RAPID ASSESSMENT OF BIRD RICHNESS AND HABITAT CONDITION IN TOURIST AREAS IN CHIZARIRA NATIONAL PARK, ZIMBABWE

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ABSTRACT

The objectives of this study were to investigate bird richness and habitat conditions in the tourist areas of Chizarira National Park (CNP), Zimbabwe. CNP, an Important Bird Area (IBA) contains globally threatened and biome-restricted birds species. Road surveys through various habitats showed that species richness (S) in the study area was 88 bird species. Of the thirteen biome-restricted birds that are found in the area, three were observed during the survey. These were Racket-tailed Roller (*Coracias spatulata*), White-bellied Sunbird (*Nectarinia talatalas*) and Meves's Starling (*Lamprotornis mevesii*). Taita Falcon (*Falco fasciimucha*) habitats could not be surveyed due to weather conditions. Habitat conditions in the tourist areas were assessed using the Global Monitoring Framework method. The overall state of the bird habitats was "near favorable". Park managers should consider bird species richness and habitat conditions when planning to improve the health of tourist areas in CNP and to boost avi-tourism.

Keywords: Bird richness; Chizarira; Habitat Condition; Tourist Areas

INTRODUCTION

The bird checklist of Chizarira National Park (CNP), Zimbabwe, comprises nearly of 400 bird species (Fishpool & Evans, 2001). CNP is home to one globally threatened species and thirteen biome-restricted bird species that were documented in the past. These categories of species qualified the CNP as an Important Bird Area (IBA) according to BirdLife International criteria (Fishpool & Evans, 2001).

Species richness (S) is simply the number of species present in a sample, community, or taxonomic group (Krebs, 1999; McGinley & Duffy, 2010). The conservation importance of an area is typically determined by assessing its biodiversity. Species richness allows the assessment of heterogeneity on the appropriate scale of interest. Species richness increases as environmental heterogeneity increases at a variety of scales (Gould, 2000). Conservation status studies, therefore, often develop a measure for valuing the species richness or adopt one from previous studies on similar ecosystems.

Species richness is widely used as an indicator of conservation value (Brooks, Mittermeier, da Fonseca...Rodrigues, 2006). However, the science of species richness gradients is still in its infancy and few papers have tested species richness hypotheses at different spatial scales (Rahbek & Graves, 2001). In CNP, ornithological studies are generally lacking and very few studies have assessed the birds of the Park and the condition of habitats. The objectives of the study were to assess bird richness and habitat condition in major tourist areas in CNP.

MATERIALS AND METHODS

Study area

Chizarira was designated as a non-hunting reserve in 1938 and as a game reserve in 1963. Chizarira attained its full National Park status under the Parks and Wild Life Act of 1975 (Government of Zimbabwe, 1975). The Park is 191,000 hectares in extent (Government of Zimbabwe, 1996) and lies at 28° 0.00' East and 17° 45.00' South, and 80 km southeast of the small town of Binga in the Matabeleland North Province. The altitude of the Park ranges from 500m to 1,434m above sea level (Fishpool & Evans, 2001). The Park is situated in the rugged, beautiful wilderness of the great Zambezi Escarpment in the north-western part of Zimbabwe, overlooking the Zambezi Valley. The Park is accessible by dust roads from Binga, Gokwe, and Lusulu. Figure 1 shows the location of CNP.
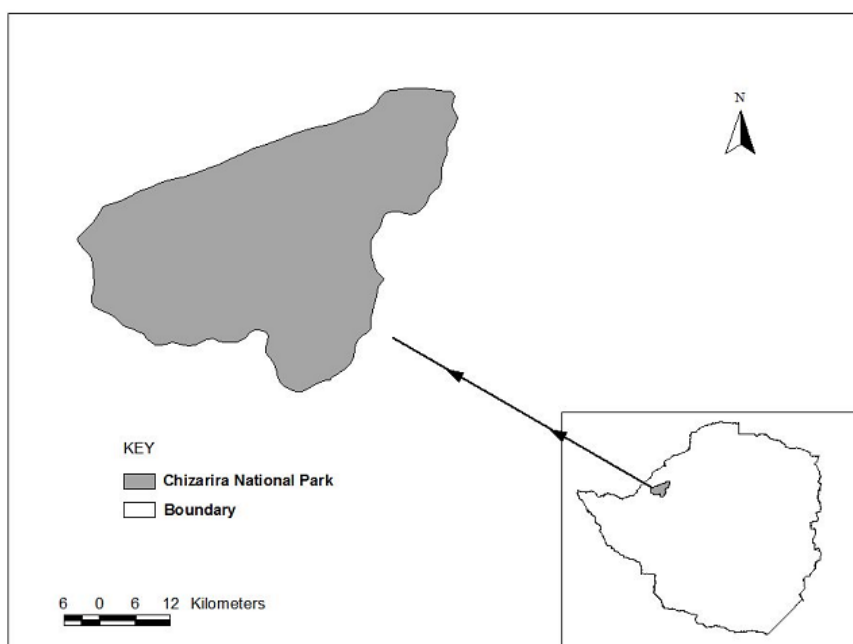

Figure 1: Location of Chizarira National Park in Zimbabwe. (Source: This study)

Climate

Annual rainfall for CNP is about 600 mm. Temperature can rise to over 30°C in the hot dry season while in winter the temperature drops to below 0°C in the river valleys (BirdLife International, 2010; Fishpool & Evans, 2001).

