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BEHAVIOUR

INTERNET SEARCHING OF BIRD–BIRD ASSOCIATIONS: A CASE OF BEE-EATERS HITCHHIKING LARGE AFRICAN BIRDS

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Worldwide, numerous commensalistic–mutualistic interactions involving birds hitchhiking large mammals have been reported (Dean & MacDonald 1981, Sazima et al. 2012, Ndlovu & Combrink 2015). Most such cases are from the African continent, where a diverse megafauna (Shorrocks & Bates 2015, Ripple et al. 2016) and bird communities are still present (Hawkins et al. 2007).

Although the African continent still harbours many large-bodied bird species, thus potentially offering an opportunity for similar interactions between birds, only little attention has been paid to bird–bird sitting associations. In most cases, bird–bird sitting associations have included two sister bee-eater species, Northern Carmine Bee-eater *Merops nubicus* and Southern Carmine Bee-eater *M. nubicoides* sitting on two bustards, Kori Bustard *Ardeotis kori* and Arabian Bustard *A. arabs* (North 1944, Jackson 1945, Dean & MacDonald 1981). However, natural ecosystems are presently rapidly changing with a negative impacts on population trends of both the bee-eater and bustard species involved in these associations (BirdLife International 2016) with unknown consequences for the patterns of their relationship.



Figure 1. Example of sitting association between bee-eaters and bustards: Northern Carmine Bee-eater *Merops nubicus* using Kori Bustard *Ardeotis kori* as a perch (photo credit: Ken Havard)

The aim of this note is to report the results of a study of the spatial and taxonomic distribution of sitting associations between bee-eaters and other African birds collected from recently published photos available on public internet sources.

Data on bird–bird sitting associations were collected by internet search for photos on Google images. Internet-based search is one of modern tools to rapidly collect a large amount of recently published data from distant geographical regions and also on quite rare natural phenomena (e.g. Mikula 2015, Mikula et al. 2016). Our search phrase contained the expression "bee-eater" and English name of the host

bird species for which we expected a sitting association with bee-eaters based mainly on published reports (North 1944, Jackson 1945, Boswall 1970, Dean & MacDonald 1981, Fry & Fry 2010). Only interactions where birds were sitting directly on the bodies of host birds were included; cases where birds were feeding or flying around them were discarded. Moreover, several photos were parts of photo series, quite often containing more shots of the same interaction. In such cases, we chose the photo with the highest number of interacting birds. To avoid pseudoreplication, we were particularly careful not to include more than one photo from each photo series into our dataset. Finally, photos suspected to be photomontages were ignored.

Altogether, we found 44 cases of sitting interactions between bee-eaters and larger-bodied birds. These are listed in Appendix 1. For all recorded cases we were able to identify birds to species level, however, for nine cases (21%) location at least to country level could not be achieved. We identified Northern Carmine Bee-eater (28 cases; 64% of all records) and Southern Carmine Bee-eater (16 cases; 36%) as the only species sitting on other African birds. As the host we recorded almost exclusively two species of bustards, Kori Bustard (35 cases; 80%) and Arabian Bustard (eight cases; 18%) (Figures 1 and 2); in one case, a White Stork *Ciconia ciconia* was recognized as a host for Southern Carmine Bee-eater. All records for Northern and Southern Carmine Bee-eater with known geographical position came from Ethiopia (21 cases, 60% of all cases with identified locality) or Botswana (14 cases, 40%). Most observations of the association between Northern Carmine Bee-eater and Kori and Arabian Bustards were from Awash National Park (10 cases, 63% of all records for this bee-eater with locality determined to this level) and Aledeghi National Park (three cases, 20%). These two national parks are in Ethiopia. For Southern Carmine Bee-eater and Kori Bustard and White Stork, it was Chobe National Park (13 cases, 100%), in Botswana. In six cases (21% out of all species-specific records) two Northern Carmine Bee-eaters were sitting together on bustards, in Southern Carmine Bee-

eater we found this in five cases (31%); these birds may have been pairs hunting together.

Beside bustards, Northern Carmine Bee-eaters have previously been found sitting on other birds including Ostrich *Struthio camelus*, Secretarybird *Sagittarius serpentarius*, Abdim's Stork *Ciconia abdimii*, Black Crowned Crane *Balearica pavonina*, herons and ibises (North 1944, Boswall 1970, Fry & Fry 2010). In contrast, little is known about associations between Southern Carmine Bee-eaters and larger birds.



Figure 2. Example of sitting association between bee-eaters and bustards: two individuals of Northern Carmine Bee-eater sitting on back of Arabian Bustard *A. arabs* (photo credit: Johan Stenlund).

