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D Engelbrecht

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GROWTH AND DEVELOPMENT OF CRESTED BARBET *TRACHYPHONUS VAILLANTII* NESTLINGS

*Derek Engelbrecht**

Department of Biodiversity, University of Limpopo, Private Bag X1106,
Sovenga, 0787, South Africa

* Corresponding author: engelbrechtd@ul.ac.za

The Crested Barbet *Trachyphonus vaillantii* is a common resident of the open woodlands and semi-arid savannah regions of southern Africa. Although aspects of its breeding biology are well known, much of it remains unknown due to its cavity-nesting behaviour. In 2008, I placed some artificial nest boxes in strategic positions in the Polokwane Nature Reserve (S23°56' E029°28') in the hope of elucidating some of the unknown aspects of the breeding of cavity-nesting species.

Methods

On 20 November 2008 one of the nest boxes had three Crested Barbet eggs. Their dimensions were:

	Size in mm	Weight in g
1	28 x 20	6.2
2	28 x 20	6.1
3	28.1 x 19.8	5.9

The nest was then inspected on alternate days to determine when hatching occurred. Two nestlings hatched on 3 December 2008 and the third on 4 December 2008, confirming the notion that incubation generally commences with the laying of the penultimate egg. The hatching day is considered as day 0. A second nest excavated in a Mountain Aloe *Aloe marlothii* contained three eggs. This nest was monitored using a dentist's mirror and a small torch, but no measurements were recorded.



Figure 1 – A newly hatched Crested Barbet nestling.

Growth and development of nestlings were recorded within the first hour after sunrise on alternate days until they were 22–23 days old. To distinguish individual nestlings, they were marked on the thigh with a non-toxic marker pen and fitted with a metal ring when they were 16–17 days old. Nestling development was described with regard to:

- (i) plumage development,
- (ii) increase in mass (g) measured with a portable digital electronic balance,
- (iii) increase in tarsus length (mm),
- (iv) head length (mm) and length of the wing chord (mm) as described by de Beer *et al.* (2001).



Figure 2 – The heel pad of a Crested Barbet nestling.

The growth rate of each nestling was determined by fitting a logistic equation of the form: $x(t) = A / (1 + \exp[-K(t - t_i)])$, where $x(t)$ is the mass or length at age t , A is the asymptote of the growth curve, K is the growth rate constant, and t_i is the age at the inflection point of the growth curve (0.5 of the asymptotic mass on a logistic growth curve (Ricklefs 1967). The t_{10-90} , i.e. the time required to complete growth from 10% to 90% of the asymptote, was also calculated. For a logistic growth curve this is calculated as $t_{10-90} = 4.394 / K$. All statistical analyses were performed using Microsoft Excel for Windows.

Results and discussion

Newly hatched nestlings were blind and naked with a pale pinkish to flesh-coloured skin (Fig 1) which gradually became a darker pink colour over the next few days. The bill was a pale pinkish-yellow

colour and the upper mandible was notably shorter than the lower mandible (Fig 1). They also had well-developed heel pads (Fig 2). The tongue was pink and lacked any tongue-spots. Newly hatched nestlings also uttered a barely audible “tseep” call which gradually changed to an incessant “churring” call which could be heard from at least 8 m away on day 10. The eyes started to open after 10 days and were fully open after 13–14 days.

Although the remiges and rectrices started to erupt through the skin (i.e. they were in pin) after 3–4 days, the remaining feather tracts were barely visible at this time. After eight days, all the tracts were visible under the skin but none of them had erupted yet (Fig 3). By day 11, all feather tracts had erupted through the skin except for the capital and dorsal feather tracts (Fig 4). After 14 days, all the tracts had erupted and the first remiges, their coverts, and the ventral



Figure 3 – Seven- to eight-day old nestlings.



Figure 4 – The nestlings at 10–11 days old.

feathers began breaking their sheaths, i.e. they were in brush. Most of the remiges and feather tracts were in brush after 17 days, although the feathers of the capital tract and the rectrices were only just starting to go into brush (Fig 5). At 20 days old, the nestlings were fully feathered and all feathers were in brush except for approximately 15% of the contour feathers on the capital tract which was still in pin. The primaries had emerged about 50% from their sheaths at the age of 23 days, by which time all the feathers were in brush.

The means of the various growth parameters for the three nestlings are presented in Table 1. The asymptotic body mass ($A = 71.02$ g) of nestlings was attained around the time they fledged. The growth rate was greatest for increase in mass and growth of the tarsus ($K_{mass} = 0.23$, $K_{tarsus} = 0.24$) and nestlings needed approximately 19

days to grow from 10% to 90% of the asymptote of these parameters. Growth of the head and wing chord was very slow with $K \leq 0.15$ and the t_{10-90} for these parameters being in excess of 30 days. Nevertheless, the results of the growth curve analyses for the various parameters show that most growth is completed at the time of fledging.

Data on the growth rates of cavity-nesting species in southern Africa are generally scarce, and only broad generalizations can be made. The growth rate compares with that of the hole-nesting Southern Yellow-billed Hornbill ($K_{mass} = 0.28$; Engelbrecht, unpublished data) but is considerably slower than for example the growth rate of open-nesting species such as Tinkling Cisticola ($K_{mass} = 0.43$; Engelbrecht and Van Tonder 2009) and Kalahari Scrub-robin ($K_{mass} = 0.40$; Engelbrecht 2008) nestlings. Cavity-nesting species usually have slower growth rates compared to birds whose nests are more exposed as the higher predation rate experienced by open-nesting species selects for an accelerated growth rate (Remeš and Martin 2002).

Despite attempts of the parents at removing faeces, the inside of the Crested Barbet nests that were monitored were foul and had a very strong smell after a few days. This attracted various invertebrates, e.g. flies. At one of the nests, a Striped Skink *Trachylepis striata* was observed catching flies at the nest entrance.

Table 1 – Means of the parameters of the logistic growth curve for the increase in mass and growth of the tarsus, head and wing length of three Crested Barbet nestlings.

	<i>A</i>	<i>K</i>	<i>t</i>	<i>t</i> ₁₀₋₉₀
Mass	71.02	0.23	9.99	18.82
Head length	46.28	0.15	3.83	30.01
Tarsus length	30.86	0.24	5.41	18.50
Wing length	126.37	0.14	21.37	31.96



Figure 5 – The nestlings aged 16–17 days old.

The nestling period lasted 27 days which compares well with the 28–31 days reported by Van Zyl (1994). All three nestlings from the nest box fledged successfully, but the Aloe nest failed after the nesting tree collapsed when the nestlings were 20 days old. It is worth noting that the parents were seen enlarging the nest cavity in the days prior to the collapse of this nest and it appeared as if this may have weakened the stem and contributed to the collapse of the tree.

Although the sample size in this study is small, this report presents baseline information on the growth and development of Crested Barbet nestlings which may serve as a base for future inter- and intra-specific studies on the growth and development of nestlings, particularly of cavity-nesting species.

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