

ARTICLES

Monitoring of Cape Vulture (*Gyps coprotheres*) breeding colonies in the Magaliesberg, South Africa: 2007-2009

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Summary

Cape Vultures (*Gyps coprotheres*) at three colonies, Skeerpoort, Roberts' Farm and Nooitgedacht, in the Magaliesberg range in South Africa were monitored during 2007-2009 to determine their breeding success and population trends. All three colonies showed high levels of breeding success, but while Nooitgedacht and Roberts' Farm supported increased numbers of breeding pairs over the monitoring period, Skeerpoort (the largest) showed a dramatic decline between 2008 and 2009, the cause of which is unknown.

Introduction

The breeding success of Cape Vultures (*Gyps coprotheres*) at three colonies located at Skeerpoort (25°44'59.6"S; 27°45'26.3"E) (also spelled Scheerpoort), Roberts' Farm (25°49'58.1"S; 27°18'37.4"E) (also variously referred to as Olifantsnek, Olifantshoek or Olifantspoort) and at Nooitgedacht (25°51'11.5"S; 27°32'31.9"E) along the Magaliesberg range on the border between the North West Province and Gauteng in South Africa have been monitored since the 1950s, but not continuously, and only since 2006 according to the draft standard protocol of the Vulture Study

Group (Benson *et al.* 2007). The data for the period 2007-2009 are presented here.

Methods

The monitoring generally followed the method described by Benson *et al.* (2007) and Wolter *et al.* (2007). Ideally, each colony would have been visited at least three times i.e. typically in late May to mid-June to estimate the number of breeding pairs early in the season, in August to mid-September to count the number of nestlings in mid-season and in October-December to assess the number of fledglings at the end of the season. However in 2009, nestlings

fledged earlier than expected and by the second count (i.e. mid-September) only large chicks and fledglings were present. Information was recorded on a series of high resolution reference photographs which need to be updated from time-to-time in order to allow for changes in the patterns of white wash on the cliffs which are useful when orientating nests.

Results

The total number of recorded breeding pairs in the Magaliesberg increased from 369 in 2007 to a peak of 402 in 2008 and then declined to 355 in 2009 (Table 1). The Skeerpoort colony supported the largest number of breeding pairs in each year, but the dominance of this colony declined from 74.5% to 66.2% between 2007 and 2009. This was at least due to two reasons. Firstly, an increase in the number of breeding pairs at Nooitgedacht, which accounted for 90.1% of the overall increase in breeding pairs in the Magaliesberg between 2007 and 2008; and secondly because of a decline in breeding pairs at Skeerpoort

between 2008 and 2009, which accounted for 89.4% of the overall decline in breeding pairs for the Magaliesberg between 2008 and 2009. Roberts' Farm remained the smallest colony, but was the only colony to grow between 2007 and 2009 and the proportional share of breeding birds at this colony increased slightly from 1.6% to 2% over the total monitoring period (Table 1). Of the 30 new breeding pairs recorded for Nooitgedacht in 2008, 20 additional pairs (66.7%) attempted to breed on the east-facing cliffs of the western dome, a sub-colony which held only 4 pairs in 2007, but which remained at 24 pairs in 2009.

On average 90.7% ($n=3$; $SD=4.3$; $range=86.1-94.7\%$) of all breeding pairs were identified from observations of incubating birds on the nest, with the remainder inferred either from the presence of an adult bird or pair at a nest (i.e. tenanted) or from adult birds repeatedly visiting or carrying nesting material into sites that were not visible from our vantage point.

Table 1. Number of Cape Vulture *Gyps coprotheres* breeding pairs recorded for each colony in the Magaliesberg, South Africa in 2007-2009. Inc. = incubating; Inf. = inferred.

Colony	Number of breeding pairs								
	2007			2008			2009		
	Inc.	Inf.	Total	Inc.	Inf.	Total	Inc.	Inf.	Total
Skeerpoort	271	4	275	231	46	277	223	12	235
Roberts' Farm	5	1	6	6	0	7*	7	0	7
Nooitgedacht	61	27	88	109	9	118	106	7	113
Total	337	32	369	346	56	402	336	19	355

* The presence of a hidden nest was inferred from the subsequent nestling count.

