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WILDLIFE TOURISM IN GONAREZHOU NATIONAL PARK, SOUTHEAST ZIMBABWE: OPPORTUNITIES FOR WILDLIFE VIEWING

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ABSTRACT

The aim of this study was to (i) estimate wild animal abundances, distribution and species diversity and (ii) examine the opportunities for wildlife viewing in major tourist areas in the southern part of Gonarezhou National Park (GNP), southeast Zimbabwe. In this study, road strip counts were used. A total of 93.5 km were traversed and 15 wild animal species were recorded. The overall species diversity and density of the recorded 15 wild animal species during this study differed among transects and habitat types in southern GNP. More animals were sighted in areas near the Mwenezi River with transects away from the river recording fewer animals. Overally, there were clear differences in the spatial distribution of animal species, suggesting greater habitat heterogeneity and increased opportunities of wildlife viewing in southern GNP.

Keywords: Conservation; Habitat; Mabalauta; Protected Area; Road Counts; Tourists

INTRODUCTION

Wildlife tourism is one of the fastest growing tourism sectors worldwide (Reynolds & Braithwait, 2001). Across the world the number of tourists seeking interactions with wildlife in their natural environment is increasing (Higginbottom, 2004; Lindsey, Alexander, Mills, Romanãch, & Woodroffe, 2007). This general interest in nature and nature-based experiences is reflected in an increasing demand to experience these, and increasing value being placed on, animals in the wild, as opposed to those in captive or semi-captive situations (Reynolds & Braithwait, 2001). Factors contributing to the overall growth in wildlife tourism and associated interest in closer interactions with animals include cheaper and faster access to destinations along with increased 'green' awareness (Rodger, Moore, & Newsom, 2007).

Wildlife tourism is tourism based on encounters with non-domesticated animals (Higginbottom, 2004). Wildlife tourism occurs within a 'spectrum of tourist-wildlife interaction opportunities' ranging from captive settings completely constructed by humans, to semi-captive settings featuring containment but some freedom of movement, to wild areas in the natural environment (Kontogeorgopoulos, 2009; Orams, 1996). It includes activities historically classified as 'non-consumptive', such as viewing, photography, and feeding, as well as those that involve killing or capturing animals, particularly hunting and recreational fishing (Higginbottom, 2004). Additionally, tourism based upon wildlife has become the leading foreign exchange earner in several countries (Reynolds & Braithwait, 2001).

Providing quality viewing opportunities may help to ensure continued support of wildlife refuges and other public lands important to wildlife conservation (Anderson, Manning, Valliere, & Hallo, 2010). Worldwide, many countries and regions rich in biodiversity and poor in economy have been vigorously promoting ecotourism as a conservation tool in their protected areas (PAs) since the 1990s (Rana, Sohel, Mukul, Chowdhury, Akhter, & Koike, 2010). PAs now cover more than 12% of the world's land area. Tourism use of PAs basically involves the travel for the discovery and learning about wild environments (Rana, et al., 2010).

Tourism is one of the most important sectors in the economy of Zimbabwe. Approximately 15% of Zimbabwe is set aside as PAs for nature conservation. Wildlife populations and scenic attributes are considerable, within these PAs and outside them, on both communal and private land. Within parks, government has provided tourism amenities including lodges and campsites. Most research on tourism demand in Southern Africa has focused on the perceptions of tourists (Mmopelwa, Kgathi, & Molefhe, 2007), preferences of tourists (Chaminuka, Groeneveld, Selomane, & van Ierland, 2011; Kerley, Geach, & Vial, 2003), tourists willingness to pay for wildlife viewing and wildlife conservation (Barnes, Schier & van Rooy, 1999) and travel motives of tourists (Saayman & Saayman, 2009; van der Merwe & Saayman, 2008). Elsewhere, recent visitor surveys and interviews indicated that wildlife viewing is an important component of the visitor experience at both Lake Umbagog National Wildlife Refuge in New Hampshire and Denali National Park and Preserve in Alaska (Anderson, et al., 2010).

