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## **THE IMPACT OF POLITICAL HISTORY ON BIRDS: A CASE STUDY IN NORTH-EASTERN MPUMALANGA, SOUTH AFRICA**

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## POLITICAL ORNITHOLOGY

### THE IMPACT OF POLITICAL HISTORY ON BIRDS: A CASE STUDY IN NORTH-EASTERN MPUMALANGA, SOUTH AFRICA

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#### Introduction

Land-use legislation impacts birds and bird distributions. A theme of the species texts in *The Atlas of Southern African Birds* (Harrison et al. 1997a, b) was the holes in distribution of many ground-nesting bird species in the eastern end of the Eastern Cape, the so-called “homeland” which was then known as the Transkei. For example, for Denham's Bustard *Neotis denhami*, the text explicitly notes: “The atlas map clearly shows the scarcity of the species in the Transkei; this is attributed to human disturbance” (Allan 1997). For Red-winged Francolin *Francolinus levaillantii*: “Its apparent absence from most of the Transkei and Lesotho probably indicates a dramatic local extinction, resulting from severe modification of the grasslands in those regions, especially from overgrazing” (Little & Allan 1997). For

the Helmeted Guineafowl *Numida meleagris*, Little (1997) was even more explicit about the Transkei “hole” and attributed it to “severe habitat degradation, and persecution by humans and domestic animals.”

Several species showed sharp discontinuities in distribution across the South Africa-Botswana border, a political border which does not coincide with any boundary of a biological region or between vegetation types (Allan et al. 1997). For the Helmeted Guineafowl, the distribution map showed a sharp increase in reporting rates across the boundary between Botswana and the Limpopo and North West Provinces of South Africa; Little (1997) attributed the discontinuity to land use status on either side of the international border, with the lower reporting rates in Botswana “almost certainly related to hunting and grazing pressure.” In contrast, both Tawny Eagle *Aquila rapax* and Bateleur *Terathopius ecaudatus* were more abundant in Botswana than in South Africa. Both species are scavengers, and they are the non-target victims of poisoned baits put out indiscriminately by commercial farmers, and intended for jackals and caracals, the predators of sheep and goats; both bird species are common in Botswana where subsistence farming is the predominant land use (Simmons 1997a, b).

The interaction between government policy and bird distributions was one of the themes running through the results of the First Southern African Bird Atlas Project (SABAP1) (Harrison et al. 1997a, b). However, this observation was never explicitly transformed into the “red thread” for a review of bird distributions in southern Africa. Hoffman (2014) commented on the role that the state and government policy play in influencing land-use practices and went even further to explain that agricultural and political policies may have induced heavy bush-encroached landscapes, which ultimately support a different array of birds, plants, insects and mammals from their original state. He further highlighted the link in the last hundred years between biodiversity, environmental change and land use, especially in commercial farming, communal areas and protected areas.

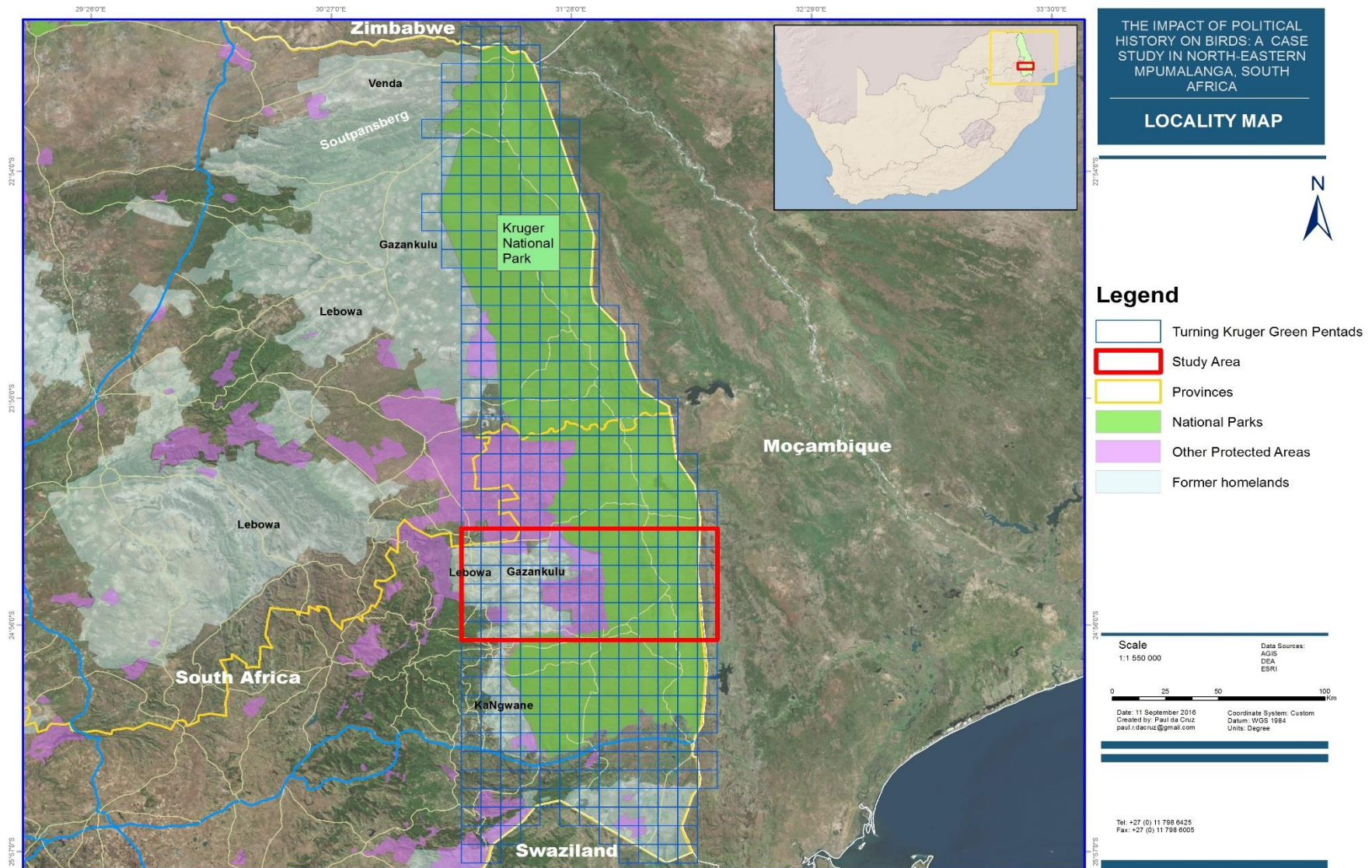


Figure 1. The red rectangle shows the location of the study area. It is south of the border, marked with a yellow line, between the Mpumalanga and Limpopo Provinces of north-eastern South Africa. The blue grid shows the pentads which are part of the “Turning Kruger Green” project, which is aiming for a minimum of four checklists per grid cell in this region, which generates green cells on the SABAP2 coverage map (Underhill & Brooks 2016)

Hoffman (2014) noted that, from the communal land perspective, the roles of the 1913 Natives Land Act and the 1936 Native Trust and Land Act were to force large numbers of black South Africans into overcrowded communal lands comprising c. 13% of the total area of the country. This policy rapidly increased and intensified land modification in areas like Gazankulu. These historical policies and the continued legacy of apartheid planning in South Africa continue to exacerbate inappropriate land-use in areas such as Gazankulu, even into the second decade of the 21st century (Cousins & Walker 2015). In contrast, ongoing protected area management strategies and policies in the Kruger National Park (KNP) are structured to ensure that the park remains a refuge and stronghold for certain species, especially charismatic species. There are, inevitably, species which “fall between the cracks” and which are disadvantaged by the current management strategies

This theme, the impact of land-use on biodiversity, specifically in bird abundance and bird communities, is pursued in this paper, with a pilot study of two adjacent half degree grid cells in north-eastern Mpumalanga, South Africa. The study compares the bird community in part of the former “self-governing state” of Gazankulu with the immediately adjacent section of the KNP. The KNP and adjacent areas are listed as a partially protected Important Bird and Biodiversity Area (IBA) under the global and sub-regional IBA assessment framework (Anderson et al. 2015).

## Methods

Two half-degree grid cells were selected for this study; 2431C and 2431D (Figures 1 and 2). Summarised bird lists for each of the 72 pentads within this area were extracted from the database of the Second Southern African Bird Atlas Project (SABAP2) on 26 August 2015. All checklists submitted to the project up to this date were included in the project. The fieldwork protocol, conceptual background

and interim results are contained in Harebottle et al. (2007), Underhill et al. (2012), Loftie-Eaton (2014, 2015), Underhill & Brooks (2014, 2016) and Underhill (2016). In brief, the spatial unit for SABAP2 is the pentad, five minutes of latitude by five minutes of longitude, almost rectangular grid cells with sides of 9.2 km north to south and 8.3 km east to west. Pentads are named by the coordinates of the north-western corner. Observers make bird lists which are as comprehensive as possible, in pentads, with a minimum time period of two hours of intensive fieldwork. Fieldwork for SABAP2 commenced in July 2007 (Underhill & Brooks 2016).

All 36 pentads within grid cell 2431D and three pentads in grid cell 2431C (2430\_3125, 2445\_3120, and 2445\_3125) were considered to be protected area (Kruger National Park and adjacent Mala Mala and Sabi Sands Game Reserves), a total of 39 pentads. The remaining 33 pentads had all been, at least in part, within the former “self-governing state” known as Gazankulu prior to the transition to democracy in South Africa in 1994. This area continues to have a large human population, and is characterised by over-grazing, removal of trees for firewood, and high levels of human disturbance. This area is referred to in this paper as the communal area. In pristine conditions the entire study area is likely to have had similar habitats. The western edge of the study area, in the communal area, has a slightly higher altitude than the protected area, and this has a significant impact on the ranges of several bird species, discussed under **Systematic list**.

The number of pentads in which each species was recorded was counted for both the protected area and the communal area. This provides an estimate of the range for each species in the two areas. The proportion of pentads containing each species in both the protected area and the communal area were calculated, by dividing by 38 and 34 respectively, and expressed as a percentage.

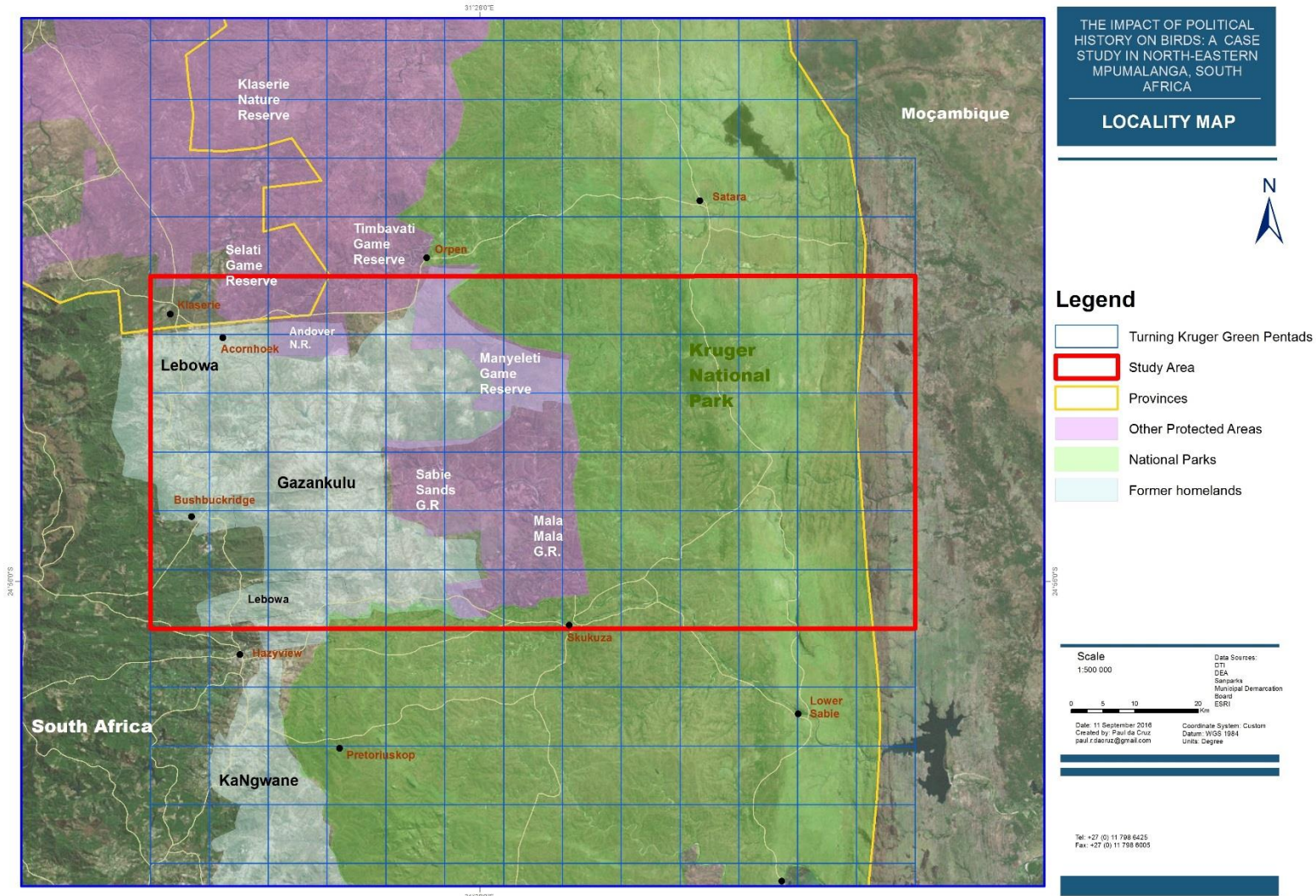


Figure 2. Detailed map of the study area, showing towns and protected areas.. The red rectangle encompasses the two half degree grid cells 2431C and 2431D

The difference between these percentages was calculated for each species. The species were sorted on these differences. Species with large positive values for the difference occurred in a large proportion of the protected area and a small proportion of the communal area; if the difference was negative, the species occurred mainly in the communal area rather than the protected area.

The analysis described above is based only on the presence or of a species in a pentad. A more nuanced approach would involve reporting rates, the percentage of the checklists submitted for a pentad which reported the species as present. The concept of “reporting rate” and its limitations were discussed by Harrison & Underhill (1997) and by Loftie-Eaton (2014, 2015). The median reporting rate for each species in the pentads in which the species occurred was computed for both the protected area and the inhabited area. This is a conditional reporting rate; i.e. “given the pentads in which the species occurred, what was the median reporting rate?” In other words, all reporting rates of zero, for the pentads in which the species did not occur, were omitted from this calculation.

No formal statistical testing is appropriate, because we have data from every pentad in the region, rather than from a sample of pentads. The observations therefore constitute a census.

## Results

The total number of checklists made for the 72 pentads in the study area between July 2007 and August 2015 was 1179; 773 of these were for the 39 pentads in the protected area (median 7 per

pentad, range 1–181, quartiles 5–17), and 424 for the 33 pentads outside the protected area (median 4 checklists per pentad, range 2–107, quartiles 4–7).

A total of 213 species occurred in 20 or more of the 72 pentads in the study area. In Table 1, presented at the end of the paper, these species are sorted on the difference of percentage range between the protected area and the communal area.



*Figure 3. Termite mound in Broad-leaved Woodland on Granitic Soils near Orpen in Kruger National Park. Photo © Jacques de Villiers*



Figure 4. Overgrazed land due to surplus of cattle and felling of trees east of Acornhoek outside Kruger National Park. Photo © Peter Lawson

### Systematic list

The 213 species are listed in the taxonomic order used by SABAP2. There are four numbers in brackets for each species. The first is number of pentads in which the species was recorded in total, out of the 72 pentads in the study area. Two percentages follow. They are the percentages (out of 39 and 33 pentads, inside and outside of the protected area, respectively) in which the species was recorded. The fourth number is the rank, out of 213, of favouring/avoiding the

protected area. Table 1 is sorted on this rank. Species with a low rank occur more inside the protected area than outside it, species with high rank occur more outside the protected area than within it. The tipping point, between favouring the protected area and favouring the unprotected area, is at rank 137. Species with lower rank favour the protected area, species with higher rank favour the unprotected area. This number also provides the line in Table 1 in which further information about the species can be found. Figures 3–14 provide insight into some of the habitats described in the species texts.

**Little Grebe** *Tachybaptus ruficollis* (20; in 28%, out 27%; rank 133) – a scarce bird both in and out of KNP, occurring mostly in wet conditions. The policy of breaching dams and closure of artificial waterholes in KNP will make it scarcer.

**White-breasted Cormorant** *Phalacrocorax lucidus* (21; in 26%, out 33%; rank 154) – frequents rivers and dams. The policy of SANParks to breach man-made dams and close artificial water pumping to temporary pans has an effect on this species in KNP. Out of KNP there are a number of suitable man-made dams that hold prey such as fish, frogs and crabs. Hence the prevalence being greater on the outside.

