

Cheetah's life style influenced by co-existing predators and prey.

Dimitris Sklias, Petros Makrogkikas

Introduction:

Cheetahs are discreet wild animals because their primary competitors for survival are often their predators. On the one hand they can be killed by another predator in order to feed on it and on the other hand they might be killed by another predator species to eliminate any potential competition for food and space. The most important among them are hyenas killing cheetah cubs and lions killing both, cubs and adult cheetahs. Paradoxically, the prey dynamics also influence their hunting habits. Here, we are going to talk about how other predators and the cheetah prey influence the life style of the wild African cheetah. The parameters which are going to be described are:

- 1). Hunting decision of the cheetah.
- 2). Moving the prey away from the side of the kill.
- 3). Breeding of the cheetah when other predators live in the same ecosystem.

1) Hunting decision of the cheetahs influenced by predators and prey^{1,4,5,6,7,8,9}.

During some researches the cheetahs showed that they prefer to hunt with decreasing preference Thomson's gazelle, Grant's gazelle and wildebeest. A significant selection of Grant's gazelle as a potential prey was noticed with increased Grant's gazelle abundance and hyena abundance. This also depends on the sex of the cheetah. The females which are smaller in size than the males, showed to be more interested in selecting larger prey like Grant's gazelle than the bigger males that were more interested in the smaller Thomson's gazelle. The relation between hunting decision, the presence of the prey and other predators (lions and hyenas) was not linear but was of quadratic function; increasing to maximum and then decreasing. On the one hand the cheetah is a stalking predator and the less prey individuals are in a group the less

is the possibility to be detected. On the other hand the abundance of prey will attract more predators and increase the chances of conflict with other predators, making them vulnerable to predation and kleptoparasitism. The presence of other predators (lions and spotted hyenas) greatly influenced the hunting behavior of the cheetahs by reducing it. No such change was noticed in case of just hyena abundance. By playback of lion calls, the cheetah behavior was much more influenced than in case with hyena calls playback. The lion calls reduced the hunting decision and the hyena calls influenced the species of the target prey. If there is increased number of lions at the area the cheetah would not hunt and if there are hyenas it would hunt choosing a smaller prey like Thompson's gazelle. Both justify the quadratic function of the cheetah hunting decision. A mother with cubs would not hunt in the presence of any of the both predators; however she would take her cubs in higher vegetation for hiding or move away.

2). Moving a kill. ^{2,4,5,10,11,12,13,14}.

65% of the 491 cheetahs observed after a successful hunt moved their prey from the side of the kill to another place before they start feeding on it. The mean distance that a kill was moved was about 65 meters with an individual that carried its kill up to 712 meters. Males prefer to move their kill to areas with higher vegetation for camouflage and shade, though this activity is reversibly correlated with the temperature. This was also related to hunger; the hungrier the animal the more chances to move its kill, even in higher temperature. Females with young cubs were noticed to move smaller kill to higher vegetation, thus providing their cubs with cover and the smaller the prey the less chances to attract predators. The older the cubs the less move of the kill to higher vegetation was noticed. Male coalitions have the ability to bring down bigger prey but the bigger the prey the more chance to attract scavengers increasing the possibilities for predation and kleptoparasitism by others. Females with cubs are progressively aware of predators and they eat as much as they can, the faster they can and they try to depart the feeding side the sooner. Single females did not show behavioral evidences to avoid scavenging or predation by other predators. Male coalitions seem to put a lot of effort to avoid small risk to be predated and females with cubs do the best to protect their youngsters from being predated.

3). Breeding of the cheetah when other predators live in the same ecosystem ^{3,7,8,9,13,15,16}.