Providing wildlife viewing opportunities has become an increasingly important component of outdoor recreation planning and management (Anderson, et al., 2010). However, little work has been done on wildlife viewing opportunities particularly in Gonarezhou National Park (GNP), southeast Zimbabwe. Estimating animal abundance and their distribution along tourist roads is central to sound wildlife management and conservation. Therefore, the aim of this study was to estimate wildlife abundances, distribution and species diversity in major tourist's roads in southern GNP in order to examine the opportunities for wildlife viewing.

MATERIALS AND METHODS

Study area

Established in the early 1930s as a Game Reserve, GNP was transformed into a national park under the Parks and Wildlife Act of 1975. GNP has been part of the Great Limpopo Transfrontier Park since 2000. Covering an area of 5053 km^2, GNP is located in southeast Zimbabwe, between 21° 00'–22° 15' S and 30° 15'–32° 30' E (Fig 1). GNP experiences two seasons, a wet season and a dry season, which are very contrasting. Annual average rainfall is about 466 mm, with October to March being the wettest months. The dry season normally lasts from April to September (Gandiwa & Kativu, 2009). Average monthly maximum temperatures are 25.9 °C in July and 36 °C in January. Average monthly minimum temperatures range between 9 °C in June and 24 °C in January (Gandiwa, Magwati, Zisadza, Chinuwo, & Tafangenyasha, 2011). The major vegetation type is *Colophospermum mopane* woodland, which covers approximately 40% of GNP. The more extensive plant communities in GNP are described by Sherry (1977). There is a wide variety of large herbivore species in the GNP ecosystem and these include African buffalo (*Syncerus caffer*), giraffe (*Giraffa camelopardalis*), waterbuck (*Kobus ellipsiprymnus*), roan antelope (*Hippotragus equinus*), sable (*Hippotragus niger*), Burchell's zebra (*Equus burchelli*), Blue wildebeest (*Connochaetes taurinus*), African elephant (*Loxodonta africana*) and hippopotamus (*Hippopotamus amphibius*). The park has a number of large carnivores such as lion (*Panthera leo*) and spotted hyena (*Crocuta crocuta*) (Zisadza, Gandiwa, van der Westhuizen, van der Westhuizen, & Bodzo, 2010).

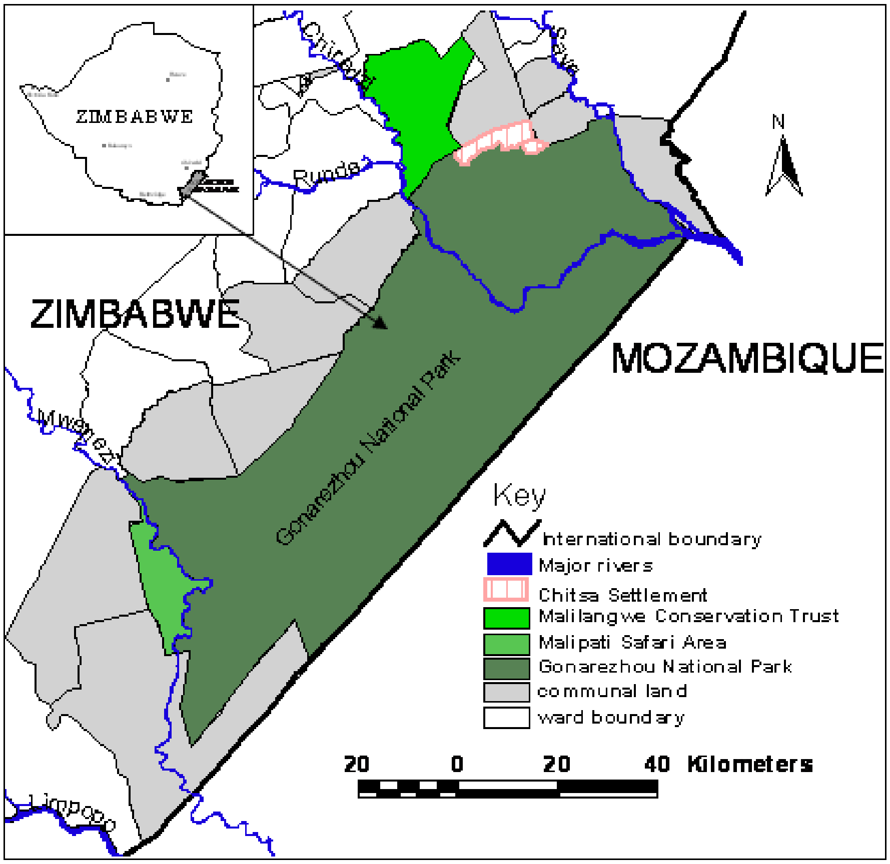

Fig 1. Location of the Gonarezhou National Park and surrounding areas in southeast Zimbabwe. Source: Gandiwa & Zisadza (2010).

