

Nest, egg and vocalisations of the Green-backed Robin *Pachycephalopsis hattamensis* in the Arfak Mountains, West Papua

RICHARD H. DONAGHEY^{1,2} AND CAROLYN A. DONAGHEY²

¹Environmental Futures Research Institute, Griffith University, Nathan, Queensland, 4111 Australia.
Email: ricardo@southernphone.com.au. ²80 Sawards Road, Myalla, Tasmania, 7325 Australia.

Summary: The Green-backed Robin *Pachycephalopsis hattamensis* is a near-endemic species of Papua (Indonesian New Guinea; Irian Jaya). Its breeding behaviour is poorly known, and its nest, egg and clutch-size were unknown prior to our study. We describe the nest and egg of a Green-backed Robin found near Kwau village in the Arfak Mountains, Papua, in mid-November 2012. A second nest with one young in late January 2012 confirms that the breeding season occurs during the wet season, at least from November to January, in the Arfak Mountains. The nest and egg are similar to those reported for the congeneric White-eyed Robin *P. poliosoma* in Papua New Guinea, and both species may have clutch-size of one. In our study area, the most frequent and persistent vocalisations of the Green-backed Robin, depicted in two spectrograms, were *tu-wee* sounds, uttered by both sexes. Other vocalisations heard were a piping whistle and a raspy *chur-chatter*. The function of these vocalisations is discussed and compared with other Australasian robins. We also describe interactions between the sexes and neighbours.

Ringkasan: Robin hijau *Pachycephalopsis hattamensis* adalah sebuah spesies dengan sebaran terbatas (near endemic) di wilayah wilayah Papua (Indonesia). Perilaku berbiak spesies ini belum pernah didokumentasikan. Sebelum penelitian ini, sarang, telur maupun jumlah anakan tidak pernah diketahui. Tulisan ini menggambarkan telur dan sarang spesies ini, dari desa Kwau di pegunungan Arfak pada pertengahan Nopember 2012. Selanjutnya di pegunungan yang sama pada bulan Januari 2012 ditemukan sarang lain sehingga diduga bahwa musim berbiaknya mencakup musim hujan (yaitu termasuk bulan bulan Nopember - Januari). Telur dan sarang burung ini mirip dengan Robin mata-putih *P. poliosoma* dari Papua Nugini. Kedua spesies ini mungkin memiliki hanya satu anakan setiap kali berbiak. Vokalisasi yang paling sering terdengar dari Robin Hijau berdasarkan dua spektrogram adalah "tu-wee". Interpretasi terhadap makna panggilan panggilan tersebut dideskripsikan berdasar perbandingan dengan berbagai spesies Robin di kawasan Australasia. Kami juga menjelaskan berbagai interaksi jantan-betina dengan lingkungan sekitarnya.

Introduction

The Green-backed Robin *Pachycephalopsis hattamensis* (Petroicidae) and its sole congener, the White-eyed Robin *P. poliosoma*, formerly named thicket-flycatchers (Rand & Gilliard 1967; Diamond 1972; Beehler 1978), are shy understorey and ground forest birds endemic to New Guinea. Christidis *et al.* (2011) placed these two species in the subfamily Pachycephalopsinae and suggested that they were sister taxa to the *Amalocichla* Ground-robins, which was confirmed by subsequent DNA studies (Kearns *et al.* 2018).

The medium-sized (15 cm) Green-backed Robin is sexually monomorphic, has a diagnostic olive-green back, rusty wings and tail and yellow abdomen (Coates 1990; Pratt & Beehler 2015). It occurs predominantly in the mountains of western New Guinea from the Vogelkop (Bird's Head) Peninsula east along the western Central Ranges, but also has an outlying population on Mt Sisa, Southern Highlands, Papua New Guinea (Boles 1989, 2007; Beehler & Pratt 2016). Of the four subspecies recognised by Beehler & Pratt (2016), the

nominate race *hattamensis* occurs in the Arfak Mountains, Bird's Head Peninsula, in Papua (Indonesian New Guinea; Irian Jaya), where we conducted our study. The species mainly inhabits hill and lower montane forests from 760 to 1650 m above sea level (asl) and forages for arthropods on the ground and in the lower understorey (Coates 1990; Beehler & Pratt 2016). At our study site, we observed it from 1380 to 1700 m asl, and it coexisted with the Blue-grey Robin *Peneothello cyanus* from 1580 to 1700 m asl.