Vegetation

CNP has a diverse range of habitats. The landscape comprises rolling hills, river gorges, flood plains, and plateaus. The vegetation ranges from highveld *Brachystegia* species in the north to lowland mopane scrub and woodland in the south. Along the escarpment, the north-facing scree slopes are sparsely vegetated. The gentler south-facing slopes are densely covered with miombo woodland of *Brachystegia* and *Julbernardia*. There are wet grasslands, springs and streams originating from the central watershed in the Park. Other vegetation-types include grasslands, *Combretum*/*Commiphora* thickets ('jesse'), and riparian woodland/forest of *Acacia*/*Trichilia* (BirdLife International, 2010). Busi River on the southern boundary is flanked by floodplains supporting *Acacia albida* woodlands.

Fauna

Most of the plains game is present in CNP, along with bigger species such as elephants *Loxodonta africana*, lion *Panthera leo*, leopard *Panthera pardus,* and African buffalo *Syncerus caffer*. There are also many species of smaller animals, including the klipsringer *Oreotragus oreotragus*, impala *Aepyceros melampus*, steenbok *Raphicerus campestris,* reedbuck *Redunca arundinum,* and warthog *Phacochoerus aethiopicus*.

The diverse range of habitats found within Chizarira contributes to the wide range of unique bird life and several hundreds of species that have been sighted within the Park. These include: the African Broadbill *Smithornis capensis*, Livingstone's Flycatcher *Erythrocercus livingstonei*, Yellowspotted Nicator *Nicator gularis*, Emerald Cuckoo *Chrysococcyx cupreus* and the rare and elusive African (Angola) Pitta *Pitta angolensis*, which visit the Park in summer (Alexander, 1994; Sibanda personal communication, 2010). Chizarira is also home to the Taita Falcon *Falco fasciinucha*, a globally threatened bird species, which nests within the gorges of the Park.

Avi-tourism activities

CNP has good wildlife populations and some majestic scenery. It has magnificent gorges, plateaus and flood plains, and is a spectacular avi-tourism destination. There are also stunning views of the Zambezi Valley. The park is the place for 4 X 4 enthusiasts with its broken terrain of untamed gorges and hills. There are many challenging roads and tracks which lead to hidden gorges, spectacular viewpoints and richly vegetated natural springs.

The *Brachystegia* woodland of the central plateau offers special birding places where the Zimbabwe *Brachystegia* specials such as Northern Grey Tit *Parus thruppi*, Boulder Chat *Pinarornis plumosus*, and Miombo Double-collared Sunbird *Cinnyris manoensis* can be found. Bird watchers will delight at the sight of Pel's fishing owl (Woolley, 1980), Crowned Eagle *Stephanoaetus coronatus*, Black Eagle *Aquila verreauxii*, Bateleur *Terathopius ecaudatus*, Ayres' Eagle *H. ayresii,* Secretary bird *Sagittarius serpentarius* (Baker, 2007; Tree, 1996), Mottled Spinetail *Telacanthura ussheri*, (Hustler, 1998), just to mention a few. An unusual sighting of the European Kestrel *Falco tinnunculus* was also recorded by Hustler in 1998 (Hustler, 2000). There are unrestricted walking safaris meant for nature enthusiasts looking for a genuine wilderness experience.

Study site selection

A map of the tourist area in CNP was used to identify routes for the survey. Routes chosen were pre-existing driveways that were commonly used by tourists. GPS points were taken at ±100 m intervals along the routes in order to map the sampling effort. GPS points were further processed in a geographic information system (Environmental Systems Research Institute, 2005) and areas traversed in a vehicle are shown on Figure 2.

Sampling

The tourist area was sampled in three days from the 24th – 26th of October 2010 in support of the hypothesis that same-day surveys yield fewer species and underestimate total species richness (Field., Tyre, & Possingham, 2002). Table 1 below shows the sampling activity.

Table 1: Sampling activity in the tourist areas in CNP

Day	Start-End Time	Distance (km)	Route(s)
1	16:30hrs – 18:00hrs	10	1
2	06:00hrs – 12:00hrs	56.5	2; 3; 4; 5
	17:00hrs – 18:00hrs	4	6
	20:00hrs – 21:30hrs	13	2
3	06:00hrs – 07:30hrs	10	1

Each bird species heard or seen along the routes was recorded once on a datasheet and the number of bird species in all the routes was detected. Bird species encountered were added to previously detected ones to make a cumulative list of the birds recorded in all the routes, implying that all the six routes were considered as an entire unit (tourist area). The subdivision of the tourist area into six routes was meant to organize the survey rather than haphazard movements. The species richness method was based on guidelines from Javed & Kaul (2002). Furthermore, the ethics of bird identification were adhered to. The survey team comprised four people lead by an experienced bird guide, to avoid bird identification errors. Birds that could not be identified were not recorded.

The condition of the habitat in the study area was assessed following the Global Monitoring Framework method (BirdLife International, 2006). The framework provides guidelines of how the scoring system works, and also outlines principles for designing and implementing a sustainable monitoring process. In the absence of detailed ecological knowledge, the exact effect of habitat degradation may only be guessed at, so this needs to be handled cautiously. Table 2 shows an extract of the habitat condition scoring assessment.