Data collection and analysis

In this study, we concentrated only in the southern section of the GNP, Mabalauta, particularly the area between the railway line and the Mwenezi River. This area has a total spatial extent of about 800 km^2. Data for animal densities, distribution, species richness and diversity were collected by driving along three transects along the existing road network. Prior to the study, transects were selected along major tourist roads traversing the main habitat types occupied by large herbivores and predators in southern GNP. The roads selected were distributed so as to ensure as much spatial representation as possible. All counts were conducted by two observers, one recorder and one driver, beginning between 6:30 a.m. and 9:00 a.m. in the morning and 3:00 p.m. and 5:00 p.m. in the afternoon for five consecutive days in November 2007. Data collected included: name of animals, number of animal species at each individual sighting, distance to the animal from the vehicle, estimated angle of sighting, habitat in which the animal was sighted, and vehicle odometer reading at the time of sighting the animal. Distances covered along transects were measured by recording the vehicle's odometer reading at the start and end of each transect.

Data was analysed in STATISTICA version 6 package (StatSoft, 2001). The numbers counted for each animal species in each habitat type were expressed as densities for each transect. The density distribution provided a measure of relative abundance coded according to species. Species accumulation curves for each transect that were computed. Discriminant Analysis with habitats as grouping variables, animal abundances, and species as independent variables were used to explore differences and similarities among the sampling segments in the different transects. A Hierarchical Cluster Analysis (HCA) using the weighted pair-group average with Euclidean distances was performed using a matrix of 187 sampling segments (0.5 km sampling segments for the three road transects) and 15 animal species abundance data to classify sampling segments based on similarity. Lastly, for each transect, the Shannon Index (H') was calculated using the formula: $H' = -\Sigma(pi) \times \mathrm{LN}(pi)$, where *pi* is the proportional abundance of a species (Ludwig & Reynolds, 1988).

RESULTS AND DISCUSSION

Species diversity and densities of animals in three study transects (November 2007) in southern Gonarezhou National Park (GNP), Zimbabwe

Only fifteen animal species were encountered in the three road transects. A comparison of their species richness, diversity and densities are presented in Tables 1 and 2. This study indicated that the wildlife species richness and diversity differed among roads. Transect 2 had the highest species richness (Table 1). The area had a high degree of spatial heterogeneity which may have encouraged the co-existence of several different species. Various different vegetation types were also recorded namely, grassland, *Acacia*, *Combretum* and mopane woodlands along Transect 2. The rarest species was the wild dog (*Lycaon pictus*) which was recorded in Transect 2. Endangered species are often the focus of wildlife tourism and such species hold a special appeal (Roger, et al., 2007). The wild dog, for example, is of increasing importance to tourism and has been promoted as a tourism icon. van der Merwe & Saayman (2008) reported that one of the key travel motivation for tourists include nature which encompasses aspects such as to see endangered species, to see animals, to see plants, for educational reasons, and to take photos of animals and plants in their study in the adjacent Kruger National Park, South Africa.

On the other hand, Transect 1 had the second highest species richness which can be explained by the proximity of the area to a perennial water source, i.e. the Mwenezi River. Furthermore, Transect 3 had the least species richness but the highest species diversity. Several reasons might have led to the low species richness in this transect. This transect was closer to human settlements and also there was evidence of some road maintenance activities during the surveys and these might have influenced animal distribution. The associated species accumulation curves for Transects 1, 2 and 3 with sampled distances are shown in Fig 2. Additionally, species accumulation curves of the three transects varied in relation to the length of each transect.

