Abundance and activity patterns of the Cape parrot (*Poicephalus robustus*) in two afromontane forests in South Africa

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Behaviour, movements and numbers of the rare Cape parrot (*Poicephalus robustus*) were investigated at two study sites to assess its conservation status and as the basis for an action plan for their conservation. Birds flew regularly to and from nearby forests and were observed arriving at a feeding site (Hlabeni) from roosting sites in the morning. Numbers varied monthly and seasonally between the sites. Mean monthly (±SE) number of birds observed daily was 21.8 ± 2.5 (n = 45) but ranged from 0–80. Activity was bimodal: it commenced at sunrise, lasted several hours, and was followed by inactivity through mid-day; activity recommenced a few hours before sunset and continued until sunset. Activity reflected changing day length. Causes of localized movements included food and water availability, and in summer some birds fed in fruit orchards. The relevance of counts of Cape parrots for the conservation of this species is reviewed.

Key words: daily activity, parrot conservation.

INTRODUCTION

The behavioural ecology of most African parrots is poorly studied. In West African rainforests, African grey parrots (*Psittacus erithacus)* gather at traditional roosts before dusk but leave at first light to feed elsewhere (Brosset & Erard 1986; Forshaw 1989). Similarly, Levaillant (in Stark & Sclater 1903) described the Cape parrot (*Poicephalus robustus*) as having very 'regular habits' with aggregations 'of considerable flocks' in the early morning. Birds sunned themselves before dispersing to feed on the kernels of *Podocarpus* (yellowwood) and *Pterocelastrus* (candlewood) spp. During midday they rested, fed again and visited specific water sites in the late afternoon, and then dispersed to roosts (LeVaillant in Stark & Sclater 1903). Cape parrots are primarily associated with afromontane forest, but are not confined to it, occasionally flying to other habitats in search of food (Skead 1964; Rowan 1983; Boshoff 1988). Skead (1964) described foraging movements between forest patches as 'daily short flights' (32 km to adjacent feeding sites) or 'irregular distant flights' to coastal (64–80 km) or more distant forests (128 km).

The Cape parrot is rare (Barnes 2000) with a restricted distribution, and its conservation should be given priority (Wirminghaus *et al.* 1999, 2000a). However, the development of a conservation action plan requires detailed knowledge of population changes (Perrin 2000) and hence the objectives of this study were to determine seasonal changes in abundance, movements and activity patterns of the Cape parrot.

MATERIALS & METHODS

Field data were collected at Hlabeni State Forest (410 ha, 29°50′40″S, 29°40′28″E), and Ingeli State Forest (752 ha, 30°32′22″S, 29°40′32″E) in southern KwaZulu-Natal, South Africa (Fig. 1). These forests comprise complexes of mistbelt mixed *Podocarpus* forest or afromontane forests (Cooper 1985). They occur at 1000–1500 m altitude, on steep, south-facing slopes on dolerite ridges and receive frequent mist in the summer, and a mean annual rainfall of >1000 mm (Moll 1972). Monthly rainfall data for Hlabeni were obtained from Mr and Mrs Scott. Fruitfall data were from Wirminghaus *et al.* (in press a).

Observations were made each month at Hlabeni and Ingeli from March 1993 to December 1996 (46 months, 1284 h). During the first year of study, all-day observations were conducted for 1–3 days per month. Thereafter, observations commenced shortly before sunrise, and continued for an hour or more after last activity of the parrots in the

