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Nest, egg, incubation behaviour and vocalisations of the New Guinea endemic Black Pitohui *Melanorectes nigrescens*

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Abstract. The Black Pitohui *Melanorectes nigrescens* (Pachycephalidae) is endemic to mid-mountain forests in mainland New Guinea. Spectrograms of three different songs recorded in the Yopno Urawa Som Conservation Area (YUS CA), Huon Peninsula, Papua New Guinea, are presented. We describe the elevation and nest-site, height above the ground, structure and materials of a nest with an egg, discovered in the YUS CA. The colour and dimensions of the egg are documented. We present photographs of the nest-site, nest, and egg, and compare these with previously described eggs and a nest. We observed only the female Black Pitohui incubating the single-egg clutch. We compare the meagre information on pitohui breeding biology with that of Australian whistlers and shrike-thrushes.

Introduction

The genus *Melanorectes* was resurrected by Dumbacher (2014) for the Black Pitohui, previously named *Pitohui nigrescens* (Pachycephalidae) (Gill & Donkser 2017; Dumbacher *et al*. 2008). *Melanorectes* is recognised by Beehler & Pratt (2016), Gregory (2017) and Gill & Donsker (2018). Pitohuis are superficially shrike-like birds with stout, hook-tipped bills, endemic to the New Guinea region. Six pitohui species, Variable *P. kirhocephalus*, Hooded *P. dichrous*, White-bellied *P. incertus*, Rusty *P. ferrugineus*, Crested *P. cristatus* and Black Pitohuis *P. nigrescens*, were recognised by Rand & Gilliard (1967), Beehler *et al*. (1986), Coates (1990) and Boles (2007). Following recent molecular phylogenies (Dumbacher *et al.* 2008; Jønsson *et al*. 2008) and taxonomic revision (Dumbacher 2014), three pitohui species (Rusty, White-bellied and Black Pitohuis) closely related to whistlers and shrike-thrushes were retained in Pachycephalidae and the genus *Pseudorectes* reassigned to the Rusty and the White-bellied Pitohuis. The Crested Pitohui, closely related to the Australian Crested Bellbird *Oreoica gutturalis*, was renamed *Ornorectes cristatus* and placed in the Australo-Papuan bellbird family Oreoicidae (Dumbacher *et al*. 2008; Jønsson *et al*. 2008; Dumbacher 2014). The Variable Pitohui *Pitohui kirhocephalus* and Hooded Pitohui *P. dichrous* were placed in the family Oriolidae (Jønsson *et al.* 2010).

The name pitohui became synonymous with 'poisonbird' with the discovery of a neurotoxin in the feathers and skin in five of the six species of pitohui, with the Hooded and Variable Pitohui most toxic and Black, Rusty and Crested Pitohuis mildly toxic (Dumbacher *et al.*1992, 2000; Jønsson *et al.* 2010). In addition to their toxicity, five of six pitohui species form leaders of mixed-species foraging flocks of brown and black birds (Bell 1983; Diamond 1987). One species (Hooded Pitohui) exhibits cooperative breeding behaviour (Legge & Heinsohn 1996), and cooperative feeding of a fledgling Rusty Pitohui has been observed (Bell 1983). In lowland rainforest sites, flock composition was more influenced by the presence of Papuan Babblers *Garritornis isidori* (Pomatostomidae) than by that of pitohuis, indicating that pitohui toxicity does not drive flock organisation (Goodale *et al.* 2012).