Table 1: Transect lengths, species richness and diversity indices for the three study transects (November 2007) in southern Gonarezhou National Park (GNP), Zimbabwe

Variable	**Transect 1** (Mwatombo loop)	**Transect 2** (Shoshangane drive)	**Transect 3** (Makokwani, Samalema gorge and Nyavasikana)
Transect length (km)	23.5	55	15
Species richness	11	15	8
H′	1.01	1.83	1.91

Table 2: Estimates of wildlife densities in the three study transects (November 2007) in southern Gonarezhou National Park (GNP), Zimbabwe

Species	**Scientific name**	**Animal densities (animals km^{-2})**		
		Transect 1 (Mwatombo loop)	**Transect 2** (Shoshangane drive)	**Transect 3** (Makokwani, Samalema gorge and Nyavasikana)
Impala	*Aepyceros melampus*	25.06	7.84	0.95
Steenbok	*Raphicerus campestris*	1.00	4.79	3.8
Warthog	*Phacochoerus aethiopicus*	1.56	—	—
Common duiker	*Sylvicapra grimmia*	2.21	1.81	0.21
Bushbuck	*Tragelaphus scriptus*	1.89	—	—
Nyala	*Tragelaphus angasii*	0.21	0.57	2.20
Kudu	*Tragelaphus strepsiceros*	0.87	0.50	0.31
Baboon	*Papio ursinus*	0.28	—	1.08
Waterbuck	*Kobus ellipsiprymnus*	2.08	—	1.85
Zebra	*Equus burchelli*	—	0.17	—
Eland	*Taurotragus oryx*	—	0.29	—
Giraffe	*Giraffa camelopardalis*	—	0.34	—
Vervet monkey	*Cercopithecus aethiops*	0.14	—	—
Wild dog	*Lycaon pictus*	—	0.05	—
Dwarf mongoose	*Helogale parvula*	—	—	0.19

