

Cat activity at Golden Bowerbird bowers and Tooth-billed Bowerbird courts

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Abstract

Predation by Feral Cats (*Felis catus*) could be a threat to bowerbirds that spend frequent short periods of time on or near the ground during their breeding season. To assess this risk, Feral Cat activity at three Golden Bowerbird (*Prionodura newtoniana*) (GBB) bowers and nine Tooth-billed Bowerbird (*Scenopoeetes dentirostris*) (TBBB) courts was determined from video footage collected from automated cameras on a single ridge in Wet Tropics upland rainforest. Fifty-five cat events were recorded at GBB bowers over 3179 trap days, and 23 at TBBB courts over 836 trap days. Fifty-three percent of cat records were of a cat walking past a camera and not interacting with a bower or court. Where cats did interact with a bower or court, their most frequent activity was walking over it. Although peak bowerbird and cat detection periods overlapped, cat visits to bowers and courts were infrequent and there was no evidence of bowerbirds being predated.

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Introduction

Predation by Feral Cats (*Felis catus*) could be a threat to endemic vertebrates restricted to Queensland's Wet Tropics upland rainforests (Rowland *et al.* 2020). Although small mammals (< 250 g) make up the largest component of the Feral Cat's diet in the Wet Tropics rainforests, bigger mammals (up to 2 kg) and birds are also important (*ibid.*). Thus, the potential impact of cats on Tooth-billed Bowerbird (*Scenopoeetes dentirostris*) (TBBB) and Golden Bowerbird (*Prionodura newtoniana*) (GBB), which are both restricted to the Wet Tropics uplands, warrants investigation.

Tooth-billed Bowerbird males clear leaf litter from areas on the forest floor on which they place leaves and perform courtship displays (Frith & Frith 1994). Golden Bowerbird males construct one or two

cone-shaped towers of sticks around supporting trees, connected to a decorated platform where they often display (Frith & Frith 2000). Both species attend the vicinity of their display sites for long periods of time during their breeding season and spend frequent short periods of time at or within one metre of the ground, maintaining them. Visiting females also spend time on or near the forest floor as they inspect the males' displays. At these times, bowerbirds may be vulnerable to predation by cats.

The aim of this paper was to assess the threat of cats to GBBs and TBBBs by analysing video footage from cameras deployed at GBB bowers and TBBB courts to study bowerbird activity.

Methods

The study was conducted at Barnes Pikle Nature Refuge (17°26'S by 145°32'E) near Tarzali in Wet Tropics upland rainforest at an elevation of 800–960 m above sea level (asl). The bowerbird study area covered approximately 8 ha and contained all the GBB bowers and TBBB courts occurring on Barnes Pikle's southernmost ridge. Three GBB bowers were located at 860–890 m asl and were 184–400 m apart. Nine TBBB courts were dispersed along the same ridge from 840–900 m asl, 75–113 m apart over a distance of 640 m. All were adjacent to, or within c. 20 m of the narrow unformed walking track along the ridge. Golden Bowerbird bowers were 50–70 m from the nearest TBBB court (Fig. 1).

Trail cameras (mostly Reconyx Ultrafire) were deployed at the bowers and courts between 2018 and 2022. The days that each camera was active and able to be automatically triggered by any movement within its immediate field of view were recorded as 'trap days'. Single cameras were deployed except at two of the GBB bowers, where two cameras were deployed at times. When two cameras were deployed at a bower, the records from them were combined and treated as one trap day.

Length of camera deployment at each bower or court varied between sites and years due to camera availability and gaps in the record resulting from equipment failure, depleted batteries, or memory cards being full. Cameras were deployed at GBB bowers year-round, but at TBBB courts cameras were only deployed over the breeding season. Hence, more cameras were deployed in Spring and Summer seasons (Table 1).

