

Random time-activity budgets in captive Southern Ground Hornbill *Bucorvus leadbeateri*

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Introduction

The conservation status of the Southern Ground Hornbill (*Bucorvus leadbeateri*) is vulnerable on the IUCN Red List.¹ The Mabula Ground Hornbill Conservation Project (2011) and Southern Ground Hornbill conservation in general aim to increase the number of hornbills through five main techniques: (1) supplemental feeding, (2) double clutching, (3) alternation of chicks, (4) group augmentation and (5) chick fostering. Numbers are threatened directly by habitat loss, hunting and international trade, and indirectly by group size (through the Allee effect) and communal breeding.²⁻⁷ Furthermore, the species has a highly K-selected life-history pattern.⁸ Captive breeding of this bird can potentially increase the population size twofold because both eggs laid are guaranteed a chance of survival, whereas in the wild only one egg is likely to survive.

Time-activity budgets in birds can be used to illustrate reproductive effort.⁹ Time-activity budgets are known for Southern Ground Hornbills from wild birds in the Kruger National Park and from one captive pair (Johnson B 2004, personal communication).¹⁰ We compared the time-activity budgets of captive Southern Ground Hornbills in the Johannesburg Zoo with randomly expected behaviour of the same birds and previously studied birds.

Methods

Both focal-animal sampling and scan sampling were used to study three hand-raised Southern Ground Hornbills: an adult male (6 years old), an adult female (ca 18 years old) and a juvenile (1 year old). Observations were made between 08:00 and 16:00 from 30 January to 15 February 2013 at the Johannesburg Zoo. Pre-study observations were conducted to establish behaviours to record during focal-animal sampling in the aviary (55 m x 25 m x 8 m). The aviary contained short mowed grass, a nesting log in the centre, a large tree and a nest box on a pole. The Southern Ground Hornbills were fed twice daily at approximately 10:00 and 14:00. For scan sampling, 1 of 12 pre-defined behaviours was recorded at 1-min intervals timed using a stopwatch. These behaviours were: walking, sitting, perching, preening, foraging, socially interacting, running, standing, flying, vocalising, interacting with bill and other (sunbathing, dust-bathing and drinking). The observations recorded were entered into a Microsoft Excel (2007) spreadsheet and converted into percentiles. Random expected frequencies were generated by dividing the observed frequencies by the number of (behavioural) categories to get the expected frequencies.¹¹ The observed and expected frequencies were compared using the Chi test statistical function in Excel, which generated probability values. Scan data from Kemp and Begg¹⁰ and B. Johnson (2004, personal communication) were each compared with random expectations using this test. This study received ethical clearance from the Johannesburg City Parks and Zoo (JCPZ/2013/April/02).

Results

There was no significant difference between the observed behaviours and those expected by chance (Table 1: $N=12$ behaviours, $p=0.91$) in Southern Ground Hornbills ($n=3$ birds). There were no significant differences between observed and expected behaviours in the male individual ($N=12$, $p=0.98$), female individual ($N=12$, $p=0.87$) or juvenile ($N=12$, $p=1.00$) (Figure 1). There was a significant difference in behaviours observed between the wild Southern Ground Hornbills of Kemp and Begg¹⁰ and random expectations ($p<0.05$). A significant difference also was found between the behaviour of Johnson's captive Southern Ground Hornbills and random expectations ($n=2$, $p<0.05$).

Of the 12 behaviours recorded, walking was always the most common (51%), followed by standing (18%), foraging (8%), perching (7%) and sitting (5%). Less frequently observed behaviours were preening (2%), flying (1%) and running (1%). Communication in the form of bill interactions and territorial calling was recorded in 5% of the observations. The female individual called more frequently (4%) than did the male individual (3%) and she spent more time perched (11%) than the male individual (4%) and the juvenile (7%). The juvenile spent more time foraging and less time walking than either of the adults (Figure 1).

Discussion

The captive Southern Ground Hornbill time-activities observed were no different from random expected time-activities (Table 1). In other words, no significant differences were found in the 12 behaviours between those observed in the three birds and those expected by chance. The higher frequency of vocalisation — a species-specific behaviour known to relate to territoriality — in the female individual may indicate 'female control'.^{8,12}

Preening, foraging and sitting were observed less frequently than in wild birds.¹⁰ It may be that captive birds fly less often and therefore do not require their feathers to be aligned into the most aerodynamic shape for easier, more efficient flight; foraging pressures may be relieved in captivity because food is provided in compact spatio-temporal instances and hence foraging occupies less of the time-activity budget; and the juvenile may be spending more time foraging and less time walking because this budget is optimal for a helper at the nest which may be faced with power struggles in a captive environment.¹³ The higher frequency of perching in the female individual is probably linked to nest site defence.¹⁴

Future research should focus on time-activity budgets of Southern Ground Hornbill groups, as a way to facilitate adaptive habitat management.

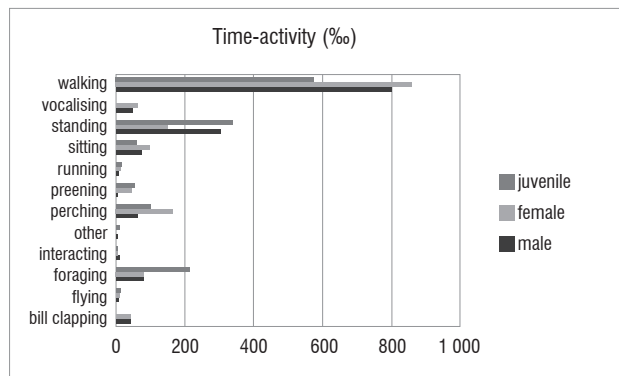


Figure 1: Time-activity budgets determined from scan behavioural samples ($N=4361$ observations; 26 h) of three captive Southern Ground Hornbills (*Bucorvus leadbeateri*): one male, one female and one juvenile individual.

Table 1: Time-activity budgets of three Southern Ground Hornbills (*Bucorvus leadbeateri*) determined from scan behavioural samples ($N=4361$ observations; 26 h).

Behaviour	Observed (%)	Random expected (%)
Walking	51.1	62.1
Standing	18.4	22.0
Foraging	8.7	10.4
Perching	7.4	9.1
Sitting	5.3	6.4
Vocalising	2.5	4.6
Preening	2.5	3.0
Bill interacting	2.0	3.7
Running	0.8	0.9
Flying	0.7	0.9
Socially interacting	0.5	0.6
Other	0.3	0.5

Conclusion

The time-activity budgets of captive breeding Southern Ground Hornbills were no different from randomly expected budgets. Higher frequencies of vocalising and perching by the female individual may indicate 'female control' and nest site defence, respectively.

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