CHAPTER 5

FINAL DISCUSSION AND MANAGEMENT IMPLICATIONS

Abstract

Results of woody vegetation and habitat utilisation by the elephants on Welgevonden Private Game Reserve are discussed in terms of their implications to management. Over all, there was a distinct lack of differences in vegetation use between elephant bachelor and breeding groups on WPGR (chapter 3). This suggests that there is unlikely to be inter-sexual competition for resources, which suggests that the elephant population on WPGR is currently below carrying capacity. Particular woody species were preferred by bachelor groups and by breeding groups. Monitoring of those species is suggested. With reference to habitat utilisation (chapter 4), both group types selected valley bottom disproportionately to that habitat's availability, in both dry and wet seasons. This habitat has the smallest area of the three habitat types, and therefore may be proportionately more impacted. Comparisons between sexes, within seasons revealed that bachelor groups and breeding groups displayed different patterns of habitat use in the dry season. Bachelor groups were observed in valley bottom more than expected, and breeding groups more so in hillslope. An explanation of this is that breeding herds could be displaced from the preferred valley bottom by human disturbance in the form of vehicles in that habitat, in search of cover in the hillslope vegetation.

5.1 Elephant – vegetation interactions on WPGR

In many ways, man has a proportionately greater impact on the environment than any individual animal. One of the most important influences, as a result of human population growth, is a reduction in space available for conservation purposes, which results in populations of large-bodied animals such as elephants becoming concentrated on small pockets of land (Novellie *et al.* 1991; Cumming *et al.* 1997). During the time of farming activities in the region, vegetation on WPGR was protected from feeding habits by large herbivores, with the result that once the area was proclaimed as a reserve (1993) and elephants were introduced (1994), changes to the structure of the vegetation became noticeable. Changes such as felled or uprooted trees (by elephants), although aesthetically unpleasing, are not necessarily detrimental to the vegetation, indeed some degree of vegetation disturbance is probably beneficial to habitat diversity as well as its productivity (Owen-Smith 1988). Such changes are inevitable where elephants are concerned, but limits surrounding the degree of change should be decided on. If the decision is made that elephants are the main priority in terms of tourist attractions, then some change in vegetative structure must be accepted. However, if the aesthetic appeal of the vegetation is also considered to be important, then damage to that vegetation by elephants should be restricted. In order to limit changes to vegetation where elephants are involved, objectives must be defined which set levels of permissible change, and determine options for management once those levels are reached. When managing increasing megaherbivore populations (with special reference to elephants), reserve managers are generally most concerned with the following points with respect to changes to vegetation (Owen-Smith 1988):

(i) radical modification of certain habitat types (and hence, possibly changes in behaviour of, or loss of, species dependant on them);
(ii) elimination of certain sensitive plant species;
(iii) reduced vegetation cover causing accelerated soil erosion and hence a decline in the overall productivity of the system;
(iv) depression of the resource base for megaherbivore populations themselves;
(v) loss of aesthetic features of the landscape such as large trees or grasslands.

Tree destruction is often attributed to elephant activity. Wind, lightning and fire also have a profound effect (Spinage & Guiness 1971; Eckhardt *et al.* 2000). Both wind and lightning are prevalent on WPGR, where August winds are known to break branches and fell trees, and lightning from dry storms causes many fires towards the end of the dry season. Besides elephants, other animals also have a certain impact on the vegetation. Giraffe (*Giraffa camelopardalis*) have been known to break branches from trees and kudu (*Tragelaphus strepsiceros*), nyala (*Tragelaphus angasii*) and rhino (*Ceratotherium simum*) have been

observed scratching their horns on young trees, thereby causing damage to the bark, sometimes extensively (pers. obs.). Such utilisation of woody species by elephants and other animals can damage trees and allow fires to burn exposed areas of wood (Yeaton 1988). Therefore, damage to woody plant species is often a combination of factors including elephant impact, feeding activities of other browsers and insects, and fire. Smaller herbivores may also have an impact on the survival of the seedlings of woody species most highly utilised by larger browsers. Elephants themselves may also influence woody species survival by searching for, and utilising seedlings thereof, as found by Dublin (1984) in the Serengeti-Mara ecosystem .

