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Lions in the Khutse Game Reserve

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Basic data collection in the Khutse Game Reserve

Most studies on free-ranging lion populations have been conducted in prey-rich areas such as a variety of study sites in East Africa or the Kruger National Park in South Africa. However, little is known about the behaviour, pride structures and range use of lions inhabiting dry, prey-poor areas. In areas of low prey densities, two different scenarios of pride structuring and range use are thinkable: On the one hand, females could form small prides of twos and threes and inhabit small territories. On the other hand, a certain minimum number of females could be required to defend resources necessary for the survival and reproduction of the pride females. In this case, territories would have to exceed those in prey rich areas.

Study site was the Khutse Game Reserve (KGR) in Botswana encompassing 2600km^2 of dry shrub savannah and bordering in the north onto the Central Kalahari Game Reserve. As the free-ranging lion population inhabiting the KGR had not been studied previously, I first had to identify all resident individuals and observe their range use. Individual identification was done by using whisker spot patterns and individual markings to establish a picture library. From the observations, I could distinguish three resident prides with on average 5.7 females and 2.3 males inhabiting the KGR. Interestingly, these pride sizes did not differ significantly from those in East Africa. Thus, with similar pride sizes, I expected very large territories.

Due to the low road coverage and the large amount of thorn bush thickets in the reserve, the lions could not be followed easily. Therefore, I decided to equip two females of two different prides with GPS/VHF collars in order to find them more easily and to assess their range use and territory sizes. The result was striking as the data from the collars revealed that the territories in the Khutse Game Reserve are with an average of 1000km^2 much larger than has previously been reported from other areas. Additionally, the different territories do not overlap, which is usually the case even in populations with very small territories. These enormous territory sizes could be one explanation for the fact, that even resident lions often leave the reserve and get into conflict with local farmers.

When looking at these large territory sizes, the question aroused how pride females could defend such enormous home ranges and how they patroled the vast areas. To find out more about these questions, we collared all the other females of the two prides, which also gave us the opportunity to collect blood samples for the serological analyses. Additionally, the collars allowed a constant monitoring of the movements of all females and thus a tight control over which females were leaving the reserve and which were staying inside. Unfortunately, I am still lacking the data sets of one pride, thus my results are not complete yet. However, the results I gained from the other pride revealed, that the females are splitting up very often. Even when all pride females had cubs, they still only spent 60% of their time as a pride and still around 20% with no other female pride member. Over the entire period of time, they

were on average 3.4 km apart from each other, which is very far, considering that other lion studies found the hearing range of lions to be 2.5 km. Some preliminary playback experiments I conducted in the KGR revealed that those lions still react upon calls that are played at up to 7 km distance. This would imply that lions in this region have either developed a more accurate hearing or that sound propagates further due to the environmental conditions. However, I have not completed the analyses on home range sizes and range use up to now and the definite results are still missing.

Human-wildlife conflict around the Khutse Game Reserve

As the lions in Khutse have very large territories compared to lions in other areas, many individuals frequently leave the reserve to kill livestock on the adjacent tribal lands, whereby getting in conflict with local farmers. To asses, where and when most problems occured, Monika Schiess-Meier (Leopard Ecology and Conservation, Khutse Game Reserve) and I computerised and analysed data of the Department of Wildlife and National Parks on livestock kills by all occurring predators (wilddog, hyena, cheetah, leopard and lion) during three years (2000 to 2003). The data were then compared to a series of interviews which we had conducted with 60 farmers from cattle posts surrounding the Khutse Game Reserve.

Our results revealed that the predators had killed a total number of 2'272 livestock in the Kweneng District of Botswana during the three years of analysis. This resulted in an overall annual impact of 0.33% of the livestock occurring in the area, which is relatively small compared to numbers reported in other studies (0.8-12%). The comparably low impact of predators in Botswana's Kweneng district might explain why the protection of wildlife in general and predators in particular finds a wide acceptance among farmers. The majority of the interviewees told us that they find the protection of predators important for Botswana's biodiversity, tourism, and economy. Other studies with higher impact rates on livestock reported a more negative attitude of farmers towards native predators.

Despite the low overall impact, there were significant differences between predator species, interacting with regional and annual effects. Leopards and lions caused the majority of the reported losses (38% and 26%, respectively) followed by wild dogs (15%), brown hyenas (12%) and cheetahs (9%).

