

# The status of Cliff-nesting Raptors on the Waterberg, SWA/Namibia

by

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## 1 INTRODUCTION

Studies on raptors have shown that, in areas where human activities are low, breeding numbers are remarkably stable over long periods of time. In areas where the total raptor fauna has been monitored, population stability has also been noted, and where a decline in one species may occur, a corresponding increase in another may be expected (Newton 1979).

A fundamental principle in the management of conservation areas is the maintenance of biotic diversity. This can be achieved only if the species composition and status of the fauna and flora occurring in conservation areas are known and monitored at regular intervals. This paper reports on the 1985 status of diurnal cliff-nesting raptors on the Waterberg-Omuverume mountain plateau, hereafter called "the Waterberg", and presents some data on cliff site selection.

## 2 STUDY AREA AND METHODS

The Waterberg (20 19 S, 17 18 E; 1500 m above sea level) rises about 420 m above the surrounding plains at its southwestern and northern sides, and slopes gently down into the surrounding area to the northeast. The plateau is circumscribed by sandstone cliffs of varying height. Below the cliffs the ground slopes steeply but evenly away to the base of the mountain; the slopes are covered by sandstone rocks weathered from the summit. The vegetation on the summit consists of broad-leaved woodland while the surrounding plains are mainly highly bush-encroached thornveld savanna (Giess 1979; Brown 1985a). The topographic and bioclimatic characteristics of the region are described in detail by Rutherford (1972) and Jankowitz (1983).

On 16 March 1985 the cliff circumference of the Waterberg was investigated from a Bell 47 helicopter. The count began at 07h20 and was completed by 11h00. Large cliffs were surveyed more slowly than

## ABSTRACT

The status and inter-pair distances of raptors nesting on the cliffs of the Waterberg-Omuverume plateau were obtained from a helicopter survey. Of the six diurnal species recorded, Rock Kestrels were most common (42 pairs), with a mean inter-pair distance of 2,3 km; followed by Lanner Falcons (23 pairs) at 4,0 km between pairs; Peregrine Falcons (14 pairs) 5,1 km apart; Black Eagles (7 pairs) 9,8 km apart; Cape Vultures (14 adult birds, 5 active nests) breeding and roosting at one colony; and Booted Eagles (maximum of two active nests but up to 8 birds).

Evidence is presented indicating that the dramatic decline in numbers experienced by the Cape Vultures has been halted and probably reversed as a result of conservation action. The adult population has remained stable over the past two years and nesting success to fledging during this period was about 78% (9 active nests) following two years of no breeding success (14 active nests). The orientation of the Cape Vulture colony is explained in terms of wind direction, with nesting cliffs being selected on the lee sides of the southeasterly wind, the most prevalent, high velocity wind.

Data on cliff size selection by the three *Falco* species at Waterberg suggest a partitioning of nesting cliffs; Peregrine Falcons used the highest cliffs, Lanner Falcons the intermediate cliffs and Rock Kestrels the lowest cliffs. The large number of Peregrine Falcons at Waterberg is attributed to the extensive bush encroachment below the cliffs.

smaller ones, the mean speed being 42 km/h. The helicopter flew just below the top of the cliffs and about 50 m out. In addition to the pilot, there was one observer and one recorder. The observer sat on the cliff side of the aircraft and verbally reported observations via the helicopter communications network to the recorder who plotted the information directly onto 1:50 000 aerial photographs of the area. Data were later transcribed onto 1:50 000 topographic maps. The count was conducted out of the breeding season of the cliff-nesting raptors. Eagle and vulture nest sites were easily identified, but the nests of the three *Falco* species could not be located. For the latter group, those sections of cliffs occupied by pairs of adult birds were assumed to be their nesting areas. Confirmation of the validity of this assumption was subsequently obtained during regular visits to the Cape Vulture colony from the ground, during which pairs of Peregrine and Lanner Falcons were always seen on the same sections of cliffs, and these were later confirmed as breeding sites.