For instance, Viljoen & Viljoen (1987) observed Southern Carmine Bee-eaters feeding on insects flushed by several large bird species; however, the bee-eaters strongly preferred to perch on Kori Bustards with no attempt to sit on other large bird species. Our results support a strong preference of Southern Carmine Bee-eaters for Kori Bustards, however, we found that occasionally this bee-eater may also use other large birds such as White Storks as a perch. Altogether, both bee-eater species appear to be very conservative when choosing birds as perches and exhibit a strong association with Kori and Arabian Bustards. Overall, it seems possible that perching association between bee-eaters and bustards has evolved only once in the ancestor of both closely related bee-eaters. This could also explain why this phenomenon occurs in two spatially separated locations.

Interestingly, while there are numerous reports of both commensal and mutualistic characteristics between birds and several mammal species (Dean & MacDonald 1981, Sazima et al. 2012), it seems that bird–bird sitting interactions are exclusively commensal where bee-eaters use the other birds only as perches from which they dive on flushed insects (Jackson 1945, Dean & MacDonald 1981). Beside birds, bee-eaters were recorded feeding on insects flushed by large-bodied mammals, man and motor vehicles (Jackson 1945, Boswall 1970, Dean & MacDonald 1981). In general, associations of smaller birds with large animals are presumably advantageous to the bird. From knowledge obtained from bird–mammal associations we can assume that birds associated with larger-bodied birds improve their foraging efficiency when compared with non-associated birds (Dean & MacDonald 1981). The birds might also be protected against predators by perching on large mammals (Koenig 1997) or the behaviour may be advantageous (e.g. to reduce energy expenditure perches, such as bushes, trees and power lines. All bird “perches” are also cursorial and walk many kilometres per day (Senyatso et al. 2013) thus sitting birds can use them to save energy, but still be on the move. When searching for appropriate photos we did not find any evidence that bee-eaters were looking for food, e.g. ectoparasites, on the bodies

of the host birds. We raise this question: do bustards receive any potential benefit from bee-eaters? For instance, the bee-eaters might help them with predator detection. This hypothesis needs to further study.

We found that associations between bee-eaters and large-bodied birds gleaned from the internet were almost exclusively represented by Northern and Southern Carmine Bee-eaters and Kori and Arabian Bustards, respectively. Especially for Northern Carmine Bee-eater we were unable to find an association with any other bird species other than the two bustards. Moreover, while Northern Carmine Bee-eater had previously been observed to perch on large birds mainly in Kenya, Ethiopia, Sudan and Somalia (Moreau 1943, North 1944, Jackson 1945, Boswall 1970), all the photos analysed came from Ethiopia. The similar behaviour of the Southern Carmine Bee-eater has, according to our best knowledge, previously been recorded only in Botswana (Viljoen & Viljoen 1987, Hancock & Weiersbye 2015) what is in good agreement with our data. Absence of some previously recorded associations could be linked to birdwatchers having paid attention particularly to “charismatic” species; moreover observations are probably biased toward well-visited areas known for the presence of such interactions, leading to an underestimation of such associations from poorly visited areas. It is possible that several associations between birds might become rarer or even be lost with time, because populations of the birds involved in bird–bird sitting associations are presently declining. Nowadays, when natural ecosystems are rapidly changing due to human activity, with negative impact on many wild-life species of birds, it is important to understand the spatial distribution as well as the strength of associations between particular bird species.