Table 2: Habitat condition scoring assessment

Assessment of **habitat area** important for birds' populations at the Important Bird Area (IBA)

Habitat	Current area or code	Quality Rating	Details/Comments
Miombo woodland	Good	Moderate	Qualitatively, the area of miombo woodland is not changing. However, the quality of miombo is 70-90% of the optimum due to natural dying off of mature trees and degradation of the habitat by elephants and fire. It seems the miombo woodland is not maturing to climax condition.
Mopane woodland	Good	Good	Generally the condition of the habitat is good. The few trees that were pulled down were due to elephant activity.
Gorges/Hillsides	Good	Good	
Wetlands (grassy vleis, rivers, springs)	Good	Good	Rivers include Mucheni and Lwizikululu. Grassy vleis include Manzituba, where there is a game viewing platform.
Thornveld	Good	Good	
Savanna	Good	Good	

Habitat area codes: Choose from Good (overall >90% of optimum), Moderate (70-90%), Poor (40-70%) or Very Poor (<40%). If you do not know the actual habitat area, give your best assessment of the current habitat area at the site, in relation to its potential optimum if the site was undisturbed. The percentages are given as guidelines only: use your best estimate. Please justify your coding in the 'Details/Comments' column.

Habitat quality codes: Choose from Good (Overall >90% of optimum), Moderate (70-90%), Poor (40-70%) or Very Poor (<40%). Give your best assessment of the average habitat quality across the site, in terms of its suitability for the important bird species. The percentages relate to the population density of the 'trigger' species in its key habitat. Thus 100% means that the species is at carrying capacity in its habitat. The percentages are given as guidelines only: use your best estimate. Please justify your selection in the 'Details/Comments' column.

The Global Monitoring Framework provides a guide to arriving at an IBA condition status score in the absence of numerical data.

Data analysis

Bird richness on tourist areas of CNP was quantified as the total number of bird species present in the tourist areas surveyed. Sasol *Birds of Sothern Africa* bird guide (Sinclair, Hocky, & Tarboton, 2002) was used to extrapolate classes of observed birds' habitat preferences. The birds observed were classified into six habitat classes i.e. woodland, savanna, thornveld, wetland/aquatic, gorges/hillsides, and diversified habitat. Diversified habitat was a category given to birds that utilize more than one habitat type.

A graphical record of species richness (S) was done in excel. Data analysis for habitat condition assessment followed the State-Pressure-Response indices method developed by BirdLife International (2006), and data presented in table format.

RESULTS

Bird survey routes in tourist areas in CNP

The six pre-existing driveways that were traversed in CNP, which cover most of the major tourist areas, are shown in Figure 2. The lengths of routes; 1, 2, 3, 4, 5 and 6 were 10 km, 13 km, 20 km, 13.5 km, 10 km and 4 km respectively. The total length for all the routes was 70.5 km and the total distance traversed during the survey was 93.5 km.
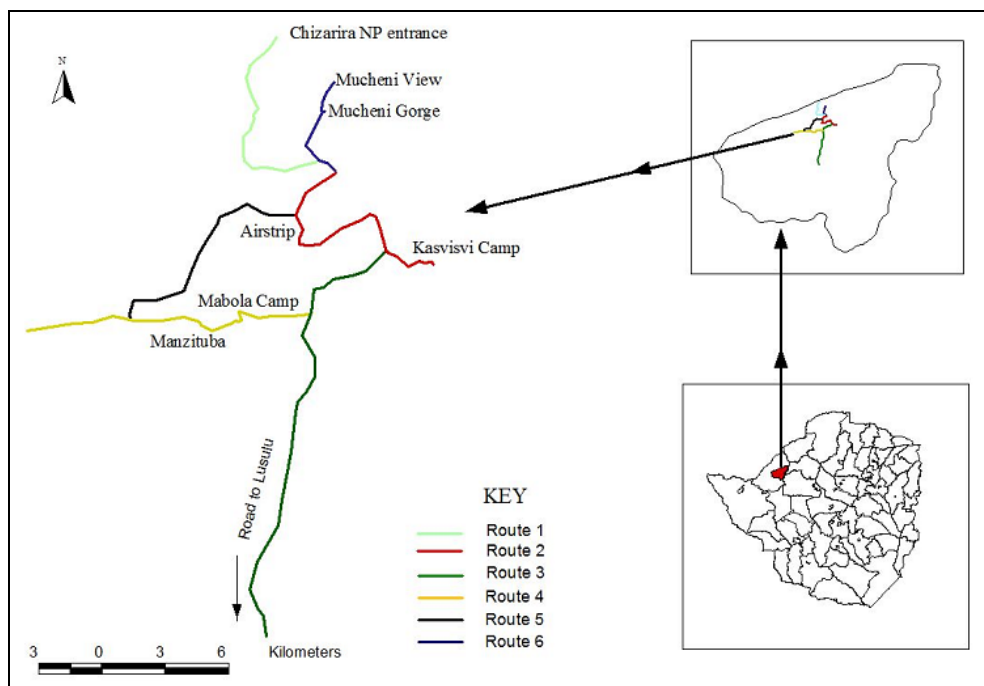

Figure 2: Bird survey routes in tourist areas in CNP (Source: This study)