### 3 RESULTS AND DISCUSSION

The perimeter of the Waterberg has a total cliff length of about 148 km. These cliffs range in size from low outcrops a few metres in height to almost sheer cliffs of about 140 m high. 94 pairs of diurnal, cliff-nesting birds of prey, belonging to six species, were found on these cliffs, consisting of one colonial vulture species, two species of eagles and three *Falco* species (Table 1).

#### 3.1 Cape Vulture *Gyps coprotheres*

The decline of the Cape Vulture in SWA/Namibia in general, and at the Waterberg in particular, has been documented by Brown (1985a), and is attributed to (i) the use of poisons on farmlands for the control of

mammalian predators such as jackals, lynx and hyaenas, and (ii) the severe bush encroachment that has taken place in the thornveld savanna regions of the country over the past thirty years as a result of overstocking.

A total of 14 adult birds inhabit the highest sections of the Karakuwisa cliffs (120-140 m) on the northern side of the plateau. In 1984 a feeding scheme was implemented in which the carcass of an adult gemsbok *Oryx gazella* or kudu *Tragelaphus strepsiceros* is provided each week, being placed in an open area on top of the plateau and some 5 km from their nesting cliffs. Even though over 200 vultures belonging to four species are often attracted to a carcass, the Cape Vultures have always been able to dominate sufficiently to fill their crops with food. On some occasions birds have returned from their nests for a second and third crop-full.

A farmer awareness programme was initiated concurrent with the implementation of the feeding scheme. A booklet was prepared on the plight of the Cape Vulture at Waterberg, giving reasons for declining numbers and indicating ways in which farmers could assist in the conservation of this species. Copies were sent to all farmers within a radius of about 120 km of the colony. In addition, "farmers days" were arranged in the park, on each occasion a different local farmers' association being invited to attend. Programmes for these days included formal lectures as well as a field excursion, with Cape Vulture conservation on farmlands being stressed. Evidence for the initial success of these programmes is obtained from the facts that (i) the adult population is no longer declining rapidly (Figure 1) and (ii) the survival rate of nestlings to fledging has increased (Figure 2). This small population remains highly vulnerable, however, as a single

TABLE 1: Population sizes, inter-pair distances and cliff sizes used by cliff-nesting raptors at the Waterberg.

Species	Number	Inter-pair distance (km)			Cliff height used (m)		
		Mean	SD	Range	Mean	SD	Range
Cape Vulture <i>Gyps coprotheres</i>	14 adults 5 active nests	colonial			132,0	11,0	120-140 (nests)
					84,0	11,4	70-100 (roosts)
Black Eagle <i>Aquila verreauxii</i>	7 pairs 15 nests	9,8	3,0	4,6-13,5	66,0	16,4	30-90
Booted Eagle <i>Hieraetus pennatus</i>	up to 8 birds 0-2 active nests	see text			71,7	10,4	60-80
Peregrine Falcon <i>Falco peregrinus</i>	14 pairs	5,1	3,9	1,8-12,1	85,4	24,7	50-140
Lanner Falcon <i>Falco biarmicus</i>	23 pairs	4,0	2,9	0,9-10,1	52,6	16,2	30-80
Rock Kestrel <i>Falco tinnunculus</i>	42 pairs	2,3	1,8	0,3-6,3	29,9	18,0	5-70

poisoned carcass on any of the more than 700 farms over which these birds forage could cause their extinction.

