

Predation of Noisy Pitta nestling by the Subtropical Antechinus, a carnivorous marsupial

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Abstract. Direct observations of predators taking birds' eggs and nestlings in Australia are rare, especially those involving mammals, which are largely nocturnal. Here we present photographic evidence of a Subtropical Antechinus *Antechinus subtropicus* (Marsupialia: Dasyuridae) taking a Noisy Pitta *Pitta versicolor* nestling from the nest, despite being smaller than its prey. As the nestling was the last survivor from a clutch of four eggs, it is possible that other nestlings or eggs had also been eaten by the antechinus. The absence of the adult Pittas for 26 minutes might have contributed to this predation event as Australian pittas typically feed their young at intervals of c.7 minutes. This report appears to constitute the third record of antechinuses robbing natural nests, and the first record of a Subtropical Antechinus taking vertebrates in the wild.

Introduction

Nest-predation is widely recognised as the main cause of reproductive failure in birds yet is rarely witnessed by humans without the aid of remote cameras (e.g. Major *et al.* 1994; Fulton 2006, 2018; Remeš *et al.* 2012; Guppy *et al.* 2017). Although predacious birds, such as the Pied Currawong *Strepera graculina*, are well known as predators of eggs of small songbirds (Major *et al.* 1996; Fulton & Ford 2001), the importance of native mammalian nest-predators is much less understood, partly because of their nocturnal habits. Studies employing cameras at both artificial and natural nests have revealed that rats are important nest-predators (Major 1991; Laurance & Grant 1994; Colombelli-Négrel & Kleindorfer 2009). Recently, cameras-traps have unexpectedly shown that the Sugar Glider *Petaurus brevipes* is a significant nest-predator of the endangered Swift Parrot *Lathamus discolor* (Stojanovic *et al.* 2014). In addition, a Long-nosed Bandicoot *Perameles nasuta* was photographed digging out the nest-burrow of a Spotted Pardalote *Pardalotus punctatus* and eating three nestlings (Guppy & Guppy 2018). Here we report an instance of diurnal predation of a nestling Noisy Pitta *Pitta versicolor* by a small, normally insectivorous mammal.

Observations

On 29 November 2011, we flushed a Noisy Pitta from the base of a tall buttressed tree situated on the steep side of a gully close to the walking trail at Maiala, Mount Glorious, D'Aguilar National Park, 30 km north-west of the Central Business District in Brisbane, Queensland. On inspecting the location from which it was flushed, we found a typical domed pitta nest, apparently complete, but empty. By 13 December, it contained four eggs (Figure 1), the commonest clutch-size in this region (Woodall 1994). The nest was not checked again until 27 December, by which time it contained no more than two largely naked nestlings (Figure 2). By 31 December, the brood had been reduced to one chick.

On 3 January 2012, BJC returned to the site to photograph the adults feeding the remaining nestling, and at 1017 h saw one of the adult Pittas departing from the nest after feeding the chick. Fifteen minutes later (1032 h), a Subtropical Antechinus *Antechinus subtropicus* (Marsupialia: Dasyuridae) was observed approaching the nest, indirectly, via the buttresses on the tree. The chick appeared to sense danger and retreated deeper into the nest (Figure 3). At 1033 h, the mammal entered the nest (Figure 4) and, 13 seconds later, started dragging the chick from the nest (Figures 5–6). During the next 4 minutes, the antechinus dragged the chick downslope ~1.5 m from the nest (Figures 7–8). After taking the photograph (Figure 8), BJC rescued the chick and returned it to the nest. One of the wings was visibly injured, though the chick had possibly also sustained life-threatening internal injuries. The antechinus soon returned, moving rapidly about the rear of the nest, as if searching for another access route.