Bird species richness

Bird species were frequently seen and heard during the initial stages of the survey, but as time went on more and more of the individuals that were observed were repeats of species already recorded. Route 1 recorded 12 bird species. Routes; 2; 3; 4; 5; and 6 recorded 52; 15; 4; 5; and 1 bird species observations respectively. Figure 3 shows a graphical record of bird species observed in each route.
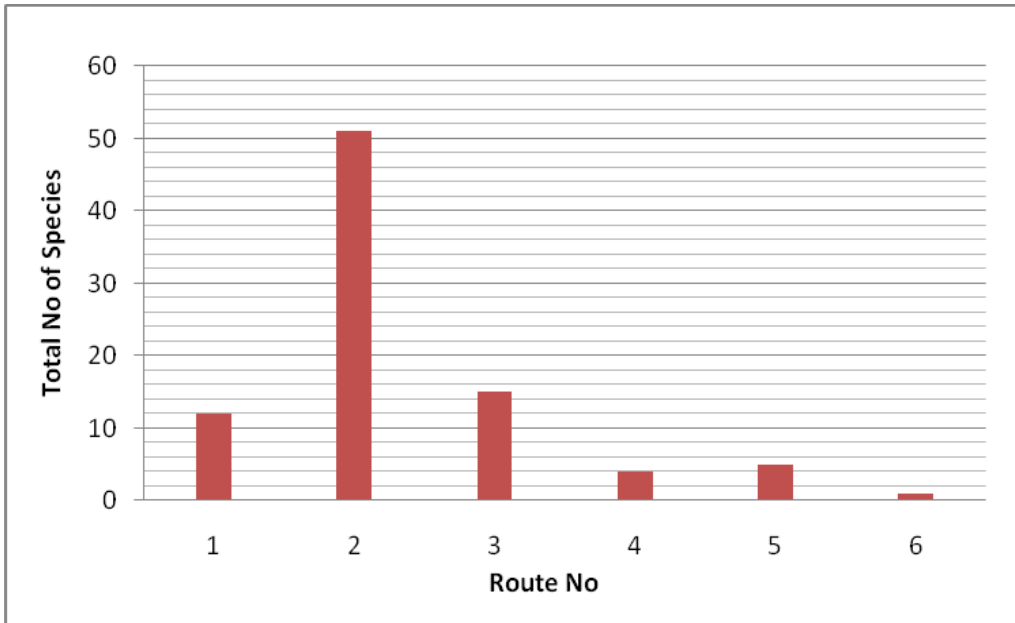
Figure 3: Bird species observations in routes. (Source: This study)

The cumulative bird richness in the traversed tourist areas (93.5 km) was 88 bird species (Figure 4).
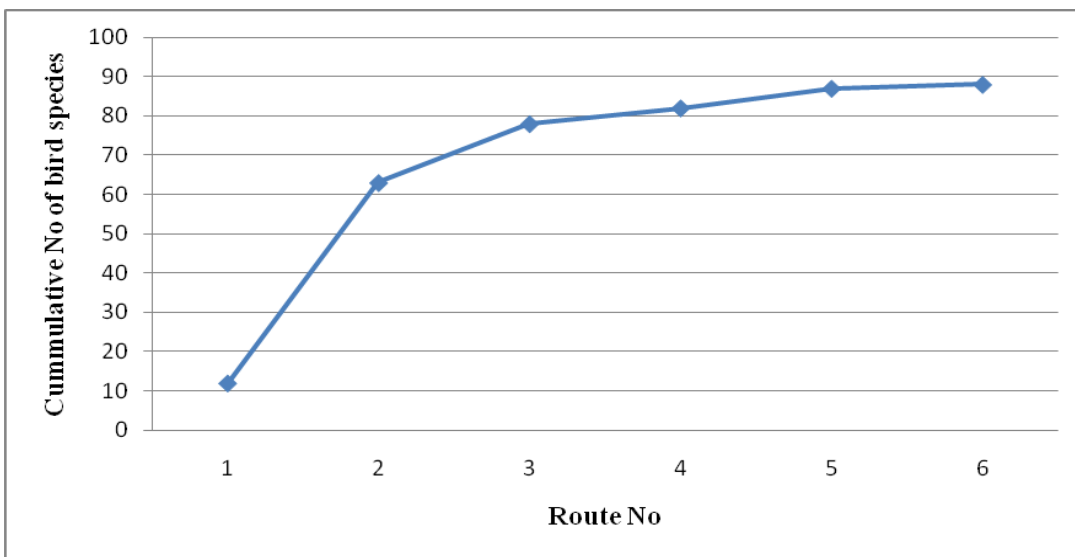

Figure 4: Cumulative bird species in surveyed routes. (Source: This study)

The total number of bird species observed during the assessment was ± 30% of the total bird species recorded in the past for CNP. Table 3(a-e) shows the list of the observed birds.

Table 3a: Birds observed in major tourist routes in Chizarira National Park
Please note: These were the birds that were seen/heard in tourist areas during the period of assessment and it is not a bird checklist of Chizarira National Park.