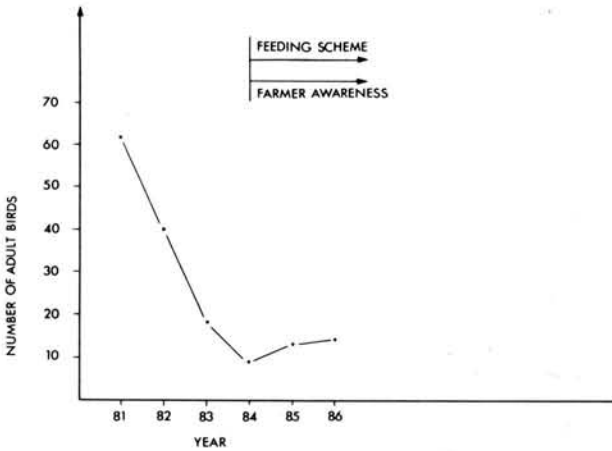


FIGURE 1: Number of adult Cape Vultures counted on the cliffs at Waterberg before and after implimentation of the feeding scheme and farmer education.

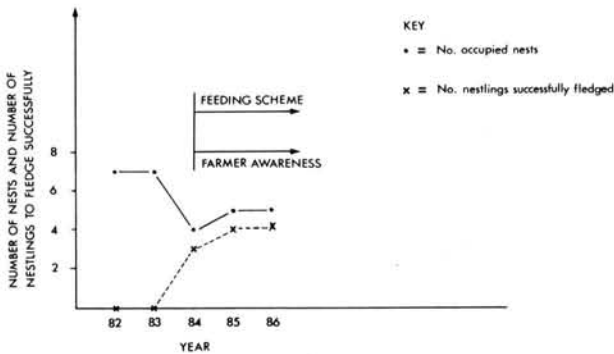


FIGURE 2: Number of active Cape Vulture nests at Waterberg, and number of nestlings that fledged successfully before and after implementation of the feeding scheme and farmer education.

A subsidy to farmers for the thinning of bush-encroached areas was approved by the SWA/Namibia Cabinet in 1986. This is also expected to benefit the Cape Vultures at the Waterberg.

Most Cape Vulture colonies have a southerly to easterly aspect (Mundy 1982; Tarboton & Allan 1984; Brown & Piper 1988). Mundy (1982) has suggested that this may be for thermoregulatory reasons, so that the nestlings are in shadow rather than exposed to the sun. In view of the facts that (i) a few large Cape Vulture colonies are north facing and appear to support as successful a breeding population as south facing colonies, (ii) breeding takes place during the winter months, (iii) other vulture species breed successfully on the tops of trees with day-long sun exposure and (iv) at the height of cliff nests there is usually at least a light cooling breeze, the thermoregulatory hypothesis does not appear to be valid.

The aspects of nest sites selected by Bearded Vultures in the Drakensberg and Maluti highlands of southern Africa has been correlated with wind direction and ve-

locity (Brown *et al.* in press). A similar correlation has been found for Cape Vultures nesting and roosting on the basalt cliffs of the high Drakensberg escarpment, where 77% of roosting birds and 84% of nests occupied ledges on cliffs that face between east and south (Brown & Piper 1988). These ledges are on the lee side of the 'berg wind, which is prevalent mainly from July to September when the birds are nesting, and which often reaches velocities of over 75 km/h, blowing out of the west and northwest.

At the Waterberg the Cape Vulture colony is on north-west facing cliffs. It was formerly a large colony supporting some 500 birds (Brown 1985a) and presumably successful breeding must have taken place here until the population started to decline in about the 1950's. An analysis of wind data gathered at Grootfontein (115 km northeast of the Waterberg and the nearest station to the Waterberg which gathers data on wind) indicates that winds of 10 m/s or faster are most common during July and August (Figure 3), a time when Cape Vultures are breeding and have young nestlings on the nest. Wind direction and duration (Figure 4)

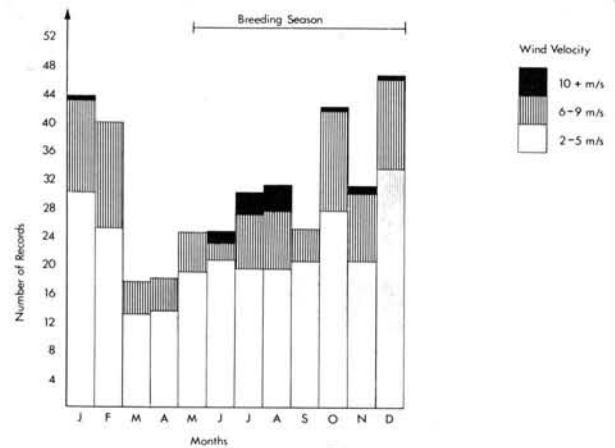


FIGURE 3: Mean wind frequency for each month of the year (1980-1985) for three categories of wind velocity, measured at 08h00 and 16h00 at Grootfontein, SWA/Namibia.

