



## Research article

# Features of the use of ungulates by oxpeckers (*Buphagus*) in central Kenya

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## Abstract

A detailed multi-year observational study of Red-Billed (RB) oxpecker (*Buphagus erythrorhynchus*) and yellow-billed (YB) oxpecker (*B. africanus*) occurrence on a range of ungulate species was performed in two Kenyan national parks. Surprisingly observation of over 2100 individual Kongoni, in group sizes of 1 to > 50, revealed a total absence of oxpeckers, of either species, on Kongoni (*Alcephalus buselaphus*: subfamily Alcephalinae) in Nairobi National Park (NNP), although it was one of the most common bovid species present. There is no population of *A. buselaphus* at the second study site in central Kenya, Lake Nakuru National Park (LNNP). By contrast, the Impala (*Aepyceros melampus*), a smaller species, whose taxonomic status is phylogenetically ambiguous, but is widely considered to have evolved relatively recently in Africa, was a frequent oxpecker host in both NNP (29% of animals observed) and LNNP (12.9% of individual animals observed). Two species of gazelle Thompson's gazelle (*Gazella rufifrons*) and Grant's gazelle (*G. granti*), subfamily Gazellinae, which were present in both parks but in relatively low abundance, were also not observed to host oxpeckers. The reason for these bovid subfamilies, apparently not being utilized as oxpecker hosts in central Kenya, is unclear and requires further research.

## Introduction

Red-Billed (RB) and Yellow-Billed (YB) Oxpeckers (*Buphagus erythrocynchus*) and (*Buphagus africanus*) are two species in an avian genus that is related to the Sturnidae (starlings), but endemic to sub-Saharan Africa. The genus occupies an unusual niche, in that their foraging is by feeding on ungulates, with their nutrition derived from parasitic ixodid ticks, host blood and skin, tears, and earwax [1]. The hosts comprise a wide range of species within the Bovidae and other ungulate families, with *B. africanus* apparently preferring larger species, particularly Rhinocerotidae, Hippopotamidae, and Giraffidae [2]. However, some studies suggest that the association of Oxpeckers and their hosts is not necessarily entirely mutualistic [3,4] with experimental evidence that at least for RB oxpeckers in domestic cattle systems, there is no demonstrable evidence for tick burden reduction by oxpeckers. The hypothesis that the interaction is not always mutualistic is supported by the fact that active resistance to the attention of oxpeckers is also sometimes observed. One bovid that resists

infestation frequently is the Waterbuck (*Kobus ellipsiprymnus*) in Lake Nakuru NP [5].

The Alcelaphinae (comprising the genera *Alcelaphus*, *Damaliscus*, and *Connochaetes*) and the Gazellinae genus (*Gazella*) are distinct lineages within the family Bovidae [6]. Kongoni (*Alcephalus Bucephalus*) is one of the most common ungulates present in NNP, Kenya, although the species is absent from LNNP, located approximately 100 miles West in the Rift Valley. A significant fraction of the oxpecker research literature documents data derived from studies in Southern Africa frequently involving captive animals [7], whereas East African oxpecker studies, are scarce. We performed systematic observations of oxpeckers that were present on ungulates in both Nairobi National park and Lake Nakuru National Park in Kenya, over seven years between 1993 and 2000. The two oxpecker species (YB and RB) are sympatric in Nairobi National park, but only RB oxpeckers occur in LNNP. The distribution of RB oxpeckers is almost universal within Kenya, with YB oxpeckers being more local in their distribution. However, YB

oxpeckers are more widespread in their overall distribution in sub-Saharan Africa than RB oxpeckers, extending into West Africa where RB is absent [2].

Our study aimed to identify major the hosts of yellow and red-billed oxpeckers in NNP and red-billed oxpeckers in LNNP. One key limitation was the fact the transects that did not cover the entire park, so not every individual of each species of ungulate was sampled on each visit.

## Materials and methods

Seventy-four random visits were made to Nairobi National Park between February 1993 and April 2000. Thirteen random visits were made to Nakuru National Park between June 1993 and December 1999. The visits occurred across multiple seasons and weather conditions. Each visit involved driving a set route around the park. All ungulates encountered on the transect were scrutinized using high-resolution Leica binoculars, as already described [5] and notes were taken on the presence, absence, species, behavior, and location of oxpeckers on the animals. The duration of the observation varied with the size of the group of ungulates with larger groups taking more time to process. For the purposes of this study, the distribution of RB and YB oxpeckers in NNP has not been recorded separately. A map showing the location of the two study sites in central Kenya is shown in Figure 1.

