

# Abundance of the endangered Cape parrot, *Poicephalus robustus*, in South Africa: implications for its survival

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Factors affecting the decline of the endangered Cape parrot, which is endemic to South Africa, are presented. Its abundance and status were investigated during annual intensive national surveys. The merits of such a census are reported. Presence of birds was unpredictable at forest patches throughout its range. Present distributions in forest fragments reflect past distribution in a larger mosaic of forest patches. Numbers are low and the best estimate of numbers is 300–350 birds in the Eastern Cape, 170–220 in KwaZulu-Natal, and 50–60 in Limpopo Province. This suggests less than 1000 Cape parrots remain in the wild. About 20% of the entire population of the Cape parrot resident within the forest mosaic of southern KwaZulu-Natal roosts in one particular forest, which consequently needs urgent conservation protection.

**Key words:** *Poicephalus robustus*, Cape parrot, abundance, census techniques, conservation, volunteer monitoring, citizen science.

## INTRODUCTION

Worldwide, parrots are under threat in their natural environments, with declines having been reported in many species (Lindsey *et al.* 1989; Evans 1991; Gnam & Rockwell 1991; Collar & Juniper 1992; Christian 1993). The Cape parrot, *Poicephalus robustus*, is South Africa's only endemic parrot and it is regarded as endangered and rare (Downs 2000). Its numbers have declined greatly in the past 50 years (Wirminghaus *et al.* 1999), especially in the Eastern Cape (including Transkei) (Skead 1964, 1971; C. Vernon, pers. comm.), and in KwaZulu-Natal (Skead 1971; A.F.B. Kerr, J. Geekie, pers. comm.). In the Limpopo Province, it remains scarce (Brooke 1984).

Various factors have caused the decline in numbers of the bird. These vary in intensity and importance from area to area, and include forest degradation and loss; food and nest-site shortages, resulting in poor breeding success and low recruitment; removal of birds from the wild for the avicultural and pet bird trade; and disease, especially psittacine beak and feather virus (Wirminghaus *et al.* 1999, 2000a).

Like all parrot populations, the size of the Cape parrot population is difficult to estimate numerically (Casagrande & Beissinger 1997). Birds fly long distances between nesting, roosting and feeding areas (Chapman *et al.* 1989; Casagrande &

Beissinger 1997). They are often difficult to detect at certain times of the day, and mark–recapture methods are unsuitable (Casagrande & Beissinger 1997). In particular, Cape parrots are difficult to catch in mistnests except at feeding sites outside of forest and individual marking techniques have been unsuccessful (Wirminghaus *et al.* 2001a). Furthermore, standard bird census techniques are inappropriate because the birds are not predictable in their occurrence at particular forests (pers. obs.; Wirminghaus *et al.* 2000b). The Cape parrot does not occur as a metapopulation (Meffe & Carroll 1997) because the birds are able to visit various forests and the subpopulations do not seem isolated, with the exception of the one in Limpopo Province.

The Cape parrot only occurs in *Podocarpus* Afromontane forest patches above 1000 m a.s.l. from the Eastern Cape to southern KwaZulu-Natal, (Wirminghaus 1997), with a relict population in Limpopo Province (Wirminghaus 1997). Although restricted to Afromontane forest patches, the birds are food nomads and are highly mobile, moving between *Podocarpus* forest patches, visiting orchards and occasionally coastal forests (Mboyti to Port St Johns, Eastern Cape, pers. obs.). At certain times of the day, the Cape parrot's loud, often continuous, calling makes it conspicuous (Wirminghaus *et al.* 2000b). They are usually active for several hours after dawn and

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before sunset, usually circling over the forest and calling loudly (Wirminghaus *et al.* 2000b). Flock size varies: singletons, pairs, or groups of 5–6 birds are usually observed. However, at localized food sites flock size may increase to 20–70 birds through aggregation, giving a false impression of abundance (Wirminghaus *et al.* 2001a). These characteristics suggest that a total count is the most practical method of determining the number of parrots left in the wild.