As leopards and lions caused most of the losses and their numbers are most reliable (due to the reporting system in Botswana), we analyzed the killings by leopards and lions in more detail. Our results revealed that leopard attacks were more evenly spaced over time and space than lion attacks. Leopards killed livestock throughout the entire district and in similar numbers at any time of the year. Lions in contrast killed livestock most frequently during the dry months and in close vicinity of the reserve. These results are in accordance to those found by other studies and reflect the spacing behavior of the two big cats: leopards as

solitary and elusive hunters are well adapted to a human environment and can even survive near large cities. Lions however, as large conspicuous cats, are rarely tolerated near human habitation. They therefore mainly survive in protected areas. During times of low prey densities, e.g. during the dry months, they may occasionally leave the reserve to kill livestock as an alternative to wild prey. Even though leopards seem to kill livestock on a much more regular basis, they are much more accepted by farmers than lions, as our interviews revealed.

Our results also indicated a clear difference in prey preference between leopards and lions: while leopards typically killed small to medium sized livestock (up to 200 kg), lions raided mostly large stock (mainly cows over 200 kg). All results have been summarized in an article that will be submitted to the Journal of Wildlife Management shortly.

When looking at the distribution of livestock kills by lions, we found that they mostly occur in close proximity to the reserve. We therefore looked at the kraaling behavior of the local farmers and found several problems occurring in the area: 1. farmers or herders rarely kraal livestock at night or do not make sure that all animals are inside the corral. Roaming cattle may thus become an easy meal for the large cats. 2. farmers often shackle their horses and donkeys in order to prevent them from roaming too far. However, shackled animals are not able to move fast enough to escape lions or leopards and are therefore easy for them to catch. 3. Sometimes, livestock is in poor condition for example due to the use of unsuitable harnesses, food shortage or diseases. In such a state, the animals cannot readily escape predators and are highly likely to be wounded or killed, if they are not corralled at night. 4. Another problem is the food shortage due to overgrazing around the village. Due to this phenomenon, livestock have to roam large distances in order to cover their daily nutritional needs. Often, they are not only found near the park boarders but also roaming inside the reserve. Such encounters between domestic stock and native wildlife may not only accustom predators to a new food source but also enhance disease transmission along the wildlife-livestock interface.

To make people aware of the different problems occurring in connection with their livestock, we organized a play with the children of the local school. The pupils designed the plot for the play together with their teachers in four different parts, each of which reflected more or less one of the four above mentioned main problems. They interspaced the four chapters of the play with singing and dancing and designed their own costumes. Despite of the seriousness of the topic, the play had the character of a comedy and therefore attracted a lot of villagers who thoroughly enjoyed watching the children perform. Through this play, we hoped on the one hand to cause people to think about the way of treating their livestock and on the other hand to influence children’s attitudes towards domestic and wild animals living in and around their village.

Health status of the lions in the Khutse Game Reserve

In order to find out more about the health status of the resident lions in this region, I collected blood samples of 21 individuals (13 females and 8 males). The samples were then analysed at the VetSuisse Faculty of the University of Zurich for the following infectious agents: canine distemper virus (CDV), feline calicivirus (FCV), feline coronavirus (FCoV), feline leukaemia virus (FeLV), feline herpes virus (FHV), feline immunodeficiency virus (FIV), feline parvovirus (FPV), *Ehrlichia canis*, and *Anaplasma phagocytophilum*.

Our results revealed that Central Kalahari lions exhibited a high prevalence of the two endemic viruses FHV (100%) and FIV (71.4%). Both viruses are also highly prevalent in most other free-ranging lion populations and are not known to have any harmful effects on the health of the large cats. CDV and FCV occurred with a low prevalence and were found in only one and two individuals respectively. CDV has been proven very harmful to lions in 1994 when a CDV epidemic killed 1/3 of the lion population in the Serengeti. However, in this single case reported here, the positive CDV titer does not necessarily mean that the lioness was sick with this disease but simply shows that this particular animal has been in contact with CDV. This might have occurred through contact with domestic dogs which have been identified as the source of the CDV outbreak in the Serengeti. CDV and FPV epidemics have been shown to occur mainly during times of high population densities with a large number of susceptibles in the population. It could thus be that necessary threshold levels for an outbreak are rarely met in the extremely low population densities occurring in Khutse, which would explain the low or zero prevalence of those diseases. FCV outbreaks in contrast are density independent and could thus, similarly to FIV and FHV, occur irrespective of population densities. FCV is known to cause stomatitis and gingivitis and has so far not been reported in southern Africa. The only population in which it has been shown to occur with a rather high prevalence is the Serengeti population. In contrast to the previously mentioned diseases, all individuals tested negatively for FCoV, FPV, FeLV antigen, *E. canis,* and A. *phagocytophilum*.

Overall, the infectious agents found to occur in high prevalence throughout the population have not been shown to influence reproductive rate or survival of the individuals. Additionally, prevalence of antibodies to CDV, FCV, FCoV and FPV is markedly lower in the Kalahari lions compared to the lion populations of East and South Africa. Thus, it can be said in conclusion, that the lion population in the Khutse Game Reserve is currently rather healthy. The results of the serological analyses have been summarized in an article which will soon be submitted.