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INTERSPECIFIC COMPETITION BETWEEN OXPECKER *BUPHAGUS* SPECIES?

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Introduction

Oxpeckers are well known for their tick foraging capabilities. They have also been seen as possible parasites on their selected host ungulates, therefore sometimes referred to as vampires (Weeks, 2000). Most of the wound opening activity, which could be detrimental to the hosts, has been seen more captive and domesticated species, rather than in natural environments (Plantan, 2009).

Two species of oxpecker occur in the world, both of which occur in Africa, these include: Yellow-billed Oxpecker *Buphagus africanus* and Red-billed Oxpecker *B. erythrorhynchus*. They are related to the Starling family, Sturnidae; however some may argue that there is enough evidence to place them within their own family (Fry *et al.* 2000; Hockey *et al.* 2006).

The main difference between these two species, is that the Red-billed Oxpecker has a complete red beak, whereas as Yellow-billed Oxpecker has a yellow base with a red tip. The Yellow-billed Oxpeckers also has a pale rump, where Red-billed Oxpeckers have the rump the same colour as the body (Hockey *et al.* 2006).

However in areas where both oxpecker species occur, what govern their specific interest in particular host ungulates, and what prevent them from competing against one another?



Fig 1 – A Yellow-billed Oxpecker (left) and a Red-billed Oxpecker (right) to show the different characteristics between the species.

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Ecologically no two species within the same area can hold the exact same ecological or realised niche for a long period, otherwise one will out compete the other (Hardin, 1960). Some reference is made to body mass and surface area ratio of the host species, thus having a higher percentage of ectoparasites, and therefore having a greater tick yield. For the Yellow-billed Oxpecker their slightly larger body mass may indicate slightly greater needs than that of the Red-billed Oxpecker, therefore a higher tick yield of engorged adult ticks and immatures may be more beneficial (Mooring & Mundy, 1996; Nunn *et al.* 2011). In captivity Yellow-billed Oxpeckers was recorded as



eating 13 000 nymph ticks or 100 engorged adult ticks and Red-billed Oxpeckers 12 500 tick larvae or 100 engorged adult ticks per day (Stutterheim *et al.*, 1988). Both oxpeckers have been observed on a large variety of ungulates, and in some studies it is shown that the presence of Yellow-billed Oxpeckers on Impala *Aepyceros melampus* has assisted with reducing their grooming needs by up to 36% (Mooring & Mundy, 1996). It is well documented though that, larger ungulates are definitely more preferred by Yellow-billed Oxpecker.

In cases where both oxpecker species have been seen on the same host species together, principally in captivity, and in particular on Greater Kudu *Tragelaphus strepsiceros* the Yellow-billed Oxpecker was always dominant. However, few interactions like these have been observed in the wild (Stutterheim & Panagis, 1988).

This study was done to:

- establish which species within the study area are host(s) to one or both oxpecker species;
- investigate which host species they share;
- explore any interspecific competition between the two oxpecker species; and
- verify feeding requirements and needs as observed by Mooring & Mundy (1996) and Nunn *et al.* (2011). These researchers looked at body mass as well as parasite yield of the host species and to what extent these factors influence preference by the oxpeckers.

Study Area

The study area is the Makuleke Contract Park in northern Kruger National Park. The area is situated between the Limpopo River, which forms the border between Zimbabwe and South Africa, and the Luvuvhu River, which separates the Makuleke Contract Park

from the Greater Kruger National Park. This contract area is approximately 24 000 ha in extent and incorporates five main landscapes (Gertenbach, 1983). The Makuleke Contract Park forms part of the Pafuri management area of the Kruger National Park. The total area of Pafuri is said to cover only 1% of the Greater Kruger National Park surface area, yet 75% of the biodiversity can be found in this region. This can be contributed to the various landscapes and geology of the area (Gertenbach, 1983; Venter, 1990).

The Makuleke Contract Park became a contractual park in 1998, when the Makuleke community had won their land claim submitted in 1994/95. It was then decided to manage the area under the commercial rights of the Makuleke community, with the environmental management still under the South African National Parks (SANParks) (Harries, 1987; De Villiers, 1999; Child, 2004).