Trends in population size of the Cape parrot are particularly important because of its rare and endangered status, and for its conservation (Downs 2000). Therefore, the abundance of the Cape parrot over several years was examined together with its use of some key forest patches.

## MATERIALS & METHODS

### *Presence in forest patches*

Visits to landowners, conservancies, and conservation managers were undertaken to obtain information on parrot numbers, flock size, local movement patterns and, where possible, also on roost, nest, and food trees from forest patches in the Eastern Cape (including Transkei), Limpopo Province, Mpumalanga and KwaZulu-Natal (KZN). In addition, a questionnaire was sent requesting information on presence and abundance of Cape parrots to landowners, conservancies, and conservation managers. In planning parrot fieldwork, a Geographic Information System (GIS) was created to assist with field data storage and manipulation. Indigenous forests in southern KZN and the Eastern Cape are remote, with poorly marked access routes. The GIS was used to produce maps to provide observers with an overview of the project and to assist them in locating their observation points; highlight the forests where the birds concentrate; predict Cape parrot's movements; and determine long-term trends in population abundance.

### *Total population estimate: Parrot Day*

As accepted census methods had been unsuccessful (unpubl. data), a national census day was implemented to eliminate temporal variation estimating abundance, and cover all localities simultaneously. Since the pilot study was initiated in 1997, a Cape Parrot Big Birding Day has been held annually (1998–2003). Forest patches (Afromontane and coastal) in the Eastern Cape, KZN and Limpopo Province were identified, and the areas divided into regions headed by a coordi-

nator (Fig. 1). Groups of two or more observers were assigned to specific observation points at forests or at feeding or roosting sites outside of forest (Symes & Downs 2002). This required the involvement of volunteer observers, including birders, landowners, farmers, students and other interested people. Observers counted and recorded presence or absence, arrival and/or departure, and roosting of Cape parrots. Movement and activity recordings included the number of Cape parrots seen and their direction of flight. Observations were made when Cape parrots were most active, 3–5 hours after sunrise and 3–0 hours before sunset. The results were scrutinized to avoid any repeated counting of the same birds. To accomplish this, directions and times of flights by birds were compared between datasheets. The census was held annually in April/May when the weather is usually clear (pers. obs.). Also, the birds often congregate at feeding sites at this time of year and are easy to count (unpubl. data).

Since 2000, it was decided to split the census observations over the afternoon of the Saturday and the morning of the Sunday to facilitate maximum involvement of volunteer observers. This also made provision for poor weather conditions on either of the days, and facilitated confirmation of the presence and number of parrots because data were analysed separately for the morning and afternoon periods.

The number of Cape parrots seen at each locality in the morning and evening, and the number of person-hours of observation for each was determined. In addition, the number of locations and the percentage of sites where Cape parrots were observed were calculated. These were summarized by provincial boundary for each year.

### *Use of forest patches*

Cape parrot presence and abundance data were collected at Hlabeni State Forest in southern KwaZulu-Natal, South Africa. This forest forms part of a complex of mistbelt mixed *Podocarpus* Afromontane forests (Cooper 1985; Wirminghaus *et al.* 2001a,b). Observations were made monthly at Hlabeni from March 1993 to December 2000 (see Wirminghaus *et al.* 2001a).

During 2001, Cape parrot presence and abundance data were recorded at Hlabeni and nearby forest patches for a day in summer, autumn, winter and spring. Volunteers were enlisted to assist and procedures followed that of the Cape Parrot Big Birding Day (see above).