The breeding success of each female cheetah observed during the research was calculated by the number of cubs raised up to twelve months or more. The number of cubs produced by the mother in a year, was divided by the reproductive lifespan of the mother, (age of the mother minus two years). On the one hand the number of hyenas seen was positively related to the life span of the cheetahs. On the other hand the breeding success of each female individual had a particular negative relationship with the number of hyenas and its breeding success, and had no connection with the age of the cheetah. The cheetahs living close to lions had negative relationship with their life span as lions are able and willing to kill adult cheetahs as well as cubs. The reproductive success had as more severe negative relationship between the number of lions present and the number of cubs surviving up to the age of twelve months. For example if two lion individuals were present the reproductive success of the cheetah will be reduced to 0.5 cubs per year. This demonstrates one third decreasing of the surviving cubs as the breeding success of a female living away or avoiding lions will be 1.5 cubs surviving per year. This is also tremendously related with the age of the mother as the more experienced the animal the more will be the avoidance to lions. But this does not stand when it comes with the number of hyenas. The mother cheetah will consider the hyenas as less significant threat to herself, and she might choose to breed in a place with an increased number of cheetahs. The hyenas though will prey and kill the cubs reducing by this the breeding success to 0.5 per year in the presence of just one hyena.

Conclusions: this amazing animal managed to survive throughout its history by learning its potential predators and trying to avoid them when it hunts, when it breeds and how to behave after it had a successful kill. The age and experience of the animal are the most important factors which increase its chances to survive and successfully bring its offspring to adulthood. As its mass, strength and size was reduced through its evolution in exchange of tremendous speed of approximately 120km/hour in less than 4 seconds, the cheetah managed to adapt and be a successful hunter by choosing when it should hunt, breed. By considering all the potential dangers that would affect these

actions and by avoiding them when is possible, the cheetah survives and hunts free in its ecosystem until today.

References:

1. ANDREW B. COOPER, NATHALIE PETTORELLI† SARAH M. DURANT†, University of New Hampshire. (large carnivores menus: factors affecting hunting decisions by cheetahs in Seregeti).
2. J. S. Hunter. S M. Durant. T.M Caro (to flee or not to flee: predator avoidance by cheetahs at kills).
3. SARAH M. DURANT INSTITUTE OF ZOOLOGY SOCIETY OF LONDON AND TANZANIA WILDLIFE RESEARCH INSTITUTE (predator avoidance, breeding experience and reproductive success in endangered cheetahs, *Acinonyx jubatus*).
4. Bednekoff PA, Lima SL (1998) Re-examining safety in number: interaction between risk dilution and collective detection depend on predator targeting behavior. *Proc R Soc Lond* 265:2021-2026.
5. Blumenshine R (1986): Early hominoid opportunities: BAR International Series 283, Oxford.
6. Brown JS, Laundre JW, Gurung M (1999) The ecology of fear: optimal foraging, game theory and trophic interactions. *J Mammal* 80:385-399
7. Caro TM (1994) cheetahs of the Seregeti plains. University of Chicago Press, Chicago.
8. Caro TM (2005) Anti-predator defenses in birds and mammals University of Press, Chicago.
9. Clutton-Brock TH (1991). The evolution of parental care. Princeton University press, Princeton.
10. Durant SM (2000a): Living with the enemy: avoidance of hyenas and lions by cheetahs in Seregeti.
11. Eaton RL (1974): the cheetah: biology, ecology and behavior an endangered species. Van Nostrand Reinhold, New York
12. Elgar MA: (1989) predator vigilance and group size in mammals and birds: a critical review of the empirical evidence. *Biol Rev* 64:13-33
13. Durant SM 1998: competition refuges and coexistence: an example of Seregeti carnivores. *Journal of Animal Ecology*, 67,370-386
14. Durant SM 2000: predator avoidance, breeding experience and reproductive success in endangered cheetahs. *Behavioral ecology*, 60, 121-131.
15. Caro TM 1987. Cheetah mother's vigilance: looking out for prey or for predators. *Behavioral Ecology and sociobiology*, 20, 351-361.
16. Kelly, M.J, Laurenson, M.K, FitzGibbon, C.D, Collins, D.A., Durant, S.M., Frame, G.W., Bertram, B.C.R & Caro, TM:1998. Demography of the Seregeti cheetah (*Acinonyx jubatus*), population: the first 25 years. *Journal of Zoology*, 244, 473-488