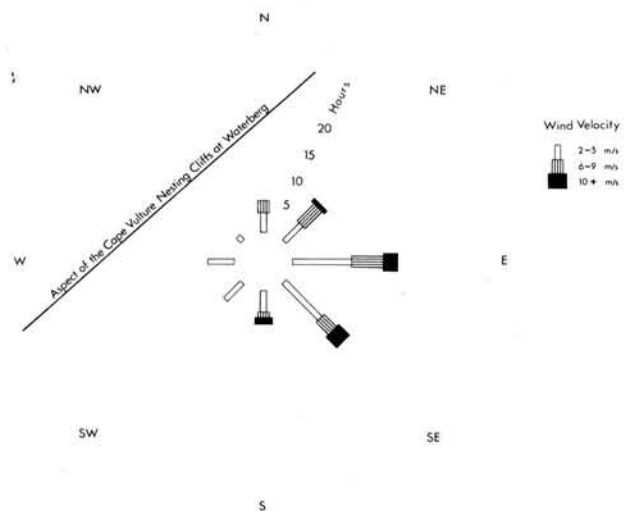


FIGURE 4: Wind direction and duration for three categories of wind velocity, calculated for the months of July and August when winds of above 10 m/s were most common, from the same source as Figure 3.

for these two months shows clearly that southeasterly winds are most common and of greatest velocity. The Cape Vulture colony is situated on the lee side of the Waterberg, and it is therefore afforded the best possible protection from the wind by the cliffs.

### 3.2 Black Eagle *Aquila verreauxii*

Black Eagles occur over most parts of SWA/Namibia where there is suitable habitat and rainfall above about 100 mm per annum. The Waterberg is on the edge of the species' range, bordering onto the Kalahari sandveld where no suitable rocky outcrops occur. Nevertheless, the Waterberg supports the densest population of Black Eagles known for this country. Seven pairs were spaced at an average interval of 9,8 km (SD = 3,0 km; range = 4,6-13,5 km). This is comparable to densities recorded for mountain ranges in other areas. In the Transvaal nests were on average between 7-13 km apart (Tarboton & Allan 1984), in the central Natal Drakensberg eight pairs were on average 9 km apart (Brown 1988) and in the Matopos, Zimbabwe, 55 pairs were on average 4 km apart (Gargett 1975).

A total of 15 nests was located at Waterberg, giving on average 2,1 nests per pair. One pair had one nest, five pairs had two nests and one pair had four nests. The mean distance between alternate nests of a pair was 1,8 km (SD = 1,6 km; range = 0,4-4,8 km). Nesting cliffs ranged from 30 to 90 m in height (mean = 66,0 m) with all nests being more than half way up the cliff. No preference was found in the aspect of cliffs used; about half faced in a northerly direction and half faced south.

### 3.3 Booted Eagle *Hieraaetus pennatus*

Three populations of Booted Eagles occur in SWA/Namibia. These are (a) non-breeding Palearctic migrants, present from November to March, (b) intra-African migrants which breed in the Cape Province, present from April to July and (c) an apparently small population of breeding birds whose movements are not known (Brooke 1974; Brooke *et al.* 1980; Biggs *et al.* 1981; Brown 1985b; Steyn & Grobler 1985).

