

## **Bone intake by vultures in Namibia**

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### **Summary**

The use of bones by vultures was assessed during early 2005 in the Otjiwarongo area in north-central Namibia. Bone fragments were utilized by all species, especially by the African White-backed Vulture *Gyps africanus* and the Lappet-faced Vulture *Torgos tracheliotos*. There was an overall increase in bone fragment consumption from May onwards (taken as the beginning of the breeding period). A rough estimate of bone fragment use for all vultures of 2.49 g/vulture (consumption/total number of vultures observed) and 60.31 g/vulture (consumption/individuals of vultures observed) was determined. The results suggest that bone fragments should be added as a supplement at vulture restaurants.

### **Introduction**

Vultures may develop a bone deficiency called osteodystrophy or metabolic bone disease, a disease more commonly associated with horses (Mönnig & Veldman 1989), mainly due to a lack of calcium in the diet (Mundy et al. 1992, Richardson et al. 1986). It is assumed that previously carnivores such as hyaenas broke up the long and big bones of dead animals with vultures utilising the resultant bone fragments. These bone fragments would then also be transported to nests during the breeding season and fed to the chicks. Richardson et al. (1986) indicate that osteodystrophy in Cape Vulture (*Gyps coprotheres*) chicks declined from 17% to 2.5% when crushed bone was supplied at a feeding site in a farming area with few or no bone-crushing predators. According to Mundy et al.

(1992) bone fragments is a vital source of calcium for vulture chicks to strengthen their bones for flight. In the absence of sufficient suitably sized bones or bone fragments, vulture nestlings seem to have a poorly calcified soft skeleton, and the wing bones in particular can bend and even break, resulting in osteodystrophy or metabolic bone disease (Mundy et al. 1992). Recently populations of hyaenas and other big carnivore numbers have declined mainly due to human persecution, resulting in a lack of readily available crushed bone for vultures.

A study by Dobbs & Benson (1984) on the calcium requirements of Cape Vulture chicks at the Kransberg colony in South Africa indicate that bone abnormalities (3.5%) and calcium requirements (<0.75%) were lower

than for other similar studies (Mundy & Ledger 1976, Evans & Piper 1981) and unusually low for a carnivorous bird. They furthermore stated that bone abnormalities are a natural mortality factor in Cape Vulture chicks and not a result of unnatural calcium deficiency.

Consumption of bone is well documented for the Bearded Vulture *Gypaetus barbatus* in South Africa (Huxley & Nicholson 1963, Newman 1969, Steyn 1982, Maclean 1993, Pickford et al. 1994), but very little is known regarding bone use and/or how this affects the breeding of Cape Vulture, African White-backed Vulture (*Gyps africanus*) (except Kemp & Kemp 1975) and Lappet-faced Vulture (*Torgos tracheliotos*) from Namibia. Maclean (1993) and Mundy et al. (1992) stated that bone fragments are utilized by *G. africanus*, mainly during the breeding season and Mundy et al. (1992) confirmed that they do not usually suffer from metabolic bone disease. Various reasons for the catastrophic collapse of the Cape Vulture, a known bone consumer (Mundy et al. 1992), in Namibia have been cited (C.J. Brown pers. comm., R.E. Simmons pers. comm., Brown 1985, Simmons & Bridgeford 1997, Bridgeford 2001, Hengari et al. 2004) although no work has determined the actual use of bone or lack thereof for the species locally. Mundy et al. (1992) include food quality – i.e. “in particular, bones” [or lack thereof] – as having a potential

impact on *G. coprotheres*. According to Benson et al. (2004), Gyps vultures compete with mammalian carnivores and other scavenging birds for food and bone and where these competitors are absent such as in farming areas, they consume more bone. Meat is often scarce in farming areas thus requiring Gyps vultures to feed more on available bone, which is energetically similar to meat and nutritious, as an alternative source of food (Benson et al. 2004).

This paper investigates the use of bone fragments supplied at a vulture restaurant close to the last known remaining free ranging *G. coprotheres* population in Namibia. The aim of this study was to determine if free-ranging vultures would eat crushed bone offered and to what extent bone would be utilized. The study also aimed to determine whether an increase in bone consumption occurred during the breeding season. If it could be proven that vultures actively sought bone fragments, it would suggest that bone fragment supplementation at vulture restaurants is worthwhile.

### **Study area and methods**

This study was conducted at a vulture restaurant situated at REST (Rare and Endangered Species Trust) on the farm Uitsig, approximately 54 km north-east of Otjiwarongo and 25 km north-west of the Waterberg Plateau, in north-central Namibia. REST is dedicated to

the preservation of endangered species in Namibia with special emphasis on research and logistical support for the local *G. coprotheres* population. The general vegetation consists of an ecotone between Thornbush Savanna, mostly bush encroached, and Mountain Savanna (Giess 1971), and is dominated by *Acacia mellifera* and *Dichrostachys cinerea* trees and shrubs. The mean annual rainfall lies between 450-500 mm and summer and winter temperatures range between 18-38°C and 5-27°C, respectively (Mendelsohn et al. 2002).