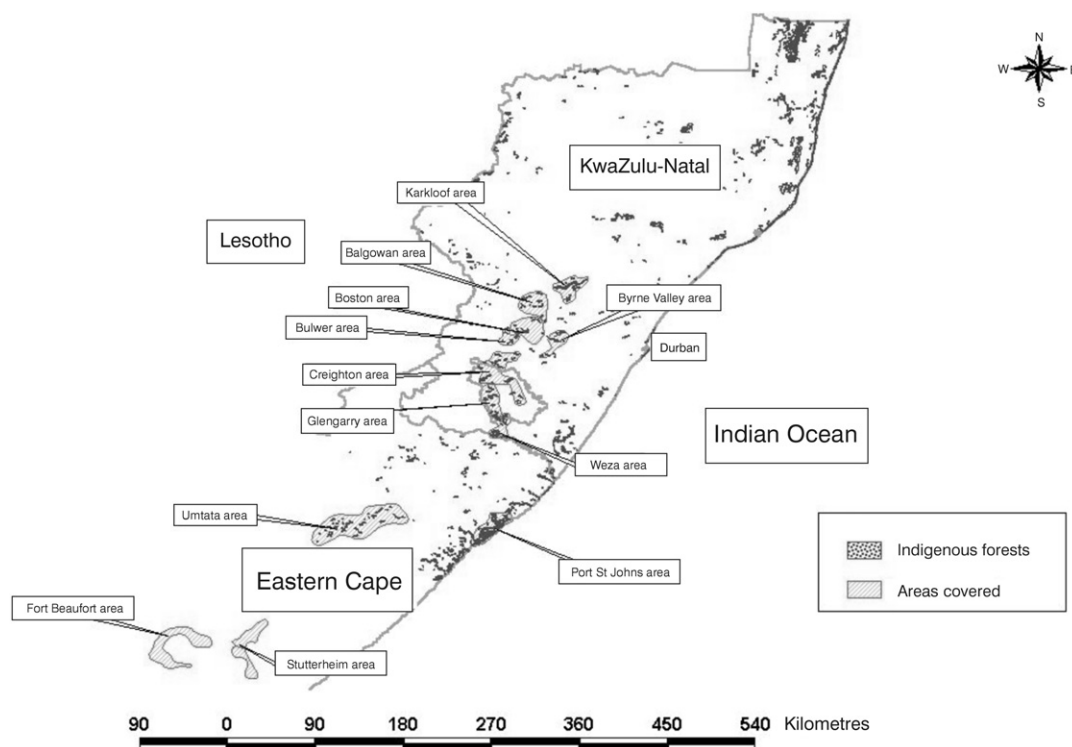


Fig. 1. The areas covered on the Cape Parrot Big Birding Day, excluding the Limpopo Province.

## RESULTS

### Presence or absence of the Cape parrot and population estimates

Prior to the census day, it was found that the presence and numbers of Cape parrot at most forests were unpredictable. Birds were usually observed in the early morning and/ or late afternoon, and regular sightings of pairs were associated with a nest locality or the seasonal fruiting of a local food supply.

Density estimates based on direct enumeration of birds during visits to forests, the completed questionnaires and personal communications showed that numbers of Cape parrot were low. Based on these data, a crude estimate of Cape parrot numbers was determined to be about 350 birds in the Eastern Cape (excluding Transkei), 150 in the Transkei, 150 in KZN, and fewer than 50 in Limpopo Province, giving a total estimate of 650–700.

More specifically, information collected prior and subsequent to the census days suggest that there were about 350 Cape parrots in the Fort Fordyce–Stutterheim area, Eastern Cape, with a

large flock of about 70–100 birds that moved into pecan nut orchards on five of the census days. In the Umtata–Port St Johns area, Eastern Cape, there were about 100 birds and in the Weza–Creighton–Bulwer area, KZN, there were about 200 birds. In the Boston–Dargle–Balgowan area, KZN, there were 16–20 birds and in the Karkloof, KZN, about 5–12.

### Population size estimates: Cape Parrot Big Birding Day 1998–2003

The national censuses showed that Cape parrot numbers were low because fewer than 1000 birds were recorded annually over six years. Cape parrot population numbers observed during the 1998–2003 censuses were below 500 until 2001 (Table 1). Observations prior and subsequent to the census day suggest that there might be a shortage of food in the forests in summer and autumn as the Cape parrots aggregated to feed on fruit (usually pecan nuts) outside of forest. Furthermore, during 2001, the parrots were observed visiting sites where they have not been seen for the past five years (unpubl. data).