In 1983 two pairs of Booted Eagles were found on nests on the cliffs at the Waterberg, constituting the first breeding records for this species in SWA/Namibia (Brown 1985b). In addition, six to eight Booted Eagles were regularly seen near the nesting cliffs, an unusually large number, as they are reported to occur singly or in pairs (Cramp & Simmons 1980; Maclean 1985). During the 1984 breeding season a maximum of four Booted Eagles was seen. Only one nest was found from the helicopter, in the area where they had most often been seen from the ground and about 20 km from the sites used the previous year. In 1985 only one Booted Eagle was seen and no nesting was discovered.

All three nests were about half way up northwest facing cliffs which ranged in height from 60-80 m.

Booted Eagles have not been found breeding in any other regions of SWA/Namibia. From good circumstantial evidence, it is likely that they breed in the Richtersveld and near Augrabies Falls, both sites just south of the SWA/Namibia border (Donaldson 1982; Steyn & Grobler 1985). Birds performing undulating courtship flights have been seen in mountainous regions of Kaokoland, in the extreme northwest of the country (S. Briane pers. comm.). On available evidence it would seem that the Booted Eagle breeding population in SWA/Namibia is rather unstable and of variable size from year to year. It has been generally accepted that breeding by Booted Eagles in the Cape Province was overlooked before 1973 (*e.g.* Brooke *et al.* 1980; Steyn 1982). Booted Eagles are one of the most common (Boshoff *et al.* 1983) and distinctive eagle species, particularly in their more typical pale-phase form. It is therefore difficult to accept that, if they had been as abundant as they are today, they would have been overlooked. If Booted Eagles were currently extending their breeding range to SWA/Namibia, this could account for the apparent instability in the breeding population. The possibility that Booted Eagles may, over the past sixty or so years, have established a breeding population in southern Africa which is growing in size, should not be excluded. This is particularly possible as, since the turn of the century, farming practices have dramatically altered the natural environment, providing water in regions that formerly held little surface water throughout much of the year, reducing predation on prey species, establishing large cultivated areas which has led to increases in the numbers of seed-eating birds, all favouring the establishment of a breeding population by Booted Eagles. While man-modified environments have been detrimental to many large raptors they have certainly been advantageous to others, *e.g.* Secretary Bird *Sagittarius serpentarius*, Blackshouldered Kite *Elanus caerulus*, African Fish Eagle *Haliaeetus vocifer* and many *Accipiter* species (Steyn 1982), and the Booted Eagle may well be found to fall into this category.

### 3.4 Peregrine Falcon *Falco peregrinus*

Peregrine Falcons are considered rare in southern Africa, being represented by the resident race *F. p. minor* as well as a non-breeding palearctic migrant race, *F. p. calidus* (Maclean 1985), the former being considerably smaller and darker than the latter (Brown *et al.* 1982). All nesting sites found in southern Africa have been on high, inaccessible cliffs (Steyn 1982; Tarboton & Allan 1984). Where ample choice of nesting sites is available, birds apparently select the highest cliffs with suitable ledges, but where a good food supply is present, less desirable nesting cliffs may be accepted (Cramp & Simmons 1980; Ratcliffe 1980; Hustler 1983).

At the Waterberg 14 pairs of Peregrine Falcons were located. The mean inter-pair distance was 5,1 km, representing the highest known population density in southern Africa (cf. Steyn 1982 who states, "it is doubtful whether a density of eight pairs in 3100 sq km (giving a mean inter-pair distance of 22 km) as found in one area in Kenya could occur anywhere in our area"), but in other parts of the world population densities may be much higher, e.g. along rivers in Alaska, linear densities of up to five pairs per 1,6 km were found, and in central Europe, England and Scotland, inter-pair distances of 1,5-5 km are common (Cramp & Simmons 1980). Only one other nesting site is currently known in SWA/Namibia, on high cliffs in the Skeleton Coast Park (Braby *et al.* 1987), although Maclean (1960) found them to be fairly common along the Fish River in the late 1950's and two clutches of eggs are recorded from this country by Peakall & Kiff (1979) for 1969 and 1970 respectively.

