A lion population under threat : understanding lion (Panthera leo Linnaeus, 1758) ecology and human-lion interactions related to livestock predation in Waza National Park, Cameroon

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Discussion, conclusions and recommendations

8.1 Discussion

The lion is the largest and best-known African top predator. Top predators play an integral role in maintaining rich ecosystems as regulators of food webs (Beschta & Ripple, 2009; Letnic *et al.,* 2009; Fraser, 2009; Miller *et al*., 2001; Terborgh *et al*., 2001). Despite their ecological importance and their being one of the world's most attractive animals in the tourism industry, lions have disappeared from much of their historical range and are threatened in part of their present range. There are presently some 23,000 to 39,000 lions left in Africa, with less than 4000 in West and Central Africa (Chardonnet, 2002; Bauer & van der Merwe, 2004; Riggio *et al*., *in prep*).

Threats faced by lions are complex, making their conservation challenging. There is probably no other carnivore species whose distribution range and numbers have shrunk over the past century to the extent of the lion's (Smithers, 1983; IUCN/SSC, 2006). The main threats to lions are habitat loss, prey base depletion and indiscriminate killing, mainly as a result of retaliatory or pre-emptive killing to protect livestock (Bauer *et al*., 2008; Tumenta *et al*., 2010). These threats are driven by the ever-increasing human population density and the consequent demand for food and natural resources, resulting in a rapid deterioration and fragmentation of the remaining lion habitats (Karanth & Chellam, 2009). The survival of lions and other top predators depends on how effectively scientists, conservationists, governments, local people and society at large will study, understand, collaborate and take action to meet the ecological needs of these species. There are variations in local ecological and

anthropogenic factors impacting lion populations. In my PhD research I have studied the Waza lion population with respect to ecological and anthropogenic factors impacting its survival. Particular attention is given to its population status, spatial ecology, movement and activity pattern, its diet and conflict with humans due to livestock predation, and to possible measures to mitigate this predation.

Conservation of lions in Waza National Park

Several authors report the alarming rate at which lion populations are declining across West and Central Africa (Bauer & van der Merwe, 2004; IUCN/SSC, 2006; Bauer *et al*., 2008; Henschel *et al*., 2010). The Waza lion population, one of the best-studied lion populations in the region of Central Africa, seems now to be one of the most threatened. In West Africa, lion populations in Kainji Lake National Park and Yankari Game Reserve are in a similar deplorable situation (Henschel *et al*., 2010). There has been a progressive reduction of all wildlife in Waza National Park in the 2000s because of various factors (Scholte *et al*., 2007; Foguekem *et al*., 2010; de Iongh *et al*., 2010).

The main factor that has contributed to the deterioration of Waza National Park and has resulted in drastic declines in wildlife numbers is poor management, partly as a consequence of insufficient financial and human resources. This situation was further exacerbated by a change to the park's management in 2007. The new management was characterized by a significant decrease in anti-poaching patrols, together with the issuance of illegal permits to fishermen and pastoralists to use park resources (de Iongh *et al.*, 2010). During 2008-2010 the poaching pressure on the park intensified, resulting in mass killing of antelopes and predators. Poaching activities and livestock intrusions, especially from neighbouring countries, were frequently observed in the park. The elimination of the western kob was on average four animals per day. During this period, within two years, a total of three collared lions out of seven were killed by pastoralists (Tumenta *et al*, 2010).

The findings of my study reflect very well the pressure on the park and its resources. Lion numbers have dropped drastically from 40-60 in 2002 (Bauer, 2003; Bauer & van der Merwe, 2004) to 14-21 in 2008 (Tumenta *et al*., 2010). There are strong indications of an existing trade in lion body parts, such as skin and meat. Of all collared lions killed during the research period, no carcasses were retrieved (Tumenta *et al*., 2010). Only

one carcass was found of an uncollared lioness, when poachers were surprised by tourists on a game drive (B. Croes, pers. comm.). There was also some evidence of a trade in live lion cubs from Waza National Park to neighbouring Nigeria. Villagers of Niwaji at the south-western limit of Waza National Park reported two lion cubs being sold to Nigerian traders (A. Ndjida, pers.comm.). A few months later, the administration of the Gombe State University in Nigeria reported in a newsletter interview that Waza National Park was the source of the lion cubs acquired for the University Zoo (Hamagam, 2010). The observed decline in numbers is not limited to the lion; the elephant population in Waza National Park was reported to have declined by 70% in the same period (Foguekem *et al*., 2010). The camera trapping survey conducted for the present study confirms the high human-livestock pressure on the park. Compared to other species of animals captured by the camera traps, humans and livestock represented 31% of the photographs (Tumenta *et al*., 2010). Kalamaloué National Park further north of Waza has suffered this same fate; today all wildlife has disappeared from that park (Scholte, 2003). Although lion populations are resilient, they may not be able to recover when numbers drop even further than the current all-time low. Lion numbers have sometimes dropped elsewhere, such as in the Amboseli National Park and the Ngorongoro Crater reserve, mainly because of drought and disease. These populations have all bounced back following appropriate and effective management. However in the Ngorongoro crater the lion population showed a very low heterozygosity after this event, which enhanced the risk of inbreeding depression (Packer *et al*., 1991).