Species Name	Scientific Name	IUCN Threat Status	Preferred habitat (Sinclair, Hocky, & Tarboton, 2002)
Spotted Eagle Owl	*Bubo africanus*	Least Concern	Mixed woodland
Golden-tailed Woodpecker	*Campethera abingoni*	Least concern	thornveld, dry, open, broadleaved woodland
Coqui Francolin	*Francolinus coqui*	Least Concern	woodland, savanna open areas, sandy soils
Chinspot Batis	*Batis molitor*	Least Concern	dry broadleaved woodland, dry thornveld
Yellow Bishop	*Euplectes capensis*	Least Concern	Dampy grass areas, mt valleys, fynbos
Racket-tailed Roller	*Coracias spatulatus*	Least Concern	tall woodland, perch even below tree canopy
Little Bee Eater	*Merops pusillus*	Least Concern	savanna, woodland, riverine reedbeds, forest margins
Crested Barbet	*Trachyphonus vaillantii*	Least Concern	woodland, savanna, riverine forest
Heuglin's Robin	*Cossypha heuglini*	Least Concern	dense riverine thickets & tangles, gardens & parks
Cardinal Woodpecker	*Dendropicos fuscescens*	Least Concern	diverse from thick forest to dry thornveld
Yellow-bellied Eremomela	*Eremomela icteropygialis*	Least Concern	thornveld, open broad-leaved woodland & scrub
Natal Francolin	*Francolinus natalensis*	Least Concern	wooded areas, esp bush thickets along rivers & on hill slopes
Stripped Kingfisher	*Halycon chelicuti*	Least Concern	thornveld & riverine,
Tropical Boubou	*Laniarius aethiopicus*	Least Concern	thickets, riverine, & evergreen forests
Greater Blue Eared Glossy Starling	*Lamprotornis chalybaeus*	Least Concern	thornveld & mopane woodland
Long-billed Crombec	*Sylvietta rufescens*	Least Concern	woodland, savanna, fynbos & arid scrublands
Lizzard Buzzard	*Kaupifalco monogrammicus*	Least Concern	open, broad leaved woodland, & thornveld-E&N
Emarald-Spotted Wood-Dove	*Turtur chalcospilos*	Least Concern	woodland & savanna

Table 3b: Birds observed in major tourist routes in Chizarira National Park

Please note: These were the birds that were seen/heard in tourist areas during the period of assessment and it is not a bird checklist of Chizarira National Park.

Species Name	Scientific Name	IUCN Threat Status	Preferred habitat (Sinclair, Hocky, & Tarboton, 2002)
Blue Waxbill	*Uraeginthus angolensis*	Least Concern	drier areas of mixed woodland,
Tawny Flanked Prinia	*Prinia subflava*	Least Concern	understory of broadleaved woodland & thick,
Hamerkop	*Scopus umbretta*	Least Concern	freshwater, dams, lakes, & rivers,
Laughing Dove	*Streptopelia senegalensis*	Least Concern	best known in the region, adapted to gardens & city centres
Cape Turtle Dove	*Streptopelia capicola*	Least Concern	found in every habitat, avoids dense coastal forests
Grey Go-away-bird	*Corythaixoides concolor*	Least Concern	thornveld & dry, open woodland
Dark-capped Bulbul	*Pycnonotus barbatus*	Least Concern	wide variety of habitats, from thornveld to forest edges
White-fronted Bee-eater	*Merops bullockoides*	Least Concern	margins of wide, slow flowing rivers, freshwater, woodlands
African Green Pigeon	*Treron calva*	Least Concern	forests, bushveld, savanna, associated with fruit trees, esp figs
Green Wood Hoopoe	*Phoeniculus purpureus*	Least Concern	wide variety of woodland & thornveld habitats
Red-billed Hornbill	*Tockus erythrorhynchus*	Least Concern	thornveld & savanna
Fork-tailed Drongo	*Dicrurus adsimilis*	Least Concern	woodland, savanna & exotic plantations
Black-crowned Tchagra	*Tchagra senegala*	Least Concern	mixed thornveld & riverine scrub
Lilac-breasted Roller	*Coracias caudata*	Least Concern	savanna, perches conspicuously, often along telephone lines
Green-winged pytilia	*Pytilia melba*	Least Concern	thornveld & broad-leaved woodland
Southern Carmine Bee-eater	*Merops nubicoides*	Least Concern	woodland, savanna, floodplains, river banks-colonial breeders
African Grey Hornbill	*Tockus nasutus*	Least Concern	thornveld & dry broad leaved woodland
Grey-hooded Kingfisher	*Halcyon leucocephala*	Least Concern	non-aquatic, broad-leaved woodland & savanna
Reed Cormorant	*Phalacrocorax africanus*	Least Concern	freshwater dams, lakes & rivers- roosts & breed colonially

Table 3c: Birds observed in major tourist routes in Chizarira National Park

Please note: These were the birds that were seen/heard in tourist areas during the period of assessment and it is not a bird checklist of Chizarira National Park.

