BFA SEMINAR SERIES NO. 22
Held at Girls' College on 20th June 2003

WILDLIFE COUNTS AT WATERHOLES IN HWANGE NATIONAL PARK

By Marion Valeix

The talk consisted of 3 parts :-
1 – Presentation of the project "Hwange Environmental Tools for Predictive Management".
2 – Presentation of the results of my master study ("*Structure of ungulate communities: a test for the role of megaherbivores in inter-specific competition*").
3 – Presentation of the research programs that are going to be developed in the frame of my doctorate study ("*Spatial and temporal variations in elephant distribution and potential consequences for the structure of African savanna ungulate communities*").

- **"Hwange Environmental Tools for Predictive Management" project**

This project is a cooperation project between France and Zimbabwe, through the CIRAD (International Cooperation Centre in Agronomic Research for Development) and the NPWLA (National Parks and Wild Life Authority). This project benefit from the scientific support from the CNRS (National Centre of Scientific Research in France). This project started in 1999, and after a first phase which lasted 3 years, CIRAD and NPWLA decided to collaborate for a second phase which is going to last another 3 years, from 2002 to 2005.

The main objectives of the projects are as follow:
1 - Long term monitoring of wildlife populations, particularly ungulate populations (3 road transect counts per year: May, October and December).
2 - Vegetation monitoring (Plots revisited regularly, satellite picture data analysed)
3 - Data management and analysis (understanding patterns: long term trends and habitat use)
4 - Capacity building (everyday field work and data analysis, and specific training sessions: GIS, Cyber tracker, Distance Sampling)
5 - Focus on some target species: 3 year study on the impala population structure, development of the rhinoceros program and focus on the elephant issue in the Park.

- **Master results**

A comparative analysis of the abundance of elephants and of other ungulates in 31 African protected areas (Fritz *et al.* 2002) suggests the hypothesis that an increase in an elephant population may lead to a decrease in mesobrowser and mesomixed-feeder populations, but should not affect mesograzers. At the start of this study, inter-specific depletion competition for vegetation in the dry season was considered as the main mechanism involved. A change in the management of the Hwange National Park elephant population (no elephant cull since 1986) created an unplanned "experimental" situation which provides an opportunity to test this hypothesis, since the elephant population has increased from 1 to 3 individuals per km².

The predictions were tested with statistical analysis (mixed models) on forty years of water pan counts (*Wildlife Society Matabeleland Branch*). The 4 browsers or mixed-feeders studied (Greater Kudu, Impala, Steenbok and Common Duiker) have declined since 1986. As for the grazers, 4 of them do not show a breakpoint in their dynamics (Roan Antelope, Buffalo, Blue Wildebeest and Burchell's Zebra) but 4 of them have declined since 1986 (Waterbuck, Reedbuck, Sable and Warthog). The results obtained are in agreement with the hypothesis that elephants may in some cases compete with other species, since 8 out of the 12 mesoherbivores studied confirm the predictions. Given the importance of this issue, not only for research but also for management, it is

necessary to go further, and if possible exclude the alternative explanations (predation, climate change) and test predictions from elephant competition hypothesis (food depletion, water monopolisation, habitat change). The results of this study underline the need to understand ecological mechanisms which regulate and structure savanna ungulate communities as a basis for management of protected areas.

• **Doctorate proposal**

The main objectives of the PhD are as follow :

→ measuring the possible changes in food niche overlapping through the year and for different spatial scales (habitats, feeding sites, plants).

→ measuring the access time to water for different species, the spatial occupancy of waterholes, the interactions between elephants and other species.

→ measuring the evolution and changes of habitats, and the possible consequences on some herbivore species.

The PhD will be supervised by Dr. Hervé Fritz (CNRS/France).