Another background factor that has contributed to the current state of Waza National Park is the poor implementation of co-management. In general, protected areas are better managed when there are conservation projects (Bruner *et al*., 2001). In this way, Waza National Park benefited from this sort of protection in the 1990s, with the presence of the IUCN Waza Logone project in the area. The project had as its main objective to redress the negative ecological effects caused by the construction of the Maga dam by partly restoring the natural flooding regime of the Waza Logone area, including Waza National Park (Loth, 2004; Scholte, 2005). As part of efforts to conserve the natural resources of the park and to ameliorate the living conditions of communities close to the park, a co-management regime was initiated. However, the project ended without acquiring sufficient funds for the co-management regime to operate effectively (de Iongh *et al*., 2010). Poorly understood by both the park management and the local communities, the co-management regime

became unofficially operational without any appropriate system set in place to guarantee its functioning (A. Saleh, pers. comm.). Two studies in the park on the co-management regime clearly indicate that this regime in fact resulted in increased human pressure on the park (Mohamadou, 2003; Ledauphin, 2006). Threats to wildlife and the lion in particular included poaching, intrusion by livestock leading to human-lion conflicts and unsustainable exploitation of other natural resources (de Iongh *et al*., 2010). This pressure had its toll on wildlife numbers in the park. After the pilot re-flooding in 1994, numbers of all herbivore species in the park initially increased. The most abundant antelope, the western kob (*Kobus kob kob*) increased to approximately 9,000 in 2000 (Scholte *et al*., 2007), after which numbers have declined to less than 2,500 in 2004 (Saleh, 2004) and to below 1,600 in 2007 (Foguekem *et al*., 2010).

Lion survival strategies in Waza National park

As stated earlier, the findings of this thesis clearly reflect a lion population under stress. The dramatic decline in lion numbers and the large home range size reported in this study illustrate the pressure on the park. The home range size of lions has increased from a mean of 630 km^2 (Bauer & de Iongh, 2005) to a mean of 1015 km^2 (Tumenta *et al*., *in review*). The lions were shown to move more during the hot dry season, indicating disturbance of the lion population. The Waza lions were nocturnal in their activity with crepuscular peaks, again pointing to disturbance, as elsewhere in Africa. However, the lions' activity pattern was exceptionally high, suggesting that the lions were constantly moving in search of prey and in order to avoid humans. The dietary niche of the lions was quite broad, reflecting the low prey biomass now available in Waza National park. High concentrations of livestock in the periphery of the park (Scholte, 2005; Foguekem *et al*., 2010) greatly influenced the lion's diet, comprising approximately 22% of lion diet. The interview survey on the human-lion conflicts revealed that pastoralists lose an important amount of income to lion predation annually. Per household, resident pastoralists lose one head of cattle whereas nomadic pastoralists lose two per annum, equating to about €260 and €520, respectively (price level 2010). The home range size, movement and activity patterns, and the diet of lions in Waza National park follow survival strategies that reflect the pressure on the park. The lions extend their home ranges, move more during very hot periods to catch scarce prey and to avoid human interference, and supplement their diet with livestock to survive.

Is there a future for lions in Waza National Park?

The Waza lion population will go locally extinct in 10 years time if the current trend continues. There is an urgent need to greatly improve the protection of Waza National Park in order to save the lion and other wildlife from disappearing. The effectiveness of park protection correlates with basic management activities such as enforcement and direct benefits to local communities (Bruner *et al*., 2001). The government will need to train and equip park personnel that can handle the current challenges to the park. To be effective, the financial resources allocated to the park must be increased. Anti-poaching patrols must be frequent, effective and continuous to prevent intrusions into the park. The local communities living close to the park should be empowered to reinforce the park's protection by directly benefiting from the presence of the park. The latter can be achieved through a well organized and implemented co-management regime. The Communal Area Management Programme for Indigenous Resources (CAMPFIRE) in Zimbabwe has been a success story of a co-management regime for the conservation of natural resources. As local communities are empowered to protect their natural resources while benefiting from the proceeds, poaching is greatly reduced, wildlife numbers are increased and habitats upgraded.

The protection of Waza National Park has been weak until recently. Recent changes in the park's management by the government in an effort to save the park and its resources (de Iongh *et al*., 2010); suggest a better future as enforcement is greatly being improved. Elsewhere in West Africa, in the Pendjari biosphere reserve in Benin, the lion population is healthy and at least stable (Sogbohossou, 2011). The park management is good compared to Waza National Park, park revenues are channeled back to the park itself and the local communities benefit directly from park proceeds. A conservation project is underway in Pendjari and together with government efforts; the area is being better protected. As suggested by stakeholders during a workshop organized in 2009 in Waza, addressing the need for an improved management of Waza National Park and its resources, the government has suspended the co-management regime (de Iongh *et al*., 2010) pending its re-organization. When poorly implemented, co-management can have devastating consequences on the park and its resources. Although there have been some efforts by the government to increase the annual budget of the park (A. Ndjidda, pers. comm.), much still needs to be done. International conservation funders will need to fund and manage projects in the park for its effective protection. The gov-

ernment should seriously consider sharing the revenues accruing from the park with the local communities in order to guarantee the future of lions in Waza National Park.