The breeding behaviour of the Green-backed Robin is poorly known. Boles (2007) reported that an incomplete nest, composed of moss, was placed 0.5 m from the ground in liana. Nest dimensions are unknown, and the egg is undescribed (Coates 1990; Boles 2007). Here we describe the site, height, dimensions and composition of two nests found in the Arfak Mountains, as well as the colour and size of the egg in one nest. We present photographs of the nest-site, nest, and egg, and two spectrograms of vocalisations recorded near our Arfak Camp.

Study Site and Methods

From 1 to 16 November 2012, as part of a birdwatching holiday, we camped at 1580 m asl in lower montane rainforest above Kwau village, Arfak Mountains, West Papua Province (1°6'S, 133°55'E). Our Camp was situated in a transition zone between the upper limit of lower montane rainforest and the lower limit of midmontane rainforest. The former occurs between 1500 and 2800 m in Papua (Johns *et al.* 2007). Below our Camp, lower montane vegetation was characterised by a canopy layer dominated by the oak *Castanopsis* and many tree species including *Elaeocarpus* and members of the Lauraceae with occasional emergent *Ficus*, and a dense ground layer of shrubs, ferns and herbs (Johns *et al.* 2007; Donaghey 2015b). In midmontane forest, lowland plant families are less frequent and are replaced by plants in the families Cunoniaceae, Cupressaceae, Elaeocarpaceae, Fagaceae, Lauraceae, and Podocarpaceae, and the ground layer is rich in mosses, lichens and ferns (Johns *et al.* 2007).

Although climatic data could not be found for the Arfak Mountains, coastal Manokwari has a wet season from November to March. Over the nine years from 1949 to 1957, mean annual rainfall was 2,576 mm with average monthly rainfalls varying from 83 mm in October to 338 mm in March. Mean monthly rainfall for each of the five months from November to March over this period was 218, 258, 252, 292 and 338 mm respectively (Hoogerwerf 1971). During our stay in November there was little sunshine and heavy rain fell most afternoons, evenings and some mornings.

On 16 November, the day before we left the study site, a Kwau villager found and showed us a nest of the Green-backed Robin, which contained a single egg. Nest dimensions were measured with a tape measure. The egg was measured with callipers to the nearest 0.1 mm and weighed to the nearest 0.1 g with an electronic pocket scale. The nest site, the nest and egg were photographed at 1740, shortly before we departed. While we recorded nest data, we heard three *tu-wee* Green-backed Robin vocalisations nearby. It was not possible to erect a hide and observe incubation behaviour early next morning because of our travel schedule. Vocalisations were recorded in one of three adjoining territories by RHD with an Olympus Linear PCM Recorder LS-20M and a Sennheiser ME66 microphone. Spectrograms were produced using Raven Pro 1.4 with FFT1024.

Observations

Nest-site, nest and egg

The cup-shaped nest of the Green-backed Robin was externally composed of bright green moss, and was situated 130 cm above ground in a vertical fork of a slender understorey sapling 2.2 m tall at an elevation of c.1700 m asl. The nest consisted of an egg cup, which was about

13 cm deep, and a tapering extension of 41 cm below the cup, giving a total nest depth, from top to bottom, of 54 cm. Externally the nest-cup measured 10.9 x 9.0 cm across, while the internal egg-cup measured 6.0 x 5.2 cm across and 3.8 cm deep. Externally the upper portion of the nest consisted of black and brown rootlets and the rest of the nest was composed of bright green moss, some dried brown leaves and hanging strands of white rootlets of orchids and/or climbers (Plate 1). The egg-cup was lined with fine rootlets and tree-fern fibre. The single egg of our study had a pale pink to buffy-pink ground colour and a dense covering of mostly medium-large brown blotches and some pale purplish-grey blotches (Plate 2). It measured 24.7 mm x 18.0 mm, and weighed 5.8 g.