At 1043 h, an adult Noisy Pitta arrived at the regular staging perch overlooking the nest. It was carrying a centipede and, on seeing the antechinus, gave a loud harsh call three times, with wings spread, before flying directly to the nest (Figure 9). Upon alighting at the nest-entrance, its wings were spread in threat (Figure 10), but the mammal had disappeared. After c. 3 minutes, the adult Pitta moved to the buttress at the righthand side of the nest, looking about for the antechinus. After another 2.25 minutes, it returned to the nest-entrance, retrieved the dropped centipede and unsuccessfully offered it to the injured chick. It then continued to look about for the antechinus for c.16 minutes. At 1103 h, it entered the nest and began brooding the chick. After 12 minutes, the other adult, carrying a centipede and an earthworm, arrived at the staging perch, and soon flew directly to the nest. The newly arrived second adult unsuccessfully attempted to feed the chick (Figure 11), but remained at, and around, the nest for c. 6 minutes. The first adult continued brooding, and was still doing so when BJC departed from the site at 1150 h. When checked 2 days later (5 January), the nest was empty.



Figure 1. Noisy Pitta nest containing four eggs, Maiala, D'Aguilar National Park, Queensland, 13 December 2011. Photo: Brian J. Coates



Figure 2. Noisy Pitta nest containing only two chicks, 27 December 2011. Photo: Brian J. Coates



Figure 3. Subtropical Antechinus approaching entrance of Noisy Pitta nest at 1032 h on 3 January 2012; remaining chick appeared to sense danger and retreated deeper into the nest. Photo: Brian J. Coates



Figure 4. Subtropical Antechinus entering nest at 1033.02 h on 3 January 2012. Photo: Brian J. Coates



Figure 5. Subtropical Antechinus dragging Noisy Pitta chick from nest at 1033.15 h. Photo: Brian J. Coates



Figure 6. Noisy Pitta chick out of nest but Subtropical Antechinus apparently wary of returning adult Pitta, 1033.21 h. Photo: Brian J. Coates



Figure 7. Subtropical Antechinus dragging Noisy Pitta chick downslope, away from the nest, at 1037.22 h. Photo: Brian J. Coates



Figure 8. Subtropical Antechinus continuing to drag Noisy Pitta chick downslope at 1037.55 h. Photo: Brian J. Coates



Figure 9. On sighting the Subtropical Antechinus at 1043.54 h, adult Noisy Pitta gave loud alarm calls with wings spread, then flew directly to the nest. Photo: Brian J. Coates



Figure 10. Adult Noisy Pitta at nest-entrance, wings spread in threat, at 1044.15 h. Subtropical Antechinus has disappeared. Photo: Brian J. Coates



Figure 11. The newly arrived second adult Noisy Pitta attempted unsuccessfully to feed the chick at 1121.19 h, while the first adult continued to brood it. Photo: Brian J. Coates

Discussion

We estimate the age of the victim in this event to be c.10 days, as this is the age when primary feathers emerge from their sheaths in nestlings of the Noisy Pitta (Hobcroft 1992 in Higgins *et al.* 2001), Rainbow Pitta *P. iris* (Zimmermann 1996), and Black-crowned Pitta *Erythropitta ussheri* (Gulson-Castillo *et al.* 2017). Based on the mean adult weight of nominate Noisy Pittas (99 g: Higgins *et al.* 2001) and the nestling growth curves of the Rainbow Pitta, we estimate the weight of the nestling at the time of the event as at least 50 g.

It seems certain that the antechinus would have successfully killed and eaten the Noisy Pitta chick had it not been for human intervention. Without intervention, the adult Pittas might have frightened the antechinus away, but only temporarily, as the chick was probably too injured to return to the nest on its own. After it had been returned to the nest, the chick did not accept the food offered to it by either adult, probably because it was suffering from injuries and trauma resulting from the attack. As the chick was too young to have fledged on 5 January, 2 days after the attack, it had probably either died or been eaten by the antechinus or another predator. Furthermore, it seems likely that the other three eggs or nestlings had suffered the same fate, as the speed by which the antechinus entered the nest after its initial appearance suggests that the nest's existence was well known to it. The second-last chick disappeared between 27 and 31 December, yet it was another 3 days before the antechinus attacked the surviving chick.