Species Name	Scientific Name	IUCN Threat Status	Preferred habitat (Sinclair, Hocky, & Tarboton, 2002)
Meyer's Parrot	*Poicephalus meyeri*	Least Concern	broadleaved woodland, & savanna
Swainson's Francolin	*Francolinus swainsonii*	Least Concern	dry thornveld & Agricultural lands
Senegal Coucal	*Centropus senegalensis*	Least Concern	tangled vegetation & long grass, often near water
Black-backed Puff Back	*Dryoscopus cubla*	Least Concern	wide variety of woodland & forests
Southern Black Tit	*Parus niger*	Least Concern	forests & broad leaved woodland
Burchell's Sandgrouse	*Pterocles burchelli*	Least Concern	semi-arid savanna, particularly common on kalahari sands
Meves's Starling	*Lamprotornis mevesii*	Least Concern	tall mopane woodland, & riverine forests
Lesser Striped Swallow	*Hirundo abyssinica*	Least Concern	usually near water, frequently perches
Common Waxbill	*Estrilda astrild*	Least Concern	long grass in dumpy areas, alongside rivers & reedbeds
Green-backed Heron	*Butorides striatus*	Least Concern	frequency mangrove stands & coral reefs at low tide as well as freshwater dams, lakes & slaggish rivers overhung with trees
Red Winged Starling	*Onychognathus morio*	Least Concern	rocky ravines, cliffs & suburbia
Red-headed Weaver	*Anaplectes rubriceps*	Least Concern	thornveld & mopane & miombo woodland
Helmeted Guinea Fowl	*Numida meleagris*	Least Concern	grassland, broadleaved woodland, thornveld & agriculture land
Giant Kingfisher	*Megaceryle maxima*	Least Concern	wooded streams & dams, fast flowing rivers in mountains
Golden Weaver	*Ploceus xanthops*	Least Concern	woodland & savanna, breed in reedbeds & trees & has a brown eye
White Bellied Sunbird	*Nectarinia talatala*	Least Concern	dry woodland & savanna, parks & gardens
Harlequin Quail	*Coturnix delegorguei*	Least Concern	grasslands, dumpy fields, & open savanna

Table 3d: Birds observed in major tourist routes in Chizarira National Park

Please note: These were the birds that were seen/heard in tourist areas during the period of assessment and it is not a bird checklist of Chizarira National Park.

Species Name	Scientific Name	IUCN Threat Status	Preferred habitat (Sinclair, Hocky, & Tarboton, 2002)
Three-banded Plover	*Charadrius tricollaris*	Least Concern	water bodies with sandy or pebbly margins, rare on the open coast
Scarlet Chested Sunbird	*Nectarinia senegalensis*	Least Concern	woodland, savanna, & suburban gardens
Water Thicknee	*Burhinus vermiculatus*	Least Concern	river edges & wetlands with suitable cover, usually in pairs
Yellow-fronted Canary	*Serinus mozambicus*	Least Concern	thornveld, & mixed woodland & savanna
Orange-breasted Bush Shrike	*Telophorus sulfureopectus*	Least Concern	thornveld & riverine forests
Black-collard Barbet	*Lybius torquatus*	Least Concern	forests, woodlands, savanna & wooded suburbs
Wahlberg's Eagle	*Aquila wahlbergi*	Least Concern	woodland & savanna
Fiery-necked Nightjar	*Caprimulgus pectoralis*	Least Concern	woodland, savanna & plantations
African Scops Owl	*Otus senegalensis*	Least Concern	bushveld & dry, open woodland. Absent from forested regions
African Fish Eagle	*Haliaeetus vocifer*	Least concern	aquatic; large rivers, lakes, dams
Purple Roller	*Coracias naevia*	Least Concern	dry thornveld & open, broad leaved woodland
Pallid Flycatcher	*Melaenornis pallidus*	Least Concern	moist, broad leaved woodland
Golden-breasted Bunting	*Emberiza flaviventris*	Least Concern	thornveld, broad leaved woodland & exotic plantations
Arrow Marked Babbler	*Turdoides jardineii*	Least Concern	woodland & savanna
Brown Snake Eagle	*Circateus cinereus*	Least Concern	savanna, avoiding open grassland & forests
White-browed Scrub-Robin	*Erythropygia leucophrys*	Least Concern	woodland & savanna
Black-chested Snake Eagle	*Circaetus pectoralis*	Least Concern	frequents a wide range of habitats, from desert to savanna
Greater Honeyguide	*Indicator indicator*	Least Concern	woodland, savanna & plantations, avoids forests

Table 3e: Birds observed in major tourist routes in Chizarira National Park

Please note: These were the birds that were seen/heard in tourist areas during the period of assessment and it is not a bird checklist of Chizarira National Park.

Species Name	Scientific Name	IUCN Threat Status	Preferred habitat (Sinclair, Hocky, & Tarboton, 2002)
White-backed Vulture	*Gyps africanus*	Near Threatened	savanna, nests on tree tops in small colonies
Yellow-throated Petronia	*Petronia superciliaris*	Least Concern	thornveld, broad leaved woodland & riverine bush
White-crested Helmet Shrike	*Prionops plumatus*	Least Concern	mixed woodland & thornveld
Common Scimitarbill	*Rhinopomastus cyanomelas*	Least Concern	dry thornveld & open, broad leaved woodland
Neddicky	*Cisticola fulvicapilla*	Least Concern	grassy understory of woodland, savanna & plantations
Brubru	*Nilaus afer*	Least Concern	dry thornveld & open, broad leaved woodland
Bateleur	*Terathopius ecaudatus*	Near Threatened	Savanna
Yellow-billed Kite	*Milvus migrans*	Least Concern	diverse, commonly seen around human habitation
African Wattled Lapwing	*Vanellus senegallus*	Least Concern	Damp grassland & wetland fringes
African Jacana	*Actophilornis africanus*	Least Concern	wetlands with floating vegetation, esp water lilies
Great Egret	*Egretta alba*	Least Concern	freshwater dams, lakes, flooded meadows
Grey Heron	*Ardea cinerea*	Least Concern	pans, dams, slow flowing rivers
Saddle-billed Stock	*Ephippiorhynchus senegalensis*	Least Concern	dams, pans, rivers & flood plains
Buffy Pipit	*Anthus vaalensis*	Least Concern	hillsides covered with short grass, but usually at lower altitudes
Double-banded Sandgrouse	*Pterocles bicinctus*	Least Concern	woodland & savanna. Flocks gather at drinking sites at dusk
Red-crested Korhaan	*Eupodotis melanogaster*	Least Concern	dry woodland & semi-desert kalahari grassland & thornveld

Of the species that were seen and heard, three bird species were biome-restricted species, which are important for the site. These were Racket-tailed Roller *Coracias spatulata*, White-bellied Sunbird *Nectarinia talatala,* and Meves's Starling *Lamprotornis mevesii*. The list of important birds "IBA trigger species" for CNP is shown on table 4.