It has been suggested (Tarboton 1984) that the African Peregrine Falcon requires continuous woodland below its nesting cliffs to be able to successfully compete with Lanner Falcons, the latter having a wider prey spectrum which includes mammals and reptiles. Only in areas which offer opportunities for exclusively aerial hunting can Peregrine Falcons retain a competitive edge. In open country different hunting opportunities are possible, and in these areas the slightly larger and more generalist Lanner Falcon is more efficient at obtaining food and thus has more time to contest the nesting cliffs (Tarboton 1984). This hypothesis is supported by the findings of Thompson (1982, 1984) and Hustler (1983), the former author noting that when woodlands are removed from the base of cliffs, Peregrine Falcons are often replaced by Lanner Falcons.

At the Waterberg extensive bush encroachment has taken place in the thornveld vegetation type below the plateau, resulting in impenetrable thickets of *Acacia mellifera* subsp. *detinens* and *Dichrostachys cinerea*, these being particularly dense around the base of the mountain because natural springs in this area led to higher grazing pressures. This very dense thicket below the cliffs would preclude Lanner Falcons hunting near ground level, and the relatively high position of the cliffs above the surrounding plains would favour the aerial hunting habits of the Peregrine Falcon. These factors may account for their unusually high density, being in a ratio of 1:1,6 with Lanner Falcons.

Cliffs occupied by Peregrine Falcons ranged in height from 50 m to the highest sites available at 140 m, the mean being 85 m. At most places below the cliffs, the steep scree slope descends some 300 m to the surrounding plain, giving most sites a height of about 400 m above the plain. In the Transvaal, Peregrine Falcons used higher cliffs than did Lanner Falcons, and similar results were found at the Waterberg (Figure 5), where a partitioning of cliffs was found; the highest cliffs

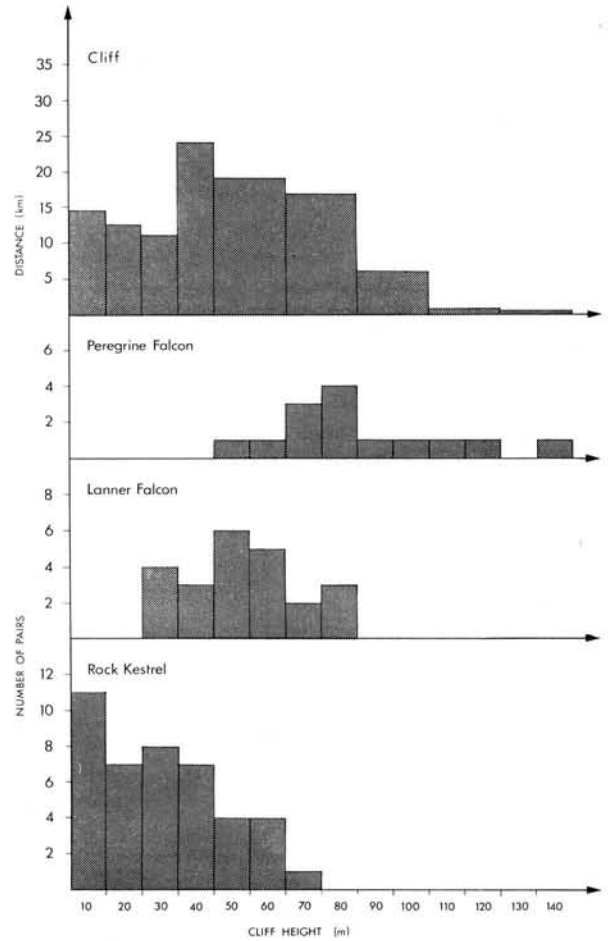


FIGURE 5: Length of cliffs within each cliff height category, and number of pairs of Peregrine Falcons, Lanner Falcons and Rock Kestrels located within each category of cliff height.