Within this study area there is a great variety of ungulates, some of which were reintroduced back into the area. White or Square-lipped Rhinoceros *Cerotherium simum simum* was reintroduced in 2005 (Pedersen, 2009). Efforts were made to reintroduce both Blue Wildebeest *Connochaetus taurinus taurinus* and Southern Giraffe *Giraffa camelopardalis giraffa* in the area. Neither of the two species did well, and Southern Giraffe left the area soon after these attempts were made.

The Makuleke Contract Park has a large diversity of over 420 bird species – it includes both oxpecker species. Yellow-billed Oxpecker was first re-discovered in South Africa in 1979 in the northern Kruger National Park (Hall-Martin, 1987; Whytte *et al.* 1987). Therefore the contract park was selected as the study site. Wilderness Safari's influence in the area made access to the site relatively easy.

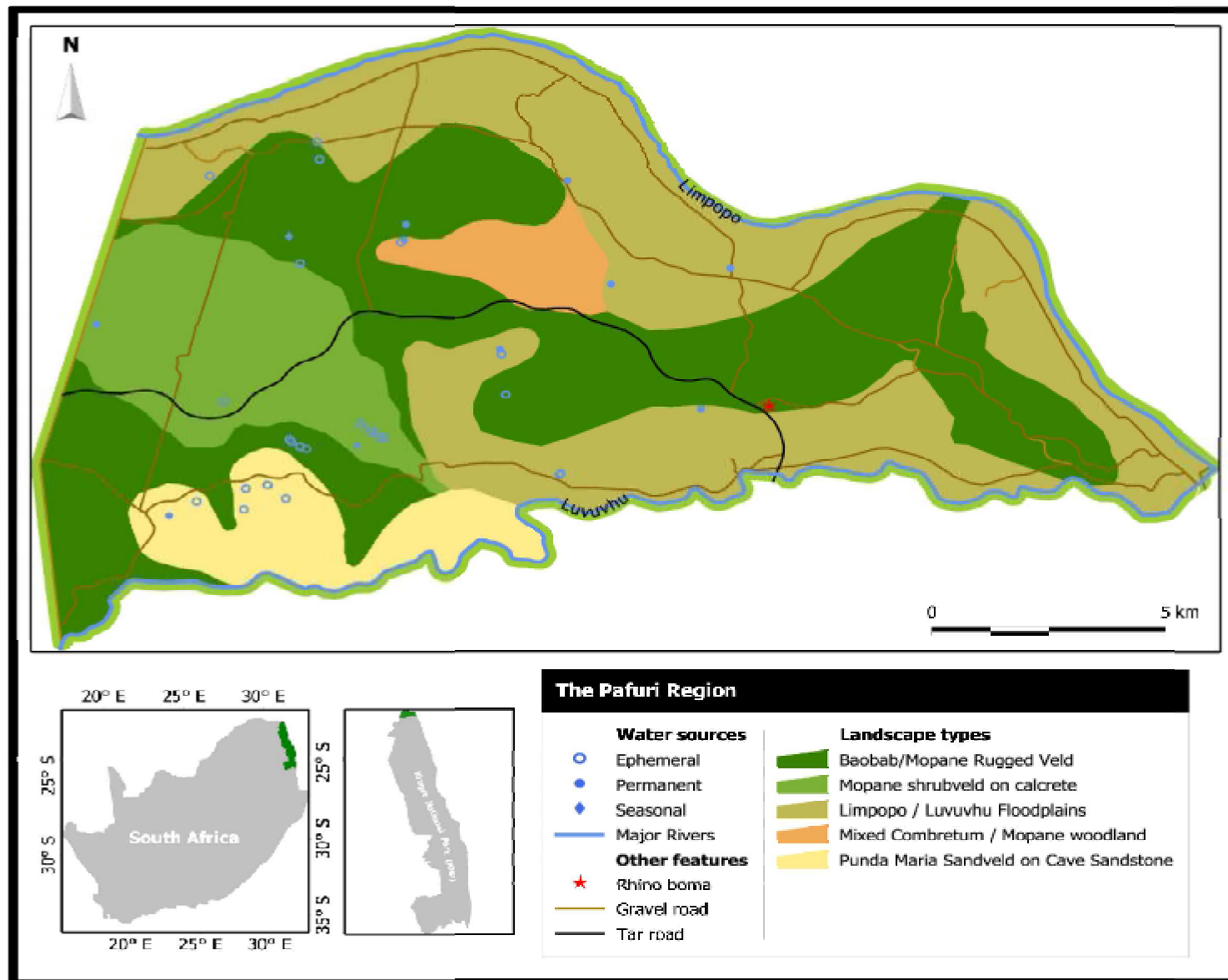


Fig 2 - Vegetation and area map of the Pafuri area, containing the Makuleke Contractual Park (Gertenbach, 1983).



Methodology

The study was done over a period of 9 months - April to December 2008.

All observations were recorded on field data sheets. Swarovski 10x42 binoculars were used to aid with viewing. Surveys were done on walks as well as drives through the study area. Records include all instances where oxpeckers were seen on a host ungulate, as well as those birds seen perched or flying overhead.

The following data were recorded:

- Observer
- Time and date
- Oxpecker species observed
- Number of individuals seen, adult and juveniles were recorded in separate columns
- Location in the study area (GPS coordinates)
- Host species
- Any interspecific competition observed, and which species was exerting it over which.
- Any additional comments and observations.

All manually recorded data were captured in MS Excel® for data analysis. Guides working at Pafuri Camp assisted with data recording in the field.

Distribution and presence of both oxpecker species within the Makuleke Contractual Park

Both species of oxpecker occur within the study area. For more than 60 years (1915-1979) Yellow-billed Oxpecker was absent from South

Africa (Stutterheim & Brooke, 1981) – the area south of the Limpopo River. It was first observed again in these northern parts of the Kruger National Park, which included the Makuleke Contractual Park. The study area was proclaimed part of the Kruger National Park in 1969 (Harries, 1987). It was assumed the oxpeckers had re-entered from Zimbabwe just north of the Limpopo River. The first breeding records after re-establishment were documented in 1985 (Hall-Martin, 1987; Whyte *et al.* 1987).

