Cat Project of the Month - August 2005

The IUCN/SSC Cat Specialist Group's website (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)*

Conservation Genetics and Behavioural Ecology of the African Wildcat in the southern Kalahari

The study on the African wildcat in the southern Kalahari focuses on conservation genetics, behavioural ecology, and sociality and social evolution in the ancestor of the domestic cat.

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The wildcat (*Felis silvestris*) is divided into many regional subspecies and their classification varies depending on which school of thought is followed. Broadly speaking four groups are recognized: the forest cats (*silvestris* group) of Europe, the Caucasus and Asia Minor; the steppe cats (*ornata* group) of South and Central Asia; the tawny cats (*lybica* group) of Africa and the Middle East; and *F. s. catus,* the domestic housecat.

The African wildcat is the most widespread and found in most parts of the African continent (Nowell & Jackson 1996). They occur in a wide diversity of habitats and therefore they have a wide range of coat coloration and markings (Rosevear 1974). The coat colour ranges from a light sandy colour in the semi-desert and grassland areas to a darker grey/ brown in the more forested habitats. Markings vary from tabby stripes to faint spots. Generally the African wildcat is of slighter build compared to the European wildcat with a more pointed tail and the characteristic reddish colour behind the ears (Nowell & Jackson 1996).

The African wildcat is recognised as being the common ancestor of the domestic housecat (*Felis s. catus;* Pockock 1907). It is thought that Egyptians completed the domestication process of cats around 4000 years ago(Malek 1993). Domestic housecats and wildcats can interbreed and produce fertile offspring. Therefore the primary threat to wildcats is hybridisation with the domestic housecat. It is believed that hybridisation has been taking place over a long period of time and there are no behavioural, vocal or olfactory inhibitations to mating between wildcats and feral domestic cats (Nowell & Jackson 1996). This provides the potential for even small introductions of a related species to result in extensive genetic introgression with indigenous species.

An adult African wildcat with radio collar. Radio collared individuals are habituated to a vehicle and followed for several hours and direct observations are recorded on their behaviours. (Photo M. Herbst)

In spite of its wide range and popular profile no field study on the African wildcat has been published and there is a great paucity of knowledge on the ecology and behaviour of the species. There is a need to understand its basic biology, both from the conservation and scientific viewpoints. Although not endangered the African wildcat is generally recognized as the ancestor of the domestic cat and hybridisation is thought to be sufficiently extensive between these two forms as to severely threaten its status (Nowell & Jackson 1996). A recent study in southern Africa found that the African wildcat and the domestic cat are indeed genetically distinct, although the level of genetic introgression appears lower than previously thought (Wiseman *et al.* 2000). This enhances the conservation status of the African wildcat and emphasises the need to keep the two species apart. The Kalahari population was not included in this study, yet in the early 1980's in an area over 75 km from the nearest domestic cat population a black and white specimen believed to be a hybrid was seen (G. Mills Personal observations).

The Kalahari is a semi desert habitat and the open vastness of the country are ideal for the radio tracking of small carnivore species (Photo M. Herbst).

Objectives
The study focuses on the conservation genetics, behavioural ecology and ecological role of the African wildcat.

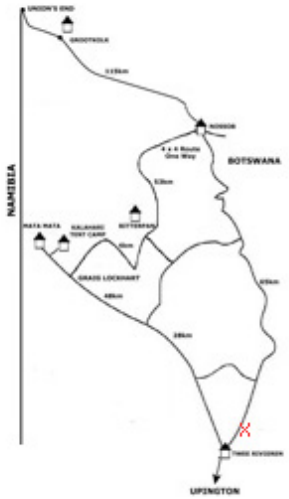
1. Conservation genetics of the African Wildcat
The southern Kalahari, as one of the most isolated and undeveloped regions in Africa, is obviously a very important area for the maintenance of a genetically pure wildcat population. It is important to investigate the genetic status of this population and to establish its purity, so that, if required, a management strategy can be drawn up and implemented to ensure the long-term integrity of this population.