**Reed Cormorant** *Phalacrocorax africanus* (32; in 38%, out 52%; rank 174) – reasonably common in KNP and adjoining reserves, wherever there is water. The policy of closing artificial water holes and breaching of dams is apparently resulting in this bird being recorded less frequently inside of KNP. Thus the percentage range is greater out of KNP where there is permanent water. Continued dry climatic conditions may result in further movement and lower reporting rates of this species, due to the ephemeral nature of water supply and availability within the KNP.



*Figure 5. Secondary Combretum/Terminalia scrub outside Kruger National Park near Paul Kruger Gate. Photo © Duncan McKenzie*



**Grey Heron** *Ardea cinerea* (37; in 59%, out 42%; rank 54) – reasonably common in KNP along rivers and dams which remain intact. It will become less frequent as artificial water bodies are closed. Out of KNP there is adequate wetland habitat and yet this heron is relatively scarce. This is probably due to disturbance, plus heavy pollution of water bodies resulting in scarcity of aquatic animals that serve as food. This issue may be more prevalent in the Olifants River system in the central and northern portions of the KNP.

**Black-headed Heron** *Ardea melanocephala* (25; in 38%, out 30%; rank 113) – this heron is not dependant on water bodies and favours grassland and open areas. Bush encroachment caused by the feeding methods of the abundant elephant thus affects it in KNP, where it is relatively scarce. Out of KNP it is scarce in spite of many man-induced open areas. This could be due to disturbance by people, dogs and domestic cattle. Another factor could be due to scarcity of food in the form of small mammals, reptiles and birds. Secure mixed heronry breeding sites may also be a challenge within communal areas.

**Cattle Egret** *Bubulcus ibis* (44; in 46%, out 79%; rank 200) – showed a strong trend for occurrence outside of KNP and the bordering private reserves. Within the protected areas this species is mainly associated with buffalo herds, and to a lesser extent with rhino, which are declining due to poaching. We occasionally also found them with other large indigenous mammals. In contrast, rural areas and previous homelands outside of protected areas there are many large herds of domestic Nguni cattle and, to a lesser extent, substantial numbers of donkeys. Cattle Egrets are more strongly associated with these animals, particularly when on pasture lands, where insects are likely to be disturbed by grazing livestock.

**Green-backed Heron** *Butorides striata* (36; in 51%, out 48%; rank 129) – favours vegetated margins of rivers and dams. Reasonably common both in and out of KNP. Due to SANParks policy of breaching dams and closing artificial water holes in KNP, decreases of this

species in the KNP are likely. Outside the KNP, extensive pollution of water bodies would certainly result in less aquatic food availability. Well vegetated riparian environments provide the foraging and nesting habitats of this species.

**Hamerkop** *Scopus umbretta* (47; in 74%, out 55%; rank 77) – common throughout the study area, wherever there is surface water, even small seasonal ponds. The lower population out of KNP could be due to less suitable large trees for nesting purposes. Socio-cultural perspectives regarding the Hamerkop as a bird of ill-omen possibly also play a role in its smaller reporting rates out of the KNP, but further investigations are required to inform this perspective.

**Marabou Stork** *Leptoptilos crumeniferus* (26; in 49%, out 21%; rank 59) – birds in KNP are usually located at mammal carcasses, or perched near refuse disposal tips where they can scavenge. Similar to vultures, they face potential risks of accidental poisoning, strikes on electricity transmission lines and related infrastructure and possibly disturbance at colonial nesting sites. Out of KNP they are recorded in flight more often than perched, possibly due to disturbance. Listed from only seven pentads outside of KNP in the study area, indicating a strong preference for the protected area. The conservation status of the Marabou Stork was changed from Least Concern to Near-threatened in the regional Red List (Taylor et al. 2015).

**Saddle-billed Stork** *Ephippiorhynchus senegalensis* (29; in 59%, out 29%; rank 32) – this species is declining both inside and outside of protected areas. It frequents large rivers that flow west into KNP from densely populated areas on the outside. The Saddle-billed Stork is listed as Endangered on the regional Red List (Taylor et al. 2015). These rivers are unfortunately becoming heavily polluted, resulting in an alarming increase in numbers of Egyptian Geese which are aggressive towards all water birds. In addition, Taylor et al. (2015) explained that water quality and quantity play a significant role in this species and drought conditions may also reduce the extent of

available habitat. The relatively low rank indicates a strong preference for the protected area.

**Woolly-necked Stork** *Ciconia episcopus* (28; in 49%, out 27%; rank 75) – generally uncommon even in KNP and normally seen near water, more so in the wet season. The Woolly-necked Stork was reclassified to Least Concern from Near-threatened by Taylor et al. (2015) in the regional Red List, but has been highlighted as requiring additional monitoring due to its habitat and nesting requirements. Out of KNP it has been listed in only nine pentads in the study area to date, and then usually in flight.

**Hadeda Ibis** *Bostrychia hagedash* (49; in 62%, out 76%; rank 177) – the high rank indicates that it is more frequent out of KNP than in, although common throughout. It is a bird associated with humans and is often in rest camps in KNP and lodges on adjoining reserves. On the outside it is often seen in well-developed and densely populated areas, where it probes lawns, sports fields and pavements for food with its long beak.

**Egyptian Goose** *Alopochen aegyptiaca* (49; in 74%, out 61%; rank 93) – common and abundant both in and out of KNP. A problem bird which is aggressive and antagonistic towards other species of water birds and has been seen in flocks of more than 100 birds on river banks. The population size has increased and the species is encountered even on small and polluted waterbodies. When breeding they have been noted utilising nests of Hamerkop, birds of prey, herons, cormorants (Tarboton 2011).

**Knob-billed Duck** *Sarkidiornis melanotos* (29; in 59%, out 18%; rank 31) – the low rank indicates a strong preference for the protected area. It is usually recorded in wet seasons where it is generally found in temporary, well-vegetated pans. It is reasonably common in KNP, but nomadic to some extent. Out of KNP in rural areas it is scarce. This is likely to be due to seasonal pans being frequented by domestic cattle

and denuded of surrounding vegetation. Many of the potential suitable wetlands are badly polluted and are probably avoided for this reason.

**White-faced Whistling Duck** *Dendrocygna viduata* (36; in 54%, out 45%; rank 112) – common in KNP but nomadic according to available wetland habitat. They gather at permanent water such as rivers when moulting during winter and it has been noted that the increase in Egyptian Goose numbers results in disturbance and conflict. Less common out of KNP in spite of permanent water and this could be due to human disturbance, plus extensive water pollution in some areas.

**Cape Vulture** *Gyps coprotheres* (23; in 38%, out 24%; rank 92) – breeds on cliffs in the Drakensberg Escarpment directly west of KNP, just beyond the boundary of the study area boundary where the population is fairly stable (Benson 2015). When seen out of KNP it is usually in flight and it is not often encountered on the ground. It is known to feed on livestock carcasses on farms to the west of the study area and is sometimes poisoned when farmers lace carcasses with poison to kill jackals and other livestock predators. Birds encountered in KNP are foraging and it then joins other vulture species at carcasses but not in large numbers. Endemic to southern Africa and listed as Endangered in the global Red List (Taylor et al. 2015).

**White-backed Vulture** *Gyps africanus* – (53; in 97%, out 45%; rank 15) – by far the most common vulture in the study area but it is declining and is listed as Critically Endangered in the global Red List (Taylor et al. 2015). Rhino and elephant poaching in KNP is a major threat to this species as well as to other vulture species. Poached animals are sometimes laced with poison because vultures seen circling above a carcass can be interpreted as an indicator of poaching having taken place. Large numbers of vultures have been killed in this way. Potentially, there is disturbance of nesting vultures by helicopters on anti-poaching operations in KNP. To some extent vultures are also targeted in the traditional medicine trade because there is an unfounded belief that by eating vulture brains you will be able to see

into the future and this is a gambling requirement (Mander et al. 2007). Breeding seldom takes place outside KNP because the nests are usually built in tall *Acacia* spp. trees which are usually felled for firewood and building timber in the rural areas.

**Lappet-faced Vulture** *Aegypius tracheliotos* (28; in 56%, out 18%; rank 34) – favours dry open savanna woodland and would thus be expected to be reasonably common over the man-made habitats outside of KNP; however, it is seldom encountered in these areas and generally seen only in flight. It is a solitary nesting species and favours low flat-topped trees for this purpose such as *Acacia tortilis*. These trees are virtually non-existent outside KNP because they are felled for firewood, and inside KNP this tree species is favoured by elephants as food and their numbers have declined as a result. This is expected to have long-term consequences for this vulture species which makes extensive use of these trees for nesting (Whyte 2016). In spite of these negatives this vulture species is relatively abundant in KNP and retains a substantial percentage range. It is classified as Endangered in the global Red List (Taylor et al. 2015).

**White-headed Vulture** *Aegypius occipitalis* (28; in 56%, out 18%; rank 35) – resident in KNP over all woodland habitat but solitary and not often encountered. The vulture is scarce in the communal areas outside of KNP; it is nomadic and is seldom recorded. Nesting takes place at the top of tall trees such as *Acacia* spp. and these trees have largely been removed outside KNP for use as firewood and building material. Within the KNP, trees suitable for nesting frequently get felled or ring-barked by elephants, particularly during drought conditions. (Whyte 2016). The White-headed Vulture is classified as Critically Endangered on the global Red List (Taylor et al. 2015).

**Hooded Vulture** *Necrosyrtes monachus* (34; in 59%, out 33%; rank 62) – this small vulture is widespread in KNP in woodland areas and solitary by nature. It is scarce outside KNP and the associated reserves. In the communal areas, it is generally seen in flight only.

Nesting takes place below the canopy in tall trees, generally in riparian areas and the nests are widely dispersed. Some nests along river banks in KNP have been observed to be taken over by invasive Egyptian Geese which are increasing rapidly in both range and abundance. The Hooded Vulture is classified as Critically Endangered in the global Red List (Taylor et al. 2015).

**Amur Falcon** *Falco amurensis* (27; in 51%, out 21%; rank 48) – recorded mainly in lightly wooded areas and in flight over grasslands. It favours areas with moderate grass height, so overgrazing in the communal area would have a negative impact. Other factors outside KNP could be a lack of suitable perching trees, felling of roosting trees, human disturbance and less insect prey out of KNP. In addition it may also be susceptible to poisoning by agricultural pesticides for insect control. It is listed as a species that merits additional monitoring (Taylor et al. 2015).

**Yellow-billed Kite** *Milvus parasitus* (39; in 62%, out 45%; rank 85) – reasonably common scavenger in all habitats in KNP, including rest camps and picnic areas, where it scavenges on food generated by tourists. Out of KNP it is less common but frequently encountered along main roads, scavenging for road kill. The need for large trees for nesting purposes may also be a limiting factor in cleared woodland in the communal area. Possibly, there is less food out of KNP due to competition from numerous stray dogs which also scavenge in communal areas.

**Black-shouldered Kite** *Elanus caeruleus* (41; in 54%, out 61%; rank 130) – This species shows similar patterns in and out of KNP, primarily due to the fact that it favours both agricultural landscapes and open woodland savanna (Tarboton 2011). Its primary population driver is prey abundance; it also moves to track rodent abundance (Kemp & Kemp 1998). Comparatively, in both agricultural and protected area mosaics, rodent abundance appears to be similar.

Black-shouldered Kites utilise both exotic and indigenous trees for nesting purposes, and although breeding peaks at the end of the rainy season, they breed at any time of the year dependent on prey abundance (Kemp & Kemp 1998, Tarboton 2011). Summer crops such as maize and citrus fruits are frequently associated with explosive growth of rodent and insect populations, which favours the kite.

Exotic trees in the communal area provide nest sites for Black-shouldered Kites, because suitable indigenous trees have been harvested and cleared for agricultural purposes. As a diurnally active rodent predator, Black-shouldered Kites are less likely to be at risk from rodenticides and poisoning events from subsistence and commercial farmers, unlike the nocturnal owls. The findings suggest a relatively stable population in both the KNP and the bordering regions.

**Tawny Eagle** *Aquila rapax* (46; in 95%, out 27%; rank 2) – out of KNP, felling of large trees for firewood and for timber has resulted in few suitable nesting trees remaining. The species is considered to be one of the most highly threatened eagles in South Africa, and sensitive to land transformation and to intense land use practices. The statistics presented here confirm this. Outside of protected areas, small mammals have been hunted almost to extinction so there is a shortage of food. Because this species is prone to be a scavenger at carcasses, both deliberate and secondary poisoning are likely to be factors in the decline of this species outside protected areas. In addition, as a large eagle, they tend to be directly persecuted due to the perception that they take domestic livestock and poultry. Their preference for thermal-assisted soaring and their habits of perching extensively in tall trees also makes them vulnerable to human disturbance (Oberprieler 2012). The Tawny Eagle is classified as Endangered on the regional Red List (Taylor et al. 2015).

**Wahlberg's Eagle** *Aquila wahlbergi* (49; in 87%, out 45%; rank 30) – the favoured habitat is well-wooded savanna with some tall trees for

nesting. Because it is a migrant, it is only recorded during summer. It is common in KNP where suitable habitat exists. Out of KNP, many trees have been felled for firewood and timber, but the largest trees are left standing due to difficulty in felling. These scattered trees are often near cultivated areas where people live and this eagle has been observed preying from them on domestic poultry. Such easy prey is plentiful and attract these eagles, and may provide an explanation for this species being relatively common out of KNP. This behaviour also potentially makes them vulnerable to persecution.

**African Hawk-Eagle** *Aquila spilogaster* (28; in 46%, out 30%; rank 88) – reasonably common throughout KNP, where there is plenty of suitable habitat and a good variety of game birds and small mammals to prey on for food. Out of KNP there is less suitable habitat and less food prey. Thus they are relatively scarce on the outside. On occasions they move into rural areas and prey on poultry and domestic pigeons. This makes them vulnerable to direct persecution and they are not favoured by residents in agricultural and communal areas.

**Martial Eagle** *Polemaetus bellicosus* (35; in 69%, out 24%; rank 25) – the preferred habitat is open savanna woodland and this is a stressed habitat outside of KNP, with many large trees felled for firewood and other uses. Even though the KNP is considered a stronghold for the species, SABAP1 vs SABAP2 comparisons reveal large declines. Nesting is usually in large trees; nests are dispersed at distances of 10–20 km (Tarboton 2011); a nest has been recorded on a pylon in the communal area outside of KNP. Birds which disperse outside the KNP are likely to be exposed to risks of persecution. Prey includes small mammals, francolin and guineafowl; these species are regularly hunted and trapped in the communal areas and there is little food left for this eagle outside of KNP. Thus the percentage range out of KNP is substantially lower than within. The Martial Eagle is listed as Endangered in the regional Red List (Taylor et al. 2015).

**Lizard Buzzard** *Kaupifalco monogrammicus* (28; in 26%, out 55%; rank 194) – this species favours broad-leaved woodland; thus it is more common on granitic soils along the western edge of the study area. Outside of KNP to the west there are many open areas with sparse woodland due to land clearing. As a perch-hunting species, it favours such areas where it can perch and keep vigil on open ground below for prey to appear. It also uses power lines for perching and has been encountered quite frequently in populated areas of human settlement. It thus has a greater percentage range out of KNP.

**Brown Snake Eagle** *Circaetus cinereus* (55; in 90%, out 61%; rank 48) – Common throughout but more so in KNP than out. This is undoubtedly due to the more abundant reptile prey in the protected area. Out of KNP nearly all reptiles are considered to be dangerous and are killed by the local community as a result of this belief.

**Black-chested Snake Eagle** *Circaetus pectoralis* (22; in 28%, out 33%; rank 145) – uncommon, but occurs both in and out of KNP, although more frequently out of KNP. It favours open woodland habitat, and bush encroachment in the KNP is likely to have a negative impact here. Powerlines are a favourite perch and because there are more of these outside the KNP, this is another potential reason for the percentage range being higher outside of KNP. It has been observed nesting on a pylon outside of KNP in the communal area.

**Bateleur** *Terathopius ecaudatus* (56; in 100%, out 51%; rank 17) – this species feeds on carrion. In the populated rural areas this is detrimental because carcasses are sometimes laced with poison by the farming community for control of small carnivores. It suffers from similar risks as vultures do in terms of available carcasses, non-discriminatory poisoning events and direct persecution by farming and communal area communities. Recent illegal harvesting of this species for traditional medicine purposes has also been noted. There is also a lack of suitable large nesting trees out of KNP due to felling for

firewood and land clearing for building and agriculture. The Bateleur is listed as Endangered on the regional Red List (Taylor et al. 2015).

**African Fish Eagle** *Haliaeetus vocifer* (44; in 67%, out 55%; rank 97) – reasonably common throughout, but more so in KNP. It is largely territorial, and occurs along rivers and on dams, wherever there is permanent water. Fish-eagles are considered to be one of the most successful large birds of prey in South Africa. The breaching of some man-made dams in the KNP has resulted in a reduction in numbers of fish-eagles in the KNP. In addition, in many areas out of KNP, riparian vegetation with large trees for nesting remains intact.

**Steppe Buzzard** *Buteo vulpinus* (27; in 41%, out 33%; rank 114) – a Palearctic migrant that is fairly uncommon in KNP and relatively scarce on the outside. Its habitat preference is open woodland, which is a disturbed habitat in rural areas due to tree felling and land clearing. Hence the smaller percentage range in the communal area.

