# Roosting behaviour and host selection of oxpeckers (Aves: Buphaginae) in Moremi Wildlife Reserve, Botswana, and eastern Caprivi, South West Africa

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Roosting behaviour and host preferences of oxpeckers were investigated in Moremi and eastern Caprivi. Redbilled oxpeckers were found on six mammal species in Moremi and two in Caprivi. Yellowbilled oxpeckers were found on two host species in Moremi and one in Caprivi. Redbilled oxpecker roosts were located in palm trees in Moremi, while yellowbilled oxpeckers roosted on their host species. Roosting by yellowbilled oxpeckers on their hosts is thought to be the result of their more limited choice of host species.
*S. Afr. J. Zool.* 1985, 20: 237 – 240

Slaapgewoontes en gasheervoorkeure van renostervoëls is in Moremi en oos Caprivi ondersoek. Rooibekrenostervoëls is op ses soogdierspesies in Moremi en twee in Caprivi gevind. Geelbekrenostervoëls is op twee gasheerspesies in Moremi en een in Caprivi gevind. Rooibekrenostervoëls slaap in palmbome in Moremi, terwyl geelbekrenostervoëls op hul gasheerspesies slaap. Dit word aanvaar dat die aanpassing van geelbekrenostervoëls om op hul gashere te slaap 'n gevolg is van hul meer beperkte keuse van gasheerspesies.
*S.-Afr. Tydskr. Dierk.* 1985, 20: 237 – 240

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Received 12 February 1985; accepted 10 June 1985



The redbilled oxpecker *Buphagus erythrorhynchus* and the yellowbilled oxpecker *B. africanus* form an endemic Afrotropical family. Both species are predators of ticks and other ectoparasites adapted to feeding on large herbivorous animals (Moreau 1933; Attwell 1966). Both species have similar habits, including nesting and feeding (Mengesha 1978), but there are important differences. One of these is the shape of the bill which possibly relates to food preferences (Stutterheim, Mundy & Cook 1976). However, the reason for their very different distribution in Africa remains obscure.

Redbilled oxpeckers roost in large groups in reed beds and trees (McLachlan & Liversidge 1981), in large dead trees in water (Newman 1983) and in clumps of large palm trees *Hyphaene natalensis* (Stutterheim 1976). However, Dowsett (1969) recorded redbilled oxpeckers roosting on buffaloes in the Luangwa Valley National Park in Zambia. Yellowbilled oxpeckers roost in dead acacia trees (Mundy & Cook 1974) and on a variety of host mammals (Dowsett 1969). Because of these conflicting reports the present investigation into the roosting behaviour of oxpeckers was undertaken.

Specific ecological requirements often favour group formation. Any attempt to understand the functional role of group composition must be combined with an understanding of the ecological requirements of the species involved. Host selection by oxpeckers has been recorded by Attwell (1966), Buskirk (1975), Stutterheim (1976, 1979), Grobler & Charsley (1978), and Grobler (1980). Although quantitative studies have been initiated in areas where the two species occur sympatrically (Stutterheim & Panagis 1985 and Huster, in prep) information on host preferences is lacking. It was therefore deemed necessary to conduct a limited investigation into host relationships in both the study areas.

## Methods

Two study areas in which both species were known to occur were selected: the Moremi Game Reserve in Botswana and the Eastern Caprivi Tribal Lands in SWA/Namibia. The major difference between the two areas is that oxpeckers occurred on game in Moremi, whereas the key host for both species in eastern Caprivi was cattle (Stutterheim & Panagis 1985). This information was supplemented by a study conducted at the Veterinary Research Institute at Onderstepoort on five redbilled and five yellowbilled oxpeckers obtained from eastern Caprivi and kept in captivity.

Counts of oxpeckers and herbivorous mammals were conducted from a vehicle and on foot following the methods of Stutterheim (1979). This was done over a distance of 351 km in Moremi and 1 661 km in eastern Caprivi between April

and June 1984. To illustrate differences in host selection, a preference index was calculated on the basis of one bird per number of individuals of a host species (i.e. mammal/oxpecker ratio) following the methods of Grobler (1980). Oxpecker roosts were located in Moremi by following a group of oxpeckers by vehicle from 17h00 until they went to roost, or by driving around looking for roosting birds. In eastern Caprivi one yellowbilled oxpecker was fitted with a radio transmitter and followed to its roosting site. Additional sightings were done by systematically searching cattle kraals by night with a spotlight.

Five redbilled and five yellowbilled oxpeckers were caught with mistnets and kept in captivity in two adjacent cages measuring 9m × 3m × 3m each containing a cow, a dead tree and a live palm tree for roosting purposes. Roosting behaviour was monitored over a period of eight days following the birds' introduction into the cages. During the day the percentage time the birds spent on the host was monitored using an instantaneous and scan sampling method (Altmann 1974). Every time the birds were visited the position and behaviour of the birds and mammals were recorded. No records were made if the birds showed any visible sign of being disturbed by the observer or any other external disturbance.