Provisioning rates among pittas

We believe that the long absence of the adult Noisy Pittas from the nest contributed to the attempted predation of the chick by the antechinus. The nest was unattended for 26 minutes, the adults returning only 10 minutes after the antechinus had pulled the chick out of the nest. In the Hunter region of New South Wales, a pair of Noisy Pittas fed their three chicks at an average rate of 5.6 times h^{-1} , or one visit every 10.8 minutes (Kyte 2017). At eight nests of the Rainbow Pitta near Darwin, Northern Territory, the adults fed younger (1–8 days old) chicks every 8.3 minutes, and older chicks every 6.4 minutes (Zimmermann & Noske 2003). In New Guinea, Coates (1990) watched a nest of Hooded Pittas *P. sordida*, at which the male and female fed the chicks every 14.6 and 18.0 minutes, respectively. This equates to an average combined feeding rate of 7.4 feeds h^{-1} , or one visit every 8.1 minutes, a remarkably close rate to that of the Rainbow Pitta.

Compared with these Australasian species, however, nestling provisioning rates of South-east Asian pittas are low. Mean feeding rates of the Black-crowned Pitta, Giant Pitta *Hydrornis (Pitta) caeruleus* and Bar-bellied Pitta *H. elliotii* were 2.17, 3.2 and 3.0 h^{-1} , respectively (Round *et al.* 1989; Eames 1996; Gulson-Castillo *et al.* 2017). These pittas have similar diets and nestling periods to the Australian species, but their brood-sizes are generally smaller. It is possible that the reduced brood in the Noisy Pitta nest in the present study contributed to the long absence of the adults, as the appetite of the single chick would be more easily satisfied than that of a brood of four.

Nest-predators of pittas

Largely distributed in the South-east Asian tropics, pittas are assumed to have low nesting success because of heavy predation, especially by snakes which take both eggs and nestlings (Lambert & Woodcock 1996; Erritzoe 2018). Published information on breeding success and nest-predators of Noisy Pittas is minimal. In the same area as the present observations were made, Braithwaite (1972) found three completed nests, one of which failed because of predation as eggshell fragments were found ~60 cm outside the empty nest. Elsewhere, one clutch was suspected of being taken by an Eastern Tiger Snake *Notechis scutatus* (Higgins *et al.* 2001), and one of a brood of two–four chicks was taken by an unidentified snake (Taylor & Taylor 1995).

In a 3-year study of the Rainbow Pitta near Darwin, predators caused the loss of 74% of nests ($n = 66$), targeting eggs and nestlings equally frequently. Of the 15 nests depredated at the nestling stage, 12 were completely intact and no remnants of their occupants were found (Zimmermann 1996). Two of the nine successful nests lost one or more (but not all) of their nestlings, suggesting partial predation of the broods. In one of these nests, one chick had disappeared 1 day after hatching, and another, the next day; the third chick, however, survived and fledged successfully after the normal nestling period of 14 days (Zimmermann 1996). Teeth impressions on two dummy eggs placed in recently depredated pitta nests were measured and identified as those of the Black-footed Tree-rat *Mesembriomys gouldii*, a large arboreal rodent (Zimmermann 1996), and this observation appears to represent the first evidence of robbing of pitta nests by mammals in Australia.

Previous records of antechinuses depredating birds' nests

The 13 species of antechinus are predominantly insectivorous and typically forage at night, though several species can be equally active during the day (Baker 2015). The Subtropical Antechinus is known to hunt in the dense rainforest understorey for invertebrates (e.g. beetles, spiders, amphipods and cockroaches) and probably small vertebrates (Burnett & Crowther 2008; Baker 2015). This species readily enters houses where it scavenges meat scraps and pet food, and it will also consume carrion in the wild (Burnett & Crowther 2008). Although one large male Subtropical Antechinus in captivity killed and ate an adult House Mouse *Mus musculus*, our observation appears to be the first of the species preying on vertebrates in the wild. It is also noteworthy that the nestling was larger than the antechinus. As House Mice weigh up to 25 g (Singleton 1995), the Noisy Pitta nestling, estimated to weigh ~50 g, represents the largest observed prey item of the species. In December–January, the entire population of adult Subtropical Antechinuses consists of females (Wood 1970), which weigh 16–33g (Baker 2015). Thus the nestling was apparently considerably heavier than its predator.