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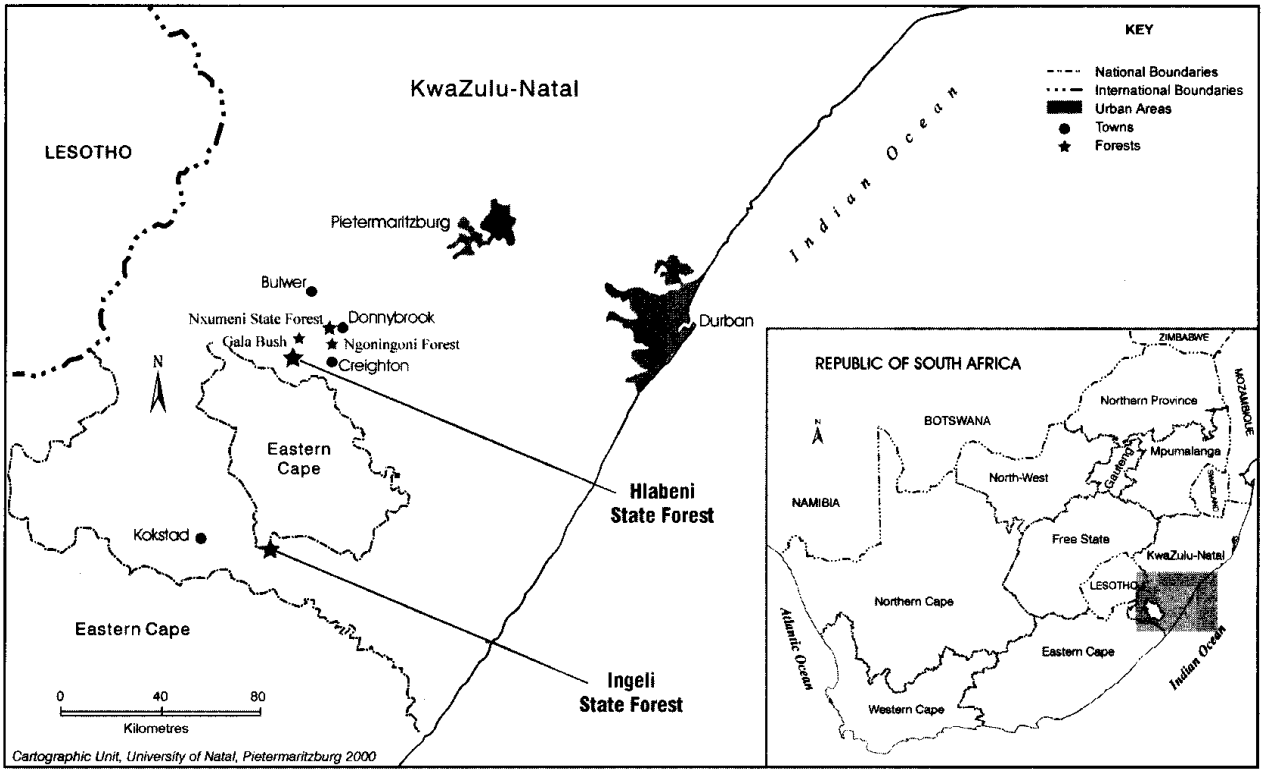

Fig. 1. The study area showing the location of Hlabeni and Ingeli State Forests.

morning. In the afternoon, observations were initiated 3–4 h before sunset and continued until sunset unless conditions made observations impossible. At Hlabeni, the total duration of all morning observations was 833 h on 177 days, and 451 h in the afternoon on 139 days. There was no significant difference in the mean duration of monthly observations (morning and afternoon pooled; MANOVA, d.f. = 45, $F = 0.722$, $P > 0.05$). At Ingeli, the total observation time was 319 h in the morning on 87 days, and 303 h in the afternoon on 83 days. Data, including times of activity, social behaviour, intra- and inter-forest movements and size of flocks were collected whenever possible. Data collection at Hlabeni were facilitated by clear views of the parrots above the forest from observation points above the canopy and Hlabeni yielded most of the results on numbers and movements. Individual marking and radio-telemetry were attempted to determine activity and local movements of the Cape parrots, but these techniques were unsuccessful. Data are presented as mean ± 1 S.E.

RESULTS

Activity of the Cape parrots was diurnal. Activity commenced at sunrise, lasted several hours, and was followed by inactivity during the middle of the day (Fig. 2a). Activity recommenced a few hours before sunset and continued until sunset (Fig. 2b). The timing of activity changed seasonally (Fig. 2) and reflected seasonal changes in the time of sunrise and sunset. At Hlabeni Forest, the morning activity period lasted between 2 and 3 h while the afternoon activity lasted 40–90 min only (Fig. 3). There was no significant difference in activity period length between months in the morning and afternoon respectively (ANOVA, d.f. = 11, $F = 0.94$, $P > 0.05$; d.f. = 11, $F = 1.06$, $P > 0.05$). Changes in weather, including snow, mist or hot (berg) winds did not prevent parrot activity although the birds were more active on cool, misty days.