Table 4: Important Bird List "IBA trigger species" for Chizarira National Park (Fishpool & Evans, 2001)

IBA Code: ZW010

A1- Globally threatened species

Scientific Name	Common Name
Falco fasciinucha	Taita Falcon

A3 (A10) – Biome-restricted species (Zambezian Biome)

Scientific Name	Common Name
Falco dickinsoni	Dickinson's Kestrel
Coracias spatulata	Racket-tailed Roller
Stactolaema whytii	Whyte's Barbet
Monticola angolensis	Miombo Rock Thrush
Myremecocichla arnotti	Arnot's Chat
Pinarornis plumosus	Boulder Chat
Camaroptera undosa	Miombo Wren-Warbler
Parus griseiventris	Northern Grey or Miombo Tit
Nectarinia talatala	White-Bellied Sunbird
Nectarinia manoensis	Miombo-Double Collared Sunbird
Serinus mennelli	Black Eared Seedeater (Black Eared Canary)
Vidua obtuse	Broad-Tailed Paradise Whydah
Lamprotornis mevesii	Meves's Starling

Other bird species that were reported by the Park's Rangers but were not seen or heard during the time of survey were the White-necked Raven *Corvus albicollis*, and the globally threatened Secretary Bird *Sagittarius serpentarius* and Southern Ground Hornbill *Bucorvus leadbeateri*.

Proportion of observed bird species' habitat preferences

Through extrapolation from Sasol *Birds of Sothern Africa* bird guide (Sinclair, Hocky, & Tarboton, 2002), about 63% of the bird species that were observed live in a wide range of habitats (diversified habitat), including woodlands; thornveld; savanna; riverine woodland, bush, and reed beds. The other classes of habitat preference were typically either species of savanna, thornveld, woodland, wetland, or gorges. Savanna is open grassland with scattered trees, also described as an open canopy system. Thornveld is described as land on which the vegetation consists mainly of thorny trees and bushes. Figure 5 shows the proportion of observed bird species' habitat preferences in the tourist areas in CNP.
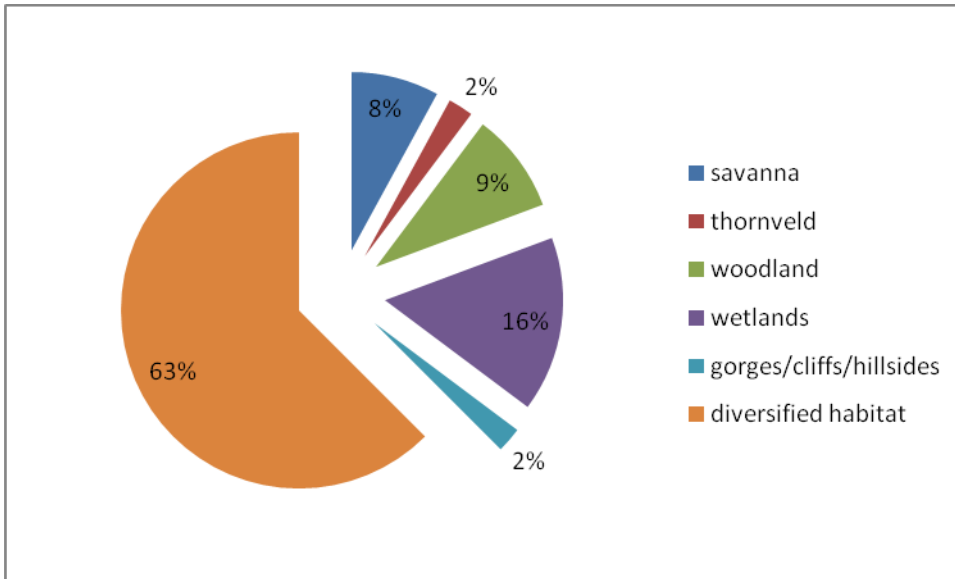
Figure 5: Proportion of observed bird species' habitat preference. (Source: This study)

The bird species that were observed were largely associated with their preferred habitats as described by Sinclair, Hocky & Tarboton (2002). The habitats preferred by these birds were available in the tourist areas in CNP in different proportions.

Habitat Condition

The six habitat classes assessed were the miombo woodland; mopane woodland; gorges; thornveld; savanna; and wetlands (mainly rivers). Table 5 shows the condition of habitats following the habitat condition scoring method, a qualitative assessment.