To our knowledge, there are only two previous records of depredation of natural nests by antechinuses, though indentations in clay eggs placed in eight artificial nests in the Sydney region, New South Wales were identified as being made by the Brown Antechinus *Antechinus stuartii*

(Major *et al.* 1994; see also Matthews *et al.* 1999). With the aid of heat-sensitive cameras placed near natural nests at a woodland site in south-eastern New South Wales, Guppy *et al.* (2014, 2017) recorded predation by antechinus of eggs of Eastern Yellow Robins *Eopsaltria australis* and of nestling Brown Thornbills *Acanthiza pusilla*. In the latter case, no nestling remains (e.g. bill or feet) were found near the nest, suggesting that the antechinus had removed the chicks from the nest to consume them some distance away (Guppy *et al.* 2014). Our observation of a Subtropical Antechinus removing a Noisy Pitta chick from its nest suggests a similar scenario. As this event took place at a time when the antechinus could be expected to have young, it is possible that it was dragging the chick to its own nest, though it is also likely that it did so to avoid retaliation by the adult Noisy Pittas upon their return.

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References

- Baker, A.M. (2015). Family Dasyuridae (carnivorous marsupials). In: Wilson, D.E. & Mittermeier, R.A. (Eds). *Handbook of the Mammals of the World, Volume 5: Monotremes and Marsupials*, pp. 232–348. Lynx Edicions, Barcelona, Spain.
- Braithwaite, R. (1972). Nesting of Noisy Pitta at Mount Glorious. *Sunbird* **3**, 12–13.
- Burnett, S. & Crowther, M.S. (2008). Subtropical Antechinus *Antechinus subtropicus*. In: Van Dyck, S. & Strahan, R. (Eds). *The Mammals of Australia*. 3rd edn, pp. 97–98. Reed New Holland, Sydney.
- Coates, B.J. (1990). *The Birds of Papua New Guinea, Volume 2*. Dove Publications, Brisbane.
- Colombelli-Négrel, D. & Kleindorfer, S. (2009). Nest height, nest concealment, and predator type predict nest predation in superb fairy-wrens (*Malurus cyaneus*). *Ecological Research* **24**, 921–928.
- Eames, J.C. (1996). Observations on the nesting behaviour of the Bar-bellied Pitta *Pitta elliotii*. *Bulletin of the British Ornithologists' Club* **116**, 216–224.
- Erritzoe, J. (2018). Pittas (Pittidae). In: del Hoyo, J., Elliott, A., Sargatal, J., Christie, D.A. & de Juana, E. (Eds). *Handbook of the Birds of the World Alive*. Lynx Edicions, Barcelona, Spain. Available online: <https://www.hbw.com/node/52298> (retrieved 28 April 2018).
- Fulton, G.R. (2006). Observations of predation, nest-predation and other disturbance events, at Dryandra, south-western Australia II: Birds as prey of other animals. *Australian Field Ornithology* **23**, 152–158.
- Fulton, G.R. (2018). Avian nest predation in Australian temperate forest and woodland: A review. *Pacific Conservation Biology* **24**, 122–133.
- Fulton, G.R. & Ford, H.A. (2001). The Pied Currawong's (*Strepera graculina*) role in avian nest predation: An artificial nest and predator removal experiment. *Pacific Conservation Biology* **7**, 154–160.
- Gulson-Castillo, E.R., Dreelin, R.A., Fernandez-Duque, F., Greig, E.I., Hite, J.M., Orzechowski, S.C., Smith, L.K., Wallace, R.T. & Winkler, D.W. (2017). Breeding biology during the nestling period at a Black-crowned Pitta *Erythropitta ussheri* nest. *Bulletin of the British Ornithologists' Club* **137**, 173–194.