The numbers of Cape parrots at Hlabeni State Forest were usually low but showed great variability (Fig. 4). For example, no parrots were observed in January 1995 while a maximum of 80 per day was seen in April and May 1995 (Fig. 4). This variability is concealed when the data for the four years are pooled and there was no significant difference between the monthly mean number of Cape parrots seen in either the morning or the afternoon (i.e. not a summation) at Hlabeni Forest (ANOVA, d.f. = 56, $F = 0.979$, $P > 0.05$). Over the entire study period, the mean number of birds observed/day was 21.8 ± 2.5 ($n = 45$) with 20.5 ± 2.7 ($n = 42$) in the morning and 18.4 ± 2.2 ($n = 33$) in the afternoon. Numbers were usually

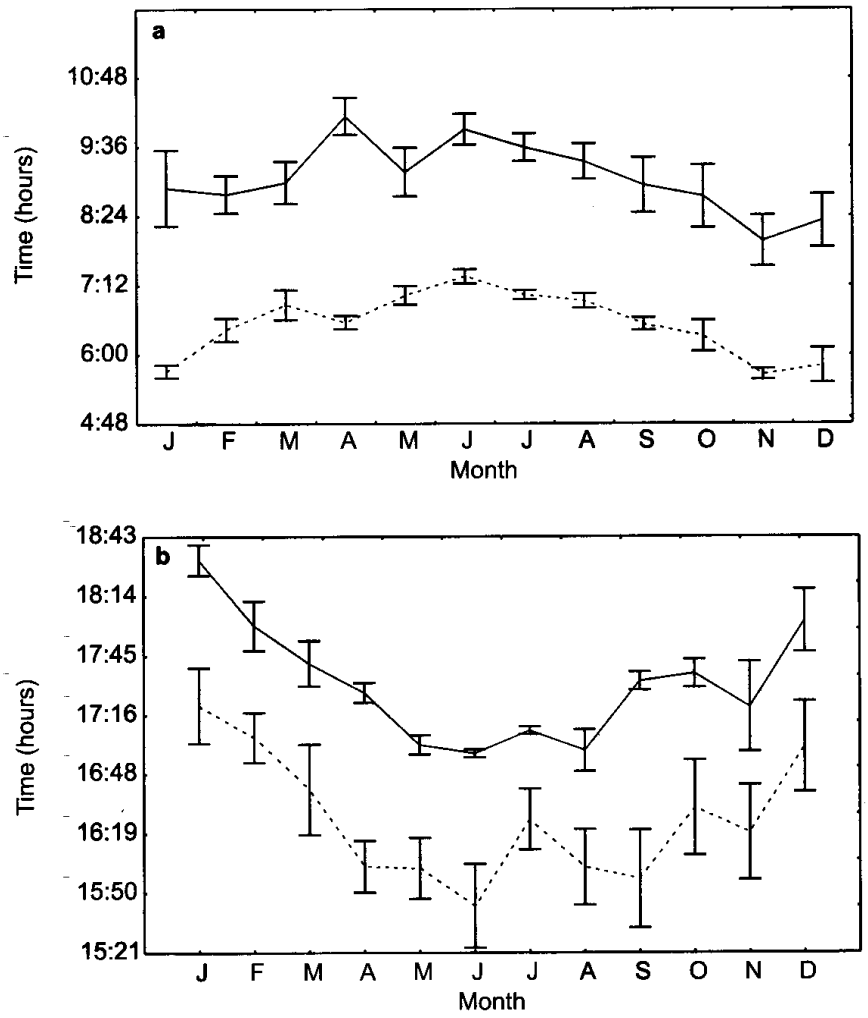

Fig. 2. Monthly changes in daily activity patterns of Cape parrots at Hlabeni State Forest. **a**, Mean time (±1 S.E.) for the start (dotted line) and end (solid line) of morning activity; **b**, same information for the afternoon activity.

lowest in October and November and highest in May and June.