Table 5: Habitat condition in tourist areas in CNP

Habitat	Current area or code	Quality Rating	Details/Comments
Miombo woodland	Good	Moderate	Qualitatively, the area of miombo woodland is not changing. However, the quality of miombo is 70-90% of the optimum due to natural dying off of mature trees and degradation of the habitat by elephants and fire. It seems the miombo woodland is not maturing to climax condition.
Mopane woodland	Good	Good	Generally the condition of the habitat is good. The few trees that were pulled down were due to elephant activity.
Gorges/Hillsides	Good	Good	
Wetlands (Rivers, wet grasslands, springs)	Good	Good	Rivers include Mucheni and Lwizikululu. Wet grasslands include Manzituba, where there is a game viewing platform.
Thornveld	Good	Good	
Savanna	Good	Good	

The scoring system uses the weakest link approach, meaning that IBA scores are based on the worst-case indicator score (highest impact score). This implies that the habitat condition for the tourist routes was determined by the status of the dominant Miombo woodland. Following the assessment and scoring method, the overall condition of habitats in major tourist areas was moderate or "near favorable".

DISCUSSION

Creating a bird species list or population estimate may be tedious, time consuming, and expensive. Previous studies by Weaver, Dunkley, & Hartley (2002) confirmed that there are difficulties that are encountered when conducting bird surveys. The rapid assessment of bird richness that was performed in the major tourist areas in CNP serve as a valuable surrogate measure for other dimensions of biological diversity that are very time consuming to quantify. Although the species richness approach gives much weight to those species which have very few individuals as to those which have many individuals, the approach is the fundamental unit in which to assess the homogeneity of an environment. In ecological terms homogeneity is expressed as a lack of, or reduction in biodiversity. Therefore, any reduction in species richness in future studies could be argued as advocating the production of a homogenous environment.

Species became more and more uncommon along the routes. A decision was made to accept "S" as the number of species observed when the number of additional new species was very low. This was the stage at which the species curve almost levels off, the so-called 'break in the curve' as described by Elroy & Raph (1955). The species curve on Figure 4 almost levels off indicating that most of the bird species that were common in the major tourist areas in CNP during the time the bird survey had been recorded.

However, the species richness number depended to some degree on the sampling effort the observers used. The sampling effort for the given area was relatively small. Some bird categories such as nocturnal and crepuscular bird species could not be assessed comprehensively due to time constraints. Smith & Smith (2009) indicated that with a minimum sampling effort, the numbers of species identified may be lower than if sampling effort is greater. Repeat surveys may capture more species per unit of survey effort (Field, Tyre, & Possingham, 2002). Baker (2007) observed the Arnot's Chat (*Myremecocichla arnotti),* and Dickson's Kestrel *Falco dickinsoni*, which are also important birds for the site. Therefore, labor-intensive sampling regimes that may produce more species need to be employed in future studies.

There is also need to survey for longer periods, extend the coverage and to survey at different seasons in order to capture a wide variety of bird species, including migrants, and to draw meaningful inferences. Additionally, future studies could also factor in climate change to evaluate if there are long-term changes in the ecosystem and how these may likely have impact on bird richness and habitat condition in tourist areas in CNP. Nevertheless, the snapshot survey carried out provides a baseline for future bird richness studies in CNP.

The presence of the three Zambezian biome species also implies that the area is still an IBA, although there is a need to establish the relative abundance or equitability of the bird species to help conservation managers to plan for effective and appropriate conservation actions. The assumed possible decline of certain species such as the Racket-tailed Roller is ascribed to the degradation of miombo habitat (BirdLife International, 2010). Continuous monitoring of IBA "trigger" species that are contained in the Park (Fishpool & Evans, 2001) using a basic monitoring system may ensure the sustainability of bird monitoring in the Park.

The "near favorable" state of the habitats in the tourist areas shows that there is need to investigate the deterministic (predictable) and stochastic (unpredictable) components that influence the growth dynamics of the dominant miombo species. This will further increase our understanding of local processes that affect species richness patterns. Population regulation in semi-arid areas is largely determined by density-dependence and density-independence mechanisms. Density-dependence factors assume that density of plants in a community affects mortality and fecundity rates. Density-independence factors assume that an individual's vital rates (births and death rates) are unaffected by or are independent of the density of the population (Crawley, 1997).

In terms of conservation and management implications, it is envisaged that conservation managers consider the baseline bird richness in the tourist areas in CNP as a yardstick to future trends and implementation of appropriate conservation actions. Birds are the most reliable indicators of terrestrial biological richness and environmental conditions in the world (Bibby, 1999). A declining species richness and composition will therefore alert conservation managers of the declining general biodiversity and deteriorating habitat condition in order to intensify conservation actions in good time. Additionally, this study's findings have implications on wildlife tourism in the Park given the increased demand for nature-based interactions by tourists in most Protected Areas (Gandiwa, 2011).

CONCLUSION

The baseline bird species richness in major tourist areas in CNP clearly indicates the great avi-tourism potential of the Park. The observations of the Racket-tailed Roller *Coracias spatulata*, White-bellied Sunbird *Nectarinia talatala,* and Meves's Starling *Lamprotornis mevesii* are valuable information to the ongoing IBA monitoring project in Zimbabwe. The "near favorable' state of the diverse habitats provides a reasonably suitable habitat for most of the bird species and other biodiversity. A species richness approach, which forms the main basis for the present study, is a worthwhile solution if conservation planning for major tourist areas in CNP is to be informed by bird species richness. The measurements provide very useful information to conservationists including habitats that are available. They have the advantage of being very graphic and easy to understand and can be easily explained to the general audiences. There are plenty of bird species that tourists would enjoy, including those species that were not seen during the time of the study but recorded in the past such as the rarely occurring African (Angola) Pitta *Pitta angolensis* and the Taita Falcon *Falco fasciinucha*.

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