The present range of the species is further south into the Kruger National Park and they had been re-introduced into the KwaZulu-Natal Parks as well (Stutterheim & Panagis, 1985).

Red-billed Oxpecker were always present in these areas, as long as there were enough ungulate hosts in the region.

Red-billed Oxpecker has suffered in the past due to cattle dipping practices. Birds disappeared from certain areas and numbers declined in other regions due to this farming practices (Bezuidenhout & Stutterheim, 1980). As farming practices changed to be more eco-friendly the populations have recovered over the years. In some areas where they were affected most re-introduction programs were implemented (Lockwood, 1988).

Observed host preference displayed by both Oxpecker species

Yellow-billed Oxpecker

Yellow-billed Oxpeckers were more often observed on African (Cape) Buffalo *Syncerus caffer* (56%), followed by Greater Kudu (22%), Plains Zebra *Equus quagga* (16%), and two separate sightings on Impala. The findings corresponded with that of Grobler



and Charsley (1978), and Campbell (1989). Although White or Square-lipped Rhino was present in the area, it was only observed after the study period that Yellow-billed Oxpecker was present on them. The numbers of Rhino are low in the study area, sightings were not regular and all were made when observers were on foot.

Table 1: Results of sightings during field surveys for Yellow-billed Oxpecker

Host species	Number of sightings	Number of individual birds seen	Average number of birds seen per host
Impala <i>Aepyceros melampus</i>	2	4	2.00
Plains Zebra <i>Equus quagga</i>	5	8	1.60
Warthog <i>Phacochoerus africanus</i>	0	0	0.00
African (Cape) Buffalo <i>Syncerus caffer</i>	18	115	6.39
Nyala <i>Tragelaphus angasi</i>	0	0	0.00
Eland <i>Tragelaphus oryx</i>	0	0	0.00
Bushbuck <i>Tragelaphus scriptus</i>	0	0	0.00
Greater Kudu <i>Tragelaphus strepsiceros</i>	7	26	3.71
TOTAL	32	153	

From the results (Table 1 and Fig 3) it is clear that African Buffalo was by far the more frequented host species. In the case of Yellow-billed Oxpeckers it is not only tick load which is important, but also host species mass, which matches with the high percentage of sightings of Yellow-billed Oxpecker on African Buffalo. These results correspond with Mooring & Mundy (1996) and Nunn *et al.* (2011).