The Black Pitohui is a 22–23-cm, 73–86 g (Diamond 1972) sexually dimorphic pachycephalid. Adult males are black and females are olive-brown to rufous (Coates 1990; Boles 2007; Pratt & Beehler 2015). Of the five subspecies recognised by Beehler & Pratt (2016), *harterti* occurs in the Huon Peninsula, Papua New Guinea (PNG), where we conducted our study. It is an uncommon inhabitant of montane forests at 1000–2600 m (mainly 1600–2200 m) above sea-level (asl), occurs singly or in pairs and mainly forages for arthropods in the middle and upper forest storeys (Coates 1990; Pratt & Beehler 2015). Near Camp 12, in the Yopno Urawa Som Conservation Area (YUS CA, named after the Yopno, Urawa and Som Rivers), Huon Peninsula, from 2200 to 2500 m asl, the Black Pitohui coexists with a more common pachycephalid, the Regent Whistler *Pachycephala schlegelii*. At Sombom Camp, YUS CA, elevation 1380 m asl (06°00´S, 146°52´E) within the altitudinal range of the Black Pitohui, RHD observed Sclater's Whistler *P. soror* but not the Regent Whistler. Sclater's Whistler mainly inhabits hill forest at 1100–1900 m asl but is replaced by the Regent Whistler at higher elevations (Beehler & Pratt 2016).

Study site and methods

Around Camp 12 (06°01′S, 146°50′E), elevation 2300 m asl, in the remote intact forest of the YUS CA, we studied mid-mountain robins (Petroicidae) from 23 October to 6 December 2014 and opportunistically studied other songbird species (Donaghey *et al.* 2019). One of our guides, George Sinao, discovered a nest of a Black Pitohui on the afternoon of 27 November. We visited the nest-site, elevation 2411 m asl, with him at 1530 h on 1 December. The nest-tree was pulled over to retrieve the single egg.

The egg was measured with callipers to the nearest 0.1 mm, weighed with a digital electronic balance to the nearest 0.1 g, and we photographed the nest-site, nest and egg. On 5 December, after DJB and TB had left Camp 12, RHD erected a portable hide 10–15 m from the nest-tree and watched the nest for 165 minutes from 1200 to 1445 h to confirm the identity and sex of birds visiting the nest and to determine the incubation rhythm. Because RHD watched and checked nests on the morning of 6 December and then left Camp 12 around 1200 h, he was unable to conduct further watches of the Black Pitohui nest.

At Camp 12, TB used a Nagra LB recorder and a DPA4061 microphone to record a Black Pitohui upslur song at 1531 h on 4 November, and a series of mellow whistles at 0657 h on 5 November. He recorded the staccato song in regrowth rainforest at Gomdan village at 1553 h on 27 October using a Nagra LB recorder and a MKH40 microphone in a parabolic reflector. He made the original recordings as 24bit 48 kHz WAV files and produced the spectrograms using Raven Pro 1.4 with FFT1024, and lodged the recordings with Xeno-canto (accession number XC472091).

In a 1-ha mid-montane rainforest plot <200 m from Camp 12, Inaho (2012) recorded 39 plant species in 36 genera and 28 families, but this species richness was low compared with that at lower elevations. The dominant plant species was *Platea excelsa* (family Icacinaceae). Vegetation structure (stem density and plant height) and further data on plant families and their importance value are presented by Inaho (2012) and Donaghey *et al.* (2019). During our stay at Camp 12, there was little sunshine and heavy rain fell most afternoons, evenings and some mornings.

Observations

Social organisation

Two pairs of Black Pitohuis occurred within 200 m of Camp 12.

Vocalisations

Figure 1 depicts an upslur song that rose from 2 kHz to 3 kHz and lasted for 0.7 seconds. Figure 2 is a series of 13 *kwik* notes of a frequency of 2 kHz that lasted for 1.2 seconds. Figure 3 depicts three mellow whistles repeated every second that sweep upscale from a frequency of 2 kHz to nearly 3 kHz. The vocalising bird was not seen during recording so its sex and the behavioural context of the recorded songs were not known. Once, RHD observed a pair of Black Pitohuis and watched the male singing.