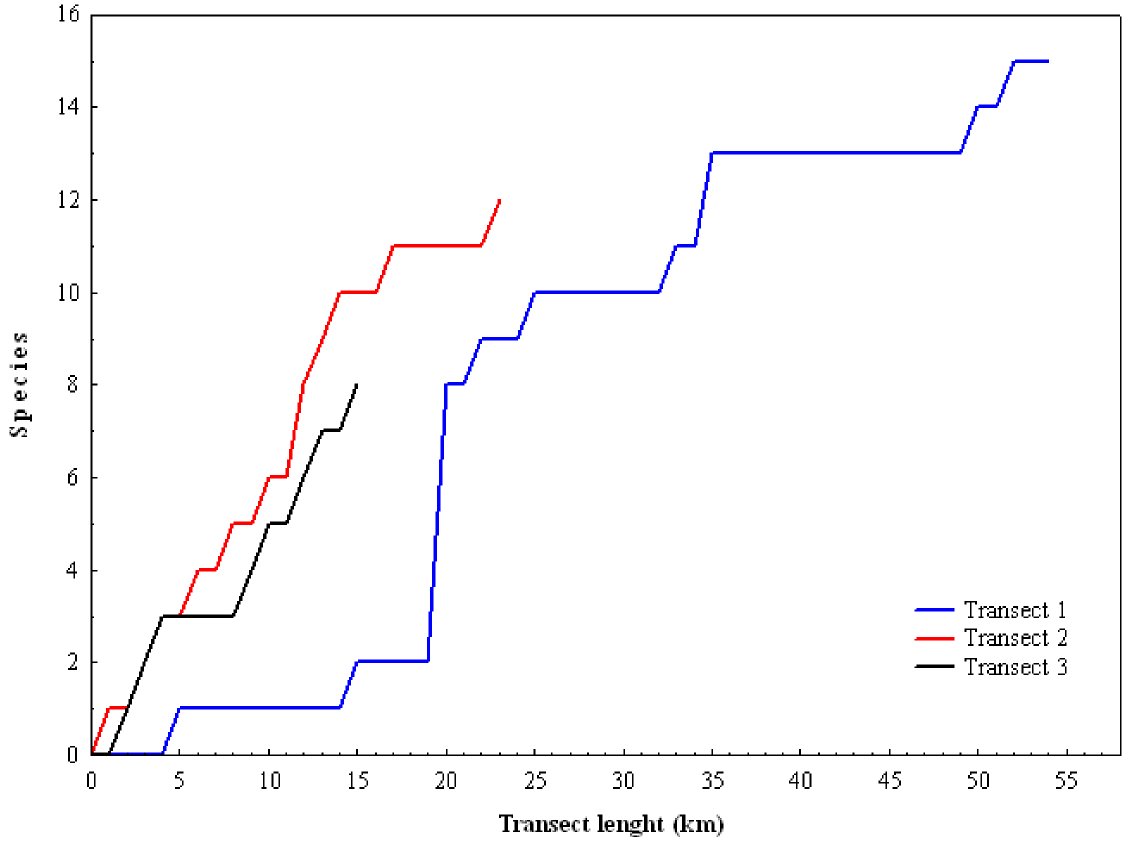

Fig 2. Species accumulation curves with distance for the three study transects (November 2007) in southern Gonarezhou National Park (GNP), Zimbabwe. Notes: Transect 1-Mwatombo loop; Transect 2-Shoshangane drive; Transect 3-Makokwani/Samalema gorge and Nyavasikana

Animal biomass in southern Gonarezhou National Park (GNP), Zimbabwe

In general, biomass contribution of the recorded animal species for this present study in southern GNP increased with increase in body size (Table 3). For example, despite the high numbers of steenbok recorded in this study, they still had a smaller biomass value as compared to the medium bodied animals like eland, and large bodied animals like giraffe. Transect 2 contributed the largest biomass, with impala as a single species contributing the largest biomass.

Table 3: Summary of animal abundances recorded in this study (November 2007) and their biomass in southern Gonarezhou National Park (GNP), Zimbabwe

Species	Total number counted in the three transects	Female body weight (kg)	Total biomass (kg)
Impala	201	40	8040
Zebra	8	300	2400
Kudu	12	160	1920
Nyala	7	250	1750
Giraffe	2	830	1660
Waterbuck	5	230	1150
Eland	1	460	460
Warthog	7	57	399
Steenbok	30	11	330
Common duiker	11	20	220
Baboon	18	12	216
Wild dog	3	25	75
Bushbuck	2	30	60
Vervet monkey	9	5	45
Dwarf mongoose	1	15	15

Note: Data on female body weights of study animal species were adapted from Hayward (2006).

Discriminant Analysis findings

Discriminant Analysis results of 15 wildlife species showed four groups (Fig 3). The first (Root 1) and second (Root 2) axes accounted for 56% and 22% of the total variation in animal sightings according to habitat respectively. Root 1 was positively correlated to sampling segments in the *Combretum* and *Acacia* woodlands and negatively correlated to sampling segments in the *Combretum*-mopane and mopane woodlands. There were however, no distinct correlations of woodlands with Root 2. Group A encompassed almost all the habitats in the mopane woodland. This has the dominant habitat in terms of harbouring the wildlife species in southern GNP. Group B represented sightings made in the *Combretum* woodland habitats although these were interspaced with sightings made in the mopane, *Acacia*, *Androstachys johnsonii* and *Combretum*-mopane woodlands. Group C represented wildlife sightings in the mopane and *Combretum-m*opane woodland habitats, with some isolated wildlife sightings in the *Acacia* and *A. johnsonii* woodlands. Group D represented sightings of wildlife species in the *Acacia* and *Combretum*-mopane woodland habitats.

