Ministère de l'Environnement et de l'Eau. République du Tchad*.
- Pennycuik, C.J. & Rudnai, J. 1970. A method of identifying individual lions *Panthera leo* with an analysis of the reliability of identification. *Journal of Zoology (London)*, 160 : 497-508.
- Smuts, G.L., Whyte, I.J. et Dearlove, T.W. 1977. A mass capture technique for lions. *East African Wildlife Journal*, 15 : 81-87.

Duration: 2003-2006

Location (see map): Zakouma National Park, South-Eastern Chad

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