During 2002 and 2003, the census coverage

**Table 1.** Numbers of Cape parrots counted on the Cape Parrot Big Birding Days 1998–2003.

Year	Cape parrot total		Number of observer sites		% Sites with observations		Number of observers	Total person hours	
	am	pm	am	pm	am	pm		am	pm
1998	321	179	47	37	64	38	136	626.6	432.4
1999	282	237	53	53	53	47	155	693.5	484.5
2000	459	460	42	38	49	46	118	284	240.5
2001	356	316	75	69	56	53	153	477.5	395.5
2002	634	476	144	141	44	41	339	952	839.3
2003	885	717	149	148	46	45	332	1021	972.5

am = morning only, pm = afternoon only.

increased greatly with increased number of observers and sites, and the highest counts of parrots were recorded (Table 1). During 2003 a minimum of 332 volunteer observers were posted at 149 observation points throughout the range of the Cape parrot. In total, 885 parrots were seen during the afternoon count and 717 the following morning. A minimum of 1993 person-hours were spent watching for parrots, and observers saw parrots at 46 and 45% of the observation points in the afternoon and morning, respectively (Table 1).

The increased number of sites and decreased number of places where Cape parrots were seen showed that despite increased coverage, the number of localities where they were seen did not increase. There appeared to be a saturation of possible sites.

During 2003, the most birds, 461, were recorded in the Eastern Cape in the Amatola Mountain area from Alice to Stutterheim. The former Transkei had 246 birds, and KwaZulu-Natal recorded 229 birds, of which most were in the Creighton area (Table 2). In Limpopo Province fewer birds (18) were recorded than in the past censuses. During 2003 there was recruitment of parrots, supported by observations of juvenile birds at a number of localities and reports of nesting in the past year.

There was no significant difference between morning and evening total population estimates during 1998–2003 (Wilcoxon matched pairs test;  $n = 6$ ,  $z = 1.99$ ,  $P \leq 0.05$ ). There was no significant difference between years for the provincial population estimates during 1998–2003 for morning and evening (RMANOVA, d.f. = 5, 17,  $F = 0.62$ ,  $P = 0.69$ ). However, there was a significant difference between years for the provincial population estimates between morning and evening during 1998–2003 (RMANOVA, d.f. = 1, 17,  $F = 5.70$ ,  $P = 0.03$ ).

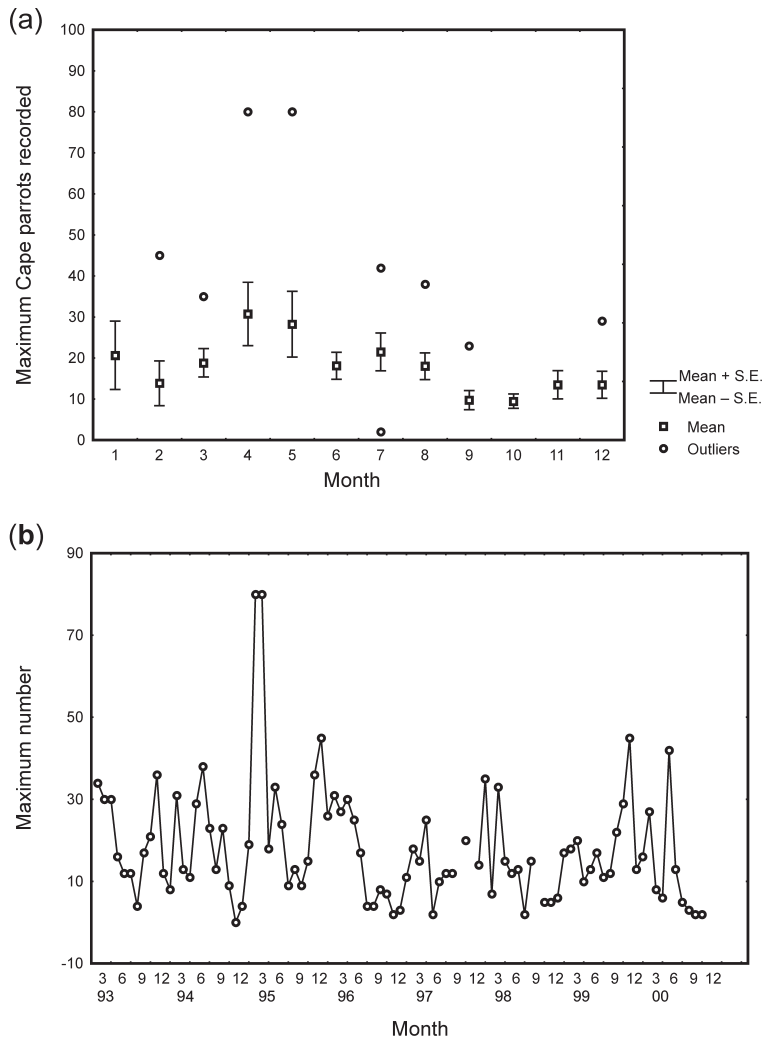
### Presence of Cape parrots in a mosaic of forest patches