Plate 1. Nest of the Green-backed Robin near Kwau village, Arfak Mountains, Papua. Photo: Richard Donaghey

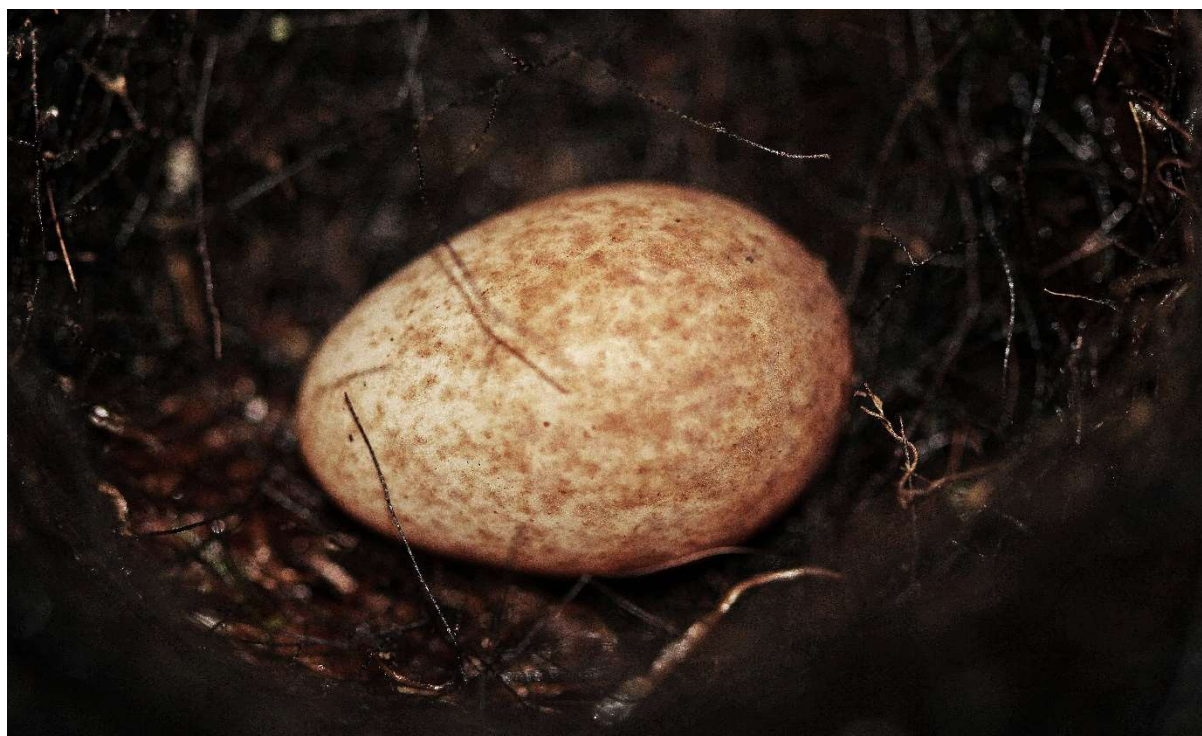


Plate 2. Egg of the Green-backed Robin, same nest as in Plate 1. Photo: Richard Donaghey

A second nest with one nestling was found on 30 January 2012 near the village of Syoubri, Arfak Mountains, at an altitude of c. 1400 asl. The nest was 120 cm above the ground in a 3 m high sapling. Using a ruler, the external diameter and depth were c.10 cm and c.10 cm, respectively, and internal diameter and depth were c.7 cm and c.5 cm, respectively. On 30 January the nest contained one young with black skin, but feathers were visible on 4 February. By 7 February the nest was empty (R. Noske, *in litt.*).