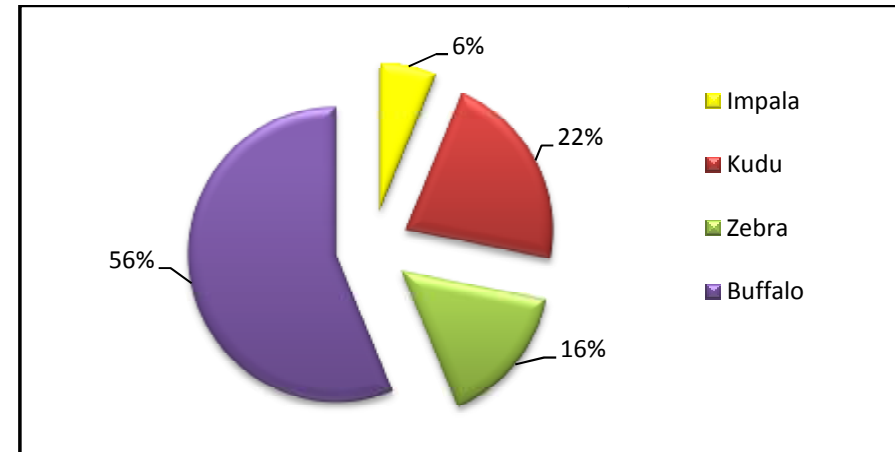


Fig 3 – Yellow-billed Oxpecker host preference as a percentage.

Red-billed Oxpecker

The results of the fieldwork for Red-billed Oxpecker are summarised in Table 2 and Fig 4.

Red-billed Oxpeckers have a wider range of host species than Yellow-billed Oxpecker - with Impala (31%) being the most preferred host, Greater Kudu (21%) and African Buffalo (16%) of the sightings.

Red-billed Oxpeckers were observed on the following species as well (Yellow-billed Oxpeckers were not seen on these hosts): Warthog *Phacochoerus africanus*, Nyala *Tragelaphus angasi*, Eland *Tragelaphus oryx*, and Bushbuck *Tragelaphus scriptus*. This species preference is similar to what was recorded and seen in Hwange National Park, Zimbabwe (Hustler, 1987), and the Moremi Game Reserve, Botswana (Stutterheim & Panagis, 1985a).

Both Bushbuck and Warthog tried to prevent the Red-billed Oxpeckers from landing and feeding on them.



Table 2: Results of sightings during field surveys for Red-billed Oxpecker

Host species	Number of sightings	Number of individual birds seen	Average number of birds seen per host
Impala <i>Aepyceros melampus</i>	31	79	2.55
Plains Zebra <i>Equus quagga</i>	10	39	3.90
Common Warthog <i>Phacochoerus africanus</i>	3	3	3.00
African Buffalo <i>Syncerus caffer</i>	16	84	5.25
Nyala <i>Tragelaphus angasi</i>	13	26	2.00
Eland <i>Tragelaphus oryx</i>	5	78	15.60
Bushbuck <i>Tragelaphus scriptus</i>	1	1	1.00
Greater Kudu <i>Tragelaphus strepsiceros</i>	21	47	2.24
TOTAL	100	357	

Even though there were only 5 different sightings of Red-billed Oxpeckers on Eland, in all cases they were in large flock densities. This resulted in the highest average number of 15.6 birds per host species.

Observations showing interspecific competition between the species of Oxpecker?