With less than 20 adult individual lions remaining in Waza National Park, one wonders what the future holds for this population. In general, a lion population of less than 50 adult individuals is considered not viable (IUCN/SSC, 2006). Improving on the genetic variation of lions in Waza National Park will only become relevant after an improvement of the park's protection will have reversed the current trend of lion decline in the park. Small isolated lion populations with no possibilities of exchange with other lion populations may suffer inbreeding depression and loss of genetic variation. Such populations are also more vulnerable to loss of habitat, as well as stochastic events such as disease-induced mortality or extreme drought. A possible way to maintain the existence of such a lion population would be to increase the genetic variation through assisted migration of individuals from another lion population. For the case of the Waza lion population, the Bénoué complex may serve as a source population, being the closest Lion Conservation Unit. This entails managing the two Lion Conservation Units as a meta population and translocating immobilized breeding males from the more viable population to the less viable one (P. Funston, pers. comm.). This management option however, requires a large amount of funding and expertise to intensively monitor the lion populations. Therefore further research should confirm if the heterozygosity of lions in Waza National Park is affected by the small population size.

8.2 Conclusions

The following conclusions can be drawn from this study:

1. Due to retaliatory killings by pastoralists, the lion population in Waza National Park has declined dramatically with at present less than 20 adult individuals surviving. If nothing is done to stem the trend, the lion population will become locally extinct in 10 years' time.

2. As predicted, the recent decline in wild prey abundance has resulted in an observed increase in the mean home range size of lions in Waza National Park, indicating a trend of general degradation of the park due to intense human pressure.

3 During the wet season, when the park is flooded, lions in the floodplain zone move their core areas to higher elevations in the floodplain, subsequently to the woodland zone and eventually out of the park.

4 The lions move out of the park during the wet season, following pastoralists and their livestock to their wet season sites, thus extending their home range size during this period.

5 During the hot dry season the distribution of lion home ranges is directly related to prey distribution at permanent waterholes in Waza National Park.

6 Lion movement in Waza National Park follows patterns observed elsewhere; however lion activity is relatively high especially during the hot dry season when home ranges are smallest. This may indicate the high disturbance on the population during this period by livestock intrusion and probably tourism, as well as the effect of low prey densities.

7 The lions in Waza National park have a broad dietary niche of 14 prey species, however only five medium to large-sized species constitute the bulk of their diet. The most common natural prey species in the diet of lions in Waza National Park is the western kob.

8 Livestock contributes an important percentage (approx 22% number base) of the lion's diet in Waza National Park. Livestock predation by lions mostly occurs in the night.

9 Livestock predation by lions is intensifying in localities neighbouring Waza National Park. A combination of improved traditional mitigation methods can substantially reduce livestock losses to predation.

10 Resident and nomadic pastoralists practice different mitigation measures to reduce livestock losses. The effectiveness of the measures is generally low but can be improved by implementing better enclosures for resident pastoralists and herding by adults rather than children for nomadic pastoralists. For a better and effective management of the human-lion conflict problem, mitigation measures must be tailored to the needs of the two groups of pastoralists.

8.3 Recommendations

- A complete halt to intrusions into the park by livestock, fishermen, poachers and collectors of other natural products will greatly reduce the human-lion conflicts in Waza National Park. These activities are already forbidden; improvement is possible through effective law enforcement. The government needs to train and equip more park staff, and also improve on the funding mechanism of projects in the park. The government should set up an intelligence network to combat poaching and illegal activities in the park in collaboration with the Rapid Intervention Battalion of the army that fights against armed robbery in the region.

- For conservation efforts to be effective in Waza National Park, local communities living close to the park should be made to benefit from the revenues generated from the park. A percentage of the revenues generated from park entrance fees should be paid to the local communities. This will motivate the communities around the park to act as custodians of the park and its resources. Tourism in the park should be better developed and organized to be ecologically friendly and to generate more income. Game drives, for instance, should be coordinated and performed by the park management. Communities could be mobilized to perform cultural dances for tourists at the Waza Lodge and to also supply farm products to the lodge management.

- Human-lion conflicts due to livestock predation should be considered as a trans-frontier problem that needs to be examined within the Lake Chad Basin Commission. Efforts should be made towards intensifying pastoralism in the Waza Logone area, which is an important resource area for pastoralists and fishermen who migrate from various countries in the Lake Chad Basin yearly for resources such as pasture, water and fish.

- Further research is needed to confirm whether the heterozygosity of the Waza lion population is affected by the small population size and relative isolation. If this is the case, assisted migration could be applied, to improve the genetic variation of the population by bringing in breeding male lions into the population from the Bénoué complex. This management option requires extensive financial resources and expertise. For this to be feasible, the government should solicit financial support from international conservation donors.

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