The total number of nestlings estimated to have hatched at the Magaliesberg colonies declined by 2.4% from 333 in 2007 to 325 in 2008, despite the 8.9% increase in breeding pairs over the same period. No data were available for 2009 (Table 2). In both 2007 and 2008, the vast majority of nestlings (i.e. 75.4% and 69.9% respectively) were recorded at Skeerpoort, though the relative proportions of all Magaliesberg nestlings at Nooitgedacht (22.8% and 28%) and Roberts' Farm (1.8% and 2.1%) increased.

Each breeding pair at Roberts' Farm

successfully hatched a nestling in 2007 and 2008, while nestling production declined from 91.3% to 82.0% at Skeerpoort and from 83.0% to 77.1% at Nooitgedacht over the same period. At Nooitgedacht, the east-facing sub-colony accounted for most of the decline in nestling production, dropping from 100% in 2007 to just 45.8% in 2008.

Only 29.4% and 60% of nestlings were directly observed in 2007 and 2008 respectively. The remaining chicks were either inferred from the presence of brooding adults at known nests or the behaviour of adult birds at hidden ones.

Table 2. Number of Cape Vulture nestlings recorded for each colony in the Magaliesberg in 2007-2008. No data were available for 2009.

Colony	Observed		Inferred		Total nestling	
	nestlings		nestlings		production	
	2007	2008	2007	2008	2007	2008
Skeerpoort	66	124	185	103	251	227
Roberts' Farm	0	6	6	1	6	7
Nooitgedacht	32	65	44*	26	76	91
Total	98	195	235	130	333	325

*The presence of a three hidden nestlings was inferred from the subsequent fledgling count.

The total number of fledglings recorded for the Magaliesberg colonies increased by up to 23% between 2007 and 2009 with a peak of 294 in 2008 (Table 3), though fledglings were not counted at Roberts' Farm in 2007. The proportions of fledglings produced at each colony remained fairly consistent between 2007 and 2009, though

Skeerpoort, the colony that produced the largest number of fledglings each year, was responsible for the majority (73.6%) of the increase in fledgling production between 2007 and 2008 and was the only colony to show a decline in the number of fledglings produced between 2008 and 2009.

At Skeerpoort, the proportion of

nestlings that survived to fledge increased from 58.2% to 87.7% between 2007 and 2008, while there was a slight decline 100% to 97.8% at Nootgedacht over the

same period. Numbers of fledglings were not recorded at Roberts' Farm in 2007, but 85.7% of nestlings fledged successfully in 2008.

Table 3. Number of Cape Vulture fledglings recorded for each colony in the Magaliesberg in 2007-2009

Colony	Number of fledglings		
	2007	2008	2009
Skeerpoort	146	199	175
Roberts' Farm	?	6	7
Nootgedacht	76	89	91
Total	222	294	273

Overall breeding success (i.e. the proportion of breeding pairs assessed to have attempted breeding in a given season relative to the number of fledglings/large chicks produced) rose from 61.2% in 2007 to 76.9% in 2009 (Table 4), though there was no consistent trend across colonies. Roberts' Farm achieved increased breeding success from 85.7% in 2008 to 100% in

2009 with no data available for 2007. At Skeerpoort, breeding success increased each year from 53.1% in 2007 to 74.5% in 2009, but remained consistently lower than for Nootgedacht despite an initial decline in breeding success at that colony from 86.4% to 75.4% between 2007 and 2008 before recovering to 80.5% in 2009.

Table 4. Proportion of Cape Vulture breeding pairs that successfully produced a fledgling for each colony in the Magaliesberg in 2007-2009.

Colony	Proportion of pairs that produced fledglings		
	2007	2008	2009
Skeerpoort	53.1	71.8	74.5
Roberts' Farm	?	85.7	100
Nootgedacht	86.4	75.4	80.5
Total	61.2	73.1	76.9

Discussion

The total number of breeding Cape Vultures at the Magaliesberg colonies increased to a peak of 402 pairs in 2008, continuing the apparent recovery trend reported by Wolter *et al.* (2007). The subsequent decline in breeding pairs of 11.7% in 2009 was primarily due to a contraction of the Skeerpoort colony, the reasons for which are unknown. Encouragingly though, both the smaller colonies grew between 2006 and 2009, Nooitgedacht by 13% (13 pairs) and Roberts' Farm by 40% (2 pairs).