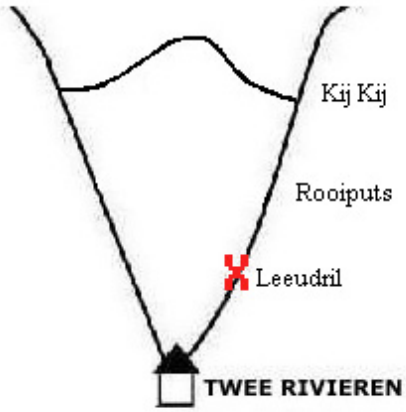
2. Behavioural ecology of the African wildcat
The basic ecological role and social system of the wild cat in a natural ecosystem need to be understood for a number of reasons. From a practical viewpoint this is important should management initiatives be required (such as the control and of feral cats inside and outside the Park). As this study would be the first field study on the species the results could, in the absence of more specific studies, be applied across its distribution range and so be of considerable value for the conservation of the species. From a less practical but human interest viewpoint life history patterns of the forerunner to the domestic cat has wide interest.

3. Social evolution in the African wildcat
With the exception of the lion (*Panthera leo*) female felids are solitary. The African wildcat is recognised as the ancestor of the domestic cat. Feral domestic cats have been found to form colonies in the presence of clumped, rich food resources, remaining solitary where prey is more evenly and thinly distributed. It is interesting that in captivity, female African wildcats have assisted mothers in provisioning of young with food, a behaviour observed in feral domestic cat colonies, but not in any other cat species. In solitary carnivores female natal philopatry is often suspected (examples see Rogers 1987, Schenk 1994 & Smith *et al.* 1987). As the southern Kalahari has a high wildcat density and present conditions are very favourable for the species, it is an excellent opportunity to investigate this interesting and important topic of sociality and social evolution in the ancestor of the domestic cat.

Study site. The study is taking place in the Kgalagadi Transfrontier Park (KTP), incorporating the Kalahari Gemsbok National Park, South Africa and the Gemsbok National Park, Botswana. The Kgalagadi Transfrontier Park is a 3.7 million hectares area in the semi arid southern Kalahari system. Two rivers run through the KTP, the Nossob and Auob. These rivers are normally dry, only flowing for short periods in abnormally high rainfall seasons. In the southern Kalahari sand dunes are arranged in a series of long, parallel dunes with fixed vegetation. The vegetation of the Kalahari is described by Acocks (1975) as the western form of the Kalahari thornveld (an extremely open shrub or tree savanna). For the purpose of this study four main habitats are describe, (i) the dry riverbeds, (ii) the driedoring veld, (iii) calcrete sides and limestone plains adjacent to the rivers and (iv) the adjacent dune areas. The main study area is along the Nossob Riverbed around the Leeuwdril area in the extreme south of the park, incorporating areas on both sides of the river, depending on the extent of the movement of the cats.

The Kgalagadi Transfrontier Park, includes the Kalahari Gemsbok National Park, SA and the Gemsbok National Park from Botswana. The study site, marked **X**, is along the dry Nossob riverbed at the Leeudril waterhole area.





Methods

The cats are caught in cage traps, fitted with a radio collar and habituated to a vehicle. This method has proven to be very successful in the Kalahari for studies on a number of species such as brown hyena, spotted hyena and honey badger. African wildcats are observed by direct observations and their feeding behaviour, activities and movement patterns are recorded by following radio-collared individuals.

Presently six cats are radio collared, three females and three male cats.All the females are habituated to the vehicle, of the male cats one is a large adult tom that are also habituated the vehicle, the remaining two male cats are recently caught and still in the process of habituating them.

Satellite study areas where cats will only be trapped and biopsies taken for genetic studies will also be selected inside the KTP.

Genetics studies will make use of microsatellites, especially developed for the family Felidae (Menotti-Raymond *et al.* 1999). Microsatellite loci are short tandem repeat sequences of DNA (generally less than 5 base pairs in length), are widely found in the nuclear genomes of eukaryotes and are often highly variable due to variation in the number of repeat units. These genetic markers are ideal for addressing questions about reproductive success, mating systems, levels of variation within and between populations, sub structuring, hybridisation and gene flow (Goodnight & Queller 1999; Queller *et al.* 1993) and have been used in a wide range of carnivore studies (Bruford and Wayne 1993).