In Fig 5 the number of sightings per oxpecker species observed on the different host species is compared. Fig 6 compares the numbers of oxpeckers per oxpecker species observed on the different host species. From these graphs it is apparent that Red-billed Oxpeckers have a wider range of host species. It is clear that Yellow-billed

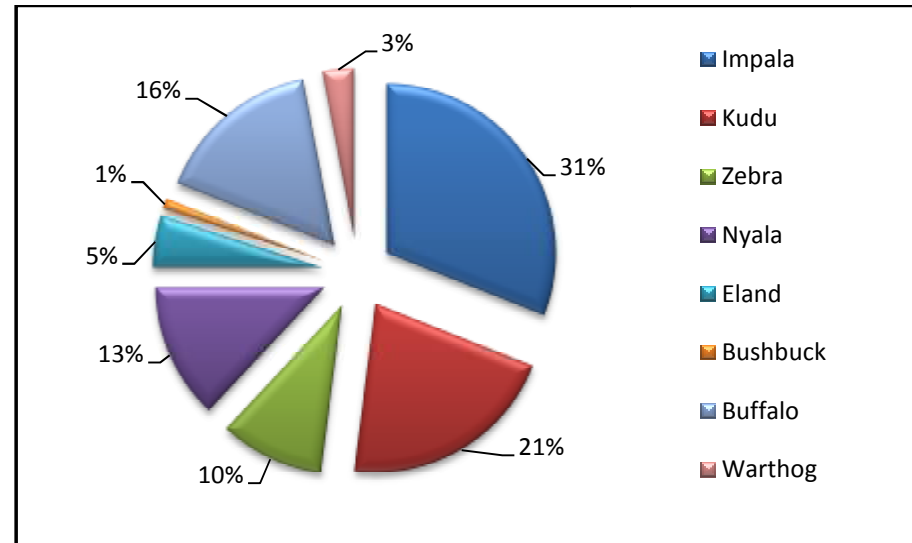


Fig 4 - Red-billed Oxpecker host preference as a percentage

Oxpeckers prefer the larger angulates – African Buffalo, Greater Kudu and Plains Zebra, with African Buffalo the favourite host.

Where both species were observed together on the same host at the same time, they were detected on African Buffalo and Greater Kudu. In the first instance Yellow-billed Oxpeckers occurred in higher numbers and in the second instance the number of birds of both species was the same on the host.(Fig 7).

In all the observations, it was never detected that one species of oxpecker would attempt to chase away the other. Interspecific competition therefore is limited to one species (Yellow-billed) being present in higher numbers than the other when the host (African Buffalo) was shared.

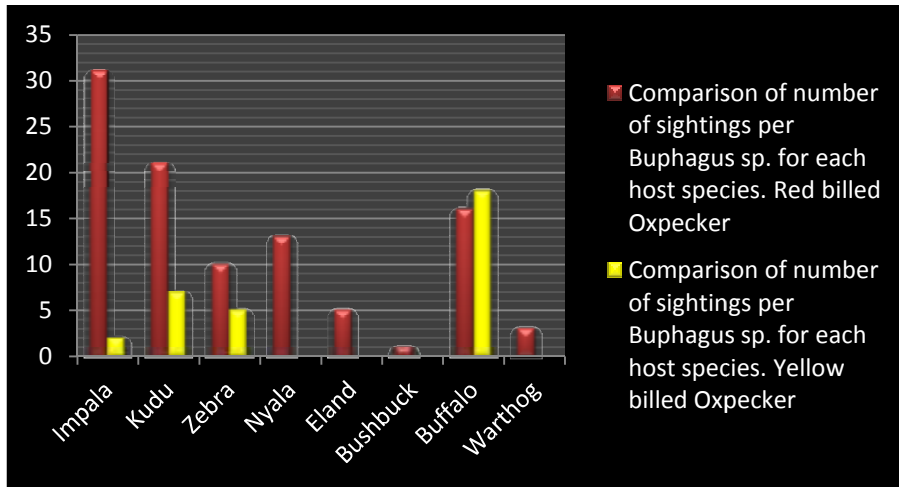


Fig 5 - Comparison of number of sightings per oxpecker species observed on different host species