The cameras were placed with a clear view of the bower or court, typically 20–40 cm and 0.5–1.0 m above ground level for TBBBs and GBBs respectively. No baits or lures were used in front of the cameras, which were set to record 20-second video clips continuously day and night, with no delay between triggers. Camera triggers were considered independent 'events' if separated by more than 60 mins on the same camera as per the methods of Bruce *et al.* 2022.

Since cameras were deployed at each bower and court, they were spaced as little as 50 m apart. Cat home ranges in the upland Wet Tropics are unknown but are likely to exceed this distance (Bengsen *et al.* 2016), so we expected that individual cats would appear on multiple cameras.



Figure 1. Distribution of Golden Bowerbird bowers (red) and Tooth-billed Bowerbird courts (yellow) on the southernmost ridge at Barnes Pikle Nature Refuge, 2018–2022.

Therefore, the maximum encounter rate obtained for a camera in a ‘season’ (varying time period spanning the bowerbirds’ breeding season) was used to compare with other studies. Individual cats could be recognised on the videos, enabling us to deduce a minimum number of cats frequenting the area.

Whether or not cat events occurred evenly between day and night, and in different seasons, was tested using Chi-squared tests in Graph Pad (www.graphpad.com).

Results

One hundred and eighteen hours of video footage was recorded over 3179 trap days at the three GBB bowers. Of this, cats were present in 22 minutes of video comprising 55 cat events. Sixty-one hours of video footage were recorded over 836 trap days at the nine TBBB courts. Of this, cats were present in 10 minutes of video comprising 23 cat events. Only single cats were recorded at any one time, and comparisons of videos revealed six individually recognisable cats.

The overall average cat event rate at GBB bowers was 1.55 events/100 days (range = 0–3.66). At TBBB courts, the overall average cat event rate was 3.06 events/100 days (range = 0–16.07). Cats were present throughout the year, but were most frequently detected between September and February over spring and the summer wet season (Table 1).

Most cat records (53%) were of a cat walking past a camera and not interacting with a bower or court.

Where cats were interacting with a bower or court, their most frequent activity was walking over it, followed by urine spray marking (Table 1).

Cat activity at GBB bowers and TBBB courts differed. At GBB bowers, 18% of cat events (10/55) were of a cat urine spray marking (Fig. 2). Urine spray marking occurred at night (7 events) and late in the day (5–6 pm; 3 events). Six of the 10 events were at the one bower.

On three occasions at a TBBB court, all in the afternoon, a cat adopted a ‘sit and wait’ pose at the court edge and watched the clear court area intensively (Fig. 3).

Cats were recorded in all seasons, but not evenly throughout the year ($\chi^2 = 9.19$; $p = 0.03$, $df = 3$). They were recorded less frequently than expected in winter and more frequently than expected in summer (Table 1).



Figure 2. A cat urine spray marking a Golden Bowerbird bower, 5:49 pm, 2 September 2020.

Table 1. Feral Cat activity recorded at Golden Bowerbird bowers and Tooth-billed Bowerbird courts, Barnes Pikle Nature Refuge, 2018-2022. N = 78 events over 4015 camera trap days at 3 GBB bowers and 9 TBBB courts. Autumn = Mar-May, Winter = Jun-Aug, Spring = Sep-Nov and Summer = Dec-Feb. Day = 0600-1800; Night = 1800-0600.

Cat activity	GBB	TBBB	Autumn	Winter	Spring	Summer	Day	Night
Walking past bower/court	26	15	5	6	12	18	19	22
Walking over bower/court	12	3	5		2	8	11	4
Looking around bower	2		1			1	1	1
Urine spray marking	10		2	2	4	2	3	7
Sniffing bower/court	4	1	2		1	2	4	1
In ‘sit and wait’ pose		3			3		3	
Catching small prey	1	1				2	1	1
Total cat events	55	23	15	8	22	33	42	36
No. of cameras			15	14	23	20		
Cat event : camera ratio			1	0.57	0.96	1.65		



Figure 3. A cat in a 'sit and wait' pose at a Tooth-billed Bowerbird court, 4:22 pm, 16 November 2020.