Radio collaring an African wildcat after a small skin sample was taken for later DNA analysis to determine the genetic purity of the Kalahari population (Photo C. Warner).

Preliminary resuts
The past year has been a very exciting year for behavioural observations of the cats. All the cats are habituated to the vehicle and can be followed for several hours at night. For the first time during the study observations of interactions between the cats have been made and evidence for sociality has been found.

Behavioural Observations
The first cat was radio collared in June 2003. During 2003 and early 2004 neither of the two radio collared females bred. In the early winter of 2004 there was an increase in the amount of urine spray marking by all three radio collared female cats. A very exciting observation was of all three coming together in the presence of a male cat. Although all the females were seen in company with various males, mating was only observed three times. During the same period a fight between two male cats was observed. The fight was vicious and both cats were severely scratched and bleeding. It took place in the area where the ranges of all three females overlap.

Reproduction
All three the radio-collared females gave birth to multiple litters of kittens during a twelve month period (July 2004 – July 2005). Summary of litters born by female African Wildcats. Numbers in brackets indicate kittens that survived up to five months of age. From the age of five months kittens are leaving the safety of the den.

Researcher looking for signals of radio collared cats (Photo J. Walker).

Summary of litters born by female African Wildcats. Numbers in brackets indicate kittens that survived up to five months of age. From the age of five months kittens are leaving the safety of the den.

Female	First litter		Second litter		Third litter		Fourth litter	
	Date	Kittens	Date	Kittens	Date	Kittens	Date	Kittens
Female 1	Sep-04	3 (2)	Dec-04	5 (1)	Jul-05	1 (1)		
Female 2	Oct-04	3 (1)	Jan-04	2 (2)	un-05	?		
Female 3	Jul-04	3 (1)	Oct-04	2 (1)	Dec-04	2 (1)	Apr-05	3

Female 3 lost her last litter and it was not yet known how many kittens she had.

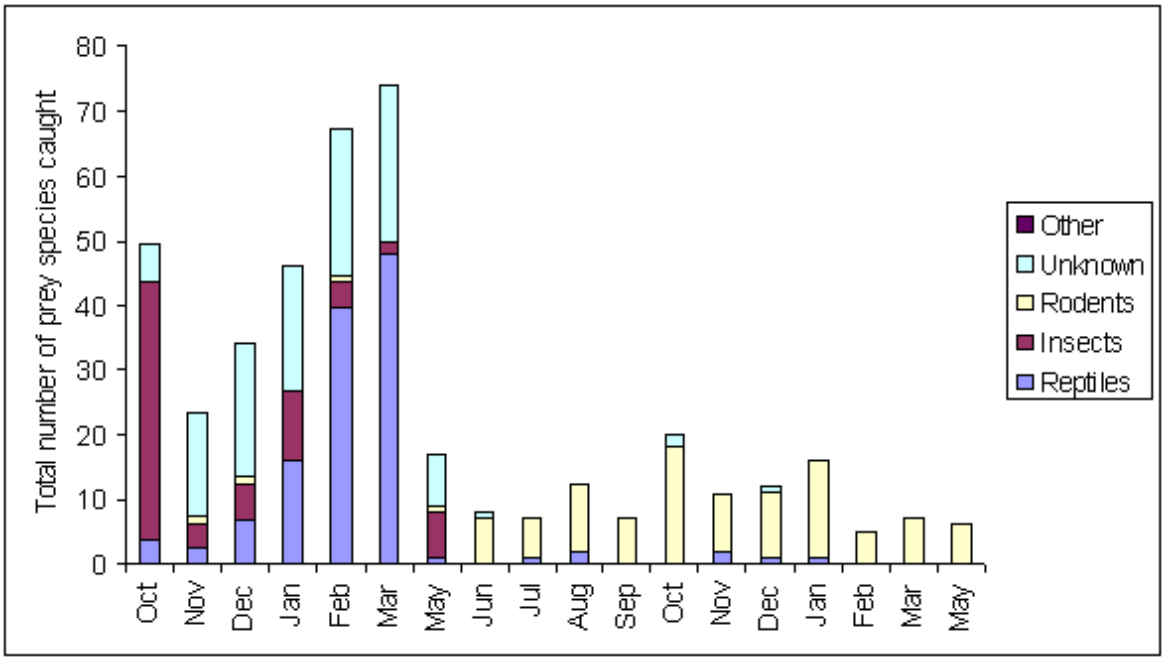
The kittens were born in dense vegetation, holes in the ground and small crevices in the calcrete ridges. For the first month the mothers left their kittens at the den for a few hours each night to go hunting alone. There were no observations of any females approaching the dens of other females, although the two females with kittens had dens not more than 200m away from each other on two occasions. Kittens from a previous litter were observed playing with their younger siblings. No observations of any females, older kittens or male cats bringing food to the den have been made. During the first month the kittens were moved to several dens. At about the age of one month the kittens were allowed to accompany the mother on short hunting trips. Male cats were observed to visit females with kittens and spend a few hours with them. More litters were soon discovered and it seems that the females were ready to mate again even though they still had kittens in the den.

