Behaviour and plumage of juvenile Rufous-vented Ground Cuckoo *Neomorphus g. geoffroyi*, with new records for Acre state, Amazonian Brazil

The genus *Neomorphus* is one of the least known among Neotropical birds[7,12], and many aspects of its biology and natural history are unknown[5,7]. The five recognised species replace each other geographically[2]. Rufous-vented Ground Cuckoo *N. geoffroyi* is the most polymorphic, its subspecies possess such well-defined diagnostic plumage characters that they might be elevated to species status[6,12]. *N. geoffroyi* also has the largest range[5,12], being known to occur in Nicaragua south to Bolivia. In Brazil, it occurs in Bahia, Minas Gerais, Espírito Santo and, historically, northern Rio de Janeiro state. In Amazonia it is only known south of the Amazon (in southern Pará, northern Mato Grosso, Tocantins and Maranhão)[5,7,10].

N. geoffroyi is considered naturally rare, with an estimated density of 0.25 pairs per 100 ha in Amazonian Peru[5]. Although it is not considered globally threatened[1], *N. geoffroyi* is thought to be sensitive to deforestation, with some populations (such as *N. g. dulcis* in Brazil's Atlantic Forest) under serious threat of extinction[5,7,9].

Many aspects of the breeding biology of species in the genus *Neomorphus* are unknown[1–3,5,8–10]. For *N. geoffroyi*, there is just one description of a nest and egg, from Mato Grosso, Brazil[8], and the description of juvenile *N. g. dulcis* from Espírito Santo, where a pair was observed with a chick[10], the first evidence of parental care in this species, in contrast to the better-known nest parasites Striped Cuckoo *Tapera naevia*, Pheasant Cuckoo *Dromococcyx phasianellus* and Pavonine Cuckoo *D. pavoninus*. Parental care in *Neomorphus* has also been reported for *N. radiolosus* in Ecuador[3]. A detailed description of juvenile *N. g. salvini* was provided by Haffer[3], based on a specimen collected by T. R. Howell in Nicaragua in 1957. It appears that this species breeds in the rainy season in Colombia, with egg laying in April. In south-east Brazil breeding occurs in December–March[5].

New records for Acre, Brazil

N. geoffroyi is the only known member of the genus to occur in Acre state, although until recently the sole record was a sighting in Alto Juruá Extractive Reserve[11]. The first documented record was made on 13 May 2012, in Alto Tarauacá Extractive Reserve (08º45'29"S 71º59'42"W), a 151,199-ha conservation unit in Jordão municipality, where an adult was photographed by a camera trap (Fig. 1) in an area where palms and bamboos of the genus *Guadua* (Bambusoideae) dominated the understorey. A second record in the same area was made on 25 May 2012, when another adult was recorded by a camera trap (08º45'26"S 71º59'06"W), c.1.1 km from the first site. The second site was dominated by bamboo and close to a watercourse. On 3 December 2012 an adult was photographed by a camera trap in a bamboo-rich site 26.8 km from the other two localities (08º59'16"S 71º55'13"W). On 6 June 2013 an adult was photographed by a camera trap (09º27'62"S 69º59'27"W) in Chandless State Park, a 695,303-ha conservation unit in Manoel Urbano municipality. This record (Fig. 2) was archived at www.wikiaves.com (WA1036243). The site is characterised by open forest dominated by *Phytelephans macrocarca*, (Arecaceae) palms. Comparison with Payne[5] shows this bird to be *N. g. geoffroyi*. On 19 January 2014 during a bird survey at a site near the rio Jurupari (08º34'15"S 69º55'15"W), 60 km east of Feijó, in Acre, a juvenile *N. geoffroyi* was seen in a patch of forest dominated by *Guadua* bamboo. At this site, the forest as a whole has an understorey dominated by palms, interspersed by clumps of bamboo.

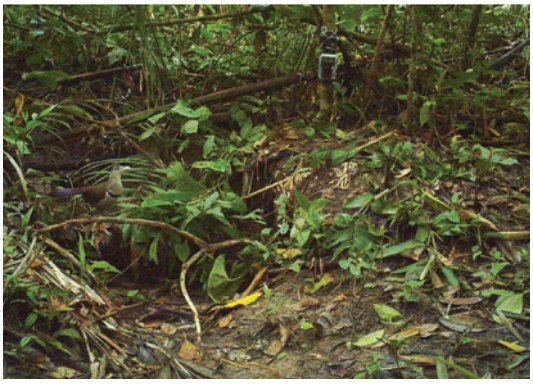

Figure 1. Adult Rufous-vented Ground Cuckoo *Neomorphus geoffroyi*, photographed by a camera trap, Alto Tarauacá Extractive Reserve, Acre, Brazil, May 2012 (André Luis Moura Botelho)