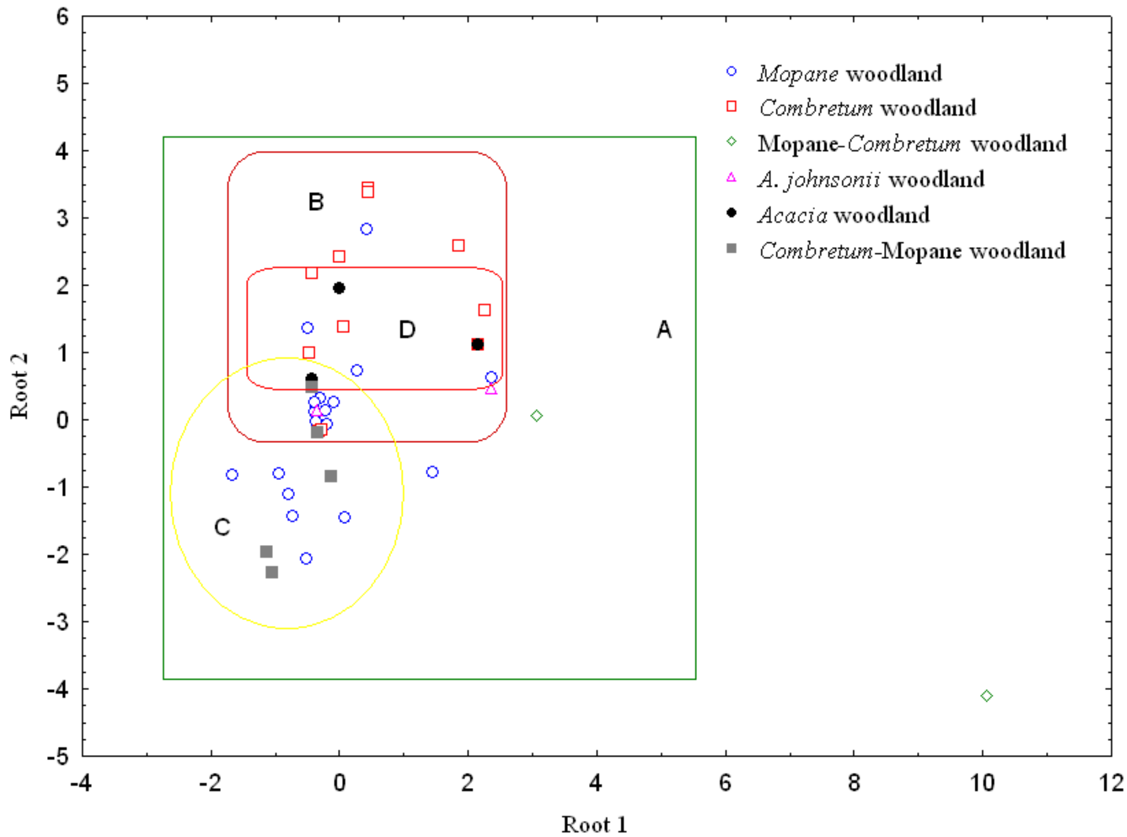

Fig 3. Discriminant Analysis factor scores of the sampling segments along the three transects in southern Gonarezhou National Park (GNP), Zimbabwe

Species aggregations in relation to habitats

The HCA dendrogram showed two major classes of sampling segments (Fig 4). Cluster A largely consisted of sampling segments that were dominated by sightings of impala, whereas Cluster B was dominated by sampling segments with steenbok, nyala and bushbuck sightings.