Nest-site, nest and egg

The nest was placed ~3 m above the ground on an upsloping branch fork against the trunk of a slender understorey rainforest tree situated at the edge of a trail along a ridge at an elevation of 2374 m asl (Figure 4). The deep, bulky, cup-shaped nest was externally composed of rootlets, dried moss, fern fronds and dead leaves (Figure 5). Nest dimensions were not measured and the interior nest materials were not examined.

The single egg had a pinkish-brown or buffy-pink ground colour, small purplish-brown spots over the entire surface, scattered large deep-purplish-brown blotches toward the larger end, and a zone of deep purplish brown at the larger end (Figure 6), it measured 33.3 × 22.4 mm and weighed 9.6 g.

Incubation behaviour

Despite a slow, quiet approach, we were unable to observe a bird on the nest because the bird incubating was extremely wary and flew from its nest in response to people walking along the trail. Once, RHD saw a brown bird fly off the nest and, once, DJB saw a black bird flying from the vicinity of the nest. On 5 December, the pitohui nest was watched by RHD for 165 minutes from 1200 to 1445 h, and by George Sinao (GS) for 45 minutes from 1540 to 1625 h. Shortly after 1200 h on 5 December, a rufous-brown bird (identified as an adult female Black Pitohui by its size, plumage and stout, hook-tipped black bill) visited the nest but quickly departed as RHD moved forward in the hide. He then set up a telescope to observe the nest. At 1225 h, the female Pitohui returned, incubated for 35 minutes then promptly departed in response to human disturbance. At 1403 h, after an absence of 1 h and 3 minutes, she arrived at the nest, incubated for 39 minutes, and then flew off as GS approached the nest-tree. After checking other nests from 1442 to 1540 h, RHD and GS returned to the nest area, and at 1540 h GS entered the hide. During his nest-watch of 45 minutes, only the female Pitohui incubated (for *c.* 30 minutes). During these two nest-watches, the female Pitohui visited the nest four times. Two timed sessions (of durations of 35 and 39 minutes) were interrupted by human disturbance.

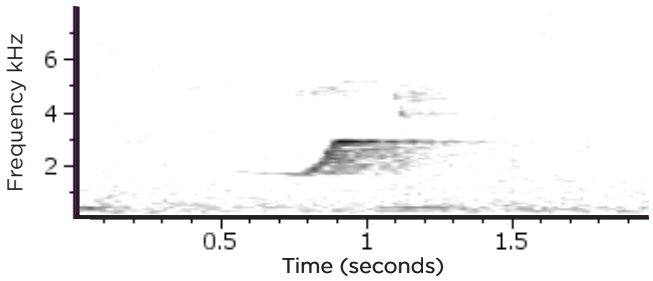

Figure 1. Spectrogram of an upslur song of a Black Pitohui in the Yopno Urawa Som Conservation Area, Huon Peninsula, PNG. Spectrogram: Tony Baylis

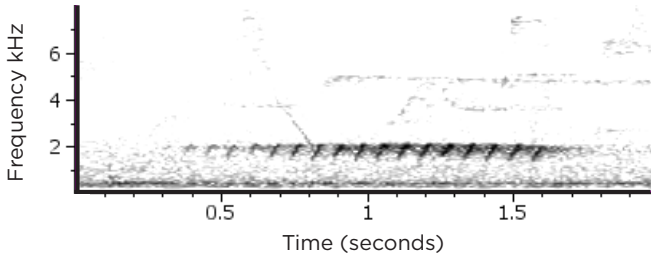

Figure 2. Spectrogram of a Black Pitohui song with 13 staccato notes recorded in the YUS CA, Huon Peninsula, PNG. Spectrogram: Tony Baylis