Home ranges
The adult male cat has a larger home range overlapping all three of the female cats. He travels over most of his home range each night, spray marking frequently and scraping his nails and rubbing his face against larger objects such as trees and termite mounds. Although all three females have overlapping home ranges, they tend to stay in a confined area for most of the night, tending to move in a circular manner. Home ranges were determined using Minimum Convex Polygon with Arcview 3.2 for all radio-collared wildcats plotting the GPS coordinate from the beginning of the observation period and the last GPS coordinate recorded. All data were pooled and no seasonal differences were included.

Home ranges form four radio collared African wildcats

Sex	Home range	Time period
Adult Male	12.7 km²	12 months
Female 1	10.6 km²	27 months
Female 2	6.3 km²	23 months
Female 3	5.9 km²	15 months

Feeding ecology
Changes in food availability are determined by rodent and reptile surveys over different seasons. Three seasons are monitored: (i) winter (August); (ii) dry summer (November) and (iii) wet summer (March). The rodents and reptiles surveys are conducted in four different habitats (riverbed, driedoring (*Rhigozum trichotomum*) veld adjacent to the riverbed, the calcrete ridges and the sand dunes). Rodents are caught with baited Sherman traps placed in two grids in each habitat of 7x7 traps each (total 49 traps per grid). Reptile numbers are monitored by placing two transect lines of pitfall traps in each habitat. To monitor smaller mammals and birds 2x100m transect lines in each habitat are also monitored.



Seasonal changes in food availability have an influence on the feeding patterns of the cats. During 2003 there were not many rodents available and the cats often hunted during the day, catching whistling rats, geckos, snakes and birds. During 2004 and 2005 there were more rodents and the cats were mainly active during the night, hunting rodents and to a much lesser extent than the previous year, geckos and reptiles.

Diet of a single female cat (Female 1) from direct observations over consecutive months. The large quantitiy of Unknown items

can be explained by the large amount of smaller unidentifiable prey species the cat was hunting during the time period when there were not many rodents in the field.

Duration:	2003 – 2007
Location (see map):	Kgalagadi Transfrontier Park, South Africa
Sponsors:	Endangered Wildlife Trust, SAN Parks, DWNP Botswana, Skukuza Marathon Club, Elizabeth Wakeman Henderson Foundation, Maxipress Tyres
Project address:	Kgalagadi Transfrontier Park, Private Bag X5890, Upington 8800, South Africa
Project leader:	Gus Mills: Research Fellow, SANParks, Head: Carnivore Conservation Group: Endangered Wildlife Trust, Extraordinary Professor, University of Pretoria and Paulette Bloomer, Molecular Ecology and Evolution Program, Department of Genetics, Associate Professor, University of Pretoria
Weblink:	www.ewt.org.za