Presence of Cape parrots at Hlabeni Forest (Fig. 2) showed that the numbers vary through the year and between years. The birds use the forest for food and visit a drinking point during the dry winter months. Numbers of Cape parrots at Hlabeni Forest were low (<30) but showed great variability (Fig. 2a,b). For example, no parrots were observed in January 1995, while a maximum of 80 per day were seen in April and May 1995 (Fig. 2b). This variability is concealed when the data for the years 1993–2000 are pooled (Fig. 2a). There was no significant difference in numbers of Cape parrots at Hlabeni between months during 1993–2000 (ANOVA, d.f. = 1, 11,  $F = 1.85$ ,  $P = 0.059$ ).

Presence of Cape parrots was found to vary between patches in the Creighton–Donnybrook area during 2001 (Fig. 3, Table 3). However, large numbers roosted regularly at one of the forests here, namely Gxalingele Forest. Total number of parrots in the overall area was consistent throughout the year ranging from 118–135 birds. There was no significant difference between counts (RMANOVA, d.f. = 1, 7,  $F = 0.67$ ,  $P = 0.69$ ). During January, birds were found feeding outside of Nxumeni Forest in non-indigenous fruit trees.

### DISCUSSION

Four methods are typically used to estimate parrot population numbers (Casagrande & Beissinger 1997). Roost counts are used where all roosts can be identified, but the assumption that all are found is rarely tested (Casagrande & Beissinger 1997). Also birds change roost sites and usage decreases as the breeding season progresses (Casagrande & Beissinger 1997). Point and line transects produce low confidence level estimates (Lambert 1993; Casagrande & Beissinger 1997). Mark–resighting has higher confidence level estimates (Casagrande



**Fig. 2.** Maximum number of Cape parrots recorded monthly at Hlabeni Forest (1993–2000) where (a) is the mean  $\pm$  S.E. and (b) the actual total seen.

& Beissinger 1997). Standard bird counting techniques are not suitable for Cape parrots. It appears that a total count, as attempted in this study, is the most practical and efficient method of determining their numbers left in the wild. It seems that a stage has now been reached when there is a reliable total count (Tables 1 & 2) with a saturated coverage. However, there is a need to continue for at least another five years to establish trends.

There are problems with the census method used because it requires knowledge of inhabited remote forest habitats and suitable observation posts, parrot movements, and enough volunteers to cover the areas where parrots occur. Because the

Cape parrot is rare, opinion questions whether a conservation effort like this may be exposing the location of the birds to those who are intent on catching them for trade. This is a paradox. Trends in population size, especially whether there is decline or increase, is fundamental information for the overall conservation effort. Furthermore, increased public awareness brings about an unofficial monitoring system of the species in addition to the formal conservation effort through the Cape Parrot Working Group that is driving the conservation effort.