Figure 2. Adult Rufous-vented Ground Cuckoo *Neomorphus geoffroyi*, photographed by a camera trap, Chandless State Park, Acre, Brazil, June 2013 (Luiz Henrique de Medeiros Borges)

Figure 3. Juvenile Rufous-vented Ground Cuckoo *Neomorphus geoffroyi*, Jurupari, Acre, Brazil, January 2014; note chestnut back and green primaries (Tomaz Nascimento de Melo)

Figure 4. Juvenile Rufous-vented Ground Cuckoo *Neomorphus geoffroyi*, Jurupari, Acre, Brazil, January 2014; note white chest feathers (Tomaz Nascimento de Melo)

Juvenile plumage and behaviour

The juvenile's plumage had a downy appearance and the tail was notably short. When the crest was erect, a greenish tint was visible at some angles. The mantle was pale brown, and the wings dark, with dark green primaries, but both the back and wings had a dark ground colour (Fig. 3). The cheeks had a few white feathers barred black. The chest also had white feathers, the flanks chestnut barred black. The belly was paler than the back (Fig. 4). The tarsi were grey, irides brown, with bare black orbital skin and a blue patch just behind the eyes visible under certain light conditions, but not in shade. The bill was pale pink at the base of the mandible, becoming dark grey near the tip, and was noticeably smaller than that of an adult.

Observations were made during rain. The bird was initially perched c. 2 m above ground in an alert posture, constantly raising and lowering its tail and crest. The bird approached the observer, jumping quickly between bamboos and pausing some 6 m away at a height of 5 m, permitting photographs and videos to be made using a digital camera with 50× zoom lens.

The juvenile *N. geoffroyi* remained perched in the same place for >1 hour, watching intently, but not moving. Total time spent observing the bird was 130 minutes. During this period, an adult *N. geoffroyi* twice visited the site, remaining c.3 minutes on each occasion, with the characteristic sound of the adult bill-snapping being heard as it moved around the observer. According to Haffer[2], bill-snapping in *N. geoffroyi* occurs most frequently when foraging or if disturbed. Adult bill-snapping lasted c.2 minutes on each occasion, with the juvenile answering by snapping its own bill, but at longer intervals, and simultaneously very rapidly raising and lowering its crest, tail and head, as well as occasionally changing perch (Fig. 5). When the sound produced by the adult ceased, the juvenile stayed behind, but occasionally raised its crest.

The bird's plumage characteristics broadly correspond to those described by Haffer[2] for *N. g. salvini*, so it is possible that the observed juvenile was the same approximate age as that described by Haffer[2], who stated that the juvenile moults directly into subadult plumage. The bird observed may, therefore, have been at the beginning of this moulting process. Karubian *et al.*[3] described the nestling and juvenile of *N. radiolosus* and commented that the area behind the eye of the nestling begins to become blue c.15 days after hatching, and by 20 days is similar to adults, as is the generally dark plumage. Karubian *et al.*[3] also reported that juvenile *N. radiolosus* leave the nest and is subsequently tended and fed by both adults.

During our observations, the juvenile *N. geoffroyi* was never observed to descend lower than 2 m above ground. Although they forage terrestrially, Sick[9] noted that adult *N. geoffroyi* perch to obtain a good vantage point while preening, resting and sleeping. In juveniles this behaviour is likely to be associated with minimising the risk of predation. According Karubian *et al.*[3], young *N. radiolosus* begin bill-snapping around 15 days after hatching, while still in the nest, and it increases from the 17th day onwards. It is only heard when the parents are absent and elicits occasional snaps by the adults in response. In contrast, in the observed juvenile *N. geoffroyi* this behaviour was observed only when an adult was present.

Our records reinforce the importance of camera traps in ornithological studies. Their use

Figure 5. Juvenile Rufous-vented Ground Cuckoo *Neomorphus geoffroyi*, Jurupari, Acre, Brazil, January 2014; in alert posture, with erect crest in presence of an adult (Tomaz Nascimento de Melo)

was championed by O'Brian & Kinnaird[4], especially for species that are inconspicuous and difficult to observe, and was confirmed by Roos *et al*.[7] who obtained the first record of *N. geoffroyi* in the Caatinga biome. The records in Acre were made in extensive areas of native vegetation, illustrating the need for effective local conservation to ensure the species' survival. Observations of juvenile behaviour are important for understanding the species' reproductive biology and social behaviour, potentially permitting points of conservation vulnerability to be identified.

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