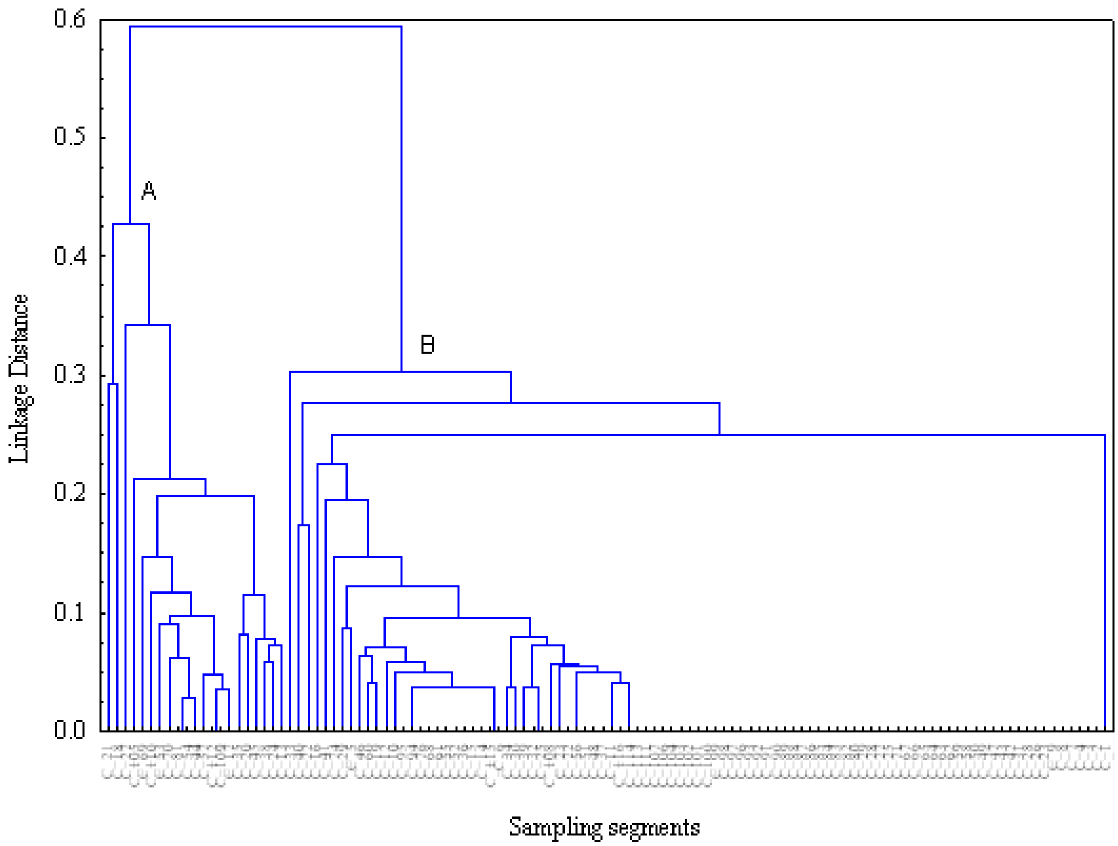

Fig 4. Hierarchical Cluster Analysis dendrogram showing classification of sampling segments (0.5 km distance) of the three road transects based on wildlife species abundance data in southern Gonarezhou National Park (GNP), Zimbabwe

Species diversity, animal abundances, and biomass in savannas: implications to wildlife tourism

Habitat heterogeneity, anthropogenic disturbance, and proximity to water source were some of the factors that may have influenced animal species diversity, densities and distribution in southern GNP. The high faunal diversity and herbivore biomass in savannas are directly linked to the high spatial heterogeneity of these ecosystems, apparently through ungulate habitat specificity that varies with body size (du Toit & Cumming, 1999). Furthermore, a high diversity of large herbivores and their predators, by virtue of their very presence and actions, maintains an even higher diversity of niches for other species, both vertebrates and invertebrates (du Toit & Cumming, 1999). Herbivores with large body size can tolerate poor vegetation quality better than smaller herbivores and larger species are thus able to feed in a wider range of habitats than smaller species (e.g., du Toit & Cumming, 1999). Caughley (1977) suggests that African grazing ungulates are restricted to areas within reach of surface water. It is therefore likely that most animal species and/or animal abundances that were recorded in this present study could have been affected by the fact that this study was conducted in the begging of the rainy season. Availability of surface water may influence animal distribution in an area depending on forage availability. Lindsey, et al. (2007) documented the importance of large, charismatic mammals as flagships responsible for attracting most tourists to PAs. Their study however, indicated that tourist preferences were not limited to such species, and that ecotourism may have greater potential to create incentives for conservation across a wider range of scenarios. For example, ecotourism has been advanced as a form of sustainable tourism that is expected to boost conservation and development in the rural communities of Southern Africa (Chiutsi, Mukoroverwa, Karigambe, & Mudzengi, 2011).

CONCLUSION

This study showed that the southern GNP apparently has some opportunities for wildlife viewing particularly along the tourist roads. This is in support of recent findings in GNP which suggest that populations of several large herbivore species are increasing (Dunham, van der Westhuizen, van der Westhuizen, & Gandiwa, 2010; Zisadza, et. al., 2010). It is however, possible with high levels of visitation and usage of the roads for wildlife viewing, it may result in some disturbance along the road to levels that would affect the wildlife species, hence the importance of continued monitoring of the park usage. Monitoring human impacts on wildlife however, can be challenging, since wildlife are mobile and engage in learned behaviour (e.g., Anderson, et al., 2010). There is need in the future to develop carrying capacities of the roads to ensure good wildlife viewing opportunities are always maintained for the park's visitors. Park managers must continue to be attentive to these and other changes in human activity along the park roads. Additionally, park managers in GNP should manage the park to allow for the persistence of wildlife and maintenance of species diversity. Large herbivore represents the feature of PAs most important to tourists, and these species play a key role in attracting the bulk of visitors to parks (Lindsey, et al., 2007). Future studies should focus on wildlife abundance, distribution and behaviour along the park's major tourist roads in the GNP.

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