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EFFECTS OF ENCLOSURE ON HOME RANGE AND RESOURCE SELECTION: A COMPARISON OF TWO AFRICAN ELEPHANT HERDS (*Loxodonta africana africana*)

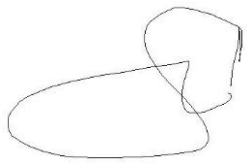
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A research report submitted to the Faculty of Science, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Science.

Johannesburg, 1 December 2013

DECLARATION

I declare that this dissertation is my own, unaided work. It is being submitted for the Degree of Masters of Science in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in any other University.



1 December 2013

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ABSTRACT

Enclosed game reserves are at risk of local vegetation over-utilization and homogenization by elephant. Understanding how the elephant spatial distribution is coupled to their seasonal resources use can aid future management given the threat of climate change.

A comparison of home ranges and core area sizes across seasons and years was made between an elephant herd outside in an open system, compared to the elephant inside Limpopo Lipadi Game and Wilderness Reserve (LLGWR). Location data, obtained by GPS-GSM technology, was used to determine seasonal home ranges and core areas by local convex hull (LoCoH) methods and to generate seasonal General Estimating Equations (GEE). Remote sensing data was used to determine habitat variables.

The home ranges of the elephant herd outside as expected, was twice as large during summers and a third larger during winters than the elephant herd inside the fenced reserve. The influence of seasonal rainfall on home range size was reflected at home range scale for the outside herd and for the core area scale for the herd inside the reserve. Increased rainfall overcomes the 'magnet effect' of artificial waterholes on elephant distribution in the landscape only in the open system. Inside the reserve, contrary to expectation the winter home ranges were non-significantly larger than summer home ranges due to space limitation induced by fencing and permanent artificial waterhole density.

Resource use was evaluated by using GEE models at a scale larger than established home ranges and therefore would reflect as home range determinants. The study confirms that elephant do not use resources randomly. A scale in resource selection of elephant cows exists, with distance to drainage lines at small scale preferred during winter, with aspect, slope, elevation, and NDVI at larger scales. Fencing furthermore, affects the scale at which selection occurs by limiting resource availability, especially during resource restrictive periods and limits range expansion during resource abundant periods. Elephant cows prefer gentle terrain, close to permanent water [<1.77km (SD$\pm$0.554) inside the reserve, and <2.33km (SD $\pm$ 2.13) outside the reserve], moderately high NDVI, riparian vegetation during late winter and early summer if available. Generally, during lower rainfall periods lower elevations are preferred along the elevation gradient, and during higher rainfall periods, higher elevations.

The elephant herd outside the reserve, furthermore prefer aspects in the landscape during hot summers that are cooling and cool winter aspects that are warming to facilitate energy saving and thermoregulation.

Key words: Elephant home range, core areas, fencing, seasonal, artificial waterholes, open system, NDVI, elevation gradient, distance to water, seasonal GEE modelling.