Weathered bones were crushed with the resultant bone fragments varying from 2-10 cm in length and were classified as follows: small =  $\pm 2$  cm, medium =  $\pm 6$  cm and large =  $\pm 10$  cm. 2 kg of bone fragments were placed on a clean rock slab approximately 2-3 m away from the actual feeding site and weighed on an electro Samson Salter Brecknell digital scale before and after feeding incidences. Unconsumed bones were retrieved on average four days after placement, so as not to disrupt other important vulture observations, which are part of REST's ongoing activities. Vultures feeding on the bones were observed between 07h00 and 14h00 with the use of Bushnell 10x50 binoculars from a hide approximately 20 m from the feeding site. The observations were repeated on 22 occasions (i.e. feeding incidences) between 10 March and 5 June 2005.

The following parameters: the mean

number of vultures visiting the restaurant, mean mass of bone fragments consumed per observation period, mean mass of bone fragments consumed per day per observation period, mean mass of bone fragments consumed per visiting vulture, and mean mass of bone fragments consumed per bone consuming vulture (i.e. birds observed to be swallowing bone) per observation period were compared between the non breeding season (before May) and breeding season (from May onwards [Mundy et al. 1992]) using the Mann Whitney test (Statsoft 1999). A P - value of  $< 0.05$  was considered significant.

## Results

*G. coprotheres* was only observed utilising the bone chips on offer on one occasion out of a total of 36 visits during the observation period. *G. africanus* and *T. tracheliotos* individuals were observed utilising bone chips on 77% (mean of 15.96 [SD=16.89] individuals) and 83% (22.00 [SD=19.19] individuals) and 41% (mean of 0.87 [SD=1.69] individuals) and 42% (mean of 1.33 [SD=2.23] individuals) of the feeding occasions during the entire period compared to the breeding season, respectively.

Significantly more bone fragments were consumed by mass, per day and per vulture during the observation period between the non-breeding and breeding seasons with more bone being consumed during the breeding season ( $P < 0.05$ ) (Table 1).

Table 1. The mass of bones consumed, mean number of vultures, mean mass of bones consumed per day and per visiting vulture and the mass of bones consumed per bone-consuming vulture at REST.

	Mass of bones consumed per observation period (g)	Mean number of vultures visiting per observation period	Mean mass of bones consumed per day per observation period (g)	Mean mass of bones consumed per visiting vulture (g)	Mean mass of bones per bone-consuming vulture
Non-breeding season	700	466	225	1.65	49.4
Breeding season	1308	356	481	10.25	61.1
Mean	1017	409	358	6.14	55.52
Statistical significance (Mann Whitney test)	Significant	Significant	Significant	Significant	Not significant

**Discussion**

The data show that vultures utilise bone chips if offered and it can be assumed that they require bone chips in their diet. The data suggest that this is especially so during the breeding season when minerals necessary for egg, bone and chick development are essential, although there is no statistical difference between the amount of bone consumed per bone-consuming individual between breeding and non-breeding season (Table 1). Since this was a pilot study it is felt that some of the differences observed could be ascribed to acclimation by the vultures during the non-breeding season when the procedures were begun. It is suggested that the study be continued for another

season. *G. africanus*, which makes up the bulk of the vultures observed, shows an increase in bone chip utilisation (77% non-breeding and 83% breeding season). This is consistent with the fact that *G. africanus* are known to breed locally. This also confirms published breeding data (Mundy et al. 1992).

A factor that could have influenced the bone consumption of vultures visiting the REST feeding site is the regular availability of meat as suggested by Benson et al. (2004). Small bones, often consumed by mammalian carnivores elsewhere, are potentially available at a feeding site avoided by such competitors and consumed together with the meat, thus not making it necessary for the

vultures to consume the crushed bone on offer.

Breeding is usually between May and November in Namibia (Tarboton 2001, Cunningham & Strauss 2004). The lack of bone fragment utilisation by *T. tracheliotos* during the study period (March to June) might indicate that breeding had not yet begun in north-central Namibia.

Few deductions could be made for *G. coprotheres* due to the few numbers involved (e.g. a maximum number of five individuals were observed utilising the restaurant during one observation period). Six male vultures have been visually and genetically identified (DNA confirmation) at REST with two more adults known, one of which is suspected of being a female. Breeding was observed at the Waterberg Plateau as recently as 2000 when C. J. Brown (pers. comm.) observed one breeding pair. During the past four years juvenile birds have been seen at REST which indicates breeding by at least one pair although these birds could also have migrated from Botswana or South Africa. This last suspected breeding pair has not yet been observed utilising bone fragments.

It is however possible that all the vultures could have utilised bones on the 2<sup>nd</sup> or 3<sup>rd</sup> days after initial feeding when observations were not taking

place, but still frequented the feeding site – i.e. roosting in the vicinity. Bone consumption figures per vultures would certainly be influenced by other factors such as Marabou Stork (*Leptoptilos crumeniferus*) (21 observations utilising bone fragments) and Black-backed Jackal (*Canis mesomelas*) (not observed utilising the bones on offer, but could occur) or other scavengers.

The authors recommend that, in further studies, the use of bone fragments by captive vultures is observed. In this way, the population under observation could be divided into experimental and control groups. The study tends to confirm the suspicion that providing bone fragments to supplement the diet at vulture restaurants especially during the breeding season would be prudent. How readily bone fragments are available in the wild and how the lack thereof may influence breeding success of the existing *G. coprotheres* in the Waterberg area requires further study.

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