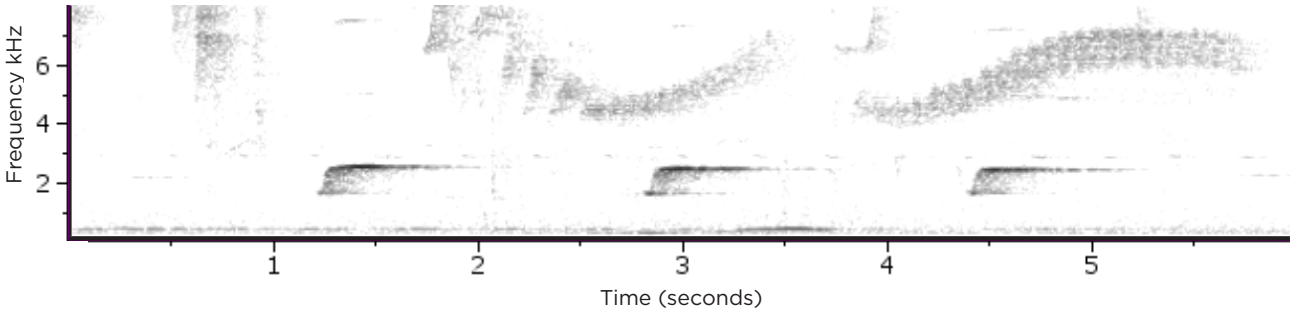

Figure 3. Spectrogram of three mellow whistles of a Black Pitohui in the YUS CA, Huon Peninsula, PNG. Spectrogram: Tony Baylis

Figure 4. Rainforest understorey tree with Black Pitohui nest in the YUS CA, Huon Peninsula, PNG. Photo: Donna Belder

Figure 5. Black Pitohui nest. Photo: Donna Belder

Figure 6. Single-egg clutch of the Black Pitohui. Photo: Donna Belder

Discussion

Vocalisations

Black Pitohui "songs vary geographically and each individual has several songs" (Pratt & Beehler 2015, p. 452). The examples of three songs from the YUS CA shown in Figures 1–3 resemble those described in Pratt & Beehler (2015) except that the staccato series consisted of 13 notes not 10.

Nest

The nest, from which an egg and a female Black Pitohui were collected by Fred Shaw Mayer in December 1932, was described as "open cup-shaped, composed of whole fern fronds loosely held together with fine rootlets, and lined with fine rootlets" (Parker 1962, p. 133). In the present study, the Black Pitohui nest was deep, bulky and externally composed of dead leaves and dried moss in addition to fern fronds and rootlets, but the interior nest materials were not observed.

Egg and clutch-size

A female Black Pitohui (with an egg in the oviduct), taken while incubating a single egg, was obtained by Shaw Mayer on 28 December 1932 at 1373 m asl in the Kratke Mountains, Buntibasa district, Eastern Ranges, PNG. The egg was a deep maroon-brown ground colour with

light- and dark-brown, and grey blotches and spots evenly distributed over the surface. It measured 32.5 × 23.3 mm (Parker 1962). Another nest, high up in a forest tree, collected by Shaw Mayer at 1200 m asl at Boneno, Mt Mura, 50 km north-west of Mt Simpson, Eastern Ranges, PNG, on 25 December 1940 contained one egg measuring 33.2 × 22.6 mm. This egg was "a deep and slightly buffish pink with numerous small spots and blotches of dark reddish brown or purple" (Harrison 1971, p. 86). The colour and size of these two eggs are like that in Figure 6.

Coates (1990), Boles (2007) and Pratt & Beehler (2015) gave clutch-size as 1–2, and Donaghey (2015) listed clutch-size as mostly one, but with a range of 1–2. In three nests, clutch-size was one (Harrison 1971; our study), and a female taken at another nest was incubating one egg and had an egg in the oviduct (Parker 1962). As sample sizes are small, however, more data are needed to verify if one is the typical clutch-size.

Incubation behaviour

The Black Pitohui was very wary around the nest in the presence of humans in the present study. Coates (1990, p. 232) stated that in the Rusty Pitohui "the adults are very shy in the vicinity of the nest". In the present study, during sessions on the nest, the female Black Pitohui mostly sat motionless low in the nest, but once bent her head and dipped her bill into the nest, and on another occasion sat upright and turned her head, indicative of incubation behaviour. Two interrupted incubation sessions averaged 37 minutes, after which only the female returned to the nest.