The numbers of Cape parrots seen per day at Ingeli could not be determined reliably as they were difficult to observe. Nevertheless, the numbers of parrots at Ingeli were lower than at Hlabeni (Fig. 4) with greatest numbers in winter and lowest numbers in summer. The maximum number recorded per day ranged from 2 to 80 (Fig. 4).

At Hlabeni there was no apparent relationship between Cape parrot numbers, fruit availability (Outeniqua yellowwood, *Podocarpus falcatus*, or real yellowwood, *P. latifolius*), or rainfall (Fig. 5).

Cape parrots showed frequent local movements, and regular flight paths to and from three forests 10–20 km from Hlabeni. Nxumeni State Forest accounted for 45 % of arrivals at Hlabeni and 39.8 % of departures; Ngoningoni Forest accounted for 3.3 % of arrivals and 12.4 % of departures; and Gala Bush <1 % arrivals and <1 % departures. Most other arrivals at Hlabeni (35 %) were from the east. At Ingeli it was difficult to ascertain directions of arrivals and departures. The group size of parrots arriving at Hlabeni varied from singletons to 17; ($\bar{x}$ = 2.76 ± 0.14; n = 264) and did not differ significantly between months (ANOVA, d.f. = 40, F = 0.92, P > 0.05). However, the number of parrots arriving at Hlabeni each day varied from month to month (Fig. 6) and, for the entire study period, the mean number of parrots arriving each day was 7.01 ± 0.72 (n = 110). Arrival times at Hlabeni, from other localities, were usually before 09:00 (97 % of morning arrivals) or after 16:00 (92 % of afternoon arrivals). Data were analysed to determine whether Cape parrots were visiting water points in Hlabeni; however, at least 50 % of the arriving birds went to parts of the forest where water was absent. The mean number of parrots arriving at Hlabeni was significantly lower than the mean number seen in the forest (t-test; t = –7.06; P <

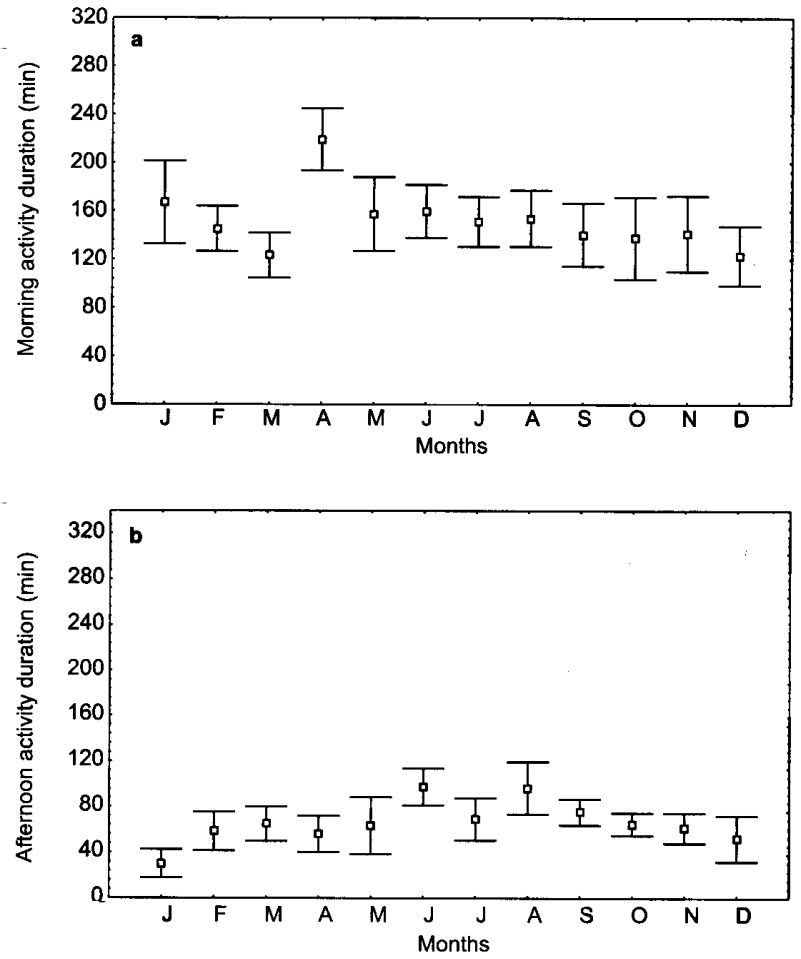

Fig. 3. Monthly changes in the duration of morning (**a**) and afternoon (**b**) activity of Cape parrots at Hlabeni Forest, (1993–1996); data are given as mean ±1 S.E.

