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Do anthropogenic and natural features act as barriers to African elephant (Loxodonta africana) space use?

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Abstract

The degree that different landscape features influence elephants use of space in the Kruger National Park and surrounding private game reserves (Balule, Timbavati, Klaserie and Umbabat) is not known. The aim of my study was to assess landscape features which influence elephant space use at two different spatial scales: at a large scale representing home range selection within the landscape and a small scale representing core area selection within the total home range. I investigated the space use of 15 male and 6 female adult elephants over a three year period (June2007-May 2010), using GPS data and satellite mapping analysis. The features selected for analysis as possible barriers to elephant space use were anthropogenic (fences, roads, railway lines and infrastructure) and natural features (rivers, geological features and vegetation). I also investigated the total and core home range size of elephants and whether elephant space use differed by sex and season. Males had larger total home ranges than females irrespective of season, but there were no size or seasonal differences of core home range size between the sexes. Elephants used features differently at the two spatial scales, differed in the use of features between seasons, and there was a difference between the sexes in the use of features. Fences, railways, rivers (in the wet season), geological features and vegetation types were the features that influenced elephant space use, and could be possible barriers at the large scale. Elephants occurred close to fences which possibly restricted their space use. Elephants also occurred close to railway lines but they might not have crossed the railway line. As expected elephants occurred less often at close distances to rivers in the wet season which could possibly be as a result of higher rainfall in this season, preventing elephants from crossing their usual riverbed corridors. Male and female elephants differed in the use of vegetation types found on particular geological features: males selected basalt and females selected granite areas for both the dry and wet seasons. Both male and female elephants were associated with a wider variety of vegetation types in the dry season, possibly because the limited food availability causes elephants to cover larger areas in search of food. Elephant space use was therefore governed by several features that may or may not restrict space use. My study, using satellite mapping analysis, can suggest what hinders movements of elephants and what is essential for assisting elephant space use, which could help conservation efforts for reserve design and corridor formation between reserves.