Observations on the reproductive biology of Thrush-like Antpitta *Myrmothera campanisona*

The breeding habits of the two species of *Myrmothera* antpittas are poorly documented. Our knowledge of the nesting of Tepui Antpitta *M. simplex* is based on the description of a single nest with a clutch of two eggs[1]. Only slightly better studied, the breeding biology of Thrush-like Antpitta *M. campanisona* is known from the description of just three nests and two clutches (n = 4 eggs) of the nominate subspecies in French Guiana[23], and a single nest and two-egg clutch of *M. c. signata* in eastern Ecuador[13]. The latter study reported brief observations on incubation behaviour, but information on nest construction and egg-laying behaviour has not been published. Here I present additional data on nest architecture and placement, egg appearance and size, as well as the first data on adult behaviour during nest construction and laying.

I studied the nesting of *M. c. signata* at three localities in eastern Ecuador: Shiripuno Research Center, prov. Pastaza (01°06'S 76°43'W; 220 m); Gareno Lodge, prov. Napo (01°01'49.08"S 77°23'29.03"W; 360 m); and Yankuam Lodge, prov. Morona-Santiago (04°15'S 78°39'W; 900 m). For further descriptions of habitat at these sites see Durães *et al.*[7], Greeney[10], and Capper & Pereira[4], respectively. I found one nest at Shiripuno, two at Gareno (one active, one inactive), and four (two active, two inactive) at Yankuam, the details of which are provided below. I made all behavioural observations at nests using tripod-mounted, continuously-recording video cameras placed 5–10 m from the nests, transcribing the information at a later date.

At 16h00 on 4 January 2007 at Shiripuno, I found an empty but apparently complete nest, into which I placed a green leaf. The following day, at 14h30, the leaf had been removed and I began video monitoring. The nest remained empty until 16h10, when the female arrived and settled immediately on the nest. I interrupted her visit at 16h17, flushing her from the (still empty) nest during a one-minute visit to adjust the camera. She promptly returned and settled on the nest at 16h24. At 16h33 she slowly rose to a crouched position and I observed several strong abdominal contractions as she laid an egg. After several seconds she slowly lowered her body into the nest, but after several minutes stood, peered into the nest, and gently rolled the egg using a rear-directed series of rapid, sewing-machine like bill movements. This 'rapid-probe' movement was nearly identical, though much softer, than the proposed nest-cleaning or parasite removal behaviour described for other antpittas[6], but similar to that used by some *Grallaricula* to, at least occasionally, roll their eggs[12]. In this instance it was clearly used only to roll the egg. The female remained standing, peering into the nest for 17 seconds before settling. Just prior to departing the nest at 16h44, she stood a second time, preened her breast, flanks and rump for 26 seconds, and pecked at the rim of the nest several times. She departed carrying a large dead leaf removed from the nest rim. Less than 30 seconds later, however, an adult arrived at the nest, peered at the egg for three seconds and then settled over it with a gentle rocking of its body. It remained covering the egg until the video ended at 16h52. I again set up the camera at 08h00 next day, at which time the egg was cold and moist, suggesting it had not recently been covered by an adult. The egg remained unattended until an adult arrived at 09h10, dropped a long dark rootlet into the nest, gently moved the egg with its bill, pecked several times into the lining of the nest, and then settled on the egg after 21 seconds. It stayed for 40 minutes, remaining relatively still except five bouts of movement lasting 33–45 seconds each, during which it preened, arranged material inside the cup and twice rolled the egg (total movement time = 3.2 minutes). On 7 January, when I set up the video camera at 15h00, the nest still contained one egg. At 16h10 the female arrived, peered briefly at the egg then settled into the nest. She stood and rolled the egg just once before laying the second egg at 16h24, remaining in the nest until I flushed her at 17h00. During the 38 minutes after laying, the female was fairly active, preening, arranging material in the nest, pecking sharply many times into the nest and appearing to consume small items. She rolled the eggs four times, spending a total of 8.5 minutes engaged in these activities. I was unable to make any further observations at this nest.