## Results

### Roosting behaviour

In Moremi redbilled oxpecker roosts were located in clumps of tall palm trees (*Hyphaene benguellensis*) in the drier parts of the floodplains. Groups of up to 20 redbilled oxpeckers were found to roost in these palms. Other oxpeckers seen flying to roosts could not be followed as they appeared to roost on the vegetated islands. Yellowbilled oxpeckers were found to roost on giraffes *Giraffa camelopardalis*. Group sizes varied from single birds to groups of nine birds per giraffe, although it was not always possible to obtain an accurate count of the birds on the animal. It was not possible to find buffaloes at night during the course of the present study, so that we could not establish whether yellowbilled oxpeckers also used buffaloes at night.

In the eastern Caprivi yellowbilled oxpeckers were located on cattle at night with the use of radio-telemetric equipment. As the yellowbilled oxpeckers only went down to the cattle after sunset, because of human disturbance, it was difficult to determine the actual number of birds in the roosting groups. Careful inspection of kraals at night revealed roosting yellowbilled oxpeckers on five occasions. No redbilled oxpeckers were seen roosting on cattle during the same period. Yellowbilled oxpeckers left the cattle before sunset in a southerly direction towards Botswana and returned again after sunset. It was not possible to find the exact location of redbilled oxpecker roosts in the Caprivi.

Observations on the captive birds supported the findings in the two study areas. When first introduced to the cages the redbilled oxpeckers attempted to sleep on the leaves of the small palm tree. They all attempted to huddle together on the same leaf, but it could not hold the combined weight. After numerous attempts to roost together on various leaves, the group split up. Three birds roosted on two different palm leaves, while the other two birds roosted together in the dry tree or alternatively on the crossbeams of the cage. The redbilled oxpeckers were never observed roosting on the mammal.

The yellowbilled oxpeckers were never observed to sleep away from the host and could be induced to leave the host only after severe disturbance, after which they always returned. The preferred site was the rump of the mammal. When disturbed they would quickly move to the opposite side of the mammal without making a sound. This behaviour may explain why they are so seldom observed sleeping on mammals under natural conditions.

### Host selection

The results from the counts for Moremi and Caprivi are presented in Tables 1 and 2 respectively. Of the 12 herbivorous mammal species counted in Moremi, six were attended by redbilled oxpeckers and only two, giraffe and buffalo *Syncerus caffer* were attended by yellowbilled oxpeckers. Of the two species used by yellowbilled oxpeckers only buffaloes were used more intensively by yellowbilled than by redbilled oxpeckers. Redbilled oxpeckers therefore seem more adaptable and capable of exploiting a wider range of host species.

In the eastern Caprivi redbilled oxpeckers frequented both cattle and goats, while yellowbilled oxpeckers were found only on cattle. There was no significant difference between the overall use of cattle by the two oxpecker species although regional differences were recorded by Stutterheim & Panagis (1985).

**Table 1** The mammal/oxpecker ratios in Moremi as calculated from counts conducted over 350 km in June 1984

| Mammal species | Number of mammals counted | Number of oxpeckers counted | Number of RBO[a] counted | Number of YBO[b] counted | Mammal/ oxpecker ratio | Mammal/ RBO ratio | Mammal/ YBO ratio |
|---|---|---|---|---|---|---|---|
| Buffalo | 70 | 20 | 6 | 14 | 11,67 | 5,00 | 3,50 |
| Giraffe | 45 | 27 | 18 | 9 | 2,50 | 5,00 | 1,667 |
| Kudu | 32 | 20 | 20 | – | 1,60 | – | 1,60 |
| Zebra | 16 | 7 | 7 | – | 2,29 | – | 2,29 |
| Wildebeest | 29 | 2 | 2 | – | 14,50 | – | 14,50 |
| Impala | 965 | 22 | 22 | – | 43,86 | – | 43,86 |
| Lechwe | 103 | – | – | – | – | – | – |
| Elephant | 75 | – | – | – | – | – | – |
| Warthog | 29 | – | – | – | – | – | – |
| Tsessebe | 32 | – | – | – | – | – | – |
| Waterbuck | 14 | – | – | – | – | – | – |
| Hippopotamus | 2 | – | – | – | – | – | – |
| Total | 1 412 | 98 | 75 | 23 | 14,41 | 18,83 | 61,39 |