## Results

During 74 random visits to Nairobi National Park, we scrutinized 2,173 Kongoni (*Alcelaphus busephalus*), in groups with numbers ranging from 1 (territorial males) to more than 50 (females with young). None of these animals carried oxpeckers of either the Yellow-billed or Red-billed species. The other species of Alcelaphine in Nairobi National park, the wildebeest (*Connochaetes taurinus*) is highly migratory, with large numbers present in the late dry season, but few or none in the wet season. Just 169 of 5059 (3%) carried oxpeckers. These wildebeest observations occurred primarily during the early years of the study, due to major population declines after 1995. None of the oxpeckers on wildebeest were noted as actively foraging, and all were red-billed, with no yellow-billed observed. By contrast, a significant percentage of Impala (*Aepyceros melampus*) herds hosted oxpeckers. Among 2,746 Impala, 814 individual animals (29%) carried oxpeckers that we were able to detect (probably a minimum estimate due to birds missed in the larger groups). None of 287 Grant's gazelles (*Gazella granti*), or 70 Thompson's gazelles (*Gazella rufifrons*) carried any oxpeckers. In Lake Nakuru, where 13 random visits were made, there is no population of *A. busephalus*. No *Gazella* of either species, Grant's or Thompson's, carried oxpeckers, although the total numbers encountered were relatively small comprising only 45 and 178, respectively, of each species.

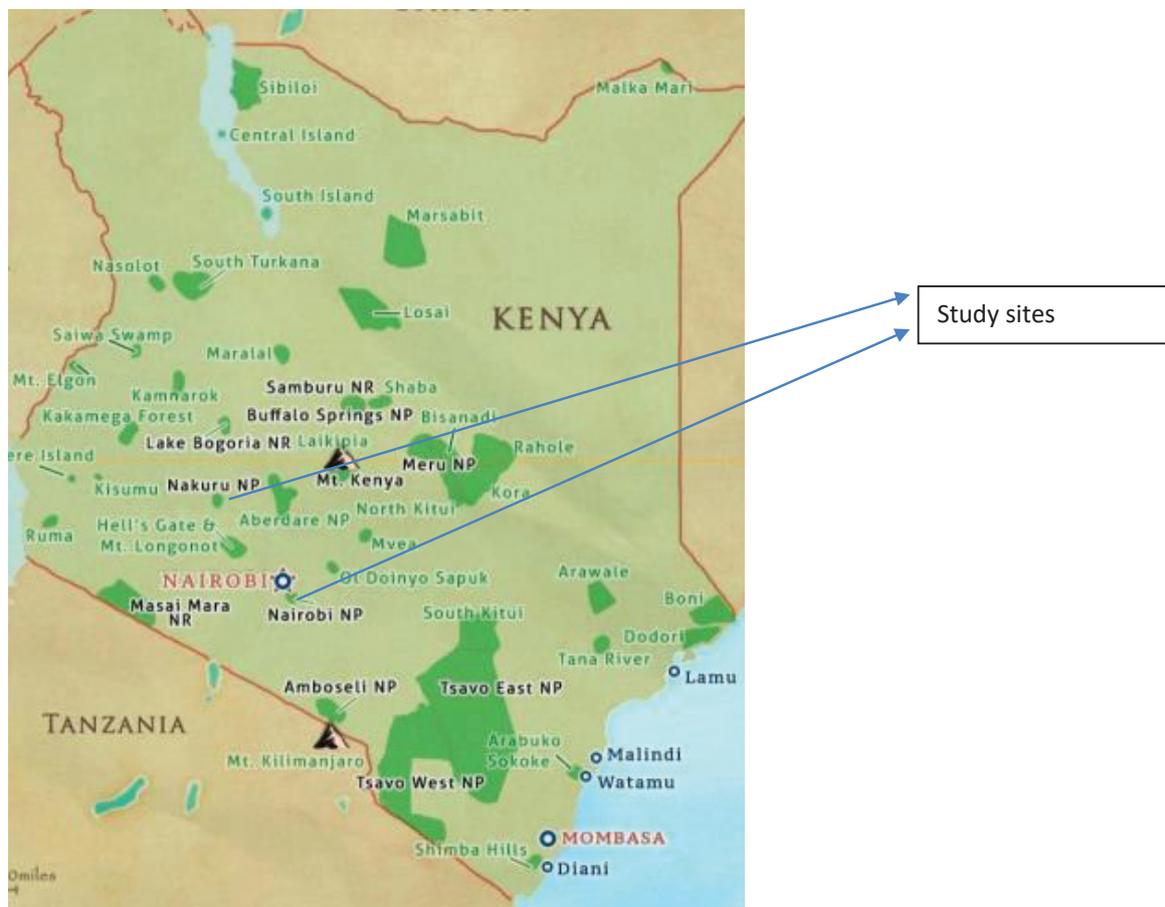


Figure 1: Map depicting the location of Nairobi NP and Lake Nalkuru study sites within Kenya.

However, 272 of 2102 (12.9%) of Impala hosted oxpeckers. In both national parks, the most frequent host by percentage was Cape buffalo (*Syncerus caffer*). In Lake Nakuru 14,61 of 1593 buffalo observed overall visits (92%) hosted red-billed oxpeckers. In Nairobi National Park 629 of a total of 968 (65%) Cape buffalo observed hosted oxpeckers. In Nairobi NP both oxpecker species occurred frequently in the same group, and sometimes on the same individual animals. Black Rhinoceros were also frequent hosts in Nairobi National park with 26 of 48 (54%) total animals observed carrying oxpeckers. A summary of all oxpeckers recorded on ungulates, in the two National parks is provided in Table 1.

