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EGG REJECTION BY GREEN WOOD-HOOPOE *PHOENICULUS PURPUREUS*

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Avian brood parasitism is a fascinating arms race between host and parasite and has been extensively studied in numerous specific host-parasite interactions (Rothstein 1990; Langmore *et al.* 2003). Most studies have a northern hemisphere bias and little is known about the intricacies of many African brood parasite relationships (Short and Horne 2001). Many of these interactions involve those between families endemic to the Afrotropics, for example honeyguides (Indicatoridae) and Old World barbets (Lybiidae) (Maclean 1990).

Numerous anecdotal accounts exist for the sub-region although some detailed work has been done, including pioneering work on Greater Honeyguides *Indicator indicator* (Spottiswoode and Colebrook-Robjent 2007; Spottiswoode and Koorevaar 2012). An important component of this brood-parasite struggle is the ability of a host to recognise a parasites egg (Davies and Brooke 1989; Aviles *et al.* 2004). However, in the first line of defence one might expect a strategy to evolve in which initial access to the nest by the parasite is prevented by the host, and that in cases where birds breed co-operatively a strategy of nest/clutch protection may operate more effectively (Brown 1987; Stacey and Koenig 1990; Canestrari *et al.* 2009). In this report I present an incident of honeyguide egg recognition and rejection by breeding Green Wood-Hoopoes *Phoeniculus purpureus*.

As part of a long term study on cavity nesting birds I have considered the opportunity of recording brood parasite-host interactions. At a site near Nelspruit (S25°34.367' E31°10.883' altitude = 800-1,000 m a.s.l.), during 17-18 September 2011, I erected a total of 30 x PVC pipe nest-boxes. These included 10 nest-boxes each of different sizes (Table 1; Fig 1). Each nest-box had a cap attached at the top and bottom, with the bottom cap glued, and holes drilled to allow water drainage. The entry hole was cut >two-thirds of the pipe height and all nest-boxes were painted with a grey enamel paint (Fig 1). A strip of carpet was glued to the inside of the nest box leading from the entrance hole to the bottom of the nest; this was to provide birds with a surface to grip onto so that they could enter and exit the nest with ease. The top cap was not glued, to allow for easy inspection of nest contents. When erected, coarse gravel was placed into the bottom of each nest box and lined with dry grass and leaves. Nest boxes were attached to selected sites in groups of six nest boxes (2 large, 2 medium, 2 small, see Table 1). This gave five sites with six nest-boxes at each site. The nest-boxes were attached to the tree with wire.

Table 1. Details of nest box dimensions and height erected.

Size	Pipe diameter (cm)	Pipe height (cm)	Entrance Diameter (cm)	Height of nest-boxes (mean metres ± SD)
Large	16	52	5.1	3.65 ± 0.96
Medium	14	46.1	4	3.63 ± 1.61
Small	11	41	3	2.90 ± 1.04

Less than a month later after erection (15 October 2011) one of the nest-boxes (M3, ht = 6.12 m, in a *Sclerocarya birrea*, Fig 2) was

Fig 1 - Preparation of nest boxes, painting a white undercoat and a grey external coat, the white boxes are upside-down and show the drainage holes

Fig 2 – A medium size nest-box (M3) *in situ*.

inspected and a clutch, that appeared to have been depredated, was observed (Figure 2a). The light-blue coloured eggs with a textured shell and tiny bumps on the surface, an unlined nest cavity, and size comparisons compared to dimensions presented in Tarboton (2011), suggested Green Wood-Hoopoe, whilst those of the white eggs (only one was measurable) suggested a honeyguide egg. Greater and Lesser Honeyguide *Indicator minor* are recorded at the site and the Green Wood-Hoopoe is recorded as an occasional host of Greater Honeyguide (Tarboton 2011; Table 2). The Cape Glossy Starling was considered as a possible candidate of the depredated eggs as it has similar coloured eggs to the wood-hoopoe but they are smooth and a nest is constructed in the cavity (Tarboton 2011). The Cape Glossy Starling was recorded breeding in a nest-box nearby (c. 5 m away in a Flat-crown Albizia *Albizia adianthifolia*, L3, ht = 4.84 m), during a later inspection of the nest-boxes (11 December 2011), with three nestlings. Additional support for this identification is given by a breeding event of Green Wood-Hoopoe on 11 December 2011 where a clutch of four blue and one white egg was observed in a