**African Goshawk** *Accipiter tachiro* (21; in 23%, out 36%; rank 175) – considerably more frequent out of KNP than in it. It favours the riparian woodland associated with drainage lines; within KNP these have been subjected to elephant damage, and are better developed in the undulating landscapes outside KNP than in the flatter areas within it. It also frequent gardens, sometimes in heavily populated areas and has been seen attacking House Sparrows, which are undoubtedly easy prey. Its apparent comfort of nesting in proximity to human habitation as well as its adaptable nature suggests that it is more tolerant of communal areas than other accipiters.

**Shikra** *Accipiter badius* (20; in 31%, out 24%; rank 118) – the preferred habitat is open, dry woodland with some tall trees. Shikras are not particularly common in the study area, just meeting the 20 pentad threshold. They are slightly more scarce on the outside of the KNP, possibly due to disturbed habitat in the rural areas. Out of KNP, a scarcity of suitable small vertebrate prey probably also has an effect.

**Gabar Goshawk** *Melierax gabar* (27; in 49%, out 24%; rank 64) – this small raptor has a preference for *Acacia* and broad-leaved woodland and is reasonably common in KNP. Out of KNP it is scarce due to lack of suitable habitat; scarcity is also likely to be due to insufficient prey.

**Dark Chanting Goshawk** *Melierax metabates* (24; in 38%, out 27%; rank 101) – uncommon in KNP and scarce on the outside. Habitat preference is well-developed broad-leaved woodland which is a disturbed habitat out of KNP due to tree felling, land clearing and building construction. This is the likely reason for this bird being scarce in the communal areas. Another reason could be lack of suitable prey which is often hunted by humans with dogs and setting snares.

**African Harrier-Hawk** *Polyboroides typus* (34; in 51%, out 42%; rank 110) – a woodland species, reasonably common in KNP but less common on the outside. This could be as it generally avoids open areas which are usually man-induced out of KNP.

**Coqui Francolin** *Peliperdix coqui* (23; in 44%, out 18%; rank 63) – this francolin prefers tall grassland and well-wooded savanna. It is becoming increasingly scarce in KNP and this could be attributed to bush encroachment due to habitat change caused by the increase in elephant numbers. Out of KNP preferred habitat is scarce due to overgrazing by domestic cattle and goats even in the less populated areas. Agricultural lands are also avoided and this species is rare out of KNP and the few birds recorded are generally in private reserves.

**Crested Francolin** *Dendroperdix sephaena* (43; in 97%, out 55%; rank 27) – common in KNP wherever there are dense thickets and scrub, the preferred habitat. Bush encroachment of *Dichrostachys cinerea* caused by the increase in the elephant population in KNP has resulted in more favoured habitat for this francolin. Out of KNP large areas have been cleared and there is considerable overgrazing by numerous domestic cattle and goats. Thus the only habitat left for this



Figure 6. Open Savanna Grassland on flat Basaltic Soil south of Satara. Photo © Leon Marais

francolin is along drainage lines where scrub is intact. Snares are set in such areas and domestic dogs are used for hunting, and this is another factor resulting in less birds out of KNP.



*Figure 7. Sabie River and riparian woodland east of Skukuza. Photo © Leon Marais*



*Figure 8. Sweni River in Kruger National Park in the northern section of the study area. Photo © Leon Marais*

**Natal Spurfowl** *Pternistis natalensis* (59; in 95%, out 67%; rank 53) – common throughout, but more so in KNP where there is a variety of wooded habitat. Less common out of KNP and mainly confined to dense thickets on riparian margins where there is less chance of it being hunted.

**Swainson's Spurfowl** *Pternistis swainsonii* (50; in 100%, out 33%; rank 3) – Abundant inside the KNP; however, the setting of snares and hunting for food is the likely cause of the decline of this species in unprotected areas out of KNP. This species is highly mobile and



utilises a variety of habitats, foraging widely in the KNP. This behaviour may put it at risk with the communal areas.

**Helmeted Guineafowl** *Numida meleagris* (56; in 87%, out 67%; rank 76) – common throughout the region but particularly so in KNP. Trapping with snares is likely to be a factor in the lower prevalence outside the KNP.

**Black Crake** *Amaurornis flavirostra* (38; in 46%, out 61%; rank 179) – common along fringes of water bodies where there is emergent vegetation, including outside of KNP. It has become less common within the KNP due to SANParks policy of closing artificial water holes and breaching dams.

**Red-crested Korhaan** *Lophotis ruficresta* (42; in 90%, out 21%; rank 1) – degraded land outside KNP impacts this species enormously. It has rank 1, occurring in 90% of the pentads within the KNP and in 21% of the pentads out of KNP. Land cleared for crop farming and heavy overgrazing, plus dense human habitation and the ongoing construction of housing and commercial buildings, results in little cover for protection and breeding. Snares set for the capture of small game are also likely to have a detrimental effect, as well as the many dogs used for hunting purposes.

**Black-bellied Bustard** *Lissotis melanogaster* (25; in 49%, out 18%; rank 45) – the habitat of this species is open woodland with tall grass. This habitat is scarce out of KNP due to the felling of trees and overgrazing by domestic stock. Clearing of land for crop cultivation and building construction in the densely populated areas is also a reason for the scarcity of this bustard out of KNP. Hunting with the use of dogs probably also takes its toll. Taylor et al. (2015) noted that there is a lack of understanding of this species and although they listed it as “Least concern” it is a species which needs to be monitored.



**African Jacana** *Actophilornis africanus* (29; in 44%, out 36%; rank 116) – widespread wherever there are water bodies with vegetation such as water-lilies. Reasonably common throughout but more so in KNP because water bodies outside tend to be heavily polluted which results in less aquatic food. The surface area of water-lily leaves in water bodies at water bodies in the communal area is also likely to be reduced by continuous utilization by domestic stock and by humans for sourcing water, reeds and other wetland products.

**Three-banded Plover** *Charadrius tricollaris* (46; in 74%, out 52%; rank 70) – resident on open shorelines of both permanent and seasonal water bodies. Reasonably common throughout but due to the closure of artificial water bodies and the breaching of man-made dams in KNP, the majority of permanent water is outside of KNP in rural areas. Thus the percentage range out of KNP is relatively high.

**Crowned Lapwing** *Vanellus coronatus* (48; in 82%, out 48%; rank 40) – common throughout but more so in KNP. Preferred habitat is open areas with short grass and it favours recently burnt areas. There would appear to be adequate suitable habitat out of KNP and the reason for it being less frequently encountered could be due to human disturbance, particularly when breeding because it nests on the ground. There are many hunters with catapults, air rifles and numerous dogs. Domestic cattle herded through potential breeding areas also cause disturbance.

**Blacksmith Lapwing** *Vanellus armatus* (42; in 67%, out 48%; rank 81) – common in KNP wherever there are wetlands or damp areas. Also regularly found in open areas away from water in short grassland. Out of KNP it is less frequent in spite of apparently suitable habitat in many areas. This could be due to disturbance because rivers and streams are frequently excavated for building sand. It is possibly also due to heavy pollution of nearly all water bodies which in turn will then hold less food in the form of aquatic invertebrates.

**African Wattled Lapwing** *Vanellus senegallus* (20; in 28%, out 27%; rank 132) – appears to be a vagrant to the study area, both in and out of KNP, just making the threshold of being recorded in 20 of the 72 pentads in the study area. Favours floodplains and recently burnt grassland. Recorded evenly throughout.

**Common Sandpiper** *Actitis hypoleucos* (26; in 41%, out 30%; rank 102) – a Palearctic migrant, reasonably common in KNP in summer, but more scarce on the outside. Habitat preference is shorelines of various wetland types and thus it should be common out of KNP as well, but the majority of wetlands are extremely polluted. This in turn will reduce food abundance in the form of aquatic insects, tadpoles and small fish. Suitable wetland habitat in communal areas is made unavailable as a result of heavy utilisation and disturbance by humans in the hot summer months.

**Common Greenshank** *Tringa nebularia* (28; in 46%, out 30%; rank 89) – a Palearctic migrant. In KNP it frequents all types of wetlands during the summer and is reasonably common. Out of KNP it is less common, in spite of adequate water bodies. This may have something to do with heavy pollution, which in turn reduces food availability, such as tadpoles and aquatic invertebrates.

**Wood Sandpiper** *Tringa glareola* (33; in 56%, out 33%; rank 102) – a Palearctic migrant, present during the rainy season where it is found on shorelines of all aquatic habitats. Out of KNP it is far less frequent and perhaps the reason is heavy pollution which would result in little suitable food such as aquatic insects, tadpoles and the like. Another key possibility is human disturbance at communal area pans and riparian areas.

**Water Thick-knee** *Burhinus vermiculatus* (37; in 62%, out 39%; rank 73) – common in KNP along rivers and dams, but due to the decision to close artificial water holes and breach man-made dams it is more

prevalent in the wet season. In dry conditions it tends to be nomadic and that is when it is recorded out of KNP.

**Double-banded Sandgrouse** *Pterocles bicinctus* (28; in 64%, out 9%; rank 11) – this ground-loving species frequents savanna woodland habitat. It shows a preference for Mopane *Colophospermum mopane*, the bulk of which is north of this particular study area. Hence the relatively small range recorded. Its low rank is due to the fact that it is prone to disturbance, which is much more likely in the heavily populated area out of KNP than within, particularly due to the large domestic dog population in the rural areas.

**Red-eyed Dove** *Streptopelia semitorquata* (51; in 54%, out 91%; rank 204) – this dove favours the areas of human habitation much more than the protected area. Perhaps, out of KNP there are more abundant food sources such as maize and other crops over wide areas; it is frequently observed foraging on the cleared ground. Of all the dove species, it is the most commensal with humans. There remain sufficient suitable trees for roosting and nesting purposes in riparian areas out of KNP.

**Cape Turtle-Dove** *Streptopelia capicola* (70; in 100%, out 94%; rank 121) – ubiquitous throughout, with a preference for open woodland savanna. This habitat is prolific in different forms in and out of KNP.

**Laughing Dove** *Streptopelia senegalensis* (69; in 100%, out 91%; rank 106) – ubiquitous both in and out of KNP in all woodland habitats, especially frequenting rest camps and gardens. Out of KNP it is frequently encountered in well-populated rural settlements, although it is not as abundant as on the inside.

**Namaqua Dove** *Oena capensis* (32; in 51%, out 36%; rank 90) – normally encountered during dry periods, mainly in arid areas and particularly in *Acacia* savanna. Due to destruction of this woodland out

of KNP this species is scarce, so this dove is slightly more frequently encountered in KNP than outside.

**Emerald-spotted Wood Dove** *Turtur chalcospilos* (70; in 97%, out 97%; rank 135) – equally common, both in KNP and on the outside. It is ubiquitous in all woodland habitats, both open and closed. Thus there is sufficient suitable habitat in and outside of KNP.

**African Green-Pigeon** *Treron calvus* (53; in 74%, out 73%; rank 131) – this pigeon seems almost equally abundant both in and out of KNP. This is certainly due to its diet being mainly figs, particularly the Sycamore Fig *Ficus sycomorus*. Large fig trees are seldom felled in rural areas due to the width of stem size. In addition, the timber does not make good firewood and it is too soft for use as building timber or fencing. This fig tree is common along drainage lines, both in and out of KNP.

**Brown-headed Parrot** *Poicephalus cryptoxanthus* (44; in 77%, out 42%; rank 37) – the preferred habitat of this parrot is open woodland and where there are large fruit and seed bearing trees along rivers and drainage lines. It is reasonably common in this habitat in KNP and private protected reserves, but scarce outside the protected areas. This is probably due to suitable large trees being felled for firewood and building timber and the clearing of land for agricultural purposes and building construction. Taylor et al. (2015) have noted that this species needs additional monitoring due to the illegal trapping trade.



**Purple-crested Turaco** *Gallirex porphyreolophus* (33; in 26%, out 70%; rank 207) – in KNP this species is common in rest camps where large trees are not damaged by elephants and where there is an abundance of fruit and flowering trees. It is more common to the south of this particular study area. Out of KNP it is found in riparian woodland and also frequents areas of human settlement where flowering trees such as *Erythrina lysistemon* are popular, and are grown in gardens and in towns. Other fruit-bearing trees are cultivated in populated rural settlements, and these also are an attraction to this species.

**Grey Go-away-bird** *Corythaixoides concolor* (59; in 95%, out 67%; rank 54) – this species has a preference for dry savanna woodland, particularly *Acacia*. It is very common in KNP, but less so on the outside where much of its preferred habitat has been interfered with or destroyed. It is still reasonably common though, due to fruit trees being cultivated in settled areas. *Erythrina* trees are popular in the gardens

of rural dwellings and during the season when these trees are in flower, it is frequently seen in them.

**African Cuckoo** *Cuculus gularis* (35; in 64%, out 30%; rank 39) – favours open woodland and riparian zones. It generally remains well hidden but can be located by its typical call. It is common in suitable habitat in KNP but far less frequent out of KNP, in spite of its host species, Fork-tailed Drongo, being common. This is possibly due to disturbance due to tree felling and other human activity because this cuckoo is a shy species and avoids humans.

**Red-chested Cuckoo** *Cuculus solitarius* (41; in 54%, out 61%; rank 151) – frequents well-wooded habitat, particularly with some tall trees which are used as calling perches. Common throughout and slightly more frequent out of KNP, which appears to be unusual because there is more wooded habitat in KNP than on the outside. Perhaps elephants and their feeding methods have something to do with this, but good habitat does exist in some areas on the outside, particularly along drainage lines. Another factor is that bush encroachment, which is rife in many areas out of KNP, provides good habitat to White-browed Scrub-Robin and White-throated Robin-Chat. Both of these are major host species for this brood-parasite. Also, moving westward towards the escarpment, the altitude is higher than in KNP, and the diversity of robin-chat species increases. These are important hosts for this cuckoo.

**Black Cuckoo** *Cuculus clamosus* (32; in 38%, out 52%; rank 170) – a woodland species, and the preferred habitat is riparian woodland and dense thickets. It is most frequently located by hearing its call, especially during the summer months. Approaching these habitats and hearing the call is easier outside of KNP than in it. This cuckoo is a brood-parasite; the main host being Southern Boubou which is common in riparian habitat out of KNP.

**Levaillant's Cuckoo** *Clamator levaillantii* (35; in 62%, out 33%; rank 52) – prefers dense wooded areas which are plentiful in many parts of KNP, and is thus a common species. Out of KNP this cuckoo is far less common due to tree felling and woodland clearing, resulting in more open areas. It is mainly confined to riverine woodland which is less disturbed, and where its host species, Arrow-marked Babbler, occurs.

**Jacobin Cuckoo** *Clamator jacobinus* (42; in 72%, out 42%; rank 47) – this is a woodland bird species. This habitat is widely disturbed out of KNP by tree felling and land clearing; this is a likely reason for a lower percentage range out of KNP than on the inside.

**Klaas's Cuckoo** *Chrysococcyx klaas* (44; in 67%, out 55%; rank 98) – relatively common throughout but more so in the KNP, probably due not only to a variety of breeding hosts being present, but also to good woodland habitat. It also frequents rest camps and staff gardens. Out of KNP the woodland habitat is sparse, resulting in a lower percentage range. However sunbirds are more prolific outside than inside the KNP, and they are a major host for this brood parasite.

**Diderick Cuckoo** *Chrysococcyx caprius* (55; in 90%, out 61%; 49) – this cuckoo is a brood parasite of weavers and bishops. These species are more prevalent in KNP due to better conserved habitat. This probably explains the higher percentage range in than out of KNP, although it is a common bird throughout.

**Burchell's Coucal** *Centropus burchellii* (66; in 95%, out 88%; rank 117) – common throughout the study area and favours riparian margins.

**Pearl-spotted Owlet** *Glaucidium perlatum* (39; in 80%, out 24%, rank 10) – in the communal areas outside of the protected KNP, all owl species have superstition attached to them. The belief is that if they are close to the property where you reside and if they can overlook

your dwelling there will be death in the family. Thus all owl species may suffer from persecution in communal areas. Because this species uses holes in trees for nesting and many suitable trees have been felled, there is a lack of breeding facilities. Another factor resulting in a lower percentage out of KNP is that this species does not occur at higher altitude than KNP. The percentage range out of KNP would probably be greater if this was a larger species that could be more readily observed. Even taking this into account, this species has a low rank, and is more abundant in the KNP than out of it

**Verreaux's Eagle-Owl** *Bubo lacteus* (24; in 44%, out 21%; rank 72; rank 72) – reasonably common in KNP but relatively scarce on the outside where it was recorded in only seven pentads in the study area. It favours riverine habitats with large trees for roosting. This habitat exists out of KNP, so that is unlikely to be the reason for the scarcity. One reason could be due to superstitions associated with owls, that their presence could lead to death in the family, and are persecuted as a result. However, the main reason could be due to the absence of suitable prey out of KNP. The other consideration is that this species utilises the nests of large birds of prey, the Hamerkop and the Red-billed Buffalo Weaver (Tarboton, 2011); these species are all less abundance outside of the KNP than inside it; this might be a contributory factor to their lower occurrence in the communal area. The nests of the smaller accipters are too small to be utilised effectively by this owl species for breeding purposes.