[a]RBO = Redbilled oxpecker
[b]YBO = Yellowbilled oxpecker

**Table 2** The mammal/oxpecker ratios in eastern Caprivi as calculated from counts conducted over 1 661 km in April 1984[a]

| Mammal species | Number of mammals counted | Number of oxpeckers counted | Number of RBO[b] counted | Number of YBO[c] counted | Mammal/ oxpecker ratio | Mammal/ RBO ratio | Mammal/ YBO ratio |
|---|---|---|---|---|---|---|---|
| Cattle | 3 683 | 369 | 188 | 181 | 9,98 | 19,59 | 20,35 |
| Goats | 112 | 4 | 4 | – | 28,00 | 28,00 | – |
| Elephant | 70 | – | – | – | – | – | – |
| Hippopotamus | 18 | – | – | – | – | – | – |
| Total | 3 853 | 373 | 192 | 181 | 10,33 | 20,07 | 21,29 |

[a]Adapted from Stutterheim & Panagis, 1985
[b]RBO = Redbilled oxpecker
[c]YBO = Yellowbilled oxpecker

Redbilled oxpeckers in captivity spent a mean of 39,6% of their time on the host ($n$ = 351 observations), compared to 75,6% for yellowbilled oxpeckers ($n$ = 300 observations). These two values show a significant difference ($\chi^2$ = 26,33; $P < 0{,}001$).

## Discussion

### Redbilled oxpecker roosting behaviour

The results of the present study confirm the observations by Stutterheim (1979) in the Kruger National Park that redbilled oxpeckers roost in palm trees by preference. There is, however, some uncertainty as to the roosting sites of redbilled oxpeckers in areas where suitable palm trees do not occur. Dowsett (1969) reported a single sighting of redbilled oxpeckers roosting on a herd of buffalo in the Luangwa Valley National Park in Zambia. No evidence of this type of behaviour was recorded either during the present study or during the intensive investigation of Stutterheim (1976 & 1979) in the Kruger National Park. Furthermore, personnel in the Kruger National Park involved with buffalo culling operations did not record redbilled oxpeckers roosting on buffaloes, despite requests for sightings (Pienaar, pers. comm.). The single record of Dowsett (1969) for redbilled oxpeckers roosting on buffalo is thought to be a misidentification.

### Yellowbilled oxpecker roosting behaviour

The present investigation indicates that yellowbilled oxpeckers roost on their host species at night. Similar observations are reported by Hustler (*in litt.*) for yellowbilled oxpeckers roosting on kudu in the Hwange National Park and by A. Kemp (pers. comm.) who collected a yellowbilled oxpecker off a roan antelope at night. The predisposition of yellowbilled oxpeckers to sleeping on their host species has major ecological implications. Dowsett (1969) postulated that the habit of sleeping on the host in the Luangwa Valley National Park was a recent habit resulting from the reduction of game in the area. However, the different roosting strategies of the redbilled and yellowbilled oxpeckers on the same host in eastern Caprivi indicate a rather basic difference between the two species.

The importance of these strategies is closely linked to the host selection of the oxpeckers. The most important host species for the yellowbilled oxpecker appear to be buffalo and giraffe in Moremi and cattle in eastern Caprivi. Buffalo and rhinoceros have been recorded as key hosts for the yellowbilled oxpecker by Attwell (1966), Buskirk (1975), Grobler & Charsley (1978), Mundy (1983) and Hustler (in press). Redbilled oxpeckers on the other hand appear to have a much wider choice of hosts with 15 host species being recorded for the Kruger National Park (Stutterheim 1976, 1979), nine host species for Hluhluwe-Umfolozi Game Reserve Complex (Stutterheim 1980), and six for Mkuzi Game Reserve (Stutterheim & Stutterheim 1981). Stutterheim (1976) postulated that communal roosting in redbilled oxpeckers functioned as an information-sharing procedure to maximize the exploitation of a patchy food supply. This seems to be a valid assumption for a species such as the redbilled oxpecker which feeds on such a wide variety of host species. However in the case of the yellowbilled oxpecker which feeds mainly on buffaloes the same assumption does not seem valid. Although buffaloes occur in large numbers they are clumped and move considerable distances (Young 1970) especially at night. It can thus be speculated that a bird roosting away from these animals would not always find them the following day. Roosting on the host can therefore be seen as an adaptation to the more limited host choice of the yellowbilled oxpecker and implies a closer host/oxpecker relationship than that of the redbilled oxpecker. This closer relationship is also reflected in the mean time the two species spend on the host, the yellowbilled oxpecker spending 36% more time on the host than the redbilled.

The ecological conditions which result in yellowbilled oxpeckers roosting in acacia trees in northern Nigeria (Mundy & Cook 1974) are not known and need to be investigated.

## Acknowledgements

The help and guidance given by Dr Alan Kemp and Dr J.D. Bezuidenhout and the financial support by the South African Ornithological Society and Endangered Wildlife Trust are gratefully acknowledged. The senior author would also like to thank the Onderstepoort Department of Veterinary Sciences which made available its facilities for captive studies.

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