Vocalisations

The most frequent and persistent vocalisations of territorial Green-backed Robins over the 16 days of our observations were clear, whistled *tu-wee* sounds. Figure 1 depicts two whistled *tu-wee* vocalisations, and Figure 2 shows a sequence of four pairs of notes. Both Figures were part of a sequence of 25 vocalisations delivered in four minutes, an output of 6.3 per minute. These vocalisations, produced by a Green-backed Robin perched in a small bush 80 cm above the ground in Territory 1, were recorded at 06:45 hrs on 11 November. At 07:00 hrs, RHD watched the presumed Territory 1 male utter six *tu-wee* vocalisations in one minute. When a second robin flew in, it perched next to the vocalising bird, presumably its mate, and gave a harsh, low frequency, raspy greeting call. In adjoining Territory 2, RHD heard mostly *tu-wee* vocalisations, but once on 3 November, a Green-backed Robin flew with audible wing-beats, alighted on a nearby low horizontal perch, and uttered a piping whistle of several notes on the same frequency.

Between 08:15 and 08:30 hrs on 4 November, RHD watched a pair of Green-backed Robins interact in Territory 1. After one bird flew 8 m, its mate followed, perched next to it, and gave a raspy, *chur-chatter*. When one member of the perched pair flew 5 m away, and uttered *tu-wee*, the remaining bird also uttered *tu-wee*. The second bird flew 10 m away, and the other bird followed, perched next to its mate and gave a *chur-chatter*. Although these birds were not individually marked, this observation indicates both sexes utter *tu-wee* vocalisations. While watching a pair of these robins in Territory 1, RHD observed one bird, presumably the male, feed its begging mate, presumably a female.

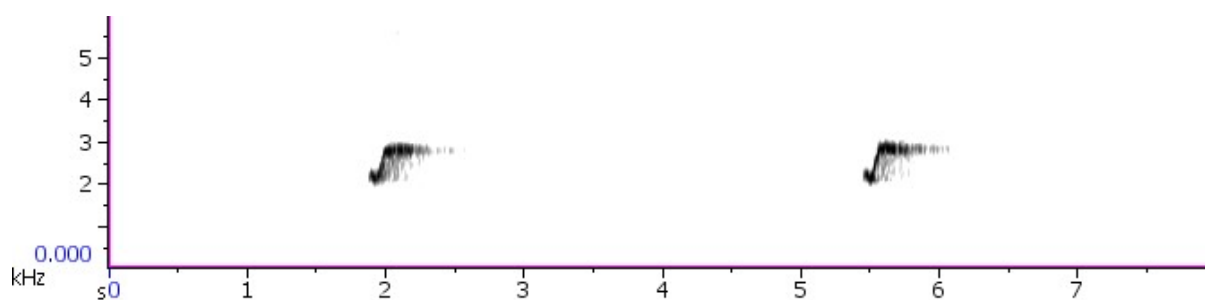


Figure 1. Spectrogram of two whistled *tu-wee* songs of the Green-backed Robin. Spectrogram: Tony Baylis

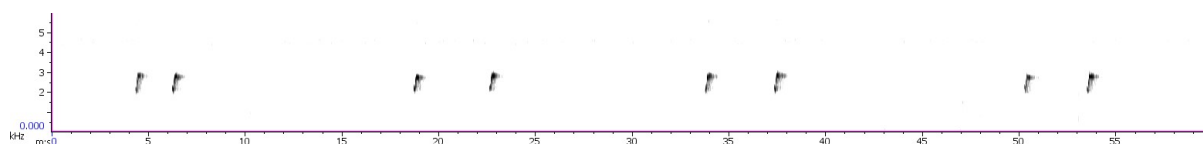


Figure 2. Spectrogram of four pairs of whistled *tu-wee* songs of the Green-backed Robin. Spectrogram: Tony Baylis