0.05), suggesting that some parrots are resident in the forest.

Most parrots (80.9 %) departed in an easterly direction and some parrots were seen flying towards Nxumeni State Forest and Ngoningoni Forest (Fig. 1). Most departures of parrots (69 %) occurred in the afternoon, with 97 % of these after 16:00. Morning departures were less frequent (31 %). The mean number of Cape parrots departing daily from Hlabeni Forest (Fig. 6) varied significantly between months (ANOVA, d.f. = 36, F = 1.79, $P < 0.05$) but the mean number of groups of parrots departing did not differ significantly between months (ANOVA, d.f. = 36, F = 0.82, $P >$ 0.05). Over the entire study, the mean number of parrots departing each day was 11.51 ± 11.7 (n = 87) and the mean number of groups was 2.74 ± 2.01 (n = 88). Flocks varied in size from singletons to a group of 26.

During November–January of each year Cape parrots were reported feeding in fruit orchards in the vicinity of Karkloof, Bulwer, and Donnybrook (Fig. 1; Wirminghaus, Downs & Symes pers. obs.) suggesting local movements in search of foods outside forests.

DISCUSSION

Activity of Cape parrots is diurnal and early in the morning, groups of parrots (usually pairs) disperse to forage in nearby forest patches, flying swiftly, before alighting on tall trees (Woodward & Woodward 1897; Skead 1964, 1971; Prozesky 1978; present study). Return flights to roosting trees commence before dusk and continue until after nightfall (Skead 1964; 1971; present study). This pattern of activity and these habits are similar to those of other African parrots. The grey-headed parrot, *P. fuscicollis suahelicus*, the yellow-faced parrot, *P. flavifrons*, and Jardine's parrot, *P. gulielmi*, fly swiftly in small flocks, usually at sunrise and sunset to feeding grounds, perch in the bare branches in tree-tops, and are seldom heard while

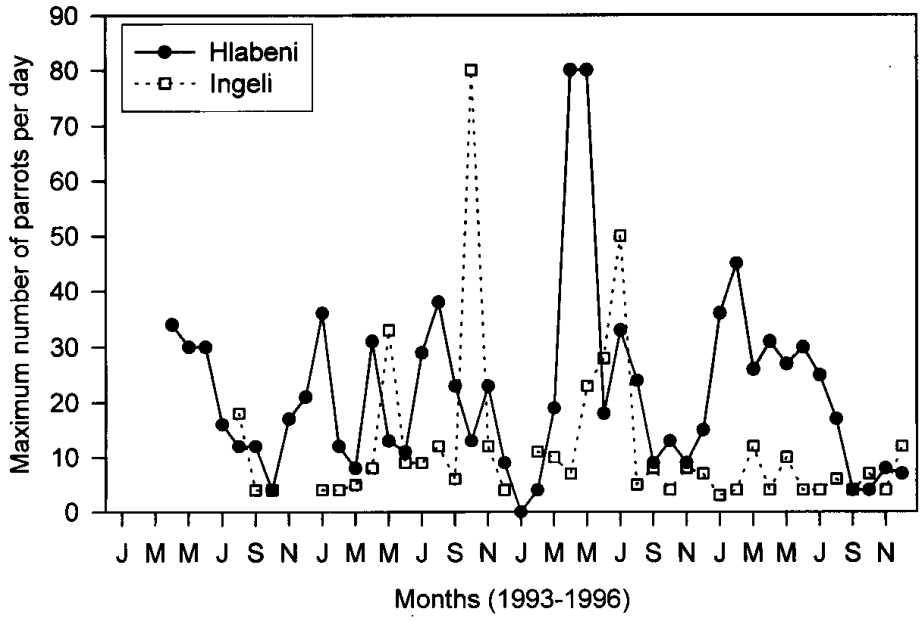

Fig. 4. Monthly changes in the maximum number of Cape parrots observed per day from 1993–1996 at Hlabeni and Ingeli State Forests. Maximum numbers are used here to illustrate the variation between months and between years.

feeding (Swynnerton 1907; Hopkinson 1910; Chapin 1939). They occur in large flocks when fruit is plentiful but as pairs during the breeding season (Chapin 1939; Bricknell 1987). All species drink regularly.