**Fiery-necked Nightjar** *Caprimulgus pectoralis* (21; in 33%, out 24%; rank 108) – favours well-developed savanna woodland. A common species, and the reporting rates are biased downwards due to this species being nocturnal and not being recorded by diurnal observers. It is sometimes encountered at dawn and dusk but the majority of records are based on calls when observers stay overnight in their pentads. The percentage range out of KNP is less than on the inside due to habitat disturbance. Recorded in only eight pentads outside of KNP.



*Figure 9. Degraded riparian woodland and forest verge outside the Kruger National Park west of Bushbuckridge.  
Photo © Peter Lawson*

**African Black Swift** *Apus barbatus* (22; in 31%, out 30%; rank 134) – similar percentage range in and out of KNP. This swift breeds on the cliffs of the northern Drakensberg Mountains close to the western border of the study area. It is an aerial forager and ranges widely to feed and is nomadic when not breeding. The range extends over the entire study area, both in and out of KNP and food which consists of aerial arthropods must occur throughout the study area.

**White-rumped Swift** *Apus caffer* (36; in 54%, out 45%; rank 111) – in KNP this swift is frequently found in rest camps, picnic areas and entrance gates where it breeds under eaves of buildings. It also uses road culverts for this purpose. Out of KNP it uses road culverts more than buildings. Because there is a maze of roads in the rural areas there are many drainage culverts suitable as breeding sites.

**Little Swift** *Apus affinis* (49; in 62%, out 76%; rank 176) – this swift is common both in KNP and to the west on the outside, but there is a greater percentage range on the outside due to more suitable breeding sites in the communal area. Breeding is colonial and takes place under large bridges and on tall buildings, which are plentiful in the densely populated urban areas.

**Alpine Swift** *Tachymarptis melba* (24; in 31%, out 36%; rank 147) – seen throughout, usually in the company of other swift species. They breed on cliffs on the Drakensberg escarpment a short distance west of the study area. Thus it is not unexpected that the percentage range is greater out of KNP than in it.

**African Palm-Swift** *Cypsiurus parvus* (39; in 41%, out 70%; rank 193) – this species is much more frequent out of KNP where tall exotic palm trees are common. Nesting takes place in dead palm fronds still attached to the trees. In the study area within KNP indigenous palms are generally not suitable for nest building and the majority of birds encountered were foraging for aerial arthropods.

**Speckled Mousebird** *Colius striatus* (48; in 44%, out 94%; rank 209) – reasonably common in KNP but very common outside where it is frequently encountered, even in densely populated settlements. It has adapted well to suburban areas; this is due to fruit trees being planted around dwellings, as well as *Erythrina lysistemon*. This is a popular tree in inhabited areas and provides a good food source during winter. It is one of the highest ranked species, far more widespread out of KNP than in it.

**Red-faced Mousebird** *Urocolius indicus* (63; in 90%, out 85%; rank 125) – common throughout the study area and favours a wide variety of wooded habitat, including restcamp gardens and gardens in rural settlements. Occurs both in and out of KNP.

**Pied Kingfisher** *Ceryle rudis* (35; in 44%, out 55%; rank 165) – habitat for this species consists of all water bodies containing fish. It generally avoids fast flowing rivers, and thus along the Sabie River it usually occurs in calmer pools and backwaters. Reasonably common throughout the study area but less common inside KNP than outside it to the west. The breaching of some man-made dams in KNP probably has resulted in less suitable habitat in KNP than previously. Out of KNP there are a number of suitable dams and this is the likely reason for the greater percentage range.

**Giant Kingfisher** *Megaceryle maxima* (26; in 31%, out 42%; rank 167) – the breaching of a number of man-made dams and the closure of windmills that were previously used to pump water into certain dams has resulted in a reduction in numbers of this species in KNP. Out of KNP to the west there are a number of suitable dams that contain water throughout the year. Thus this species has a greater percentage range out of KNP.

**Malachite Kingfisher** *Alcedo cristata* (32; in 13%, out 38%; rank 171) – due to the closure of artificial waterpoints and man-made wetlands in Kruger National Park, this kingfisher is more prolific out of KNP

where aquatic habitats remain plentiful. It is seldom found away from water and frequents even small ponds. Out of KNP, breeding sites in vertical sandbanks are also plentiful due to erosion and sand excavation for dwelling construction.

**Woodland Kingfisher** *Halcyon senegalensis* (47; in 87%, out 39%; rank 19) – a summer migrant that is common in open woodland savanna in KNP where suitable habitat is plentiful. Out of KNP to the west there is not as much suitable habitat due to felling of trees for



firewood and building material. In this area it is mainly found in riparian habitat where large trees are difficult to fell and thus remain intact. However, this habitat is restricted to drainage lines and this kingfisher is thus relatively scarce out of KNP.

**Brown-hooded Kingfisher** *Halcyon albiventris* (64; in 82%, out 97%; rank 181) – very common in and out of KNP, but more common on the outside. This could be explained by an abundance of vertical sand banks for breeding purposes, created by large numbers of sand quarries used for the excavation of building sand. There is also massive soil erosion in some areas, also providing breeding banks. Transmission lines are favourite perches in these areas.

**Striped Kingfisher** *Halcyon chelicuti* (36; in 41%, out 61%; rank 185) – prefers open woodland which is often man-induced out of KNP and adjoining reserves, due to the felling of trees for firewood. Another reason for the greater percentage range to the west of KNP is that this species generally moves to slightly higher altitudes in winter.

**European Bee-eater** *Merops apiaster* (61; in 97%, out 70%; rank 58) – a very common Palearctic migrant throughout during summer, but more so in KNP. It is highly gregarious and often occurs in large flocks in woodland areas. Although they are common out of KNP, numbers are less than inside and a reason could be due to more open areas and less insect prey.

**Southern Carmine Bee-eater** *Merops nubicoides* (38; in 79%, out 21%; rank 8) – this gregarious species is an intra-African migrant and is present in the area during summer only. Habitat preference is open woodland and savanna which is abundant in parts of KNP. Hence this species is common in KNP. To the west out of KNP there has been drastic habitat change due to tree felling and abundance of domestic stock. Also, much of the former range is subject to ongoing building construction to support the large and increasing human population,

with increasing rural urban nodes forming. There is little suitable habitat left for this bird and thus the percentage range is low.

**White-fronted Bee-eater** *Merops bullockoides* (21; in 26%, out 33%; rank 153) – as for the Little Bee-eater, this is a hole-nesting species

but it prefers higher vertical sand banks where they are colonial breeders and excavate their nesting tunnels on the upper side of the bank. Suitable nesting sites in KNP are generally along vertical alluvial banks, but out of KNP there are many more breeding sites due to soil erosion taking place and due to excavation of sand quarries for removal of building sand. Thus the percentage range out of KNP is greater than within.

**Little Bee-eater** *Merops pusillus* (58; in 77%, out 85%; rate 156) – although the habitat frequented is woodland the percentage range outside of KNP is greater than in it. This in



spite of much of the woodland vegetation out of KNP being cleared. The main reason for this is likely to be that nesting sites are more abundant and more widely distributed out of KNP than in it. Nests are excavated in low sandbanks which occur in many places outside of KNP as a result of soil erosion taking place in areas overgrazed by domestic cattle.

**European Roller** *Coracias garrulous* (46; in 92%, out 30%; rank 5) – a summer migrant from the Palearctic which prefers woodland habitat with dead branches to be used as perches while waiting for prey such as large insects to appear on the ground below. Thus it is common in KNP. Out of KNP to the west there are few suitable perch trees because they have been felled for firewood and building material. The majority of sightings out of KNP are of birds using power lines for perching. Another key factor is that there is likely to be a greater abundance of prey items in the protected area than in the communal area. The European Roller was listed as Near-threatened in the global Red List by Taylor et al. (2015) but it was subsequently reclassified as Least Concern (<http://www.iucnredlist.org/details/22682860/0>).

**Lilac-breasted Roller** *Coracias caudatus* (42; in 100%, out 58%; rank 29) – very common in KNP but less so on the outside. It has a preferred habitat of dry woodland and it perches in trees for long periods. Nesting takes place in natural tree cavities. Out of KNP the habitat has been drastically changed. Trees are constantly felled and thus restricts both perching and breeding. Another factor is reduced suitable food of large insects, lizards, small snakes and rodents. Heavily overgrazed areas are extensive and there is little animal life in such areas.

**Purple Roller** *Coracias naevius* (44; in 82%, out 36%; rank 24) – the favoured habitat is dry, open woodland which is abundant in KNP. Thus this roller is relatively common in KNP and much more scarce outside of KNP where trees are felled extensively and far less suitable habitat exists. It is also noted that there are few sightings out of KNP



in winter because this bird has a tendency to move east at this time and is then recorded in KNP.

**African Hoopoe** *Upupa africana* (52; in 77%, out 67%; rank 103) – has a preference for open woodland with short grass. Also frequents rest camps in KNP and gardens of dwellings and commercial buildings on the outside. Thus it is common both in and out of KNP, but less so on the outside. The reason for this could be due to lack of natural tree cavities for nesting because dead branches of trees are gathered for firewood.

**Green Wood-Hoopoe** *Phoeniculus purpureus* (56; in 92%, out 61%; rank 43) – very common throughout but more so in KNP due to more intact woodland. Out of KNP there is much woodland destruction due to tree felling and land clearing. There are also less breeding facilities because this species is a hole-nester and uses natural tree cavities. This species tends to favour riparian habitat, with large trees, which in the communal area is fairly limited, due to reduced tree cover and land utilisation practices.

**Common Scimitarbill** *Rhinopomastus cyanomelas* (55; in 90%, out 61%; rank 50) – various woodland types form the habitat of this species, and as such habitat is better preserved in KNP than out it stands to reason that there would be more birds on the inside. However, it is a common bird throughout.

**African Grey Hornbill** *Tockus nasutus* (48; in 100%, out 52%; rank 18) – a common species, both in and out of KNP. It occurs in a variety of woodland types, including riparian on the outside which is largely still intact. It is, however, more abundant in KNP where there is less disturbance and where there are more suitable nesting trees with natural cavities.

**Southern Red-billed Hornbill** *Tockus erythrorhynchus* (55; in 97%, out 52%; rank 22) – almost ubiquitous in KNP where it favours open

woodland habitat, which is plentiful. Nesting takes place in natural tree cavities and there are many of these. Out of KNP there is less suitable habitat due to extensive tree felling. It is, however, frequently encountered in areas heavily overgrazed by domestic cattle, and is often seen feeding on the ground. Because such areas are plentiful, this hornbill remains fairly common out of KNP to the west.

**Southern Yellow-billed Hornbill** *Tockus rufirostris* (63; in 100%, out 73%; rank 60) – a very common bird in the study area, both inside KNP and out. It has a wide range of woodland habitat. The percentage range outside of KNP is lower than in it, because of disturbance and destruction of woodland. Suitable trees with natural cavities for nesting are limited out of KNP and hence the lower percentage range in the communal area compared to the protected area.

**Southern Ground-Hornbill** *Bucorvus leadbeateri* (33; in 74%, out 12%; rank 4) – this large hornbill has specific nesting requirements, normally using natural tree cavities in large trees. In the heavily populated areas outside of KNP such trees are felled for firewood, building material and to make room for building activities and agriculture. Also, birds are killed when they attack their own reflections in glass windows due to territorial aggression, causing the glass to break. The shortage of food prey such as lizards, tortoises and small mammals in unprotected and communal areas also has a detrimental effect. There is also cause for concern within KNP when suitable nesting trees are destroyed or damaged by the increase in the elephant population. The Southern Ground-Hornbill is listed as Vulnerable in the regional Red List (Taylor et al. 2015). It is ranked 4 in terms of the contrast between percentage ranges inside and outside.

**Black-collared Barbet** *Lybius torquatus* (56; in 69%, out 88%; rank 184) – common throughout, but particularly common outside of KNP. Favourite habitat is riparian woodland where there are many natural

fruit-bearing trees such as *Ficus sycomorus*. It is especially abundant in settled areas where many domestic fruit trees are cultivated.



**Acacia Pied Barbet** *Tricholaema leucomelas* (29; in 49%, out 30%; rank 80) – favours *Acacia* woodland but also found in dry wooded areas. Reasonably common in suitable habitat in KNP, but relatively scarce on the outside. This is due to tree felling for firewood and land clearing for crop production and dwelling construction. Recorded in only 10 pentads out of KNP to date.

**Yellow-fronted Tinkerbird** *Pogoniulus chrysoconus* (32; in 21%, out 73%; rank 210) – this is not a KNP bird except for areas with higher altitude south of the study area, and along the Sabie River to some extent and in sections of the adjoining reserves. It is particularly fond of parasitic mistletoes and can be found where these occur. Out of KNP to the west it is an extremely common species at slightly higher altitudes.

**Crested Barbet** *Trachyphonus vaillantii* (63; in 95%, out 79%; rank 87) – common throughout, especially in *Acacia* woodland, but also frequents rest camps in KNP and dwelling gardens in the rural areas. Less frequently encountered out of KNP; this is likely to be due to habitat disturbance and lack of suitable dead branches for nest excavation.

**Lesser Honeyguide** *Indicator minor* (29; in 36%, out 45%; rank 160) – habitat is woodland and evergreen riparian vegetation with tall trees that can be used as regular calling sites, and where breeding host species are relatively common for this brood-parasite. The primary host species, Black-collared and Crested Barbets are more common outside the KNP than in it; secondary host species, Little Bee-eater, also has is more abundant out of KNP than in it; the bee-eater has a surfeit of breeding sites due to soil erosion and the excavation of quarries for sand. The Lesser Honeyguide is frequently encountered in these areas. This could be a reason for this honeyguide having a greater percentage range out of KNP than within.

**Bennett's Woodpecker** *Campethera bennettii* (21; in 44%, out 12%; rank 44) – this woodpecker favours tall deciduous broad-leaved woodland, which is relatively common in some areas of KNP. The percentage range inside the KNP is larger than outside. This might be a consequence of trees being felled for firewood, building timber or land clearing for crop production. This species is seldom encountered out of KNP and to date has only been recorded in four pentads.

**Golden-tailed Woodpecker** *Campethera abingoni* (53; in 77%, out 70%; rank 115) – common throughout but slightly less frequent out of KNP due to habitat disturbance. Out of KNP it is mainly recorded in riparian woodland.

**Cardinal Woodpecker** *Dendropicos fuscescens* (58; in 85%, out 76%; rank 109) – common throughout but less frequent out of KNP due to habitat disturbance, particularly in *Acacia* woodland. A factor could also be less suitable nesting sites as dead branches are generally removed for firewood.

**Bearded Woodpecker** *Dendropicos namaquus* (48; in 80%, out 52%; rank 56) – has a preference for open mixed deciduous woodland with some tall trees. It is common in KNP where there is an abundance of suitable habitat, including large dead trees for nest excavation. Out of KNP it is less common due to much of the deciduous woodland being felled for firewood and other uses. It is fortunate though that really large trees are often left standing due to difficulty in felling and it is these trees that this woodpecker makes use of.

**Rufous-naped Lark** *Mirafra africana* (55; in 72%, out 82%; rank 162) – the favoured habitat is open wooded savanna and margins of farmland. Large areas out of KNP in rural areas to the west have been cleared of vegetation and are overgrazed by numerous domestic cattle. There is encroachment of exotic weed growth which makes ideal calling perches for this lark and they are plentiful in such areas. To further enhance this stressed habitat in favour of this species, crops

are planted in some areas and margins of this farmland have short grass cover. By way of contrast, KNP to the east has large elephant populations which have resulted in extensive habitat change. Bush encroachment as a result has closed previously open savanna. This explains the greater percentage range out of KNP.

**Sabota Lark** *Calendulauda africanoides* (42; in 82%, out 30%; rank 16) – this lark is common in KNP but relatively scarce in the adjoining rural areas to the west. It favours open woodland with perches from which to sing. This habitat has been largely clear-felled for firewood and building timber and to make open areas to construct housing and other structures. Thus the explanation for the much larger percentage range in the KNP is the habitat change which has taken place outside the KNP.

**Flappet Lark** *Mirafra rufocinnamomea* (31; in 56%, out 27%; rank 51) – the preferred habitat of this species is woodland clearings with short grass cover. In areas out of KNP the woodland habitat is generally too open, and overgrazing has resulted in almost no grass cover in places. This is not suitable habitat for this species and there are not many suitable grass tufts for nest building. Thus the percentage range in the KNP is double that outside of KNP.

**Barn Swallow** *Hirundo rustica* (66; in 97%, out 85%; rank 95) – a summer migrant. Abundant and common throughout but more so in KNP than on the outside. This might perhaps be due to insect food being more prolific in the protected area.

**Wire-tailed Swallow** *Hirundo smithii* (46; in 49%, out 82%; rank 201) – this swallow is associated with water bodies, no matter how small. In KNP there are far fewer water bodies than in previous years due to the closure of windmills and artificial water points. Outside of KNP to the west there are numbers of artificial waterpoints, particularly in heavily populated areas. There are also more breeding facilities because this swallow builds its nest under bridges and road culverts;

there is a maze of roads throughout the communal areas with many bridges and culverts. It also uses suitable buildings in settlements where birds have been noted nesting.