Discussion

Breeding season

Our record of a Green-backed Robin nest with an egg in mid-November and the record of a nest with young in late-January (the Syoubri nest), show that egg laying in the Arfak Mountains occurs at least from November to January, during the wet season. By contrast, in the congeneric White-eyed Robin, two breeding records, one of a nest with a newly hatched chick on Mt Missim in mid-August and the other of a juvenile at Moroka in early November, indicate breeding in at least the mid-late dry season (Coates 1990).

Nest, egg and clutch size

Our observations at Kwau revealed that the Green-backed Robin builds a cup-shaped nest, externally composed of rootlets and bright green moss that tapered below the nest base, placed in a fork of a small understorey tree, only 1.3 m above ground. The dimensions, nest-site and height above ground of the Syoubri nest, were similar to those of our Kwau nest. The one recorded nest of the White-eyed Robin was also placed 1.3 m above ground and was a firm cup of rootlets and green moss (Coates 1990), but its dimensions were not documented, and it is not known if green moss extended below the base of the nest as in our Green-backed Robin nest.

A single egg of the White-eyed Robin, collected in south-east New Guinea (Frith 1971), had a similar ground colour and markings to that of the Green-backed Robin egg described above. This egg of the White-eyed Robin measured 27.3 x 19.4 mm, thus was slightly larger than that of the smaller-bodied Green-backed Robin (Frith 1971; Boles 2007).

In our study, clutch size in the Green-backed Robin nest was one, and brood size was one in the Syoubri nest, and in a nest of the White-eyed Robin (Coates 1990). These few data provided further evidence that clutch size and brood size is one in montane New Guinean robin species (Donaghey 2015a), reflecting a general trend for New Guinea passerines to lay smaller clutches than birds in other tropical regions (Freeman & Mason 2014).

Vocalisations

In the Wandammen and Foja Mountains, Papua, Diamond (1985) recognised two songs and one call of the Green-backed Robin (formerly named the Western White-eyed Robin). He described the common song as a series of 2–5 buzzy notes, the first three upslurred and at

progressively higher pitches, the last two at a higher pitch than the previous 2–3 notes. The common call is a piercing, clear, whistled, upslur. The second song has the same clear piercing quality as the call but consists of a short, unslurred note repeated identically up to a dozen times except for occasional irregular pauses. Xeno-canto (2019) lists four recordings and sonograms of Green-backed Robins, all from the Arfak Mountains near our study area. The 2-note whistled upslur recorded by Frank Lambert (catalogue number XC163242) at 1300 m asl closely resembles the vocalisation noted in our study area. The other three XC recordings that sound like *pee-ar* are similar but end with a downslur. In our study area, the most frequent vocalisation was the clear, whistled *tu-wee* notes ending with an upslur, that resembles the common call described by Diamond. The piping vocalisation we heard once may resemble the second song described by Diamond (1985) but there are no spectrograms available for comparison. The common buzzy song described by Diamond (1985), but not heard by us, may represent a geographical dialect. Clearly, further recordings of Green-backed Robin vocalisations, along with descriptions of their context, from a wider geographic area, would be useful.

Song, in northern temperate regions, is defined as an “often loud and sometimes complex vocalisation used to attract mates or compete with members of the same sex” (Byers & Kroodsma 2016: 360) and tends to be produced by males in the breeding season (Catchpole & Slater 2008). Some North American passerines have simple songs (examples in Byers & Kroodsma 2016: 364), as do some Australian robins as discussed below. Among passerines, female song is much more prevalent in the tropics and Southern Hemisphere than in the Northern Hemisphere, and both sexes may sing throughout the year (Cooney & Cockburn 1995; Morton 1996; Langmore 1998; Slater & Mann 2004). Unlike songs, calls usually occur in particular contexts related to specific functions such as flight, threat, alarm and mobbing (Catchpole & Slater 2008). Calls tend to be shorter, simpler and produced by both sexes throughout the year.