At Gareno, at 08h00 on 22 December 2010, I flushed an adult from a freshly constructed but empty nest. I did not make any behavioural observations at it. Subsequently, at Yankuam, on 16 February 2012 I discovered a nest

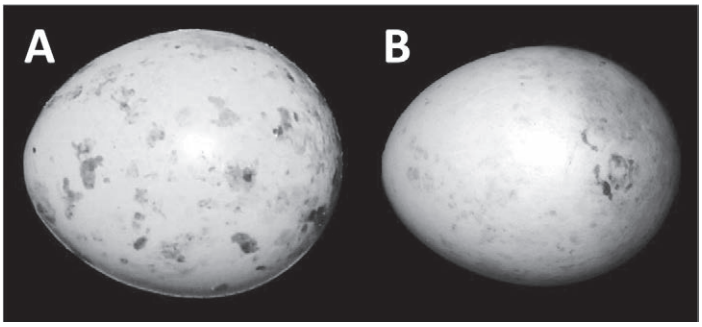

Figure 1. Eggs of Thrush-like Antpitta *Myrmothera campanisona signata* from eastern Ecuador, (A) Shiripuno Research Center; (B) Yankuam Lodge (Harold F. Greeney)

in the final stages of construction. I videotaped this nest on 17, 18 and 19 February at 10h15–13h15, 07h15–11h30 and 14h30–16h30, respectively. Although I was unable to record laying at this nest, two eggs were eventually laid, the first on the afternoon of 22 February, the second on the afternoon of 24th. During the three hours filmed over five days prior to laying the first egg, an adult visited the nest just once, at 10h22. It arrived with a long flexible rootlet that was dropped into the nest's cup. It remained in the nest for ten minutes, alternating between tucking loose material into the nest, shaping the nest and singing. The adult grasped loose rootlets with its bill, tucking them into the rim or nest lining with the same gentle, but rapid, movement of the bill as described above for egg-rolling. It shaped the nest by lowering itself into the cup, crossing its wings partially over its back, pressing its breast downward and vibrating slightly, a movement used by many species for nest-shaping[16,19]. Most tucking or shaping movements were separated by a 90° shift in orientation, the adult completing several complete circles while at the nest. Construction behaviours were punctuated by a total of 25 vocalisations. These were muted, shorter (2–5-note) versions of the typical song[18]. During the two hours of video in the afternoon three days prior to laying there was a similar lack of activity. Around 16h30 an adult spend four minutes at the nest, alternating between standing and crouching inside it, appearing to inspect the nest from multiple angles, but not performing any of the aforementioned construction behaviours. During this time, a second adult arrived for two brief visits (23 and 24 seconds). Upon the second adult's arrival, the first crouched low in the nest in a threatened or submissive posture, but there was no obvious contact. Neither brought material to the nest, but the second adult carried away small items from its rim on both departures. I observed most activity at the nest on the morning of 18 February, four days prior to clutch initiation. During 250 minutes of video, adults arrived at the nest 14 times, carrying a long, dark, flexible rootlet on all but one occasion. Visits to the nest lasted 0.3–3.6 minutes (mean ± SD = 95.9 ± 71.4 minutes) and their behaviours were as described above. In all, an adult was present for 22.4 minutes (9%) of the observation period, during which I observed 18 cup-shaping manoeuvres and 35 vocalisations (overall rate of 1.6 songs / minute).

I found a second nest under construction at Yankuam that appeared near-complete on 23 February 2012, and R. A. Gelis provided information on a nest at Tiputini Biodiversity Station, prov. Orellana (00°38'S 76°08'W; 230 m)[3,8] that held two partially incubated eggs on 2 May 2009. Along with the two active nests discussed above and the previously published record of incubation on 20 May 2003[13], laying appears to commence in late December or early January, and continue until at least early May. These dates suggest that nesting is initiated at the start of the rainier season, with fledgling timed near the middle or end of the wetter months[3,11].