Other problems with such a census are:

- Are all areas covered?
- Are volunteers able to identify Cape parrots

**Table 2.** Results of the Cape Parrot Big Birding Day censuses 1998–2003 in terms of provincial boundaries.

Year	Province	Weather	No. observers	No. Cape parrots		Max. No. Cape parrots	No. locations		% Observations	
				am	pm		am	pm	am	pm
1998	E. Cape	Good	27	153	107	153	7	7	100	71
	Transkei		28	97	56	97	11	8	55	25
	KZN		81	71	16	71	29	22	38	18
	<b>Max. total</b>					<b>321</b>				
1999	E. Cape	Poor	8	51	38	51	4	5	100	90
	Transkei		36	103	65	103	12	11	58	55
	KZN		103	128	134	134	35	35	54	43
	Limpopo		8	0	0	0	2	2	0	0
	<b>Max. total</b>				<b>288</b>					
2000	E. Cape	Good	25	225	260	260	14	10	93	100
	Transkei		30	96	56	96	6	7	67	43
	KZN		63	138	144	144	27	26	48	54
	Limpopo		0	0	0	0	0	0	0	0
	<b>Max. total</b>				<b>500</b>					
2001	E. Cape	Good	47	88	54	88	32	30	50	57
	Transkei		31	115	162	162	20	19	55	58
	KZN		64	146	94	146	18	16	61	44
	Limpopo		11	7	6	7	5	4	60	50
	<b>Max. total</b>				<b>403</b>					
2002	E. Cape	Good	85	302	182	302	52	49	46	43
	Transkei		91	111	91	111	29	28	59	43
	KZN		121	171	175	175	48	48	35	40
	Limpopo		42	50	28	50	15	16	33	38
	<b>Max. total</b>				<b>638</b>					
2003	E. Cape	Mixed	91	392	461	461	48	46	40	43
	Transkei		67	246	112	246	23	22	74	64
	KZN		148	229	142	229	63	65	48	48
	Limpopo		26	18	2	18	15	15	20	7
	<b>Max. total</b>				<b>954</b>					

KZN = KwaZulu-Natal, am = morning only, pm = afternoon only.