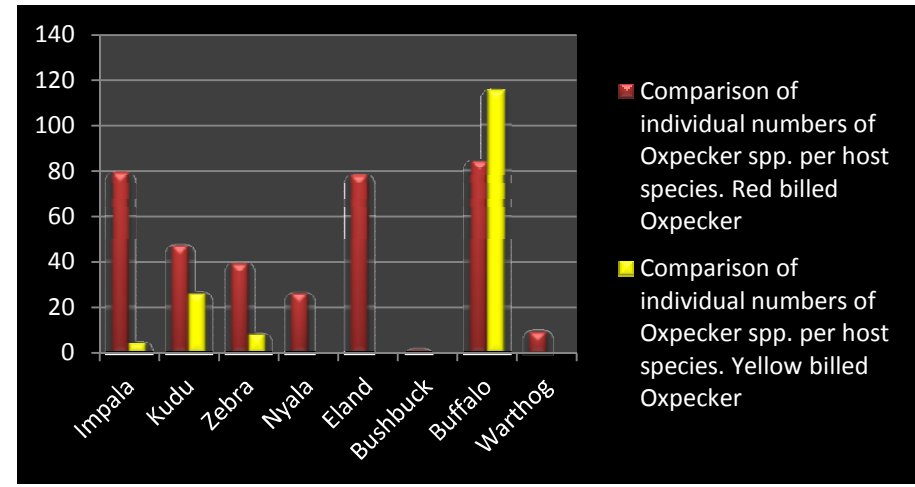


Fig 6 - Comparison of individual number of oxpecker species observed per host species

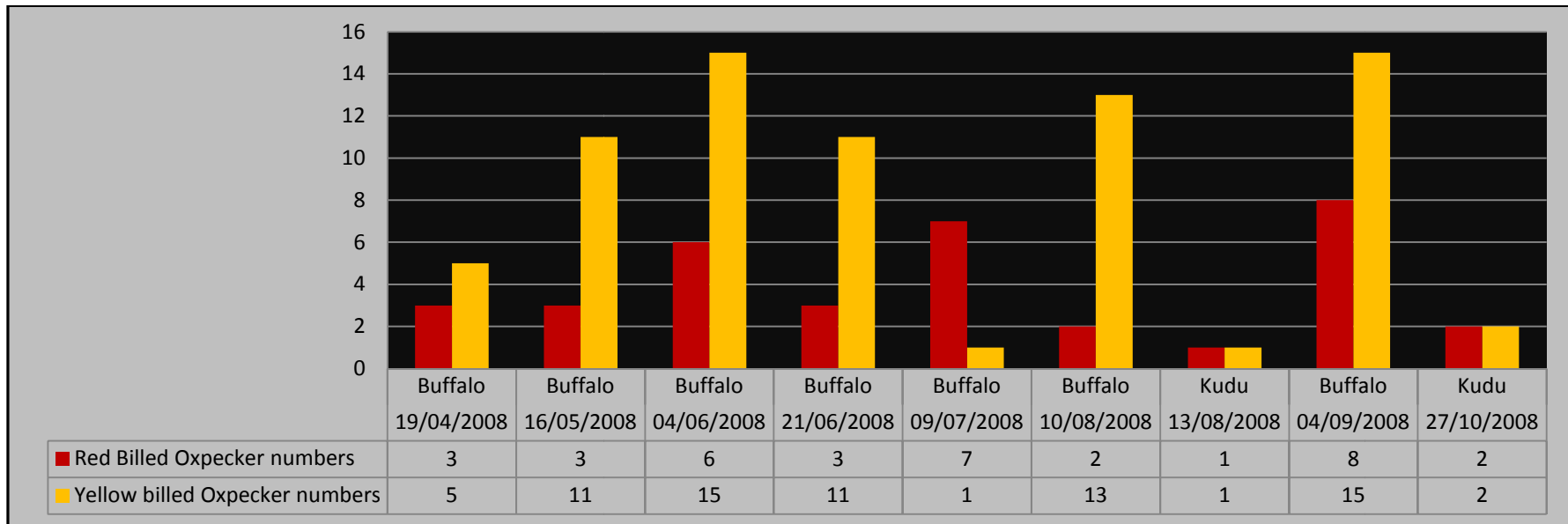


Fig 7 - Comparison of numbers of both oxpecker species occurring on same host species



Feeding biology of Oxpecker species

There are no clear indications of positive dominance or aggressive behaviour displayed between the two Oxpecker species when they share the same host species. What else could be governing the host preference and selection?