## Discussion

The absence of oxpeckers on *Alcephalus buselaphus* in Nairobi NP is surprising, since the species is one of the most common ungulates in NNP and it is difficult to believe that this species is entirely free of ixodid tick infestation, although, in the absence of direct assessment of tick numbers, this possibility cannot be entirely excluded. We previously observed active resistance to oxpeckers in Waterbuck (*K. ellipsiprymnus*) in LNNP [5], although this species has been reported to be subject to heavy tick infestation [9]. A minority of Impala (*A. melampus*), which were relatively frequent hosts in both Kenyan parks, were observed to flick their heads presumably to remove the attentions of the oxpeckers, but the species was also frequently tolerant of oxpecker infestation, unlike the waterbuck in Lake Nakuru NP. Studies of YB oxpeckers on Impala in a game reserve in Zimbabwe indicated potential to benefit from oxpeckers in that they were distributed primarily on the head, ears, and neck, which had higher tick densities than other body regions and from which the impala could not remove ticks by grooming themselves [10]. Since no oxpeckers were observed to land on *A. buselaphus*, resistance behavior seems unlikely to explain the total absence of oxpeckers from this species. Neither additional *Alcelaphus* species and sub-species or *Damaliscus* species were present in our study area. However, recently, in October 2022, we observed 7 groups of a different hartebeest species, *Alcelaphus lichtensteini* (ranging in numbers from 1–6 per group), in Saadani National park (SNP), Tanzania, which did not host oxpeckers although two herds of buffalo and three individual Giraffe carried oxpeckers of both species in the SNP on the same date. This provides preliminary evidence that our result may extend to other ecosystems. In the future, it will interesting to extend this research to investigate,

whether other members of these two genera are not oxpecker hosts in other regions, within their extensive ranges, which span a large part of sub-Saharan Africa. Mooring and Munday and Nunn, et al. [10,11] suggest that ungulate size is typically a key predictor of ungulate feed preference. However, in our study Impala were relatively frequent oxpecker hosts, although *Aepyceros melampus* is considerably smaller than *Alcelaphus busephalus*. This suggests that size is an imperfect indicator of oxpecker preference in Kenya. Nunn, et al. [11], also argue that tick density is the key factor in oxpecker preference and that the association with the mammalian host is typically mutualistic. However, blood feeding has been noted on cattle in Zimbabwe, and field experiments did not indicate any reduction in tick burdens when oxpeckers were excluded, suggesting that the interaction of oxpeckers, at least with cattle which represent an evolutionarily recent host that is exotic to Africa, is not always mutualistic [3,4].

Oxpeckers observed on Wildebeest (*Connochaetes taurinus*), which are also classified in the tribe Alcelaphini, were never observed actively feeding, and may simply have been ‘hitching a ride on these highly mobile bovids, to minimize energy expenditure during foraging. In this context, it is interesting to note that wattled starlings (*Creatophora cinerea*) were quite frequently seen associating with wild mammals, including common Zebra (*Equus burchelli*) and Eland (*Taurotragus oryx*) in Nairobi NP, but never observed actively foraging. By contrast oxpeckers present on Impala were frequently observed apparently actively foraging, by ‘using a scissor action with their bills and also plucking, particularly in the ears and on the head and neck.

The general oxpecker host preference in Kenya for buffalo and impala was similar to that observed in other studies, for example recently in the field in Zimbabwe [12], suggesting that the absence of *A. busephalus* in Nairobi NP, may have a species-specific explanation, and is probably not due entirely to environmental factors in Nairobi NP. An explanation for the absence of oxpeckers on *A. busephalus* will require future additional research, particularly direct measurement of the number of ixodid ticks typically present on *A. busephalus*. As mentioned, it would also be interesting to determine if the host preferences of oxpeckers observed in this study extend to other parks and across a wider geographical range in sub-Saharan Africa.

**Table 1:** Number of ungulates and associated oxpeckers recorded in NNP and LNNP.

Ungulate species	Nairobi National Park (red and yellow-billed oxpeckers)			Nakuru National Park (yellow-billed oxpeckers only)		
	No. individuals observed	No. individuals with oxpeckers	% of ungulate hosts occupied	No. individuals observed	No. individuals with oxpeckers	% of ungulate hosts occupied
Cape Buffalo	968	629	65	1593	1461	92
Black rhinoceros	48	26	54	0	0	0
Impala	2746	814	29	2102	272	12.9
Maasai Giraffe	535	102	19	50	10	20
Wildebeest	5059	169	3	0	0	0
Kongoni	2173	0	0	0	0	0
Grant's gazelle	287	0	0	45	0	0
Thomson's gazelle	70	0	0	178	0	0



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