nest-box nearby (c. 10 m away in a Tree Aloe *Aloe barberae*, L4, ht = 2.55 m). The Green Wood-Hoopoes were active at this box, possibly the same breeding flock as those from the depredated nest, and on the initial inspection the white egg was not noticed. The egg, which was pushed to the side was only noticed when photographs were inspected the following day (Fig 4). To confirm that the egg was still present, the nest-box was inspected on 12 December 2011, and the egg observed in the same position as when it was photographed. It was then placed back with the clutch of four blue eggs. On 14 December 2011, when the nest-box was inspected before departure from the study site, the egg was again pushed to the side. It is speculated that this clutch fledged despite the Greater Honeyguides propensity to damage its host eggs during egg-laying (Spottiswoode and Colebrook-Robjent 2007; Spottiswoode and Koorevaar 2012), because no egg shells were found in the nest during nest-box inspections in February 2012.

Egg-stage defences are well studied and may involve recognition and rejection of eggs that are too large, eggs that are the wrong colour, or eggs laid at the wrong time (Brooker and Brooker 1989; Rothstein and Robinson 1998). Although it might appear easier to defend a cavity nest from brood-parasites, even in co-operative breeding species, in cases where the defences are breached, recognition of a different colour or size egg in a dark cavity may be particularly challenging. This case is therefore particularly interesting because it presents a situation of egg rejection in the Green Wood-Hoopoe that, to the best of my knowledge, has not been recorded before. The breeding flock of wood-hoopoes is at least four birds and it would be interesting to have observed how the honeyguide accessed the nest. Although a larger bird, the Green Wood-hoopoe does not appear aggressive, unlike Black-collared Barbets *Lybius torquatus* that may pose more of a challenge to Lesser Honeyguides. To test this further it might not be too difficult, except for finding accessible nests of the species, to test hypotheses related to egg recognition my placing dummy eggs in a breeding wood-hoopoe nests during different stages of the breeding cycle.

Table 2. Comparison of egg sizes of Green Wood-hoopoe, Greater Honeyguide, and Lesser Honeyguide, compared to clutches observed in nest-boxes at Pullen Farm. Dimensions give actual measurements for measurable remains of depredated eggs, or mean (minimum – maximum) for data from Tarboton (2011).

Species	**Clutch size**	**Egg size**	
		Length (mm)	**Breadth** (mm)
Green Wood-Hoopoe	3-4 (2-5, rarely 6)	**24.9** (22.2-29.2)	**17.3** (16.0-18.9)
Blue eggs (this study)		broken	18.1; 17.9
Greater Honeyguide	1+	**24.3** (21.0-26.0)	**18.8** (17.1-20.0)
Lesser Honeyguide	1+	**21.5** (20.0-24.0)	**17.0** (16.1-19.6)
White eggs		23.2	>17.1

Other boxes that were also in use during this field trip included Southern Black Tit *Parus niger;* two nestlings were observed on 11 December 2011 (nest M1, ht = 1.95 m, in a *Searsia* sp.) and fledged the following day.

Fig 3 - Clutch of hatched/depredated eggs (possibly 3 x Green Wood-Hoopoe and 2 x honeyguide eggs; see Table 2 for egg size comparisons),

Fig 4 - Clutch of Green Wood-Hoopoe eggs with possible honeyguide egg.

This study will soon be supplemented with natural log nest-boxes. These might encourage numerous other cavity nesting species in the area, e.g. Violet-backed Starling *Cinnyricinclus leucogaster*, Black-collared Barbet, Narina Trogon *Apaloderma narina*, that have so far shown no interest in the PVC nest-boxes.

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