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References

- BirdLife International** 2016. IUCN Red List for birds. Downloaded from <http://www.birdlife.org> on 28/07/2016.
- Boswall J** 1970. The association of the Northern Carmine Bee-eater *Merops n. nubicus* with mammals, birds and motor vehicles in Ethiopia. *Bulletin of the British Ornithologists' Club* 90: 92–96.
- Dean WRJ, MacDonald IAW** 1981. A review of African birds feeding in association with mammals. *Ostrich* 52: 135–155.
- Fry CH, Fry K** 2010. Kingfishers, bee-eaters and rollers. A&C Black, London.
- Hancock P, Weiersbye I** 2015. *Birds of Botswana*. Princeton University Press, Princeton.
- Hawkins BA, Diniz-Filho JAF, Jaramillo CA, Soeller SA** 2007. Climate, niche conservatism, and the global bird diversity gradient. *American Naturalist* 170: S16–S27.
- Jackson THE** 1945. Some *Merops–Ardeotis* perching associations in northern Kenya. *Ibis* 87: 284–286.
- Koenig WD** 1997. Host preferences and behaviour of oxpeckers: co-existence of similar species in a fragmented landscape. *Evolutionary Ecology* 11: 91–104.
- Mikula P** 2015. Fish and amphibians as bat predators. *European Journal of Ecology* 1: 71–80.
- Mikula P, Morelli F, Lučan RK, Jones DN, Tryjanowski P** 2016. Bats as prey of diurnal birds: a global perspective. *Mammal Review* 46: 160–174.
- Moreau RE** 1943. Dr. J.G. Myers on migrants and on bird–insect nesting associations in the Sudan. *Ibis* 85: 97–101.
- Ndlovu M, Combrink L** 2015. Feeding preferences of oxpeckers in Kruger National Park, South Africa. *Koedoe* 57: 6 pages. Available online at <http://www.koedoe.co.za/index.php/koedoe/article/view/1316/1840>
- North MEW** 1944. The use of animate perches by the Carmine Bee-eater and other African species. *Ibis* 86: 171–176.
- Ripple WJ, Chapron G, López-Bao JV, Durant SM, Macdonald DW, Lindsey PA, Bennett EL, Beschta RL, Bruskotter JT, Campos-Arceiz A, Corlett RT, Darimont CT, Dickman AJ, Dirzo R, Dublin HT, Estes JA, Everatt KT, Galetti M, Goswami VR, Hayward MW, Hedges S, Hoffmann M, Hunter LTB, Kerley GIH, Letnic M, Levi T, Maisels F, Morrison JC, Nelson MP, Newsome TM, Painter L, Pringle RM, Sandom CJ, Terborgh J, Treves A, Van Valkenburgh B, Vucetich JA, Wirsing AJ, Wallach AD, Wolf C, Woodroffe R, Young H, Zhang L** 2016. Saving the world's terrestrial megafauna. *BioScience*. doi 10.1093/biosci/biw092
- Sazima C, Jordano P, Guimarães Jr PR, Dos Reis SF, Sazima I** 2012. Cleaning associations between birds and herbivorous mammals in Brazil: structure and complexity. *Auk* 129: 36–43.
- Senyatoso KJ, Collar NJ, Dolman PM** 2013. Assessing range-wide conservation status change in an unmonitored widespread African bird species. *Diversity and Distributions* 19: 106–119.
- Shorrocks B, Bates W** 2015. *The biology of African savannahs*. Oxford University Press, Oxford.
- Viljoen PC, Viljoen SB** 1987. Notes on the foraging association between Carmine Bee-eaters and Kori Bustards in the Chobe National Park, Botswana. *Ostrich* 58: 187–188.

Appendix 1: List of internet source links to photos used for analyses with locality and species involved in bird–bird interactions.

	Country	Locality	Visitor species	Host bird	Source links
1.	Botswana	Chobe National Park	<i>Merops nubicoides</i>	<i>Ardeotis kori</i>	Kori Bustard with hitch-hiking Carmine Bee-eaters
2.	Botswana	Chobe National Park	<i>Merops nubicoides</i>	<i>Ardeotis kori</i>	Bee-eaters riding on Kori Bustards
3.	Botswana	NA	<i>Merops nubicoides</i>	<i>Ardeotis kori</i>	Kori bustard with Carmine Bee-eaters riding on its back
4.	Botswana	Savute, Chobe	<i>Merops nubicoides</i>	<i>Ardeotis kori</i>	Kori Bustard with hitch-hiking Carmine Bee-eaters
5.	Botswana	Savute, Chobe	<i>Merops nubicoides</i>	<i>Ardeotis kori</i>	Carmine Bee-eater rides on back of Kori Bustard
6.	Botswana	Savute, Chobe	<i>Merops nubicoides</i>	<i>Ardeotis kori</i>	Carmine Bee-eater perched on a Kori Bustard's back
7.	Botswana	Savute, Chobe	<i>Merops nubicoides</i>	<i>Ardeotis kori</i>	Kori bustard with Carmine bee-eater on back
8.	Botswana	Savute, Chobe	<i>Merops nubicoides</i>	<i>Ardeotis kori</i>	Kori Bustard with two carmine bee-eaters
9.	Botswana	Savute, Chobe	<i>Merops nubicoides</i>	<i>Ardeotis kori</i>	Southern Carmine Bee-eater on Kori Bustard
10.	Botswana	Savute, Chobe	<i>Merops nubicoides</i>	<i>Ardeotis kori</i>	Kori Bustard and Carmine Bee-eaters
11.	Botswana	Savute, Chobe	<i>Merops nubicoides</i>	<i>Ardeotis kori</i>	Kori Bustard with hitch-hiking Carmine Bee-eaters
12.	Botswana	Savute, Chobe	<i>Merops nubicoides</i>	<i>Ardeotis kori</i>	Bustard & bee-eater
13.	Botswana	Savute, Chobe	<i>Merops nubicoides</i>	<i>Ardeotis kori</i>	Hitch-hiker by Ken Watkins
14.	Botswana	Savute, Chobe	<i>Merops nubicoides</i>	<i>Ciconia ciconia</i>	White Stork and Carmine Bee-eater
15.	Ethiopia	Aledoghi National Park	<i>Merops nubicus</i>	<i>Ardeotis arabs</i>	Northern Carmine Bee-eater riding on Arabian Bustard
16.	Ethiopia	Aledoghi National Park	<i>Merops nubicus</i>	<i>Ardeotis arabs</i>	Northern Carmine Bee-eater riding on Arabian Bustard
17.	Ethiopia	Aledoghi National Park	<i>Merops nubicus</i>	<i>Ardeotis arabs</i>	Arabian Bustard with Northern Carmine Bee-eaters
18.	Ethiopia	Awash National Park	<i>Merops nubicus</i>	<i>Ardeotis arabs</i>	Arabian Bustard with a Northern Carmine Bee-eater
19.	Ethiopia	Awash National Park	<i>Merops nubicus</i>	<i>Ardeotis kori</i>	Kori bustard with Bee-eater
20.	Ethiopia	Awash National Park	<i>Merops nubicus</i>	<i>Ardeotis kori</i>	Carmine Bee-eater riding back of Kori bustard
21.	Ethiopia	Awash National Park	<i>Merops nubicus</i>	<i>Ardeotis kori</i>	Kori Bustard with Carmine Bee-eater on back
22.	Ethiopia	Awash National Park	<i>Merops nubicus</i>	<i>Ardeotis kori</i>	Kori Bustard with Northern Carmine Bee-eater
23.	Ethiopia	Awash National Park	<i>Merops nubicus</i>	<i>Ardeotis kori</i>	Kori Bustard with two Carmine Bee-eaters
24.	Ethiopia	Awash National Park	<i>Merops nubicus</i>	<i>Ardeotis kori</i>	Kori Bustard with Carmine Bee-eaters on back
25.	Ethiopia	Awash National Park	<i>Merops nubicus</i>	<i>Ardeotis kori</i>	Arabian Bustard with Northern Carmine Bee-eater
26.	Ethiopia	Awash National Park	<i>Merops nubicus</i>	<i>Ardeotis kori</i>	Bee-eaters riding on Kori Bustard
27.	Ethiopia	Awash National Park	<i>Merops nubicus</i>	<i>Ardeotis kori</i>	Bee-eaters riding on Kori Bustard
28.	Ethiopia	Bilen/Awash area	<i>Merops nubicus</i>	<i>Ardeotis arabs</i>	Arabian Bustard with Northern Carmine Bee-eater

