GfÖ
GfÖ Ecological Society of Germany, Austria and Switzerland
Basic and Applied Ecology 21 (2017) 55–65
Basic and Applied Ecology
www.elsevier.com/locate/baae

Spatial ecology and habitat use of giraffe (*Giraffa camelopardalis*) in South Africa

Francois Deacon*, Nico Smit

Department of Animal, Wildlife and Grassland Sciences, University of the Free State, PO Box 339, Bloemfontein 9300, South Africa

Received 2 September 2016; accepted 4 April 2017
Available online 13 April 2017

Abstract

The lack of long-term studies remains a limiting factor in understanding the home range, spatial ecology and movement of giraffes. We equipped eight giraffes with GPS satellite units and VHF capacity, which were built in to the collars for the remote collection of data on their movements and home ranges over two years on Khamab Kalahari Nature Reserve (KKNR) within the Kalahari region of South Africa. Giraffe numbers in KKNR dropped from 135 individuals to 111 in just five years, revealing the lack of knowledge about their required habitat needs, space use and diet. With over 1000 km^2 available for roaming within the reserve, habitat selection, principle and preferred food species played a significant role in home range size and overlap between individuals. These giraffes used an average annual home range of 206 km^2 (20 602 ha) as calculated by a 95% minimum convex polygon (MCP) with a standard deviation core home range calculated by a 50% MCP of 10.1 km^2 to satisfy their annual needs for survival and reproduction in their preferred vegetation. In the wet, hot season (summer: December–February) when food was abundant, giraffes frequented smaller areas (average 177 km^2), while in the dry, cool season (winter: June to August) the mean home range size increased to approximately 245 km^2. Rainfall influenced spatial distribution since it determined vegetation productivity and leaf phenology. The different seasons influenced giraffe movements, while different vegetation types and season influenced their home range size. Season and food availability also influenced home range overlap between different giraffe herds. Home range overlap occurred when giraffes were forced to roam in overlapping areas during the dryer months when the winter deciduous nature of the majority of the tree species resulted in lower food availability. In winter, the overlap was approximately 31% and in autumn approximately 23%. During the wet and warmer months, overlapping was 15% in summer and 19% in spring, respectively. The percentage of time spent in different vegetation type areas was influenced by the abundance of the principal food species of that plant community. It is thus concluded that the movements of giraffes were primarily influenced by a combination of environmental factors such as season, rainfall and vegetation density.

© 2017 Gesellschaft für Ökologie. Published by Elsevier GmbH. All rights reserved.

Keywords: Giraffe; Competition; Habitat use; GPS satellite tracking device; Home range overlap; Seasons; Vegetation types; Spatial ecology

Introduction

Spatial ecology is a key to understand the interrelationship between giraffes and their environment. Knowledge of spatial ecology and landscape use is essential to understand

*Corresponding author. Fax: +27 51 401 2608.
E-mail address: deaconf@ufs.ac.za (F. Deacon).

http://dx.doi.org/10.1016/j.baae.2017.04.003
1439-1791/© 2017 Gesellschaft für Ökologie. Published by Elsevier GmbH. All rights reserved.

their biological and ecological requirements. Resource richness and home range depend on the spatial arrangement of habitat patches (Fabricius 1994). The relationship between species density and resource quality is also scale-dependent. Resource quality includes the value and availability of forage and shelter (Schamberger & O'Neil 1986). Factors such as predation, competition, habitat size, climatic elements and resource quality have an impact on species distribution within the same landscape (Scheepers 1992). At a fine resolution, foraging group size varies according to within-patch richness. An animal's home range is determined by spatial arrangements of resource patches within that home range (Lawson & Rodgers 1997). An herbivore will expand its home range until all its resource requirements are met within the smallest possible area. Landscapes with densely packed habitat patches may contain many small home ranges, whereas landscapes with sparsely distributed habitat patches may contain few large home ranges. As habitat patches become sparsely distributed, the animals suffer a net energy loss by moving between patches to forage (Fabricius 1994).