The extent to which mortality and emigration contributed to the decline in breeding pairs recorded at Skeerpoort and that to which immigration and recruitment of juveniles into the adult population contributed to increases at the other two colonies is not known. Mundy *et al.* (1992) reported on average 80% usage of a nest site from one year to the next in the Magaliesberg and assumed that pairs remained attached to a particular colony. Consequently, large-scale emigration (in the absence of any obvious major perturbation such as the construction activity that led to the extended abandonment of the Nooitgedacht colony (Verdoorn 2004) seems an unlikely explanation for the declines recorded at Skeerpoort. No increased incidents of vulture mortality were recorded for the foraging range of the Magaliesberg colonies in 2008-2009, but mass mortality events have occurred in this area in the past

(e.g. Verdoorn 2004) and it is possible that dead birds were overlooked. Cape Vultures do not necessarily breed each year (Mundy *et al.* 1992) and while this may result in some natural variability in the number of breeding pairs, this is highly unlikely to explain the sharp decline in breeding activity at Skeerpoort.

While Skeerpoort continued to produce the vast majority of nestlings (average of 73% of the total for 2007 and 2008), its dominance declined slightly in relation to both the smaller colonies. This is attributed primarily to the reduction in relative numbers of breeding pairs utilizing Skeerpoort since nestling production (i.e. the proportion of pairs that hatched chicks) at Skeerpoort (mean=86.7%) compared favourably with that at Roberts' Farm (mean=100%) and Nooitgedacht (mean=80.1%) during 2007 and 2008. The growth of the east-facing sub-colony at Nooitgedacht from 4 to 24 pairs between 2007 and 2008 is encouraging despite relatively poor nestling production there in 2008 (i.e. 45.8% of breeding pairs). Breeding at this sub-colony was first recorded in 1994, but after peaking at 12 pairs in 1995 it began an apparent decline (Verdoorn *et al.* 1997). No monitoring data were available for the period 1996-2000, but no breeding took place there in 2001 and 2002 and temperature intolerance has been proposed as a possible reason for the abandonment (Verdoorn 2003). While it can be speculated that the relatively poor

nestling production at this sub-colony in 2008, when compared with the south facing cliffs (85.1% of breeding pairs), was a consequence of unfavourable temperatures, it is not known why pairs attempted to breed on the east-facing cliffs when apparently suitable ledges remained unoccupied on the south-facing cliffs.

Survival of nestlings to fledging was close to 100% at Nooitgedacht in both 2007 and 2008, (despite the presence of an active Verreaux's Eagle *Aquila verreauxii* nest within the east-facing sub-colony) and exceeded 85% at the other two colonies in 2008, following relatively poor survival at Skeerpoort in 2007. Overall breeding success (i.e. the number of pairs that successfully produced a fledgling) increased from 61.2 to 76.9% between 2007 and 2009 and greatly exceeded the mean of 44% reported by Mundy (1982), though Komen (1985) recorded much more variable success (23.1-81.8%). Thus while there was a reduction in the number of fledglings produced by the Magaliesberg colonies between 2008 and 2009, breeding success improved over the monitoring period, emphasizing the loss of breeding pairs at Skeerpoort as the primary cause of the lower reproductive output.

While the transformation of the area around the Skeerpoort colony reported by Tarboton and Allan (1984), Benson *et al.* (1990) and most recently Wolter *et al.* (2007) continues apace, the food

requirements of the Magaliesberg colonies are artificially supplemented at four active vulture restaurants within their recorded foraging range (K. Wolter, unpublished data) and when other sources of food are considered, food availability is likely to exceed demand (C. Whittington-Jones, unpublished data). The breeding cliffs remain vulnerable to the types of human disturbances (e.g. hiking, climbing, aircraft) that have been shown, or are suspected, to have a significantly negative impacts on Cape Vulture breeding success (e.g. Benson & Dobbs 1985, Komen 1985, Verdoorn *et al.* 1997). However, overall breeding success was relatively good (Mundy 1982, Komen 1985), suggesting that disturbance (notwithstanding the decrease in breeding pairs) was not unusually high over the monitoring period. In the absence of any obvious ecological constraints or known major mortality events, the marked decline in breeding pairs at Skeerpoort between 2008 and 2009 is puzzling and it remains to be seen whether this trend continues in 2010 and beyond.

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