Spatial Demography of Selected Tree Species in the Kruger National Park, in relation to elephant impacts.

Researcher:
Michele Vivienne Hofmeyr
Centre for African Ecology
Department of Animal, Plant and Environmental Sciences (APES)
University of the Witwatersrand
Private Bag 3
Wits
2050
Email: mhofmeyr@mweb.co.za

Supervisors:
Prof. Norman Owen-Smith and Prof. Tim O'Connor (University of the Witwatersrand)

Aim

The aim of this study is to identify those factors influencing selected tree species population dynamics and demography in the Kruger National Park and to what extent these factors are spatially variable in their influence. The factors considered are geology and related substrate variations, elephant impacts, fire, rainfall regime and browsing by herbivores.

Objectives

a. To identify functional groups of tree species in terms of their population dynamics, conservation status, ecosystem importance and susceptibility to elephant impacts.
b. To establish the current population structure, distribution and impacts for representative species in high elephant density zones within the Kruger National Park.
c. To integrate current data and knowledge of these species into population viability models that accommodate spatial distribution, temporal variability in recruitment in response to rainfall and other factors, growth and mortality patterns and the effects of disturbances such as fire and elephant impacts.
d. To document the spatio-temporal variation of elephant distribution and hence ecological pressure on these tree species
e. To refine over time appropriate conceptual or more formalized models that will help guide managerial decisions with regard to the maintenance of biodiversity and ecosystem processes in protected areas.

Activities undertaken to achieve objective:

Selected Study Species

Based on advice from KNP Scientific Services staff/ Wits academic staff, together with findings of past research, the following species were selected:

1. Baobab - *A digitata* (major species)
2. Common Star Chestnut - *S rogersii* (subsidiary species)

These two species appear to be distributed in similar habitats, preferring dry, rocky areas. This will allow simultaneous sampling of both species in selected landscapes. Both species are also favoured by elephants.

3. Marula *Sclerocarya birrea* (major species)
4. False Marula *Lannea Schweinfurthii* (subsidiary species)

Marula trees are widespread throughout the park and are apparently targeted by elephants, which uproot the trees with their destructive feeding habits. False Marula trees have a similar distribution to Marula in the KNP and are also apparently targeted by elephants. These factors make the False Marula a suitable species for comparison to Marula.

Summary of findings (unpublished)

The indications are that the baobab (*Adansonia digitata*) population is experiencing a lack of recruitment into the smaller size classes. In addition elephant damage in certain localized areas may cause some trees to become stunted and non-reproductive. These are both areas of concern for the population as a whole. Baobab trees will persist in areas where elephants are not able to reach them, such as steep inclines and hillsides. These areas may serve as a source to repopulate areas where trees have been lost or reduced due to elephant pressures. Of the elephant damage to adult trees, most of the damage is superficial and not recent. Elephants may utilize baobabs on a seasonal basis, particularly eating the bark towards the end of winter when other vegetation is limited.

Sterculia rogersii trees are very sparsely distributed in the landscape and are found to be in low numbers. As a result of this, this species is in more danger of severe elephant impacts than the baobabs. Further surveys over larger areas need to be conducted to determine if there are any smaller trees, the level of damage to adult trees and how these trees are distributed in the landscape.

Marula and false marula appear to be affected by fire as smaller trees are kept trapped in the grass layer by fire and are potentially non-reproductive individuals in the population. Elephants are utilizing the trees but very few trees are directly killed by elephants. Most of the mortality is in the form of severe bark stripping and ring-barking. A combination of elephant damage in the form of bark stripping, burning of the exposed main trunk and high winds blowing weaken trees over is affecting the larger trees in the population.

As elephants are classified as mega-herbivores (Owen-Smith 1992), consuming large amounts of vegetation, it is anticipated that they will have an impact on their habitat. In the scope of this project, the trees surveyed show that elephants are playing a role in both the population dynamics and population structure, although impacts are not highly detrimental to the populations. Elephant impacts may be seen as seasonal and localized ie: in areas close to water or on trees that are accessible above the grass layer and the surveyed populations are not in danger of immediate extinction. The project has also served to highlight that a-biotic factors are playing an important role in the distribution and structure of the selected tree species, particularly the role of fire in the landscape.

Finally, it is a fortunate development that the KNP will be extending its borders to increase the size as part of the Transfrontier Park with Mozambique. It is anticipated that eventually elephants will disperse into these new areas and thus reduce the pressures on tree population in the existing KNP.