A female Black Pitohui obtained by Shaw Mayer that was taken while incubating a single egg (Parker 1962) and another female caught on a nest containing an egg (Harrison 1971) provide further evidence of incubation by only the female in this species. Two observations of incubation by a female are too few to indicate that only the female incubates. In other pachycephalids, such as whistlers and shrike-thrushes, both the male and the female share incubation so further study may discover if the male also incubates in the Black Pitohui. For other New Guinean pitohui species, there is a paucity of information on the role of the male and female in incubation and parental care of young. In addition to a female Black Pitohui taken while incubating, Shaw Mayer also obtained a female Hooded Pitohui with a clutch and "another female was secured on her nest with one chick" (Parker 1962). These observations indicate that in the Hooded Pitohui the female incubates and broods.

The molecular phylogeny of Dumbacher *et al.* (2008) shows that the Black Pitohui is allied with the *Pachycephala* whistlers, and the Rusty and White-bellied Pitohuis are allied to the *Colluricincla* shrike-thrushes. Furthermore, Dumbacher *et al.* (2008) stated that in pitohuis there appears to be general convergent evolution in plumage coloration, size, morphology, and behaviour such as mixed-species flocking and toxicity. Thus, in pitohuis we might expect a similar convergence in the role of the male and female in incubation and care of the young.

Both the male and female share incubation in the sexually dimorphic Golden Whistler *Pachycephala pectoralis* (van Dongen & Yocum 2005) and Rufous Whistler *P. rufiventris* (Bridges 1994) and in the slightly sexually dimorphic Olive Whistler *P. olivacea* (Higgins & Peter 2002). Nests with eggs of the two strongly sexually dimorphic forest whistlers of mainland PNG inhabiting the YUS CA (Sclater's and Regent Whistlers) have not been observed so there is no information on the role of the male and female in incubation for these two species (Coates 1990; Boles 2007).

Among the four species of Australian shrike-thrushes, the male and female share incubation in the sexually dimorphic Grey Shrike-thrush *Colluricincla harmonica* (Higgins & Peter 2002; Stevens & Watson 2005) and Bower's Shrike-thrush *C. boweri* (Frith & Frith 1990). Both the male and female incubate in the Little Shrike-thrush *C. megarhycha* (Higgins & Peter 2002; Boles 2007), but the role of the sexes in incubation has not been quantified in the Little Shrike-thrush nor in the Sandstone Shrike-thrush *C. woodwardi* (Higgins & Peter 2002).

The mean length of incubation bouts for the male and female was 18.9 and 24.4 minutes, respectively, for the Golden Whistler (van Dongen & Yocum 2005), 15.5 and 21.3 minutes for the Rufous Whistler (Bridges 1994), and (during late incubation) 42.6 and 50.2 minutes for the Grey Shrike-thrush (Stevens & Watson 2005). It appears that the length of two partial incubation bouts in the Black Pitohui (35 and 39 minutes: this study) more resemble the length of incubation bouts in the Grey Shrike-thrush than those of the Golden and Rufous Whistlers but more data on the length of Black Pitohui incubation bouts are needed.

Parental care of offspring

For five of the six pitohui species, there is no information on the role of the sexes in parental care of nestlings (Coates 1990; Boles 2007). At a Hooded Pitohui nest with two nestlings, Legge & Heinsohn (1996) observed three meal deliveries in <1 minute and therefore assumed that three adults fed the nestlings. They also observed mobbing behaviour (cooperative nest-defence) by at least four different adults. Furthermore, Bell (1983) observed more than two Rusty Pitohuis feeding a fledgling. Presumably, both sexes care for Hooded and Rusty Pitohui young, but this requires further study.

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