Little is known about the resource and space use of giraffe populations in general, more so within constrained areas. Giraffe (*Giraffa camelopardalis*) home range sizes are highly variable and population structures and number of individuals may vary considerably within home ranges (Bercovitch & Berry 2010; Dagg 2014; McQualter, Chase, Fennessy, McLeod, & Leggett 2016). Home ranges vary between environments differing in size, food availability, seasonal rainfall and frequency of predation (Fennessy 2009).

Addressing the concerns of giraffe conservation requires a more comprehensive understanding of their spatial ecology. Especially because the population numbers within Khamab Kalahari Nature Reserve (KKNR) declined from 135 individuals in 2009 to less than 111 in 2013. Population numbers are declining in many regions of Africa (Bercovitch & Deacon 2015), whereas in a few regions the population numbers are increasing, partly due to translocations, even though the minimum habitat requirements of giraffe are largely unknown (Deacon 2015). Assessing seasonal variation in giraffe home ranges and habitat use can assist both game managers and nature conservation officials in making informed decisions regarding the best conservation plan for preserving giraffes, especially during critical periods of environmental extremes, such as drought (Deacon 2015).

In general, the movements and home range size of giraffe are strongly linked to seasonal browsing and/or water availability (Hall-Martin 1974; Berry 1978; Kok & Opperman 1980; Pellew 1984; Fennessy 2009). Seasonal movements have specifically been associated with phenological changes of preferred plant species (Hall-Martin & Basson 1975; Leuthold & Leuthold 1978) with shifts in forage preferences leading to seasonal expansion or contraction of ranges (Ciofolo & Le Pendu 2002; Fennessy 2009).

Technological advances in GPS tracking devices for giraffe (Deacon 2015) have allowed researchers to monitor the movement and behaviour of giraffe from a distance. This method of tracking is ideal, because it does not require direct observation of the animal (McQualter et al. 2016). GPS tracking is preferred because it is very difficult to collect enough data over extended periods and seasons based on visual observations alone. In addition, GPS tracking devices allow the wildlife to behave more naturally without being disturbed by human presence, which could affect their normal behaviour. Advances in understanding the spatial ecology of animals have expanded considerably with the use of GPS tracking devices. In this paper, we address the limited knowledge of the spatial ecology of giraffes in a semi-desert fenced environment with the following specific objectives:

i) To determine seasonal and annual home ranges of giraffes and how they vary according to resource quality,
ii) To determine home range overlap between individuals and groups and how it may vary by season, and
iii) To determine how different vegetation types influence the time that giraffes spend in an area.

Materials and methods

Study site

The study was conducted in the Khamab Kalahari Nature Reserve (KKNR:-25°48′49.39″S, 23°25′40.35″E) situated in a remote area of the savanna Biome in the north-western Kalahari region of the Republic of South Africa (Fig. 1). Four annual seasons were identified and described following Collinson (2008) and grouped according to year and season i.e., year 1 (2012) and 2 (2013) and seasons winter (June–August as dry and cool), spring (September–November as dry and hot), summer (December–February as wet and hot) and autumn (March–May as wet and cool). The KKNR is 95 538 ha in size with an average long-term (1969–2013) annual rainfall of 333 mm (Collinson 2008; EES 2012). The area is considered semi-arid and the rainfall is erratic and unpredictable with a high coefficient of variation (CV = 34%). The average minimum and maximum daily temperatures vary from 0 °C to 22 °C in July and 18 °C to exceeding 34 °C in January. Frost occurs in winter with a mean number of 27 days of frost (Collinson 2008; EES 2012).

The KKNR is located within the Molopo Bushveld (SVk11) vegetation type (Mucina & Rutherford 2006). The density and composition of the savannah vegetation was largely influenced by past management practices prior to the establishment of the nature reserve. The most important of these include localized overgrazing by cattle and the applications of various arboricides in an attempt to combat the problem of bush thickening. As a result of these previously management practices, the vegetation types vary from grassland to open savannah to dense thickets. For the purpose of this study, the eleven identified vegetation types (Brown & Bezuidenhout 2000; EES 2012) were grouped into three major plant communities: (1) *Ver-*

Download English Version:

https://daneshyari.com/en/article/5742824

Download Persian Version:

https://daneshyari.com/article/5742824

Daneshyari.com