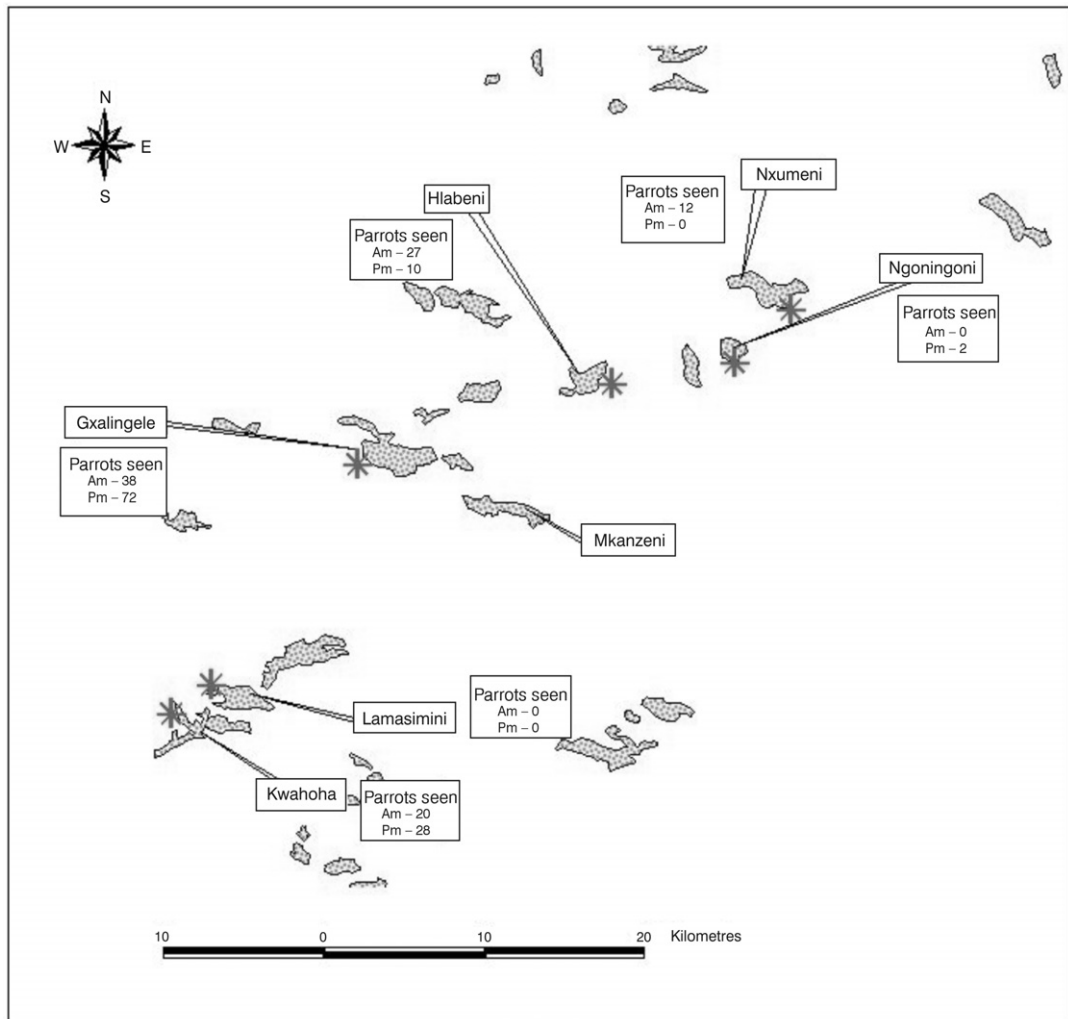
accurately and from good vantage points?

- Is the weather suitable for effective observations?
- Are parrots counted twice when moving between locations?

The number of observers over the past five years has increased, especially with more observers in the 2002–2003 (a more than 221% increase on previous years) (Table 1). It is essential to have all locations where parrots have been observed in the past five years monitored on the day. One of the trade-offs of increasing locations where observers are stationed is that a number will not record birds (often to their dismay), resulting in a decrease in the percentage of sites where birds were observed (Table 1). However, these nil counts are as important as sightings of the birds. Causes for the variability of results, especially the discrepancy between the morning and afternoon counts, may be a consequence of poor weather, double counting, and perhaps missing an area where parrots

are. It is possible that during 2003 over-counting occurred in the Eastern Cape where birds were seen in large flocks and that these flocks were counted twice

Other than highlighting the predicament of the Cape parrot and the need to conserve its forest habitat, this census involves volunteers from all walks of life. The success of this monitoring programme results from the enthusiastic and expert support received from volunteer parrot watchers. More than 50% of the volunteers during 2003 participated in one or more previous Cape Parrot Big Birding Days. The census would be impossible without the involvement and commitment of volunteers. Sometimes criticism is made by the scientific community in questioning the accuracy of counts made by volunteers. However, the importance and successful use of volunteers in wildlife monitoring programmes, especially avian studies, has been shown (Howe *et al.* 1989; Haig &



**Fig. 3.** Importance of Gxalingele Forest as a roost, feeding and nest site for Cape parrots compared with other forests in the Donnybrook–Creighton area. However, most birds departed from this forest and visited other forests in the mosaic of forest patches. Forests in the area are shown, with asterisks highlighting those where observers were positioned during the seasonal counts in 2001.

Plissner 1993; Bildstein 1998; Pattengill-Semmens & Semmens 2003). In the present monitoring programme, a number of volunteers have been involved for several years, and most novices are included in groups with experienced observers. Attempts are made to have observers stationed at the same points each year, so consequently, the validity and reliability of the data collected are good. Furthermore, in many areas, local people who have Cape parrots visiting their gardens, or nearby, have also become involved. The Cape parrot usually makes a loud shriek while flying, alerting observers to its presence. In addition,

the day is divided over an afternoon and a morning with separate tallies for each, to further improve the reliability of the count, especially when the weather is not good during one of the sessions.