The rigid activity pattern of the Cape parrot, and frequent use of local preferred natural perching sites for socialization, may facilitate the illegal capture and trade of Cape parrots which has negative implications for their conservation.

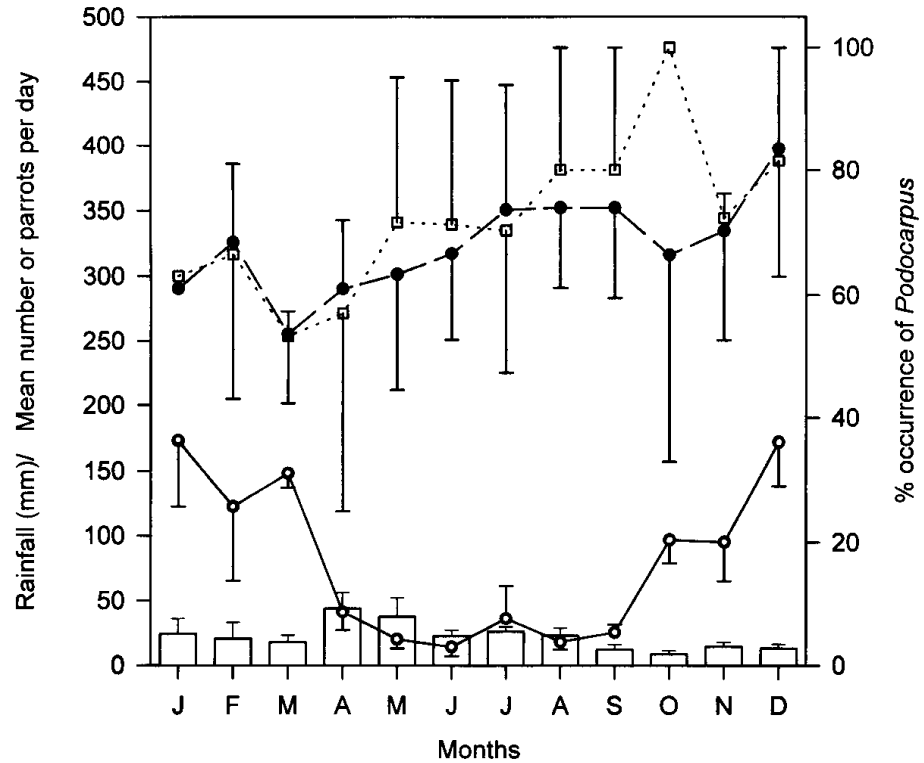

Fig. 5. Relationship between the abundance of Cape parrots (bars at bottom), monthly precipitation (○), and availability of the fruit of *Podocarpus falcatus* (●) and *P. latifolius* (❑) at Hlabeni State Forest. The abundance of parrots is given as the mean number seen per day for each month for the entire study period 1993–1996. Percentage occurrence of *Podocarpus* spp. (mean ± 1 S.E.) shows the variability in fruit occurrence.