Three nests had a complete clutch of two eggs. Those in the Shiripuno and Tiputini nests were pale blue to greenish blue with large, irregularly shaped brown blotches of varying shades fairly evenly distributed, only slightly denser at the large end (Fig. 1A). The two eggs in the Yankuam nest were rather different, being very pale blue in ground colour with fairly dense, fine, pale brown speckles and wash, with a few scattered scrawls of darker brown, and distinctly denser markings at the larger end (Fig. 1B). The first egg laid at Shiripuno measured 22.6 × 19.4 mm and the second 23.4 × 19.7 mm. On the day they were laid they weighed 4.67 g and 4.90 g, respectively. The eggs from Tiputini measured 25 × 20 mm and 24 × 19 mm. At Yankuam, measured and weighed 24 hours after each was laid, the first and second eggs, respectively, were: 25.6 × 19.9 mm, 5.57 g; 25.1 × 20.2 mm, 5.50 g.

All nests were broad, somewhat shallow, open cups composed externally of long sticks (c.0.5–2.0 cm diameter), internally of smaller sticks and dead, humid leaf matter, and had a sparse cup lining of long, dark, flexible rootlets and flexible, unbranched leaf petioles. All were in low-lying swampy areas or beside small, shady streams, generally in dense, tangled vegetation such as a treefall or branch tangle. All were rather precariously perched on (not interwoven with) multiple thin (1–3 cm diameter), crisscrossing supports such as the branches of live shrubs, aerial leaf petioles, vines, dead branches and, in one case, a thicker angled log, approximately half the width of the nest. With the addition of two additional inactive nests measured at Yankuam, and one at Gareno, mean ± SD measurements (cm) for eight nests were: height above ground 29.6 ± 10.2; inner cup diameter 9.1 ± 1.1; inner cup depth 4.3 ± 0.5; outer height (thickness) 9.5 ± 2.2; minimum outer diameter (where most material stops) 19.0 ± 4.6; and max. outer diameter (including longest sticks) 28.5 ± 2.7.

My observations on Thrush-like Antpitta demonstrate two previously undocumented similarities between the reproductive biology *Myrmothera* and *Grallaria*. Both genera appear to lay eggs in the afternoon and to frequently vocalise from the nest. Dobbs *et al.*[6] suggested that afternoon laying by *Grallaria* may reflect their terrestrial habits, as largely terrestrial birds presumably experience relatively little cost in carrying a nearly formed egg, and may thus be freed from such constraints imposed on other passerines that rely on flight to forage efficiently, and most of which lay eggs in the morning[5,14,20]. Indeed, although sample sizes are small, the less terrestrial *Grallaricula* appear to lay in the morning[9]. No comparative data are available for *Hylopezus*. Adults, especially females, in several species vocalise from the nest[2,15,21],

but both sexes of *Grallaria* appear to be particularly vocal at the nest, throughout the nesting cycle[14], while *Grallaricula* are somewhat less so[14]. Vocalising from the nest presumably makes the nest more conspicuous to predators and parasites[24], and would not be expected unless it confers sufficient benefits to offset this cost. With antpittas, potential benefits may include communication between mates to help coordinate their typical 'unceremonious'[14] and rapid exchanges at the nest, thus reducing probability of detection, but nest singing may also be important in pair-bonding. Perhaps the low-pitched, ventriloquial vocalisations of most antpittas also permit them to more easily remain undetected by sound. While our understanding of the reproductive habits of antpittas has increased exponentially in the last decade[14,17,22], nest construction and the behaviours surrounding clutch deposition are perhaps the most poorly studied part of the nesting cycle for all species. There is a dearth of comparative information for all species, but data for the poorly studied *Hylopezus* antpittas, and related groups such as gnateaters (Conopophagidae), would be especially useful for further developing ideas concerning these aspects of life history evolution in this, and other, poorly known tropical birds.

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