A number of papers on the feeding behaviour of oxpeckers pose the suggestion that oxpeckers are "vampires" and that they actually target host species to feed on blood by deliberately opening wounds to obtain fresh blood. Ticks drink blood, therefore they are targeted as a "bycatch" (Weeks, 2000). This may be true of captive or domesticated host species as in the Weeks study (1999), and as observed on captive Black Rhino (McElligott *et al.*, 2004). These papers conclude that oxpeckers are in fact more detrimental to their host species than beneficial.

On the other hand there are accounts and other studies to contradict this view. In studies on wild species parasitism was found to be of a lesser extent. Oxpecker species were more focussed on feeding on host species with a larger tick yield, African Buffalo being a very good example (Nunn *et al.*, 2011). I did not observe any opening of wounds on purpose during this current study.

However other observers have mentioned blood feeding by both Yellow-billed Oxpecker (McClellan, 1993) and Red-billed Oxpecker (Van Someren, 1951; Bezuidenhout & Stutterheim, 1980). Where the birds fed on (and around) wounds and opened them allowing the blood to flow, the wounds were also cleared of fly larvae. This in itself was beneficial to the host species. In the study carried out by Plantan (2009), it was confirmed that Red-billed Oxpeckers on wild host species in Kruger National Park exploited wounds, rather than creating wounds. This behaviour was observed on donkeys as well.

Red-billed Oxpeckers have been recorded to feed on four main genera of ticks: *Amblyomma*, *Hyalomma*, *Boophilus* and *Rhipicephalus* (Plantan, 2009). Some species are preferred with *A. herbreaum*, *B. decoloratus*, *H. truncatum* and *R. appendiculatus* (Brown-eared Tick) being well documented as favourites (Bezuidenhout & Stutterheim, 1980; Stutterheim, 1982; Stutterheim & Panagis, 1985; Stutterheim *et al.* 1988; Plantan, 2009). Red-billed Oxpeckers are further described as having 4 feeding mechanisms: scissoring, plucking, pecking and insect-catching (Bezuidenhout & Stutterheim, 1980). They obtain most food requirements from the host and this may include ear wax as well as flies and lice *Damalinia bovis* (Bezuidenhout & Stutterheim, 1980; Stutterheim & Bezuidenhout, 1988; Plantan, 2009). This species may also feed on termite alates, as a substitute food source. I observed this behaviour on 28 December 2008, when I came across Red-billed Oxpeckers hawking termite alates.

Both Oxpecker species have the same diet (Stutterheim *et al.*, 1988) however the intake by Yellow-billed Oxpecker was larger. This could be related to its larger body size to that Red-billed Oxpeckers. Yellow-billed Oxpecker weighs 60 g on average and Red-billed Oxpecker approximately 50 g (Hockey *et al.*, 2006) and thus having greater nutritional needs.

Conclusion

During this study, no observations were made of any of the two oxpecker species actually chasing one another away from a particular host. Nor were evidence of any other form of direct physical competition on a specific host.

Yellow-billed Oxpeckers were present in higher numbers than Red-billed Oxpeckers when they shared their host (Fig 7) – in particular



African Buffalo. At 45% more, it is almost double the number. In the average number of birds per host species sighting, Yellow-billed Oxpecker had an average of 6.39 individual birds per sighting, compared to 5.25 individual Red-billed Oxpeckers birds per sighting.

This larger number densities where they shared the same host species and then only on African Buffalo (Fig 7) may be the only form of "interspecific competition" – and this was in no instance related to physical interaction. The higher numbers can be related to larger nutritional needs as Yellow-billed Oxpeckers are slightly larger than their cousins.

In all studies Yellow-billed Oxpeckers preferred larger ungulates – larger body mass and higher tick yield (Grobler & Charsley, 1978; Stutterheim & Panagis, 1985; Hall-Martin, 1987; Hustler, 1987; Campbell, 1989; Mooring & Mundy, 1996; Nunn *et al.*, 2011). Red-billed Oxpeckers on the other hand has a wider selection of host species.

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