**Grey-rumped Swallow** *Pseudhirundo griseopyga* (25; in 31%, out 40%; rank 157) – the stressed habitats out of KNP favour this swallow. There are many areas where trees have been felled and overgrazing by domestic cattle and goats has resulted in very short grass cover. It also forages over agricultural lands and even over football fields, of which there are many in the communal area. This swallow nests underground in deserted rodent burrows in flat, short grassland. Within KNP to the east there is more dense bush cover and less open short grassland than on the outside.

**Red-breasted Swallow** *Hirundo semirufa* (53; in 85%, out 61%; rank 66) – common throughout, with a preference for open woodland and grassland. Breeds under low road culverts, both in and out of KNP and these are plentiful.

**Lesser Striped Swallow** *Hirundo abyssinica* (59; in 77%, out 88%; rank 164) – breeding mainly takes place under the eaves of buildings and under bridges and storm water culverts. Although this swallow is common both in and out of KNP, there are more breeding facilities on the outside, especially on buildings. This species is becomes commensal with humans.

**Black Cuckooshrike** *Campephaga flava* (39; in 51%, out 58%; rank 148) – the preferred habitat is well developed tall broad-leaved woodland which is abundant in KNP. Hence this species is relatively common. Out of KNP much woodland has been destroyed but riparian woodland is still plentiful in a number of areas. This species is regularly found in this habitat and it is more frequent than in KNP.

**Fork-tailed Drongo** *Dicrurus adsimilis* (68; in 92%, out 97%; rank 143) – this species occurs in all types of woodland, even sparsely

wooded areas and thus does not appear to be stressed in areas where tree felling is taking place. There is a close association with human activities in populated areas and it is often seen following domestic livestock and gleaning disturbed insects. This explains the slightly larger percentage range out of KNP.

**Black-headed Oriole** *Oriolus larvatus* (66; in 87%, out 97%; rank 161) – various woodland types are favoured, wherever there are large trees, and it often frequents sparse woodland. Out of KNP large areas have been cleared and many trees are regularly felled for firewood and building timber, but large trees such as *Ficus sycomorus* and *Sclerocarya birrea* are not used because the timber is soft and unsuitable. Black-headed Orioles are regularly encountered in trees of this nature out of KNP and also riparian woodland with large trees. This oriole is also partial to feeding on nectar and *Erythrina lysistemon* trees are favoured when flowering for this reason. They are often planted in towns and gardens and are not as common in KNP. Aloe flowers are also favoured and there are few aloe species in KNP due to destruction by elephants, kudu and other herbivores. Thus the percentage range outside of KNP is greater than within.

**Pied Crow** *Corvus albus* (32; in 13%, out 82%; rank 213) – virtually absent in KNP and only occasionally seen close to the western boundary near human settlements. Pied Crows are abundant in crowded rural areas outside KNP, often in the centre of busy towns and refuse dumps where discarded food scraps are plentiful. It has been observed preying on newly hatched domestic chickens. It has been recorded breeding on electric pylons. The Pied Crow has the highest rank of any species, with the largest difference in percentage range inside and outside the protected area.

**Southern Black Tit** *Parus niger* (63; in 95%, out 79%; rank 86) – very common throughout the study area in all broad-leaved woodland habitats. It is also regularly found in rest camps in KNP. There are fewer birds outside of the KNP due to destruction of much habitat,

particularly because this is a hole-nesting species in natural tree cavities. Many suitable trees are felled for firewood.

**Grey Penduline-Tit** *Anthoscopus caroli* (28; in 33%, out 45%; rank 168) – prefers broad-leaved woodland to more open *Acacia* habitat. An easily overlooked species in the study area and this could be the reason for the lower percentage range in KNP than on the outside. It probably has a larger percentage range in the KNP than currently recorded.

**Arrow-marked Babbler** *Turdoides jardineii* (64; in 100%, out 76%; rank 65) – very common throughout, especially in KNP, where suitable woodland habitat abounds. Out of KNP it is found mainly in riparian thickets, but has been recorded in rural areas amongst human dwellings.

**Dark-capped Bulbul** *Pycnonotus tricolor* (65; in 82%, out 100%; rank 183) – the habitat preference is for all types of woodland. It is common in suburban areas where it is frequently encountered even in heavily populated human settlements. In housing areas many exotic trees and shrubs take the place of indigenous woodland and food is plentiful. This bulbul is ubiquitous outside of KNP, and is common on the inside as well.

**Terrestrial Brownbul** *Phyllastrephus terrestris* (27; in 26%, out 52%; rank 192) – this species has a preferred habitat in the study area of low and dense evergreen woodland thickets. Such vegetation occurs mainly in the southwestern corner of the study area and along drainage lines. This is a major reason for the greater percentage range being out of KNP. Another reason is that it is normally associated with slightly higher altitude than the low-lying areas of the part of the study area within the KNP.

**Sombre Greenbul** *Andropadus importunus* (58; in 67%, out 97%; rank 196) – this species is common throughout the study area but

more so outside of the KNP, where it is found along streams and drainage lines in riparian woodland. It is also common in rural settlements where there is often an abundance of fruiting and flowering trees and shrubs.

**Kurrichane Thrush** *Turdus libonyana* (50; in 54%, out 88%; rank 202) – relatively common throughout the study area, but more so out of KNP because this thrush is habituated to humans and their environment. It appears to favour rural environments with disturbed land around dwellings and settlements where it can forage in open areas on the ground.

**Groundscraper Thrush** *Psophocichla litsitsirupa* (36; in 38%, out 64%; rank 189) – this species is closely associated with human settlements and is often observed near houses in the rural areas. In particular, it is common where there are large trees for perching, for example in the parking areas of shopping complexes. Ground insects are probably easier to locate on bare ground than in grassy areas in open woodland in KNP where it also occurs, but less frequently than outside the KNP.

**African Stonechat** *Saxicola torquatus* (28; in 36%, out 42%; rank 150) – the species is an altitudinal migrant to KNP in winter, where it favours open grassland areas. Out of KNP to the west the altitude rises slowly to the escarpment foothills and this species is thus more abundant. Outside of KNP, there is also more suitable habitat as a result of crop cultivation and cleared open areas where domestic cattle graze.

**White-browed Robin-Chat** *Cossypha natalensis* (28; in 28%, out 52%; rank 187) – common outside of the KNP and adjoining reserves, but less frequent within it. Natural habitat is riparian woodland and thickets which are relatively intact in the rural areas. It also readily adapts to gardens with shrubs and thickets. Another reason for the higher percentage range in the communal area to the west of KNP is



that there is a tendency for this species to have a preference for the slightly higher altitude that occurs here compared with the lower altitude of the Lowveld of the KNP.

**White-throated Robin-Chat** *Cossypha humeralis* (49; in 64%, out 73%; rank 158) – common throughout the study area but more so out of KNP. Usually found in thickets and dense vegetation along drainage lines and rivers. It would appear that bush encroachment favours this species and there are many areas out of KNP where bush encroachment is rife and not controlled.

**White-browed Scrub Robin** *Cercotrichas leucophrys* (72; 100%, 100%; rank 137) – almost surprisingly this species occurs, both in and out of protected areas. In spite of tree-felling being rife in the communal areas outside of KNP, there is still sufficient scrub,

particularly along drainage lines, to provide suitable habitat. It is commensal with humans, occurring in heavily populated rural areas, even where only small patches of stressed woodland persists.

**Willow Warbler** *Phylloscopus trochilus* (48; in 79%, out 52%; rank 55) – reasonably common throughout but more so in KNP where there is more woodland. Out of KNP there are many man-made open areas which do not suit this species, but it is on occasion encountered in gardens of dwellings in settled areas.

**Yellow-bellied Eremomela** *Eremomela icteropygialis* (23; in 38%, out 24%; rank 91) – uncommon in KNP, where it occurs in broad-leaved woodland. Scarce out of KNP due to less suitable habitat from tree felling and land clearing. To date recorded in only eight pentads outside of KNP in the study area.

**Burnt-necked Eremomela** *Eremomela usticollis* (23; in 54%, out 6%; rank 20) – this small bird species is habitat-specific to fine-leaved *Acacia* woodland, particularly *Acacia tortilis*. It is thus not found throughout in KNP but is relatively common wherever there is suitable habitat. Out of KNP it is very scarce, only two pentads, due to suitable habitat trees being felled for firewood and the clearing of land for crop production and dwelling construction. It does not occur in riparian woodland which is still relatively intact along drainage lines.

**Marsh Warbler** *Acrocephalus palustris* (20; in 31%, out 24%; rank 119) – this is a highly secretive, non-breeding migrant which is only present from mid to late summer. It favours low dense thickets and thus severe bush encroachment, due to elephants changing the environment, is to the advantage of this species in KNP. Out of KNP to the west there is less suitable habitat due to crop cultivation and overgrazing of domestic cattle and goats. Thus it is scarce in this area and has been recorded in only eight pentads.

**Stierling's Wren-Warbler** *Calamonastes stierlingi* (33; in 54%, out 36%; rank 82) – prefers thickets in both broad-leaved and mixed woodland. Bush encroachment makes ideal habitat for this species both in KNP and on the outside, but there is far less suitable habitat out of KNP due to factors such as tree felling, land clearing, overgrazing by domestic cattle and building construction. Thus this species is relatively scarce on the outside.

**Long-billed Crombec** *Sylvietta rufescens* (70; in 100%, out 94%; rank 123) – common both in and outside the KNP. It favours dry woodland with well-developed shrub and bush growth. Thus bush encroachment due to the number of elephant in KNP suits this bird. Out of KNP it is often encountered in rural settlements where there is growth of shrubbery around dwellings.

**Yellow-breasted Apalis** *Apalis flavida* (65; in 85%, out 97%; rank 169) – very common throughout the study area, but more so out of KNP. Frequently encountered along riparian fringes, particularly in tall thickets. Out of KNP it is also encountered in wooded gardens of dwellings. It is more easily recorded outside the KNP due to access to preferred habitat.

**Green-backed Camaroptera** *Camaroptera brachyura* (63; in 90%, out 85%; rank 124) – this species is very common throughout the study area. A favoured habitat is wooded thickets and thus this species takes advantage of bush encroachment, both in and out of KNP. Out of KNP it is often encountered in riverine woodland; this habitat is better preserved here than other woodland types.

**Zitting Cisticola** *Cisticola juncidis* (44; in 72%, out 48%; rank 68) – common in KNP wherever there is long grass. Out of KNP there is far less suitable habitat, especially because tall grass is cut for thatching. However, because it requires only small grassy patches, it remains reasonably common outside of KNP.

**Neddicky Cisticola** *Cisticola fulvicapilla* (58; in 77%, out 85%; rank 155) – preferred habitat is lightly wooded grassland with low shrubs for perching and calling. Out of KNP woodland has been modified by clearing and impact of domestic cattle, and this appears to favour this cisticola. Thus it is more prolific out of KNP than in it, particularly because there are open areas with very short grass where it can forage on the ground.

**Rattling Cisticola** *Cisticola chiniana* (69; in 100%, out 91%; rank 105) – very common throughout but more so in KNP where there is more suitable dry *Acacia* and broad-leaved woodland habitat than outside due to land clearing and overgrazing by domestic livestock. In rural areas to the west it is frequently encountered in small pockets of suitable habitat which is still intact.

**Red-faced Cisticola** *Cisticola erythrops* (51; in 59%, out 85%; rank 191) – a common bird throughout wherever there is rank vegetation, and/or reed growth bordering streams, dams and watercourses. It appears to be absent from such areas when many seasonal wetlands are dry. This could well be the explanation for a small percentage range inside the KNP than outside it. This is probably a species that is impacted negatively by the SANParks policy to close artificial waterpoints and breach dams. In the rural areas to the west there are a number of artificial wetlands, and most have rank vegetation on the periphery.

**Croaking Cisticola** *Cisticola natalensis* (24; in 33%, out 33%; rank 136) – this large cisticola has a preference for open grassland with scattered small shrubs for perching. It appears to be equally abundant both in and out of KNP. This appears strange at first because the landscape within the KNP is vastly different to that to the west on the outside. However, this cisticola species does not require extensive grassland areas and it inhabits grassland which is not pristine. It is often found in small, isolated pockets of suitable habitat, even where there has been extensive clearing nearby.



*Figure 10. Overgrazing by cattle and subsequent bush encroachment outside the Kruger National Park near Acornhoek. Photo © Peter Lawson*



**Tawny-flanked Prinia** *Prinia subflava* (71; in 97%, out 100%; rank 141) – found wherever rank grass or tall weed growth exists along drainage lines or wetlands, even along really minor watercourses. It is commensal with humans, and apparently tolerates disturbance. Some altitudinal movement is noted during winter, hence the slightly lower percentage range in KNP.

**Spotted Flycatcher** *Muscicapa striata* (46; in 79%, out 45%; rank 38) – a Palearctic migrant which is common in KNP, particularly in rest camps and gardens. It favours open woodland with large trees and low branches where it can perch when hawking insects. Suitable trees are protected from feeding elephants within rest camps. Outside of the KNP there is less suitable woodland but it remains reasonably common in open areas where large trees are still intact due to absence of elephant and because of the difficulty in felling them by the human population.

**Ashy Flycatcher** *Muscicapa caerulescens* (21; in 28%, out 30%; rank 139) – prefers dense woodland, particularly riparian forest, which occurs both in and out of KNP. Also has a tendency for altitudinal movement and is found at moderately higher altitudes to the west of KNP in dry periods. This might explain why the percentage range outside of KNP is slightly larger than inside.

**Grey Tit-Flycatcher** *Myioparus plumbeus* (34; in 64%, out 27%; rank 36) – The habitat for this species is various types of woodland and thickets which are plentiful in KNP. This bird is thus common in the KNP. Outside of KNP large areas of woodland have been felled for reasons such as crop cultivation, firewood, and timber for the construction of dwellings and settlements for an expanding human population. Out of KNP, this species is largely confined to riparian woodland that has not been felled, and thus it is a relatively uncommon.

**African Paradise Flycatcher** *Terpsiphone viridis* (52; in 69%, out 76%; rank 149) – Common throughout the study area during summer, but more so outside of KNP. Favourite habitat is riparian woodland, a habitat which is intact and plentiful in many areas out of KNP. Hence the percentage range is greater on the outside of the KNP than inside it.

**Pale Flycatcher** *Bradornis pallidus* (36; in 49%, out 52%; rank 142) – occurs mainly in broad-leaved woodland and is reasonably common throughout the study area. The preferred habitat is sparse in many areas out of KNP, but this species is often found in small pockets of woodland, sometimes close to human settlements.

**Southern Black Flycatcher** *Melaenornis pammelaina* (56; in 72%, out 85%; rank 172) – common throughout the study area in a wide range of open woodland. More frequent out of KNP where open woodland is created due to tree-felling. Also, it associates with humans and is often seen around dwellings and even well populated settlements.

**Chin-spot Batis** *Batis molitor* (67; in 97%, out 88%; rank 104) – this species common throughout the study area but more so in the KNP where its favoured habitat, *Acacia* woodland, is plentiful. It also frequents restcamp gardens. Out of KNP it is also common but not as prolific as on the inside. This is probably due to *Acacia* woodland being sparse due to land clearing and tree felling.

**Cape White-eye** *Zosterops virens* (21; in 18%, out 42%; rank 188) – scarce in KNP and the associated reserves except in rest camps and around lodges. Its favoured natural habitat is riparian zones which are relatively intact outside of KNP. It is more common in these zones but also frequents developed areas, especially where fruit trees are grown. In season, white-eyes are common amongst flowering aloes in gardens; these are scarce in KNP because they tend to get eaten by



herbivores. Also, flowering *Erythrina lysistemon* trees are popular and these are planted in gardens and around settlements.

**African Pied Wagtail** *Motacilla aguimp* (33; in 36%, out 58%; rank 186) – due to the closure of artificial water points and the breaching of dams in KNP, the percentage range is higher outside of KNP than inside it. Also, it has adapted well to human settlements in rural areas and roosts and breeds on buildings.

**African Pipit** *Anthus cinnamomeus* (50; in 64%, out 76%; rank 166) – the habitat outside of KNP favours this pipit. It frequents very short grassland. Outside the KNP, there are large areas of overgrazed

pastureland, cropland and numerous football pitches. It is frequently encountered in these areas; it is even recorded on pavements in well populated areas.

**Yellow-throated Longclaw** *Macronyx croceus* (54; in 59%, out 94%; rank 203) – the habitat preference is open woodland with short grass. Due to tree felling and overgrazing by domestic cattle and goats in the communal areas to the west of the KNP, there is far more suitable habitat available outside the KNP than within it. Bush encroachment within KNP has reduced suitable habitat considerably in some areas.

**Lesser Grey Shrike** *Lanius minor* (32; in 64%, out 21%; rank 28) – a Palearctic migrant that arrives mid-summer. In KNP it is found mainly in the eastern basaltic grassland savanna with scattered *Acacia* trees and less frequently in dry broadleaved woodland further west. Out of KNP, the favoured basaltic grassland savanna does not exist; this is the primary explanation for this bird being scarce out of KNP. In addition, large areas of woodland here have been cleared.