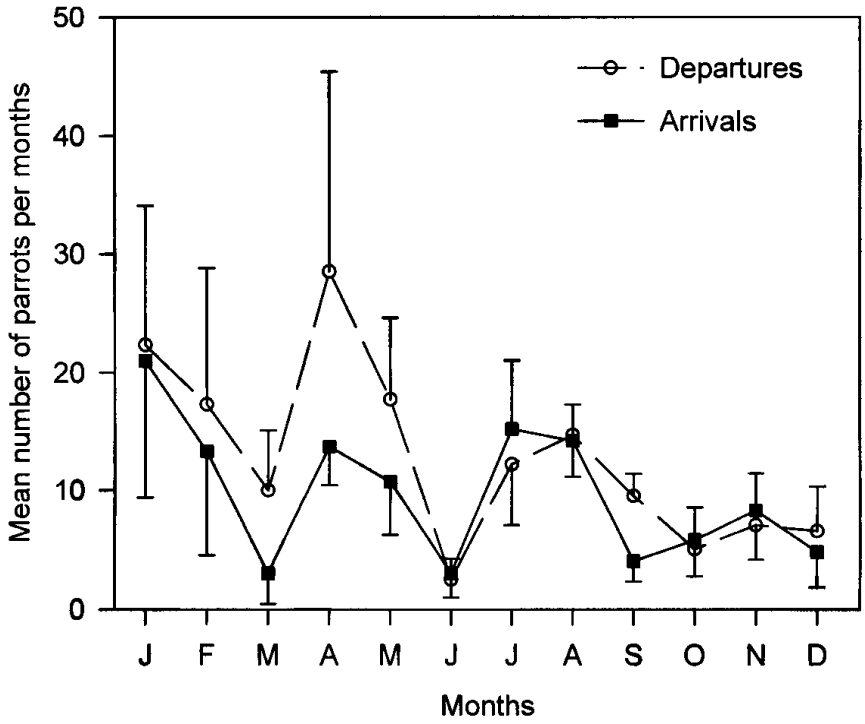

Fig. 6. Monthly changes in the number of Cape Parrots observed each day arriving at and departing from Hlabeni Forest. Data are given as mean ± 1 S.E. for the entire study.

Although described as a resident forest species (Skead 1964), the Cape parrot travelled routinely between forest patches in southern KwaZulu-Natal, and local numbers varied between months. Such movements have been described as feeding forays (Skead 1964; Brooke 1984; Boshoff 1988), although Skead (1964) could not explain their cause. At Hlabeni most birds regularly commuted between at least three forests, although a small group of parrots was resident. Although flight patterns were not predictable, the arrival and departure of birds suggest temporal exploitation of suitable roosts, food resources and water.

Cape parrots specialize in feeding on *Podocarpus* spp. and have a low dietary diversity (Wirminghaus *et al.*, in press b.). Fruit production is patchy in afromontane forests (Wirminghaus 1990; Wirminghaus *et al.*, in press a.) and the pattern of movement reported here may be between roosts and patches of fruiting trees. Past timber extraction has also resulted in the permanent removal of food resources used by the parrots creating a patchy environment which may have caused or exacerbated the need for inter-forest movements.

Like Cape parrots, Puerto Rican parrots (*Amazona vittata*) are food-nomads, reliant on foods that are spatially and temporally distinct and which fruit asynchronously (Snyder *et al.* 1987). Before a population decline, the Puerto Rican parrots made regular feeding forays from mountains to lowlands, however, after the decline, there was a decrease in forays, and movements became restricted to montane forest (Snyder *et al.* 1987). In our study, frequency and pattern of flights, particularly to distant coastal forests, were difficult to assess. In 1964 Skead described them as irregular and there have been few sightings of Cape parrots in coastal forest localities in the past 10 years, except at Port St Johns in the Eastern Cape (Wirminghaus *et al.* 1999, 2000a; C. Battle, C. Costello, A. Hein, K. Cooper, pers. comm.).

Cape parrots were observed drinking regularly at Hlabeni and Ingeli Forests (the former site has at least one perennial water site) and this could explain some daily movements, particularly during the dry winter months when very little free water is available.

The numbers of Cape parrots at Hlabeni and Ingeli Forests on any particular day varied monthly and seasonally and were generally lower in summer than winter. In summer, Cape parrots were observed feeding in fruit orchards.

The behaviour, movements and numbers of Cape parrots reported here, and the patchy nature of their food (Wirminghaus *et al.* 1999, 2000a,b, in press a,b) all suggest that the birds are food nomads. This makes the estimation of Cape parrot

abundance difficult and highlights the need to conserve afromontane *Podocarpus* forests which are essential feeding grounds. The maximum daily number of birds observed each month is believed to represent reliable population estimates of Cape parrots in the study area.

Because we lack precise data on density and movements of Cape parrots, measures adopted for Cape parrot conservation (Perrin 2000, Wirminghaus *et al.* 1999, 2000a) are qualitative rather than quantitative.

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