As for the methodology, we will focus on some further analysis. We want to take into account quantitative data from counts other than water point ones (road transect counts, aerial counts). Moreover, following the MSc temporal approach, spatial analysis will be realised. Recent counts give GPS position of the animals and more remote counts give the odometer data, which will allow the use of mapping software – Mapinfo, ArcView – and of spatial statistics methods. This work, realised at different scales should result in **spatio-temporal correlations** and should allow a better understanding in the Hwange ecosystem functioning through the last decades. For **habitat modification**, we will analyse aerial pictures provided by Surveyor General (whole Park covered in 1974, 1983 and 1998). We will study the evolution of woodlands, shrublands, coppices and open areas. Then, we will correlate the changes with the evolution of animal abundances. Indeed, some species, like Waterbuck, Reedbuck and Duiker, which do not escape predators by running away but by hiding could suffer from habitat opening due to elephant activity.

As for the field work, we will mainly focus on collecting new data so as to understand the ecological mechanisms explaining elephant – other herbivore interactions. On the one hand, field work will continue with the existing seasonal surveys (different types of count), and on the other hand there will be specific surveys in areas contrasted for elephants densities:

→ to test of the **potential depletion competition for food**, as suggested in some studies (Jarman 1971, Hansen *et al.* 1985), it seems necessary to understand better the overlap of food niches, and more accurately the changes in these overlaps between the end of rainy season (April) and the end of dry season (December). We will collect data from accurate observations of the feeding behaviour of ungulates. Otherwise, it would be interesting to test the hypothesis of niche overlap at different scales. To reach that, it would be necessary, for example, to study more carefully the areas where the decreases are more pronounced, more particularly for the Impala (*Aepyceros melanpus*). The existence of impala marked populations (more than 100 individuals) in Hwange National Park could allow to confirm these constraints at the level of the individual.

→ to test of the **potential interference competition for water**, another key-resource (Illius & O'Connor 2000), water pan surveys (10 water pans surveyed every two weeks) and behavioural surveys at group level (Scan Sampling [Altmann 1974]) and at individual level (Focal Sampling [Altmann 1974]) will allow the estimation of whether the use of water in the dry season is corresponding to the water requirement models known for ruminants. These different surveys will be carried on many different water point areas where the intensity of elephant use is contrasted.

Finally, we must not forget that other mechanisms need to be tested since different alternative hypothesis have to be taken into account: predation, pathogens (Gasaway *et al.* 1996) and climate (Owen-Smith 1990) can play a role in ungulate populations. This will be run through complementary bibliographical work on the ecology of the different ungulate species studied, through the analysis of internal Park report (carcasses study and diagnosis of cause of death), and also through the analysis of climatic events that happened in the last thirty years. This last type of analysis will be run by Simon Chamaillé-Jammes who will focus on the impact of global changes on the extinction risk of herbivores in protected areas, under the direction of Jean Clobert (Paris 6) and Hervé Fritz (CNRS-CEBC). For the predation aspect, it will be useful to collect the data already existing on lion, spotted hyaena and hunting painted dog populations, so as to take these data into account in the next analysis. For that, we will develop close collaboration with the Hwange CRU (Carnivore Research Unit).

References

Altmann, J. (1974). "Observational study of behaviour : sampling methods." *Behaviour* **49**: 227-267.

Fritz, H., P. Duncan, et al. (2002). "The influence of megaherbivores on the abundance of the trophic guilds in African ungulate communities." *Oecologia* **131**: 620-625.

Gasaway, W. C., K. T. Gasaway, et al. (1996). "Persistent low densities of plains ungulates in Etosha National Park, Namibia : testing the food-regulating hypothesis." *Can. J. Zool.* **74**: 1556-1572.

Hansen, R. M., M. M. Mugambi, et al. (1985). "Diets and trophic ranking of ungulates of the northern Serengeti." *J. Wildl. Management* **49**(3): 823-829.

Illius, A. W. and T. G. O'Connor (2000). "Resource heterogeneity and ungulate population dynamics." *Oikos* **89**: 283-294.

Jarman, P. J. (1971). "Diets of large mammals in the woodlands around Lake Kariba, Rhodesia." *Oecologia* **8**: 157-178.

Owen-Smith, N. (1990). "Demography of a large herbivore, the greater kudu Tragelaphus strepsiceros, in relation to rainfall." *Journal of Animal Ecology* **59**: 893-913.

***Contact*: Marion Valeix**
Hwange Main Camp Research
P. Bag DT 5776
Dete
phone: (018) 647
e-mail: ciradhwg@mweb.co.zw