**Common Fiscal** *Lanius collaris* (28; in 10%, out 73%; rank 212) – within the study area, this is not a species that occurs in the KNP, but it is common on the outside, particularly in residential areas. Often observed perched on transmission lines along roads in these areas. It is closely commensal with humans and it is likely that it has a preference for slightly higher altitude than the low-lying areas of KNP.

**Red-backed Shrike** *Lanius collurio* (51; in 95%, out 42%; rank 14) – a summer migrant that has a preference for open *Acacia* woodland and other woodland in semi-arid areas. It is common in KNP where the preferred habitat is suitable and plentiful. Out of KNP to the west the landscape has altered considerably due to felling of trees for firewood and clearing of land for crop farming and dwelling construction. There is little suitable habitat left for this species and it is not as frequently encountered out of KNP.

**Southern Boubou** *Laniarius ferrugineus* (62; in 82%, out 91%; rank 159) – very common throughout but recorded more frequently out of KNP. Perhaps might be related to the ease with which this species is recorded out of KNP because the preferred dense vegetation habitat is mainly along drainage lines which are areas which atlasers target when they make checklists for the project.

**Black-backed Puffback** *Dryoscopus cubla* (69; in 95%, out 97%; rank 140) – a woodland species, particularly riparian forest. It occurs less frequently in dry woodland. Very common throughout the study area because there is a lot of suitable habitat, both in and out of KNP. It often lives in close association with humans and is common in rest camps in the KNP and around dwellings on the outside.

**Brown-crowned Tchagra** *Tchagra australis* (62; in 95%, out 76%; rank 79) – this species favours dense woodland and thickets. Thus bush encroachment, both in KNP and on the outside, forms prime habitat. It is very common throughout the study area but the lower percentage range out of KNP could be explained by the fact that there is more open man-made habitat on the outside.

**Black-crowned Tchagra** *Tchagra senegalus* (70; in 100%, out 94%; rank 122) – extremely common throughout and recorded in all pentads, except for two, in the study area. Favours a wide range of woodland habitats, including open areas with scattered shrubs. This species also occurs in rest camps in KNP and in wooded gardens in the rural areas.

**Orange-breasted Bushshrike** *Telophorus sulfureopectus* (67; in 95%, out 91%; rank 126) – very common throughout the study area, and occurs both in and out of KNP. The smaller percentage range outside of the KNP might be explained by densely populated rural settlements being poor habitat for this species.

**Gorgeous Bushshrike** *Telophorus viridis* (21; in 15%, out 46%; rank 195) – this species occurs mainly farther south in Kruger National Park than the study area; the records from within the study area are from the western side of the Sabie River. It is scarce in dense riparian woodland habitat. Outside of Kruger National Park it is relatively common in riparian zones, particularly to the west where there is some dense undisturbed vegetation, mainly along rivers and drainage lines.

**Grey-headed Bushshrike** *Malaconotus blanchoti* (59; in 87%, out 76%; rank 99) – common throughout the study area but more so in KNP where *Acacia* woodland is more prolific than on the outside. It also frequents rest camps. Almost certainly, a greater number of prey items are available in the protected area than outside the KNP and this could be a contributing factor for the higher percentage range. Out of KNP this species is still relatively common but it is found mainly in riparian woodland which is largely intact, compared with other woodland habitats.

**Magpie Shrike** *Corvinella melanoleuca* (54; in 100%, out 46%; rank 13) – this species has a preference for habitat consisting of open *Acacia* woodland and it is particularly fond of *Acacia nigrescens* woodland. Very little of this habitat exists in the previous homeland area out of KNP because tree-felling for firewood and other purposes is rife and large areas are now virtually treeless. Thus the percentage range in KNP is more than double the range on the outside.

**White-crested Helmetshrike** *Prionops plumatus* (48; in 74%, out 58%; rank 83) – this species wanders considerably through broad-leaved woodland and also mixed *Acacia* woodland. It is common in KNP, particularly during winter. Out of KNP it is not as common and is located mainly along wooded drainage lines, where woodland is less disturbed by humans. Sometimes also encountered in commercial timber plantations.



*Figure 11. Rural sprawl west of the Kruger National Park near Bushbuckridge. Photo © Duncan McKenzie*

**Retz's Helmetshrike** *Prionops retzii* (25; in 41%, out 27%; rank 94) – normally found in tall broad-leaved woodland in KNP, but flocks move widely in search of insects to feed on, particularly during the winter. It is reasonably common in KNP but fairly scarce on the outside. This is probably due to the destruction of suitable habitat. Recorded in only nine of the pentads outside of KNP in the study area to date.

**Southern White-crowned Shrike** *Eurocephalus anguitimens* (22; in 41%, out 18%; rank 71) – the habitat is dry deciduous woodland and mixed *Acacia* woodland, with sparse ground cover. In KNP there is a tendency for an increase of bush encroachment, probably elephant-related. This almost certainly leads to a reduced population of this shrike. Out of KNP suitable habitat is limited due to tree felling for firewood and clearing of land for crop cultivation and construction of dwellings. Thus this species is relatively rare and to date has only been listed in 22 pentads in the study area, of which only six are outside of KNP.

**Brubru** *Nilaus afer* (61; in 95%, out 73%; rank 74) – the main habitat is reasonably dry woodland. It is common throughout the study area, although more so in KNP than out. Much of the preferred habitat on the outside is either already lost or under ongoing disturbance by woodcutters.

**Wattled Starling** *Creatophora cinerea* (41; in 69%, out 42%; rank 61) – a nomadic species, sometimes present in large numbers. Habitat preference is open dry woodland. Nesting is colonial, with numerous nests covering large areas in *Acacia* trees. Suitable habitat is present in KNP but there is less of it outside the KNP due to human destruction. Hence the lower percentage range.

**Violet-backed Starling** *Cinnyricinclus leugogaster* (47; in 67%, out 64%; rank 128) – common and fairly evenly distributed both in and out of KNP in savanna and riverine woodland. The slightly lower reporting rate out of KNP is possibly due to less favourable habitat in densely

populated settlements. This starling has been recorded nesting in hollow fence posts in rural areas.

**Cape Glossy Starling** *Lamprotornis nitens* (68; in 97%, out 91%; rank 120) – very common, both in and out of KNP. In KNP it is generally found in wooded savanna habitat, but it especially frequents public picnic areas and rest camps where it scavenges on scraps of food. Out of KNP there is less woodland habitat but this starling frequents rural settlements where food scraps are plentiful and it is often encountered among refuse disposal. It also follows domestic cattle, and catches insects disturbed while cattle are walking.

**Greater Blue-eared Starling** *Lamprotornis acuticaudus* (49; in 90%, out 42%; rank 21) – the habitat of this species is open savanna woodland and it nests in natural tree cavities. In the non-breeding season it roosts in large flocks in large *Acacia* trees. It is common in KNP where suitable habitat is plentiful. It also gathers at picnic sites in KNP where food scraps are offered. Out of KNP there is extensive tree felling and land clearing and thus suitable habitat is limited. Outside of KNP, it occurs in considerably smaller numbers.

**Burchell's Starling** *Lamprotornis australis* (54; in 100%, out 45%; rank 12) – habitat preference is open, tall *Acacia* woodland, where there is an abundance of insect food, plus seasonal flower shoots as secondary food. Breeding also takes place in this habitat where it uses natural tree cavities. Such habitat is abundant in parts of KNP and this species is thus common. Out of KNP to the west tall *Acacia* trees are felled for firewood and large areas have been cleared for crop farming. The preferred habitat is thus limited. This starling avoids contact with humans, unlike some other starling species. Thus another reason for the much lower percentage range out of KNP is housing development and an increasing human population.

**Red-billed Oxpecker** *Buphagus erythrorhynchus* (55; in 97%, out 52%; rank 23) – abundant in KNP and seen on a variety of species of

medium to large mammals, but not on elephants. It is also reasonably common out of KNP in rural areas where it feeds on ectoparasites on domestic cattle and to a lesser extent on donkeys. Nesting takes place in hollow trees. Out of KNP, dead trees tend to be used for firewood, and there are therefore few suitable nesting sites; as a result it is scarcer out of KNP than in it.

**Marico Sunbird** *Cinnyris mariquensis* (48; in 85%, out 45%; rank 33) – the favoured habitat is dry *Acacia* and riparian woodland. It also frequents rest camps in KNP. Suitable habitat is plentiful in KNP and thus this sunbird is common. Out of KNP to the west large areas have been clear-felled and there is far less suitable habitat, but this sunbird remains reasonably common. It is also regularly recorded in well-populated rural areas as well, particularly where there are nectar-producing plants around dwellings.

**White-bellied Sunbird** *Cinnyris talatala* (61; in 77%, out 94%; rank 182) – very common throughout, particularly out of KNP and adjoining reserves. It associates with human settlements and is even found in heavily populated rural areas. The reason is that there is an abundance of nectar-producing flowering trees and shrubs in these settled areas, and in particular *Erythrina lysistemon* in season. This is probably the major reason for the abundance of this species out of KNP.

**Collared Sunbird** *Hedydipna collaris* (29; in 26%, out 58%; rank 199) – more common out of KNP and adjoining reserves due to a preference for slightly higher altitude and more dense vegetation in riparian zones in these areas. Nectar-producing flowering plants are often grown in rural gardens of dwellings and this also provides an attraction.

**Amethyst Sunbird** *Chalcomitra amethystine* (26; in 18%, out 58%; rank 205) – this species does not generally occur in KNP, in spite of suitable habitat. The reason is that it frequents areas of slightly higher

altitude than much of the low-lying terrain in KNP. Out of KNP the altitude rises gradually to the west towards the escarpment and this species is fairly common in this area. Another factor is that this sunbird favours inhabited areas with gardens containing flowering plants, representing a more abundant food source.

**Scarlet-chested Sunbird** *Chalcomitra senegalensis* (36; in 38%, out 64%; rank 190) – this sunbird has a preference for open woodland and thornveld, but is also closely associated with human settlements out of KNP, where it is seasonally common in many gardens. It appears to be nomadic to some extent and moves around according to available food supply. The rural areas seasonally have many flowering *Erythrina lysistemon* trees which are a major attraction to this species. This is one of the reasons why it is more widespread outside of KNP than within it.

**Red-billed Buffalo-Weaver** *Bubalornis niger* (48; in 95%, out 33%; rank 6) – this species prefers *Acacia* savanna habitat, particularly for colonial breeding. Much of this habitat has been felled for firewood and/or clearing of land for crop cultivation and construction of housing, roads and commercial buildings in areas out of KNP. Thus there are fewer populations away from protected areas.

**House Sparrow** *Passer domesticus* (35; in 23%, out 79%; rank 211) – this common resident is associated with human settlements where cavities in buildings, such as under eaves, are used for nesting purposes and discarded food scraps provide food. In KNP they are only found in rest camps, around staff housing and office buildings, and at certain entrance gates. They do not occur away from such areas. Out of KNP their preferred habitat is prolific in rural areas where buildings and food scraps are plentiful. This explains the large percentage range outside of KNP.



*Figure 12. Mopane woodland near Orpen in the Kruger National Park. Photo © Jacques de Villiers*

**Southern Grey-headed Sparrow** *Passer diffuses* (69; in 97%, out 94%; rank 127) – extremely common throughout the study area both in and out of KNP in all woodland habitats. It also favours human habitation in the communal areas, and is frequently recorded in densely populated rural settlements and is observed nesting in holes in buildings.

**Yellow-throated Petronia** *Petronia superciliaris* (35; in 54%, out 42%; rank 100) – habitat is open woodland and it is common in KNP, but less common on the outside. This is probably due to less suitable habitat out of KNP due to ongoing tree felling. This also results in fewer natural tree cavities for nesting and roosting.

**Spectacled Weaver** *Ploceus ocularis* (56; in 72%, out 85%; rank 173) – occurs mainly in riparian woodland. Common throughout but more so out of KNP, because it appears to favour slightly higher altitude than the Lowveld in KNP.

**Lesser Masked Weaver** *Ploceus intermedius* (36; in 51%, out 48%; rank 130) – reasonably common both in and out of KNP. Prefers savanna woodland habitat and has taken to nesting on thatch of restcamp buildings in KNP and in gardens of rural dwellings and shopping complexes, particularly where *Acacia xanthophloea* trees have been planted.

**Village Weaver** *Ploceus cucullatus* (40; in 49%, out 64%; rank 180) – common, both in and out of KNP, but more common on the outside. It is highly gregarious, particularly when nesting and is frequently seen in populated rural areas where it can glean food scraps and where *Acacia xanthophloea* is a popular garden tree around dwellings and commercial buildings. This is a favoured tree species for nesting purposes.

**Southern Masked Weaver** *Ploceus velatus* (52; in 72%, out 73%; rank 138) – equally common throughout the study area. Prefers open

savanna habitat, particularly with *Acacia* trees. Often a solitary breeder, generally away from water. Out of KNP it is often found breeding in isolated trees where other trees have been felled and land has been cleared. Also in trees in populated housing settlements. Thus there is suitable habitat for this species both in and out of KNP.

**Thick-billed Weaver** *Amblyospiza albifrons* (25; in 21%, out 52%; rank 197) – this species has never been particularly common in KNP. Generally it is found at artificial wetlands where there is growth of reeds and bulrushes, and where it roosts and nests. Within KNP, many of these artificial water points have been drained, or are in the process of being breached and there will probably be further decreases of this species. Another factor inside KNP is that the large elephant population often destroy reed beds. Out of KNP there are many dams and swamp areas for domestic cattle and most of these have reed beds, where breeding takes place. Also, during the non-breeding season this weaver tends to join feeding flocks of other seed eaters, and they are observed searching for seed on the ground in overgrazed pasturelands and crop fields. Thus this species is relatively common out of KNP.

**Red-billed Quelea** *Quelea quelea* (45; in 87%, out 42%; rank 26) – this exceptionally gregarious and abundant bird has a preference for semi-arid savanna and thus it would be expected to inhabit the large areas of cleared and overgrazed land in the previous homeland outside of the KNP. The percentage range out of KNP is half of that within and thus there are other factors resulting in the greater number in KNP. This could be due to lack of food on the outside. Persecution in areas where crops are farmed is likely to be an important factor. Breeding is unlikely to take place out of KNP because nests are built in *Acacia* trees in huge colonies spread out over a considerable area, and cleared areas lack sufficient suitable trees. Also, colony destruction is likely to take place at large colonies out of KNP but this form of persecution does not occur within KNP.



**Southern Red Bishop** *Euplectes orix* (24; in 31%, out 36%; rank 146) – requires reed beds for roosting and nesting and these are on the decline in KNP due to elephant destruction and the decision to breach man-made dams. Out of KNP there are a number of dams that contain *Phragmites* and thus the percentage range is higher outside than inside.

**Red-collared Widowbird** *Euplectes ardens* (20; in 8%, out 52%; rank 206) – preferred habitat is scrub and cultivated areas and there is far more suitable habitat outside of KNP with large cleared areas and crop cultivation. In the non-breeding season this species is highly gregarious and flocks with other seed-eating species. They are then encountered in abundance, feeding on the ground in open areas, particularly in agricultural fields out of KNP.

**White-winged Widowbird** *Euplectes albonotatus* (42; in 69%, out 45%; rank 67) – common resident in open grassland areas. Out of KNP it is recorded mainly in the non-breeding season when it becomes gregarious and joins other seed eating birds, feeding on the ground. This often takes place in open areas where grass is sparse due to overgrazing by domestic cattle.

**Bronze Mannikin** *Spermestes cucullata* (35; in 28%, out 73%; rank 208) – more frequent south of this particular study area in southern KNP. Generally encountered in rest camps. Out of KNP it is common in populated rural areas and in towns and settlements, where it is often encountered feeding in gardens and even on pavements.

**Green-winged Pytilia** *Pytilia melba* (39; in 82%, out 21%; rank 7) – habitat preference is relatively dry woodland, particularly *Acacia* savanna. This habitat is abundant in KNP, and bush encroachment by sicklebush *Dichrostachys cinerea* in areas subjected to habitat change due to over population of elephant creates good habitat for this bird as well. Thus it is common in KNP. West of KNP in populated rural areas there has been drastic habitat change. Large areas have had trees

felled to be used as firewood or building timber. Land has been cleared for cattle grazing or for crop cultivation and there is little suitable habitat for this species. Thus the percentage range out of KNP is far less than within it.

**African Firefinch** *Lagonosticta rufica* (25; in 28%, out 42%; rank 178) – this firefinch is more common outside of KNP because it frequents higher lying areas with lush vegetation, mainly along rivers and drainage lines. Bush encroachment in these areas favours this bird as it prefers low and rank vegetation.

**Jameson's Firefinch** *Lagonosticta rhodopareia* (43; in 74%, out 42%; rank 42) – common in KNP where it favours relatively dry woodland, which is abundant. Out of KNP there is less suitable habitat due to habitat disturbance by the large human population, but it remains reasonably common.

**Red-billed Firefinch** *Lagonosticta senegala* (37; in 64%, out 36%; rank 57) – occurs in thickets with rank grass in KNP. Because bush encroachment is on the increase in many areas more habitat for this species occurs. Out of KNP, thickets and bush encroachment occurs on the perimeter of land cleared for crop production and it is in these areas where this species sometimes occurs. It is occasionally found on the ground amongst feeding flocks of other seed-eating birds, relatively close to human settlements.