Much experimental research on northern temperate songbirds, confirms that the two main functions of birdsong are repelling rivals (Krebs *et al.* 1978; Falls 1988; Nowicki *et al.* 1998) and attracting mates (Catchpole 1973; Eriksson *et al.* 1986; Johnson *et al.* 1996 and Amrhein *et al.* 2002). Song use and territoriality differ greatly between northern temperate and tropical passerines. Northern temperate migratory songbirds have short breeding seasons, males arrive first on their breeding territories, and sing to establish territories and attract mates. By contrast, in tropical suboscine and oscine birds, territories are defended year-round, often by both sexes, and adult survival is high (Morton & Stutchbury 2000; Stutchbury & Morton 2001). Very low turnover of adults contributes to stable territory boundaries and pair bonds (Greenberg 1986, 1997). In tropical songbirds, the primary function of year-round song is territorial defence since pair formation occurs infrequently and at any time of year.

Australian robins exhibit life-history traits such as small clutch sizes, high territory and mate fidelity, low reproductive rates, high nest failure, multiple nesting, and high adult survival and longevity (Marchant 1985; Frith & Frith 2000; Russell *et al.* 2004; Debus 2006; Noske 2011; Donaghey & Donaghey 2017) that are more characteristic of tropical passerines than northern temperate songbirds (Magrath *et al.* 2000; Robinson *et al.* 2010). Some Australian robins have simple as well as complex songs. For example, the Eastern Yellow Robin *Eopsaltria australis* sings a loud, explosive double note *chu-chu* or *chop-chop* at dawn, early morning and dusk, that functions in territorial advertisement (Marchant 1985; Keast 1994). The loud, strident, repetitive dawn *chee-chee-chee-chee* notes of the tropical, sedentary, long-lived White-faced Robin *Tregellasia leucops* (Coleman *et al.* 2012; Rawsthorne & Donaghey 2012) are described as a call (Higgins & Peter 2002: 767) but probably function in territorial advertisement (RHD pers. obs.). In north-west Tasmania, the *choo-wee* song of the male Dusky Robin *Melanodryas vittata* functions in territorial advertisement and mate attraction (RHD

pers. obs.). The piping whistles of the Grey-headed Robin *Heteromyias cinereifrons* and congeneric Black-capped Robin *H. armiti* (Higgins & Peter 2002; RHD pers. obs.), and the two whistled notes of the Black-chinned Robin *Poecilodryas brachyura* (Noske & Spaeth 2009), are further examples of simple songs in Australasian robins.

In southeast Australia, Keast (1994) found that the Eastern Yellow Robin delivered its territorial *chop-chop* song at a maximum rate of 16–19 songs per minute for periods of several minutes, while Jacky Winter *Microeca fascinans* songs were uttered at a rate of 11–14 songs per minute (Keast 1994). Three individual Southern Scrub-robins *Drymodes brunneopygia* at Gluepot Reserve, South Australia, delivered early morning songs in the early breeding season at rates of 12–15 songs per minute (RHD unpub. data). The White-faced Robin uttered eight rapid *chee-chee-chee* notes in 2.5 seconds (Sonagram B in Higgins & Peter 2002: 767). A recording with a longer sequence of *chee* notes and their context is required to determine if these notes represent a song. In the present study, a tropical, territorial, paired male Green-backed Robin delivered 6.3 *tu-wee* vocalisations per minute in a sequence lasting four minutes in the first hour after sunrise. The continuous, repetitive sequence of the *tu-wee* notes by a paired male, *tu-wee* notes by both sexes, and *tu-wee* counter-singing by neighbouring males, suggests that the primary function of these vocalisations is territorial advertisement. Thus, they should be considered songs. The greeting *chur-chatter* call described above, possibly functions to maintain the pair-bond.

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