Although noticeable at times, damage to woody vegetation by the elephants on WPGR is not presently considered to be destructive on a large scale. Results from this research (at the present elephant density) show that the elephants (bachelor groups and breeding groups together) utilised only 7% of the 7 579 individual woody plants recorded as available to them. All height classes are utilised, the elephants do not appear to be selecting for tall trees. This is important since it suggests that over all species, the elephants are using what is available. If the elephants utilise woody species which have an abundance of seedlings (which fall into the smaller height classes), this may suggest that these species regenerate more readily than those species which have relatively few seedlings, and therefore that they would have a better chance of survival. The percentage of all feeding activities comprised of felling, uprooting, barkstripping and branch breaking by both bachelor groups and breeding groups in both seasons was consistently lowest for tree felling and highest for branch breaking (7% felling; 9% uprooting; 30% barkstripping and 54% branch breaking). Average percentage plants utilised to unutilised in each food plot was 26% in the dry season and 18% in the wet season. This means that bachelor groups and breeding groups are utilising more woody plants per food plot in the dry season than in the wet season, and they are using less than a third of the resources available to them within each of the patches at which they choose to feed, in either of the seasons.

The elephant population density on WPGR is presently at 0.21 elephants/km^2. When elephant populations are at densities approaching 0.5 elephants/km^2 for periods of ten years and more, it has been observed that savanna woodlands begin to convert to shrublands or grasslands (Fowler 1973; Cumming *et al.*1997). For the elephant population to equal this density on WPGR, there would have to be 167 elephants on the present property size. Selective use of resources by the elephants can, however, cause localised woodland damage and loss of certain tree species at elephant densities of less than 0.2 elephant/km^2 in a wide range of woodlands (Cumming *et al.* 1997). Therefore it is important that elephant impact on woody species which

are utilised by both bachelor groups and breeding groups, in both dry and wet seasons, be monitored.

5.2 Management suggestions

1. Particular woody species were preferred by bachelor groups and by breeding groups. These species should be carefully monitored in the future for changes in abundance as well as height-age class distribution on WPGR. Recovery mechanisms of these species in response to impact by elephants should also be monitored.

2. Exclusion plots may be erected in the different habitat types which, if regularly monitored, would provide valuable information in the long term. Such exclusion plots would have to be surrounded by electric fencing (powered by solar panels), and the number of electrified strands of wire can be manipulated depending on which animals are intended to be excluded from the area. This will provide baseline data on the level and type of impact that elephants are having on woody species where, for example, a) all large browsers (including elephant and giraffe) are excluded, and b) where smaller ungulates are excluded. The results can then be compared to provide information on which factors most influence the recruitment of seedlings of species preferred by the elephants.

3. Tree species of aesthetic importance to landowners may be identified, tagged and monitored for elephant damage over the long term. In conjunction with data from these trees, other factors such as edaphic and climatic effects which would influence growth rates apart from the influence that elephants may have, should be also recorded.

4. Since few significant differences were found in the utilisation of vegetation between bachelor and breeding groups, it may be suggested that little intersexual competition exists and that the population may currently be below carrying capacity, and therefore adjusting the sex ratio is no longer recommended as a management option. Vegetation utilisation can therefore be monitored collectively for both elephant sexes while elephant densities are low and summer rainfall figures are above average. The results obtained and conclusions made from this study will undoubtedly need to be re-assessed after the removal of the fence (E. Leibnitz, pers. comm.) which currently separates WPGR and Marakele National Park.

5.3 Directions for future elephant research on WPGR

Our tendency as scientists is to generalise about systems from the limited scope of our own research, this is necessary so that we can use these results to make informed management

recommendations for the near future (Dublin 1984). This provides a starting block in finding the pieces for the "bigger picture", and as more research is conducted over a larger temporal scale, those pieces begin to fall into place. It is the role of the scientist to provide the technical information and set out the management alternatives. It is then the role of the manager to choose the most appropriate management policy for the park (Bell 1983). The state of a park in 10 or 20 year's time depends upon the events of today. In order to understand tomorrow's ecological and management problems we must study those that exist today (Barnes 1983). Woodland – herbivore interactions are both complex and dynamic. Due to the life expectancy of African elephants, the impact they can have over long periods of time is cumulative. Therefore, understanding the ecology of systems which include elephants is a long term project of continuous data collection and interpretation. The following points are suggestions for future research on WPGR which are considered important to supplement the research done in this study.

- Monitor the recovery of woody species impacted by the elephants in terms of their resprouting capabilities in combination with various degrees of damage, and whether or not the elephants (or other animals) ustilise the coppice.
- Analyse chemical composition (nutrient content, tannin content) of woody species preferred by the elephants on WPGR (see chapter 3). This should be done on a seasonal basis to highlight any changes in species utilisation by the elephants in conjunction with changes in plant chemistry. This will provide information which may be important in predicting which species may be targeted by the elephants at a particular time of year.
- Investigate influence of fire and insects on survival of woody species after impact by elephants e.g. barkstripping which exposes underlying tissues vulnerable to these factors.

5.4 References

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