Cape parrots are endemic to South Africa but there is variation in numbers of birds seen in the different provinces (Table 2). Furthermore, there is a discontinuous distribution of the birds within each of the provinces. This highlights how difficult it is to make a general conservation plan for the species. The present distribution of Cape parrots, in patches and fragments of a large

**Table 3.** Number of Cape parrots observed during simultaneous censuses at a number of nearby forests at various times of the year in the Creighton area, KwaZulu-Natal, during 2001.

Forest	Location	Area (ha)	Number of Cape parrots							
			Jan		May		Aug		Nov	
			am	pm	am	pm	am	pm	am	pm
KwaHoha	30°09'40"S 29°31'40"E	350	20	28	2	0	7	7	14	10
Lamasimini	30°08'40"S 29°33'40"E	250	0	0	21	34	14	11	17	14
Gxalingele	30°01'50"S 20°37'40"E	608	38	72	81	33	100	33	22	80
Hlabeni	29°58'20"S 29°44'00"E	402	4	10	7	7	7	5	19	9
Ngoningoni	29°56'55"S 29°49'00"E	250	0	2	2	2	3	3	0	1
Nxumeni	29°55'30"S 29°50'20"E	385	13	13	5	5	4	4	5	6
Total			75	125	118	81	135	63	77	120

am = morning only, pm = afternoon only.

mosaic of forests in the Eastern Cape and KZN, reflect the past distribution of Cape parrots, as shown by museum records (Wirminghaus *et al.* 2002a).

### Implications for conservation

The 1998–2003 censuses (Table 1) showed that Cape parrot population numbers are low compared with the previous estimates made by Skead (1964), who estimated 600 birds in the Eastern Cape alone, and Boshoff (1988) who estimated as many as 1000 birds.

During the censuses, most sightings of Cape parrots were made of birds flying between forest patches and roosting sites. Cape parrots in these areas are the important nuclei for the surviving population. Forests in these areas must be highlighted as focal conservation areas. In particular, the Gxalingele Forest in the Creighton–Riverside area, which has many large *Podocarpus* spp., needs special attention. This was further shown by its usage compared with other nearby forest patches during 2001 with 50–100 (Table 3) birds roosting there, usually leaving in the morning early, and splitting into smaller flocks to visit nearby forest patches. However, this forest has little protection through provincial nature conservation organizations and there is evidence of trees having been removed (pers. obs.).

If it is assumed that the Cape parrot has a stable population, and age of first breeding is about five

years of age in the wild (Wirminghaus *et al.* 2002c), there should be large numbers of non-breeders depending on longevity and recruitment. In addition, there may be adult pairs which fail breeding early, lose a nest site, lose a mate, do not breed in a given season, or produce chicks with disease, and so do not contribute to the effective breeding population. There are no data on the sex ratio of birds in the wild and whether this is balanced. Therefore, it is possible that a population of 800 Cape parrots may only have 10–20% of birds breeding, as has been shown in Amazon parrots in South America (Munn 1992), which are similarly sized and occupy a similar niche in the forest. Thus, the viability of the Cape parrot is likely to be lower than the numbers above might suggest.

Finally, it is of little use attempting to conserve Cape parrots without conserving their 'special' forest habitat. *Podocarpus* spp. are common canopy trees in certain forests in South Africa, but are also a source of valuable timber and were intensively logged in the past (Wirminghaus *et al.* 1999). In the Eastern Cape, there is continued logging of *Podocarpus* spp. under permit and in certain rural areas these trees are being felled for building materials (pers obs). As the Cape parrot requires holes in dying/dead trees for nest sites (Wirminghaus *et al.* 2001c), this habitat reduction is likely to have serious consequences for the conservation of the species.

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