	Country	Locality	Visitor species	Host bird	Source links
29.	Ethiopia	Boloyta, Afar Region	<i>Merops nubicus</i>	<i>Ardeotis kori</i>	Carmine Bee-eater using the back of a Kori Bustard as a hunting perch
30.	Ethiopia	Goba area	<i>Merops nubicus</i>	<i>Ardeotis kori</i>	Kori Bustard and Northern Carmine Bee-eater
31.	Ethiopia	NA	<i>Merops nubicus</i>	<i>Ardeotis arabs</i>	Arabian Bustard with Carmine Bee-eaters
32.	Ethiopia	NA	<i>Merops nubicus</i>	<i>Ardeotis arabs</i>	Carmine Bee-eater and Arabian Bustard
33.	Ethiopia	NA	<i>Merops nubicus</i>	<i>Ardeotis kori</i>	Kori Bustard with Carmine Bee-eater
34.	Ethiopia	NA	<i>Merops nubicus</i>	<i>Ardeotis kori</i>	Kori Bustard with Bee-eaters
35.	Ethiopia	NA	<i>Merops nubicus</i>	<i>Ardeotis kori</i>	Kori Bustard with Bee-eaters
36.	NA	NA	<i>Merops nubicoides</i>	<i>Ardeotis kori</i>	Kori Bustard with Bee-eater
37.	NA	NA	<i>Merops nubicoides</i>	<i>Ardeotis kori</i>	Carmine Bee-eater using bustard as perch hawking insects
38.	NA	NA	<i>Merops nubicus</i>	<i>Ardeotis arabs</i>	Northern Carmine Bee-eater riding an Arabian Bustard
39.	NA	NA	<i>Merops nubicus</i>	<i>Ardeotis kori</i>	Bee-eater on Kori Bustard
40.	NA	NA	<i>Merops nubicus</i>	<i>Ardeotis kori</i>	Carmine Bee-eater on Kori Bustard
41.	NA	NA	<i>Merops nubicus</i>	<i>Ardeotis kori</i>	Kori Bustard with Bee-eaters riding on its back
42.	NA	NA	<i>Merops nubicus</i>	<i>Ardeotis kori</i>	Kori Bustard with Bee-eaters
43.	NA	NA	<i>Merops nubicus</i>	<i>Ardeotis kori</i>	Carmine Bee-eater on Bustard
44.	NA	NA	<i>Merops nubicus</i>	<i>Ardeotis kori</i>	Bee-eaters on Kori Bustard