**Blue Waxbill** *Uraeginthus angolensis* (68; in 100%, out 88%; rank 96) – this is a very common species both in and out of KNP. Habitat preference is open *Acacia* woodland which is more prolific in KNP than on the outside where large areas of woodland have been felled and cleared. This waxbill is dependent on surface water because it drinks regularly; with the closure of artificial water points in KNP it appears to be becoming less abundant during dry periods, but more prolific at such times on the outside where there is more surface water.



*Figure 13. Mixed Broad-leaved Woodland west of Tshokwane in Kruger National Park. Photo © Jacques de Villiers*

**Common Waxbill** *Estrilda astrild* (51; in 56%, out 88%; rank 198)- this waxbill is found along watercourses and wetlands in rank vegetation, but also favours weed growth bordering agricultural land. Thus it is more common out of KNP in populated rural areas.

**Pin-tailed Whydah** *Vidua macroura* (46; in 62%, out 67%; rank 144) – found in a variety of habitats and not particularly disturbed by close association with human populations. Because the Common Waxbill is the primary host of this whydah it is understandable that it should be more prevalent out of KNP where the host species is also more abundant.

**Purple Indigobird** *Vidua purpurascens* (21; in 33%, out 24%; rank 107) – favours dry woodland with tall grass. Recorded in only 21 pentads in the study area, this is a scarce species inside the KNP and rare on the outside. This is probably due to tree felling for firewood and grass cutting for thatching purposes.

**Long-tailed Paradise Whydah** *Vidua paradisaea* (38; in 80%, out 21%; rank 9) – habitat preference is dry, open *Acacia* savanna or mixed savanna woodland. It is a brood parasite which is host-specific to Green-winged Pytilia. It makes sense that the percentage range, both in and out of KNP, should be similar to that of its host species.

**Yellow-fronted Canary** *Crithagra mozambica* (68; in 90%, out 100%; rank 163) – this canary is not disturbed by human populations and is often encountered in densely populated areas, including towns. It is a woodland bird but takes to residential gardens and is frequently seen feeding on pavements where there is plenty of activity. Hence the percentage range out of KNP is greater than inside it, although it is nonetheless also common in KNP.

**Cinnamon-breasted Bunting** *Emberiza tahapisi* (41; in 72%, out 39%; rank 41) – favours wooded rocky areas with boulders and rock ridges. Such areas are common in KNP, hence the large percentage

range within the KNP. There is less suitable habitat out of KNP and this species is therefore recorded less frequently than inside the KNP.

**Golden-breasted Bunting** *Emberiza flaviventris* (60; in 92%, out 73%; rank 78) – this species is very common throughout the study area; the preferred habitat is dry woodland. Outside of KNP there are areas which have been cleared of woodland, and also heavily populated settlements; thus the percentage range outside is smaller. Of interest though is that this species is frequently encountered in commercial plantations and in fruit orchards.

## Discussion

There are recurring themes explaining differences in the percentage ranges inside and outside the protected areas, the contrast between the KNP and the communal area: clearing of woodland outside the KNP; loss of wetland habitat inside the KNP; planting of trees that produce fruit and nectar outside the KNP; bush encroachment which is occurring mainly within the KNP and attributed largely to elephant activity; occurrence of species associated with crops outside the KNP; occurrence of species that feed on bare ground outside the KNP; persecution of species outside the KNP; occurrence of species which are commensal with humans outside of KNP (and at tourist camps and picnic sites within it).

To a limited extent, mention is made in the systematic list of species which are more easily recorded out of KNP. This is because, apart from tourist rest camps and official picnic sites, observations need to be made from within a vehicle within the KNP. Searching on foot is not possible, and calls that would otherwise have been heard are potentially missed. This would have resulted in species being overlooked in the KNP. On the other hand, there were fewer checklists on average per pentad outside the KNP than within it. Thus it is possible that, to an unknown extent, percentage ranges outside the

KNP were underestimated. However, these factors are unlikely to detract from the overall ranking of species and consequently the main findings are unlikely to be seriously biased.

The analysis approach used in this paper is deliberately the simplest one possible; it does not make use of reporting rates, although these are made available in Table 1, where the reporting rates given are the median reporting rates for the pentads in which the species was recorded, for pentads inside the KNP and for pentads outside the KNP.

In Table 1, there was a predominance of species which had smaller percentage ranges outside the KNP than within it. In this analysis, 135 out of 213 species (63%) were disadvantaged in the communal area compared to the KNP. In comparison, 76 species (36%) were advantaged in the communal areas. None of these 76 species are in threat categories.

13 of the 213 species are in the regional Red List threat categories of Taylor et al. (2015). All of them had smaller percentage ranges outside the KNP than in it, and all were negatively impacted by the activities in the communal area. Other species in threat categories occurred in the study region (e.g. Secretarybird *Sagittarius serpentarius*), but none met the 20-pentad threshold for inclusion: Tawny Eagle (Endangered, rank 2); Southern Ground Hornbill (Vulnerable, rank 4); European Roller (Near-threatened, rank 5); White-headed Vulture (Critically Endangered, rank 15); Bateleur (Endangered, rank 17); Martial Eagle (Endangered, rank 25); Saddle-billed Stork (Endangered, rank 32); Lappet-faced Vulture (Endangered, rank 34); White-backed Vulture (Critically Endangered, rank 35); Marabou Stork (Near-threatened, 59), Woolly-necked Stork (Near-threatened, rank 75) and Cape Vulture (Endangered, rank 92). The Cape Vulture, the lowest ranked species in this list, had its breeding colony beyond the communal area outside the KNP, and was most recorded in the pentads of the communal area while commuting over them.

16 species, at the top of Table 1, had differences exceeding 50%. Five of these 16 species are in threat categories. With a few exceptions, these are the species that are the most negatively impacted by high human densities, and the most positively impacted by the existence of the protected areas. A further 47 species had differences in percentage ranges between 25% and 50%, with larger percentages inside the KNP than outside it. 72 species had percentage range differences between 0% and 25%, with slightly larger percentage ranges inside the KNP than outside it. Two species had differences of zero, White-browed Scrub Robin and Croaking Cisticola.

At the other end of the scale, for species which had a larger percentage range outside the KNP than inside it, five species had percentage range differences greater than 50%. These five species, the last five in Table 1, are potentially the species which are positively impacted by high human densities: Pied Crow, Common Fiscal, House Sparrow, Yellow-fronted Tinkerbird and Speckled Mousebird. The only one of these species which is not commensal with humans is Yellow-fronted Tinkerbird, which is mainly found outside of the KNP at slightly higher altitudes. For 20 species, the difference in percentages ranges was between 25% and 50%, with the larger percentage outside the KNP than inside it. 51 species had percentage range differences between 0% and 25%, with slightly larger percentage ranges outside the KNP than inside it.

Perhaps the most striking result is how large the differences in percentage ranges are. For seven species, the differences in percentage ranges inside vs outside the KNP exceeded 60%. Without exception these are species which have benefitted the most from the protection offered by the KNP and have been negatively impacted by the range of processes that takes place in area of dense human habitation: Red-crested Korhaan, Tawny Eagle, Swainson's Spurfowl, Southern Ground-Hornbill, European Roller, Red-billed Buffalo Weaver and Green-winged Pytilia.



*Figure 14. Open Savanna Woodland on flat Basaltic Soil near Tshokwane in the Kruger National Park. Photo © Leon Marais*

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This paper is the first product of the Greater Kruger National Park challenge. The objective of the challenge was to obtain a minimum of four checklists for every pentad in the challenge area (Figure 1). Permission to conduct these bird surveys in the Kruger National Park was granted by SANParks Scientific Services under the leadership of Sharon Thompson based in Phalaborwa. The initial motivation to SANParks for the project was done by Doug Harebottle, with subsequent administration handled by LGU, and the processing, curation and extraction of data by MB.

The project management was undertaken by BirdLife Lowveld, with PL leading the on-the-ground project management and liaison with SANParks. The field work for the challenge would not have been possible without generous donations made by individuals, by business enterprises and by organisations. Funding was managed by BirdLife Lowveld; this bird club delved deep into its own funds to ensure the project kept making progress.

Numerous citizen scientists atlased pentads in the study area of the project, and generated much of the data which constitutes the basis for this paper. This was in sections of Kruger National Park open to the general public as well as in private reserves and adjoining pentads out of reserves. Names are too numerous to mention.

Field work away from tourist routes was conducted by PL, Ian Whyte, Joe Grosel and Duncan McKenzie. Permission was granted for them

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Table 1. These 213 species occurred in 20 or more pentads in the study area (half-degree grid cells 2431C and 2431D) in north-eastern Mpumalanga. The table is sorted on the final column, in bold. The first column provides the sorting rank. The second and third columns give the species name and reference number in SABAP2. The fourth column is the total number of pentads, out of 72, in which the species was recorded in the study area. Columns 5–7 provide statistics within the 39 pentads of the Kruger National Park (KNP) and columns 8–10 provide the same statistics for the 33 pentads outside the KNP, referred to in the text as the communal area. Columns 5 and 8 are the number of pentads in which the species was recorded inside and outside the KNP; columns 6 and 9 are the percentage ranges inside and outside the KNP (ie the values from the previous columns divided by 39 and 33 respectively). Columns 7 and 10 are the median SABAP2 reporting rates for the pentads in which the species occurred inside and outside the KNP. Column 11 is the difference between columns 6 and 9, and provides the differences in percentage range.

Rank	Ref no.	Species name	Total range	KNP range	Percentage range KNP	KNP Median Rep Rate	Outside range	Percentage range Outside	Outside Median Rep Rate	Difference in range
1	224	Red-crested Korhaan	42	35	89.74	33.33	7	21.21	33.33	<b>68.53</b>
2	134	Tawny Eagle	46	37	94.87	27.78	9	27.27	19.05	<b>67.60</b>
3	185	Swainson's Spurfowl	50	39	100.00	56.67	11	33.33	10.53	<b>66.67</b>
4	430	Southern Ground-Hornbill	33	29	74.36	22.73	4	12.12	7.87	<b>62.24</b>
5	412	European Roller	46	36	92.31	35.71	10	30.30	22.50	<b>62.00</b>
6	779	Red-billed Buffalo-Weaver	48	37	94.87	41.67	11	33.33	18.10	<b>61.54</b>
7	830	Green-winged Pytilia	39	32	82.05	23.61	7	21.21	10.28	<b>60.84</b>
8	407	Southern Carmine Bee-eater	38	31	79.49	25.00	7	21.21	17.14	<b>58.28</b>
9	852	Long-tailed Paradise-Whydah	38	31	79.49	16.67	7	21.21	12.90	<b>58.28</b>
10	365	Pearl-spotted Owlet	39	31	79.49	25.00	8	24.24	25.58	<b>55.24</b>
11	310	Double-banded Sandgrouse	28	25	64.10	20.00	3	9.09	28.57	<b>55.01</b>
12	743	Burchell's Starling	54	39	100.00	89.39	15	45.45	50.00	<b>54.55</b>
13	724	Magpie Shrike	54	39	100.00	83.33	15	45.45	47.06	<b>54.55</b>
14	708	Red-backed Shrike	51	37	94.87	37.50	14	42.42	21.76	<b>52.45</b>
15	107	White-backed Vulture	53	38	97.44	54.44	15	45.45	50.00	<b>51.98</b>
16	460	Sabota Lark	42	32	82.05	42.86	10	30.30	25.00	<b>51.75</b>
17	151	Bateleur	56	39	100.00	75.00	17	51.52	36.36	<b>48.48</b>
18	424	African Grey Hornbill	56	39	100.00	57.14	17	51.52	33.33	<b>48.48</b>
19	399	Woodland Kingfisher	47	34	87.18	38.75	13	39.39	36.36	<b>47.79</b>

Rank	Ref no.	Species name	Total range	KNP range	Percentage range KNP	KNP Median Rep Rate	Outside range	Percentage range Outside	Outside Median Rep Rate	Difference in range
20	601	Burnt-necked Eremomela	23	21	53.85	20.00	2	6.06	0.94	<b>47.79</b>
21	738	Greater Blue-eared Starling	49	35	89.74	37.50	14	42.42	42.43	<b>47.32</b>
22	4129	Southern Red-billed Hornbill	55	38	97.44	66.52	17	51.52	35.29	<b>45.92</b>
23	748	Red-billed Oxpecker	55	38	97.44	63.61	17	51.52	52.94	<b>45.92</b>
24	415	Purple Roller	44	32	82.05	25.00	12	36.36	21.55	<b>45.69</b>
25	142	Martial Eagle	35	27	69.23	16.67	8	24.24	13.03	<b>44.99</b>
26	805	Red-billed Quelea	48	34	87.18	28.57	14	42.42	22.29	<b>44.76</b>
27	174	Crested Francolin	56	38	97.44	66.67	18	54.55	51.32	<b>42.89</b>
28	706	Lesser Grey Shrike	32	25	64.10	14.29	7	21.21	14.29	<b>42.89</b>
29	413	Lilac-breasted Roller	58	39	100.00	75.00	19	57.58	42.86	<b>42.42</b>
30	137	Wahlberg's Eagle	49	34	87.18	30.95	15	45.45	25.00	<b>41.72</b>
31	91	Knob-billed Duck	29	23	58.97	20.00	6	18.18	13.68	<b>40.79</b>
32	75	Saddle-billed Stork	29	23	58.97	19.44	6	18.18	22.50	<b>40.79</b>
33	755	Marico Sunbird	48	33	84.62	25.00	15	45.45	25.00	<b>39.16</b>
34	108	Lappet-faced Vulture	28	22	56.41	18.33	6	18.18	6.40	<b>38.23</b>
35	109	White-headed Vulture	28	22	56.41	14.29	6	18.18	6.52	<b>38.23</b>
36	657	Grey Tit-Flycatcher	34	25	64.10	20.00	9	27.27	20.00	<b>36.83</b>
37	328	Brown-headed Parrot	44	30	76.92	28.57	14	42.42	29.17	<b>34.50</b>
38	654	Spotted Flycatcher	46	31	79.49	25.00	15	45.45	26.32	<b>34.03</b>
39	341	African Cuckoo	35	25	64.10	14.29	10	30.30	17.14	<b>33.80</b>
40	242	Crowned Lapwing	48	32	82.05	40.00	16	48.48	33.33	<b>33.57</b>
41	872	Cinnamon-breasted Bunting	41	28	71.79	18.61	13	39.39	20.00	<b>32.40</b>
42	835	Jameson's Firefinch	43	29	74.36	16.67	14	42.42	25.00	<b>31.93</b>
43	419	Green Wood-Hoopoe	56	36	92.31	41.43	20	60.61	47.86	<b>31.70</b>
44	446	Bennett's Woodpecker	21	17	43.59	14.29	4	12.12	14.67	<b>31.47</b>
45	227	Black-bellied Bustard	25	19	48.72	21.21	6	18.18	25.36	<b>30.54</b>

Rank	Ref no.	Species name	Total range	KNP range	Percentage range KNP	KNP Median Rep Rate	Outside range	Percentage range Outside	Outside Median Rep Rate	Difference in range
46	119	Amur Falcon	27	20	51.28	18.18	7	21.21	12.50	<b>30.07</b>
47	348	Jacobin Cuckoo	42	28	71.79	21.61	14	42.42	21.21	<b>29.37</b>
48	145	Brown Snake-Eagle	55	35	89.74	25.00	20	60.61	25.00	<b>29.14</b>
49	352	Diderick Cuckoo	55	35	89.74	25.00	20	60.61	25.00	<b>29.14</b>
50	421	Common Scimitarbill	55	35	89.74	37.50	20	60.61	40.95	<b>29.14</b>
51	468	Flappet Lark	31	22	56.41	23.21	9	27.27	29.91	<b>29.14</b>
52	347	Levaillant's Cuckoo	35	24	61.54	22.08	11	33.33	20.00	<b>28.21</b>
53	183	Natal Spurfowl	59	37	94.87	66.67	22	66.67	50.00	<b>28.21</b>
54	339	Grey Go-away-bird	59	37	94.87	80.00	22	66.67	75.74	<b>28.21</b>
55	599	Willow Warbler	48	31	79.49	25.00	17	51.52	25.00	<b>27.97</b>
56	451	Bearded Woodpecker	48	31	79.49	22.22	17	51.52	33.33	<b>27.97</b>
57	837	Red-billed Firefinch	37	25	64.10	16.00	12	36.36	24.26	<b>27.74</b>
58	404	European Bee-eater	61	38	97.44	40.00	23	69.70	29.63	<b>27.74</b>
59	73	Marabou Stork	26	19	48.72	10.00	7	21.21	14.29	<b>27.51</b>
60	426	Southern Yellow-billed Hornbill	63	39	100.00	83.33	24	72.73	59.82	<b>27.27</b>
61	735	Wattled Starling	41	27	69.23	30.00	14	42.42	25.00	<b>26.81</b>
62	110	Hooded Vulture	34	23	58.97	22.10	11	33.33	25.00	<b>25.64</b>
63	173	Coqui Francolin	23	17	43.59	14.29	6	18.18	19.64	<b>25.41</b>
64	162	Gabar Goshawk	27	19	48.72	11.11	8	24.24	11.93	<b>24.48</b>
65	533	Arrow-marked Babbler	64	39	100.00	75.00	25	75.76	57.14	<b>24.24</b>
66	501	Red-breasted Swallow	53	33	84.62	30.00	20	60.61	25.00	<b>24.01</b>
67	814	White-winged Widowbird	42	27	69.23	14.29	15	45.45	25.00	<b>23.78</b>
68	629	Zitting Cisticola	44	28	71.79	20.83	16	48.48	26.79	<b>23.31</b>
69	264	Wood Sandpiper	33	22	56.41	21.83	11	33.33	14.81	<b>23.08</b>
70	238	Three-banded Plover	46	29	74.36	37.50	17	51.52	25.00	<b>22.84</b>
71	730	Southern White-crowned Shrike	22	16	41.03	14.33	6	18.18	14.29	<b>22.84</b>

