ABSTRACT

THE SPATIAL ECOLOGY, HABITAT PREFERENCE AND DIET SELECTION OF GIRAFFE (*GIRAFFA CAMELOPARDALIS GIRAFFA*) IN THE KALAHARI REGION OF SOUTH AFRICA

by

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The research project was conducted within two separate study areas. The main research project was conducted in the Khamab Kalahari Nature Reserve (KKNR) in the North West Province of South Africa. The main research project only commenced after the completion of a preliminary study that was conducted on the Woodland Hills Wildlife Estate in the Free State Province of South Africa. KKNR is situated in a remote portion of the Kalahari savanna and is 95 537.56 ha in size with an average rainfall of 333 mm. Vegetation types present are grassland, open thickets, dense thickets and areas that were previously treated with arboricides. In total, 11 plant communities were described, which were grouped into three major plant communities. Little is known of the environmental impacts on giraffe in this ecological region, and concern has been expressed regarding population numbers declining in KKNR.

The first objective of the research project was to develop and design efficient and safe GPS collars for giraffes. During a second phase of the study, a giraffe population in KKNR was studied with the objective of assessing their habitat selection and spatial ecology as influenced by season, habitat resources (browse and water) and plant species composition. The diet selection of giraffe in relation to browse availability, and changes in daily activities (feeding and non-feeding) over seasons were also studied. The final objective of the study was to establish management guidelines for giraffe in arid regions to ensure sustainability and to aid in future decisions to promote population growth amongst other sub-species in the rest of Africa.

Although the giraffe in the KKNR have free reign within the reserve of 95 653 ha and appears to have adapted well to their new surroundings, their numbers are still on the decline since their re-introduction. The distribution patterns of giraffe in the reserve were found to be strongly influenced by seasonal effects on vegetation, deciduous nature of woody species, provision of water and human impact on habitat persecutions and available browse for giraffe.

With the aid of the GPS collars it was established that the average daily distance travelled was 5.1 km, with females travelling for longer hours and distances during the winter months compared to other seasons. Average distances travelled fifer between seasons, with the lowest in autumn (5.05 km / day), and the highest in winter (5.75 km / day) with an average speed of 0.21 km / h. Giraffes in KKNR utilized an average home range of 206.0 km² (20 602 ha) to find sufficient forage to sustain their daily requirements. In the wet, hot season (summer) when food was abundant, giraffes frequented smaller areas (average 177 km²), while in the dry, cool season (winter) they extended their home range (average 245 km²) to fulfil their daily needs. Giraffes clearly favoured areas (53% of all recorded locations) that were selectively treated (more than 13 years ago) with arboricides, but avoided untreated bush thickened areas (underutilizing these areas by 62% compared to availability). Giraffes also avoided areas where most of the woody plants were cleared (underutilizing these areas by 233% compared to availability).

Giraffes in the KKNR preferred tree densities of 744 to 1 084 plants ha^{-1}, combined with a high (> 5 600) Total Evapotranspiration Tree Equivalent (ETTE ha^{-1}), where they can select very specific woody species to browse. *Acacia erioloba, Z. mucronata, B. albitrunca* and *A. mellifera* were the tree species most preferred, and are considered to be critical resource species, especially the evergreen *B. albitrunca*. These four woody species, combined, represent 93% of the giraffe diet of giraffe in KKNR, suggesting that giraffe are preferentially searching for these woody species, although they are not always the most abundant woody species available (36.2%).

Female giraffe feeds predominantly at a height of 3.0 m or higher, but this differed between tree species due to differences in size and growth from: 99% of female feeding occurred ≥3.0 m on *A. erioloba* (89%), ≥3.0 m on *A. mellifera* (70%), ≥3.0 m on *Z. mucronata* (90%) and >3.0 m on *B. albitrunca* (94%). Male feeding occurred ≥ 4.0 m on *A. erioloba* (90%), ≥4.0 m on *A. mellifera* (92%), ≥4.0 m on *Z. mucronata* (95%) and >4.0 m on *B. albitrunca.* Male and female giraffes were browsing on levels that largely excluded direct competition from other browsers (>2.0 m), especially during the dry season. Only 7% of all female feeding occurred below 2.0 m and only 19% of all male feeding occurred below 4.0 m.

Giraffes were further influenced by the seasonal cycle of tree phenology due to the winter deciduous nature of the majority of the tree species influenced. Results demonstrated that giraffes experienced difficulty finding preferred browse material during the critical dry period from July – October and they increase their home range in response. During this time (July – October), the availablility of areas that can be described as “critical resource areas”, such as *B. albitrunca*-abundant areas, had a significant ($P<0.05$) effect on the survival of giraffes during the pre-season dry period.

Giraffes also favour areas with high shoot availability (<2.0 mm in diameter) within the high preference areas (1 545 kg ha^{-1}), which is two times more than in the low preference areas (873 kg ha^{-1}), indicating that this is one of the main criteria influencing habitat selection other than tree species. Osteophagia as an activity of all giraffes was common during the winter (>500 recordings), indicating that the giraffes were in need of supplementary minerals during the dry season and that they were under nutritional stress.

Activity budgets indicated that 39% of time was spent related to non-feeding activities for all observations with female 36%, male 44%, sub-adult male 54%, sub-adult female 34% and juvenile 51% of time devoted to non-feeding activities.

The key to the survival of giraffe in the Kalahari is proper management principles which are based on the habitat’s carrying capacity and by keeping numbers accordingly. The results indicate KKNR can sustain 4 512 browser units (BU) based on the biomass available below 2.0 m and 9 765 BU if browse between the 2.0 m and 5.0 m strata are included.