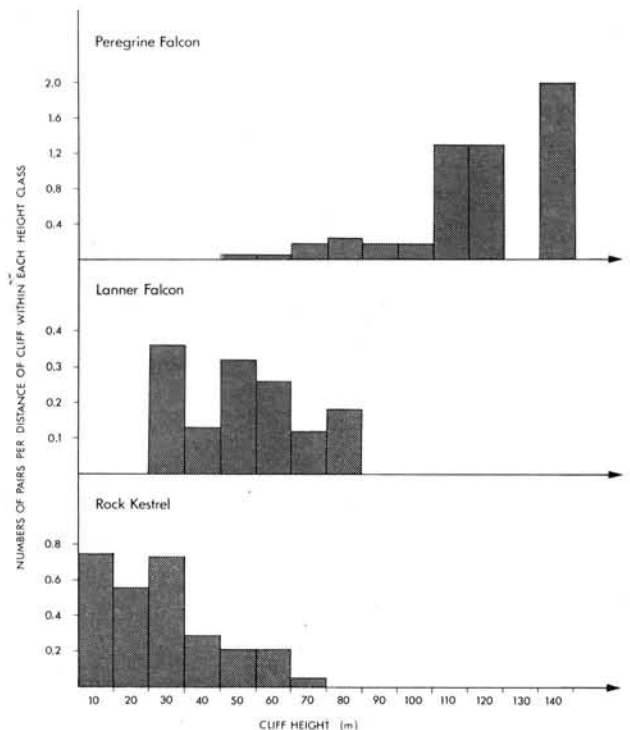


FIGURE 6: Number of pairs of each *Falco* species per distance of cliff, within each height category.

were used by Peregrine Falcons, cliffs of intermediate height were used by Lanner Falcons and the lowest cliffs were used by Rock Kestrels. The extent to which Peregrine Falcons selected the highest cliffs can be seen from the number of pairs per distance of cliff of each height class (Figure 6), with cliffs above 100 m in height being particularly popular.

During 1985 the average productivity of four pairs of Peregrine Falcons was determined as 2 young/pair/year. One pair did not breed, one produced two flying young and two pairs produced three young each.

### 3.5 Lanner Falcon *Falco biarmicus*

The Lanner Falcon is one of the most common falcons in Africa, particularly in semi-arid and arid regions (Brown *et al.* 1982). It has, however, been surprisingly little studied. Only in the Transvaal, and two small areas in Zambia, have population estimates been made (Tarboton & Allan 1984; Osborne & Colebrook-Robjent 1984).

At the Waterberg 23 pairs were spaced at an average interval of 4,0 km (SD = 2,9 km; range = 0,9-10,1 km). In the Transvaal two study areas had mean inter-pair distances of about 9 km with a minimum distance between two pairs of 200 m, but on continuous cliffs nests were usually 2-5 km apart (Tarboton & Allan 1984). In Zambia two areas had mean inter-pair distances of 3,5 km (n = 5) and 1,8 km (n = 7) respectively, with a minimum inter-pair distance of 400 m (Osborne & Colebrook-Robjent 1984).

### 3.6 Rock Kestrel *Falco tinnunculus*

Rock Kestrels were found to be the most common cliff-nesting raptors at Waterberg (42 pairs), occurring at an average interval of 2,3 km (SD = 1,8 km; range = 0,3-6,3 km). They occupied mainly the lower cliffs (mean height of 30 m) with 11 pairs on cliffs below 10 m. Rock Kestrels have been little studied in Africa, and no published data on breeding densities are available. In Europe this species has been found breeding at high densities, *e.g.* seven pairs within 40 m of cliff, and even colonially, although solitary nesting is much more common (Cramp & Simmons 1980; for a review of breeding density in Europe see Village 1984).

Because of their acceptance of low cliffs as breeding sites, as well as their use of tree and pylon nests (Maclean 1985; Brown & Lawson in press), Rock Kestrels are widespread throughout SWA/Namibia. They appear little affected by human activities and do not warrant conservation attention at present.

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