Rank	Ref no.	Species name	Total range	KNP range	Percentage range KNP	KNP Median Rep Rate	Outside range	Percentage range Outside	Outside Median Rep Rate	Difference in range
72	369	Verreaux's Eagle-Owl	24	17	43.59	11.11	7	21.21	12.50	<b>22.38</b>
73	274	Water Thick-knee	37	24	61.54	41.43	13	39.39	25.00	<b>22.14</b>
74	731	Brubru	61	37	94.87	48.48	24	72.73	34.85	<b>22.14</b>
75	77	Woolly-necked Stork	28	19	48.72	14.29	9	27.27	18.18	<b>21.45</b>
76	192	Helmeted Guineafowl	56	34	87.18	34.17	22	66.67	42.02	<b>20.51</b>
77	72	Hamerkop	47	29	74.36	36.11	18	54.55	34.31	<b>19.81</b>
78	874	Golden-breasted Bunting	60	36	92.31	40.00	24	72.73	50.00	<b>19.58</b>
79	714	Brown-crowned Tchagra	62	37	94.87	40.00	25	75.76	33.33	<b>19.11</b>
80	432	Acacia Pied Barbet	29	19	48.72	16.67	10	30.30	13.39	<b>18.41</b>
81	245	Blacksmith Lapwing	42	26	66.67	62.50	16	48.48	26.79	<b>18.18</b>
82	615	Stierling's Wren-Warbler	33	21	53.85	14.29	12	36.36	23.61	<b>17.48</b>
83	727	White-crested Helmet-Shrike	48	29	74.36	28.57	19	57.58	33.33	<b>16.78</b>
84	54	Grey Heron	37	23	58.97	37.50	14	42.42	25.46	<b>16.55</b>
85	129	Yellow-billed Kite	39	24	61.54	18.33	15	45.45	18.18	<b>16.08</b>
86	527	Southern Black Tit	63	37	94.87	66.67	26	78.79	58.20	<b>16.08</b>
87	439	Crested Barbet	63	37	94.87	61.11	26	78.79	63.33	<b>16.08</b>
88	141	African Hawk-Eagle	28	18	46.15	13.39	10	30.30	14.29	<b>15.85</b>
89	263	Common Greenshank	28	18	46.15	10.56	10	30.30	13.39	<b>15.85</b>
90	318	Namaqua Dove	32	20	51.28	16.67	12	36.36	19.64	<b>14.92</b>
91	600	Yellow-bellied Eremomela	23	15	38.46	11.11	8	24.24	9.62	<b>14.22</b>
92	106	Cape Vulture	23	15	38.46	7.14	8	24.24	16.82	<b>14.22</b>
93	89	Egyptian Goose	49	29	74.36	57.14	20	60.61	46.43	<b>13.75</b>
94	728	Retz's Helmet-Shrike	25	16	41.03	18.59	9	27.27	25.00	<b>13.75</b>
95	493	Barn Swallow	66	38	97.44	53.57	28	84.85	50.00	<b>12.59</b>
96	839	Blue Waxbill	68	39	100.00	75.00	29	87.88	75.00	<b>12.12</b>
97	149	African Fish-Eagle	44	26	66.67	28.57	18	54.55	37.04	<b>12.12</b>

Rank	Ref no.	Species name	Total range	KNP range	Percentage range KNP	KNP Median Rep Rate	Outside range	Percentage range Outside	Outside Median Rep Rate	Difference in range
98	351	Klaas's Cuckoo	44	26	66.67	15.14	18	54.55	25.00	12.12
99	723	Grey-headed Bush-Shrike	59	34	87.18	42.22	25	75.76	40.00	11.42
100	788	Yellow-throated Petronia	35	21	53.85	22.22	14	42.42	24.88	11.42
101	163	Dark Chanting Goshawk	24	15	38.46	6.25	9	27.27	20.95	11.19
102	258	Common Sandpiper	26	16	41.03	14.29	10	30.30	15.26	10.72
103	418	African Hoopoe	52	30	76.92	28.34	22	66.67	40.37	10.26
104	673	Chinspot Batis	67	38	97.44	76.55	29	87.88	72.73	9.56
105	642	Rattling Cisticola	69	39	100.00	85.71	30	90.91	75.00	9.09
106	317	Laughing Dove	69	39	100.00	55.47	30	90.91	75.00	9.09
107	850	Purple Indigobird	21	13	33.33	10.00	8	24.24	11.69	9.09
108	373	Fiery-necked Nightjar	21	13	33.33	16.67	8	24.24	28.10	9.09
109	450	Cardinal Woodpecker	58	33	84.62	25.00	25	75.76	33.33	8.86
110	171	African Harrier-Hawk	34	20	51.28	10.56	14	42.42	24.88	8.86
111	383	White-rumped Swift	36	21	53.85	19.44	15	45.45	25.00	8.39
112	100	White-faced Whistling Duck	36	21	53.85	22.22	15	45.45	28.57	8.39
113	55	Black-headed Heron	25	15	38.46	6.67	10	30.30	22.50	8.16
114	154	Steppe Buzzard	27	16	41.03	11.81	11	33.33	14.81	7.69
115	447	Golden-tailed Woodpecker	53	30	76.92	24.12	23	69.70	25.00	7.23
116	228	African Jacana	29	17	43.59	40.00	12	36.36	25.00	7.23
117	4131	Burchell's Coucal	66	37	94.87	47.22	29	87.88	47.06	6.99
118	161	Shikra	20	12	30.77	6.11	8	24.24	8.37	6.53
119	607	Marsh Warbler	20	12	30.77	4.88	8	24.24	26.79	6.53
120	737	Cape Glossy Starling	68	38	97.44	71.83	30	90.91	83.18	6.53
121	316	Cape Turtle-Dove	70	39	100.00	96.67	31	93.94	75.00	6.06
122	715	Black-crowned Tchagra	70	39	100.00	66.67	31	93.94	54.55	6.06
123	621	Long-billed Crombec	70	39	100.00	66.67	31	93.94	62.50	6.06

Rank	Ref no.	Species name	Total range	KNP range	Percentage range KNP	KNP Median Rep Rate	Outside range	Percentage range Outside	Outside Median Rep Rate	Difference in range
124	627	Green-backed Camaroptera	63	35	89.74	40.00	28	84.85	50.00	4.90
125	392	Red-faced Mousebird	63	35	89.74	37.50	28	84.85	50.00	4.90
126	719	Orange-breasted Bush-Shrike	67	37	94.87	51.38	30	90.91	50.00	3.96
127	4142	Southern Grey-headed Sparrow	69	38	97.44	63.06	31	93.94	57.14	3.50
128	736	Violet-backed Starling	47	26	66.67	20.00	21	63.64	27.27	3.03
129	63	Green-backed Heron	36	20	51.28	31.69	16	48.48	25.00	2.80
130	792	Lesser Masked-Weaver	36	20	51.28	11.81	16	48.48	21.76	2.80
131	323	African Green-Pigeon	53	29	74.36	33.33	24	72.73	42.73	1.63
132	247	African Wattled Lapwing	20	11	28.21	10.00	9	27.27	25.00	0.93
133	6	Little Grebe	20	11	28.21	30.00	9	27.27	50.00	0.93
134	380	African Black Swift	22	12	30.77	7.88	10	30.30	25.00	0.47
135	321	Emerald-spotted Wood-Dove	70	38	97.44	81.67	32	96.97	69.05	0.47
136	647	Croaking Cisticola	24	13	33.33	20.00	11	33.33	25.00	0.00
137	588	White-browed Scrub-Robin	72	39	100.00	65.15	33	100.00	83.87	0.00
138	803	Southern Masked-Weaver	52	28	71.79	21.71	24	72.73	31.18	-0.93
139	656	Ashy Flycatcher	21	11	28.21	33.33	10	30.30	23.03	-2.10
140	712	Black-backed Puffback	69	37	94.87	70.00	32	96.97	67.54	-2.10
141	649	Tawny-flanked Prinia	71	38	97.44	71.43	33	100.00	100.00	-2.56
142	662	Pale Flycatcher	36	19	48.72	14.29	17	51.52	25.00	-2.80
143	517	Fork-tailed Drongo	68	36	92.31	84.52	32	96.97	94.35	-4.66
144	846	Pin-tailed Whydah	46	24	61.54	16.67	22	66.67	31.62	-5.13
145	146	Black-chested Snake-Eagle	22	11	28.21	5.56	11	33.33	20.00	-5.13
146	808	Southern Red Bishop	24	12	30.77	7.75	12	36.36	14.29	-5.59
147	386	Alpine Swift	24	12	30.77	5.16	12	36.36	25.00	-5.59
148	513	Black Cuckooshrike	39	20	51.28	21.11	19	57.58	25.00	-6.29
149	682	African Paradise-Flycatcher	52	27	69.23	25.00	25	75.76	33.33	-6.53

Rank	Ref no.	Species name	Total range	KNP range	Percentage range KNP	KNP Median Rep Rate	Outside range	Percentage range Outside	Outside Median Rep Rate	Difference in range
150	576	African Stonechat	28	14	35.90	11.81	14	42.42	25.00	<b>-6.53</b>
151	343	Red-chested Cuckoo	41	21	53.85	22.73	20	60.61	25.00	<b>-6.76</b>
152	130	Black-shouldered Kite	41	21	53.85	14.29	20	60.61	25.00	<b>-6.76</b>
153	409	White-fronted Bee-eater	21	10	25.64	31.51	11	33.33	25.00	<b>-7.69</b>
154	47	White-breasted Cormorant	21	10	25.64	9.25	11	33.33	25.00	<b>-7.69</b>
155	637	Neddicky	58	30	76.92	25.00	28	84.85	47.58	<b>-7.93</b>
156	410	Little Bee-eater	58	30	76.92	21.67	28	84.85	50.00	<b>-7.93</b>
157	499	Grey-rumped Swallow	25	12	30.77	4.88	13	39.39	50.00	<b>-8.62</b>
158	582	White-throated Robin-Chat	49	25	64.10	20.00	24	72.73	29.17	<b>-8.62</b>
159	709	Southern Boubou	62	32	82.05	39.00	30	90.91	38.10	<b>-8.86</b>
160	442	Lesser Honeyguide	29	14	35.90	6.16	15	45.45	25.00	<b>-9.56</b>
161	521	Black-headed Oriole	66	34	87.18	52.71	32	96.97	50.00	<b>-9.79</b>
162	458	Rufous-naped Lark	55	28	71.79	25.00	27	81.82	50.00	<b>-10.02</b>
163	859	Yellow-fronted Canary	68	35	89.74	46.67	33	100.00	81.48	<b>-10.26</b>
164	503	Lesser Striped Swallow	59	30	76.92	38.00	29	87.88	50.00	<b>-10.96</b>
165	394	Pied Kingfisher	35	17	43.59	41.67	18	54.55	25.00	<b>-10.96</b>
166	692	African Pipit	50	25	64.10	20.00	25	75.76	50.00	<b>-11.66</b>
167	395	Giant Kingfisher	26	12	30.77	22.50	14	42.42	25.00	<b>-11.66</b>
168	530	Grey Penduline-Tit	28	13	33.33	15.00	15	45.45	25.00	<b>-12.12</b>
169	625	Yellow-breasted Apalis	65	33	84.62	44.00	32	96.97	52.27	<b>-12.35</b>
170	344	Black Cuckoo	32	15	38.46	14.29	17	51.52	25.00	<b>-13.05</b>
171	397	Malachite Kingfisher	32	15	38.46	12.71	17	51.52	25.00	<b>-13.05</b>
172	664	Southern Black Flycatcher	56	28	71.79	29.00	28	84.85	50.00	<b>-13.05</b>
173	791	Spectacled Weaver	56	28	71.79	25.00	28	84.85	50.00	<b>-13.05</b>
174	50	Reed Cormorant	32	15	38.46	16.67	17	51.52	50.00	<b>-13.05</b>
175	160	African Goshawk	21	9	23.08	9.38	12	36.36	25.00	<b>-13.29</b>

Rank	Ref no.	Species name	Total range	KNP range	Percentage range KNP	KNP Median Rep Rate	Outside range	Percentage range Outside	Outside Median Rep Rate	Difference in range
176	385	Little Swift	49	24	61.54	25.79	25	75.76	28.57	-14.22
177	84	Hadeda Ibis	49	24	61.54	37.30	25	75.76	50.00	-14.22
178	833	African Firefinch	25	11	28.21	12.71	14	42.42	23.71	-14.22
179	203	Black Crake	38	18	46.15	30.75	20	60.61	25.00	-14.45
180	797	Village Weaver	40	19	48.72	20.00	21	63.64	50.00	-14.92
181	402	Brown-hooded Kingfisher	64	32	82.05	39.70	32	96.97	66.67	-14.92
182	763	White-bellied Sunbird	61	30	76.92	31.94	31	93.94	75.00	-17.02
183	545	Dark-capped Bulbul	65	32	82.05	42.86	33	100.00	100.00	-17.95
184	431	Black-collared Barbet	56	27	69.23	33.33	29	87.88	75.00	-18.65
185	403	Striped Kingfisher	36	16	41.03	10.10	20	60.61	31.37	-19.58
186	685	African Pied Wagtail	33	14	35.90	53.75	19	57.58	40.00	-21.68
187	580	White-browed Robin-Chat	28	11	28.21	22.00	17	51.52	25.93	-23.31
188	1172	Cape White-eye	21	7	17.95	12.50	14	42.42	21.32	-24.48
189	557	Groundscraper Thrush	36	15	38.46	28.57	21	63.64	25.00	-25.17
190	774	Scarlet-chested Sunbird	36	15	38.46	20.00	21	63.64	37.50	-25.17
191	644	Red-faced Cisticola	51	23	58.97	27.78	28	84.85	36.07	-25.87
192	546	Terrestrial Brownbul	27	10	25.64	17.81	17	51.52	25.00	-25.87
193	387	African Palm-Swift	39	16	41.03	13.39	23	69.70	25.00	-28.67
194	144	Lizard Buzzard	28	10	25.64	6.70	18	54.55	25.00	-28.90
195	721	Gorgeous Bush-Shrike	21	6	15.38	12.05	15	45.45	25.00	-30.07
196	551	Sombre Greenbul	58	26	66.67	30.95	32	96.97	62.96	-30.30
197	804	Thick-billed Weaver	25	8	20.51	7.74	17	51.52	25.00	-31.00
198	843	Common Waxbill	51	22	56.41	23.54	29	87.88	50.00	-31.47
199	771	Collared Sunbird	29	10	25.64	30.95	19	57.58	25.00	-31.93
200	61	Cattle Egret	44	18	46.15	10.80	26	78.79	66.67	-32.63
201	496	Wire-tailed Swallow	46	19	48.72	25.00	27	81.82	33.33	-33.10



Rank	Ref no.	Species name	Total range	KNP range	Percentage range KNP	KNP Median Rep Rate	Outside range	Percentage range Outside	Outside Median Rep Rate	Difference in range
202	552	Kurrichane Thrush	50	21	53.85	21.09	29	87.88	50.00	<b>-34.03</b>
203	704	Yellow-throated Longclaw	54	23	58.97	24.24	31	93.94	50.00	<b>-34.97</b>
204	314	Red-eyed Dove	51	21	53.85	16.67	30	90.91	50.00	<b>-37.06</b>
205	772	Amethyst Sunbird	26	7	17.95	4.97	19	57.58	33.33	<b>-39.63</b>
206	813	Red-collared Widowbird	20	3	7.69	0.78	17	51.52	25.00	<b>-43.82</b>
207	337	Purple-crested Turaco	33	10	25.64	49.24	23	69.70	54.55	<b>-44.06</b>
208	823	Bronze Mannikin	35	11	28.21	12.50	24	72.73	50.00	<b>-44.52</b>
209	390	Speckled Mousebird	48	17	43.59	14.29	31	93.94	50.00	<b>-50.35</b>
210	437	Yellow-fronted Tinkerbird	32	8	20.51	8.33	24	72.73	50.00	<b>-52.21</b>
211	784	House Sparrow	35	9	23.08	9.38	26	78.79	70.83	<b>-55.71</b>
212	707	Common Fiscal	28	4	10.26	7.25	24	72.73	70.83	<b>-62.47</b>
213	522	Pied Crow	32	5	12.82	3.87	27	81.82	50.00	<b>-69.00</b>