- Guppy, M. & Guppy, S. (2018). The long-nosed bandicoot (*Perameles nasuta*) as a nest-predator. *Australian Mammalogy* **40**, 106–108.
- Guppy, M., Guppy, S., Marchant, R., Priddel, D., Carlile, N. & Fullagar, P.A. (2017). Nest predation of woodland birds in south-east Australia: Importance of unexpected predators. *Emu* **117**, 92–96.
- Guppy, M., Guppy, S., Priddel, D. & Fullagar, P. (2014). Nest predators of a woodland bird community in south-east Australia. *Australian Zoologist* **37**, 105–116.
- Higgins, P.J., Peter, J.M. & Steele, W.K. (Eds) (2001). *Handbook of Australian, New Zealand & Antarctic Birds, Volume 5: Tyrant-flycatchers to Chats*. Oxford University Press, Melbourne.
- Hobcroft, D. (1992). The husbandry of the Noisy Pitta. *Australian Aviculture* **46**, 77–79.
- Kyte, R. (2017). Observations of Noisy Pitta nestlings through to fledging. *Whistler* **11**, 10–14.
- Lambert, F. & Woodcock, M. (1996). *Pittas, Broadbills and Asities*. Pica Press, Mountfield, Sussex, UK.
- Laurance, W.F. & Grant, J.D. (1994). Photographic identification of ground-nest predators in Australian tropical rainforest. *Wildlife Research* **21**, 241–248.
- Major, R.E. (1991). Identification of nest predators by photography, dummy eggs, and adhesive tape. *Auk* **108**, 190–195.
- Major, R.E., Gowing, G. & Kendal, C.E. (1996). Nest predation in Australian urban environments and the role of the Pied Currawong, *Strepera graculina*. *Australian Journal of Ecology* **21**, 399–409.
- Major, R.E., Pyke, C.H., Christy, M.T., Gowing, G. & Hill, R.S. (1994). Can nest predation explain the timing of the breeding season and the pattern of nest dispersion of New Holland honeyeaters? *Oikos* **69**, 364–372.
- Matthews, A., Dickman, C.R. & Major, R.E. (1999). The influence of fragment size and edge on nest predation in urban bushland. *Ecography* **22**, 349–356.
- Remeš, V., Matysiuková, B. & Cockburn, A. (2012). Long-term and large-scale analyses of nest predation patterns in Australian songbirds and a global comparison of nest predation rates. *Journal of Avian Biology* **43**, 435–444.
- Round, P.D., Treesucon, U. & Eames, J.C. (1989). A breeding record of the Giant Pitta *Pitta caerulea* from Thailand. *Forktail* **5**, 35–47.
- Singleton, G.R. (1995). House Mouse. In: Strahan, R. (Ed.). *The Mammals of Australia*, pp. 646–647. Reed Books, Sydney.
- Stojanovic, D., Webb, M., Alderman, R., Porfiro, L. & Heinsohn, R. (2014). Discovery of a novel predator reveals extreme but highly variable mortality for an endangered bird. *Diversity and Distributions* **20**, 1200–1207.
- Taylor, P. & Taylor, P. (1995). Observations on nesting Noisy Pittas. *Australian Bird Watcher* **16**, 39–41.
- Wood, D.H. (1970). An ecological study of *Antechinus stuartii* (Marsupialia) in a south-east Queensland rain forest. *Australian Journal of Zoology* **18**, 185–207.
- Woodall, P.F. (1994). Breeding season and clutch size of the Noisy Pitta in tropical and subtropical Australia. *Emu* **94**, 273–277.
- Zimmermann, U. (1996). Ecology of the Monsoon Rainforest-endemic Rainbow Pitta *Pitta iris*. PhD thesis. Northern Territory University, Darwin.
- Zimmermann, U. & Noske, R.A. (2003). The breeding ecology of the monsoon rainforest-endemic Rainbow Pitta *Pitta iris*. *Emu* **103**, 245–254.

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