Cats were recorded more frequently by day than at night (Table 1), but this difference was not significant ($\chi^2 = 0.46$, $p = 0.50$, $df = 1$). They were recorded at all hours, with peaks in detection in the early morning, late afternoon, and evening (Fig. 4).

Discussion

The density of cats at Barnes Pikle Nature Refuge appears comparable to that reported for other rainforest sites at similar elevations (Rowland *et al.* 2020; Bruce *et al.* 2022). They are present year-round with most cat detections occurring in the early morning.

Male TBBBs and GBBs attend their courts and bowers during their display season, which typically extends from September to January at Paluma (Frith & Frith 1994, 2000) and at this study site (personal observation). Tooth-billed Bowerbird

court attendance levels are highest between 0600-0900 h (Frith & Frith 1994), and Golden Bowerbird males add most decorations to their bowers in the morning (Frith & Frith 2000). However, despite this seasonal and time overlap with cat detections and the frequent short periods of time that male GBBs and TBBBs spend on or near the ground during their breeding season, cat visits to bowers and courts were infrequent and there was no evidence of either bowerbird species being predated.

Although cat visits were infrequent, there may be indirect effects of cats at individual bowers and courts. When urine spray marking, cats spray pungent urine mixed with vaginal or anal-gland secretions on prominent or conspicuous objects along the paths and boundaries of their range (Feldman 1994). Golden Bowerbird bowers are prominent and conspicuous 'objects' in the landscape and could become a focus for a cat's spray marking, as suggested by the majority of sprays being recorded at the one bower. Whether or not GBBs are influenced by smell is unknown, but the importance of scent is increasingly recognised for many bird species (e.g. Amo *et al.* 2011; Whittaker 2022), including Satin Bowerbirds (*Ptilonorhynchus violaceus*) – where bower paint may function as a chemical signal (Hicks *et al.* 2013).

Tooth-billed Bowerbird courts provide clear areas that may make it easier for cats to hunt, as suggested by the three observations of a cat in a 'sit and wait' posture on the edge of a court. Cats adopt this posture at places where prey is likely to pass

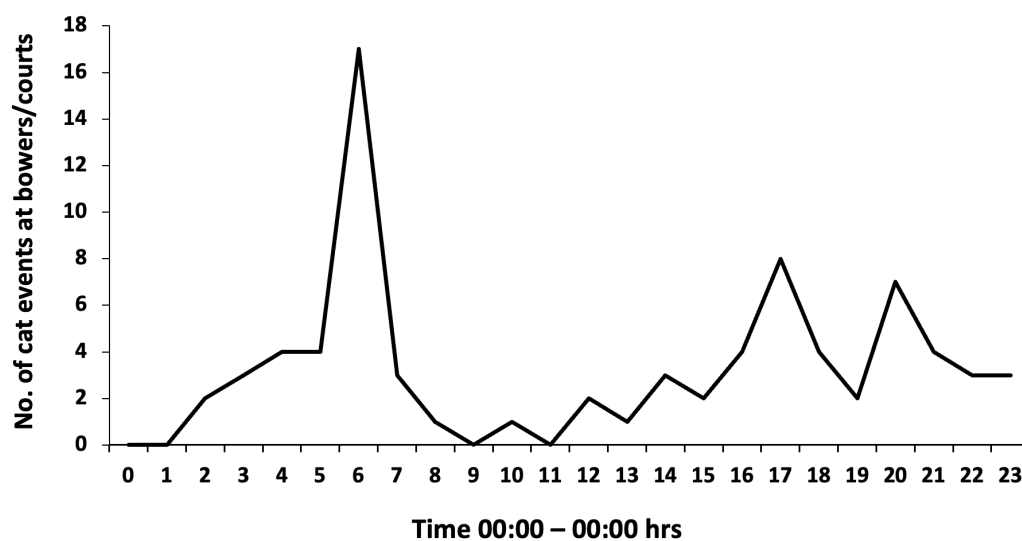


Figure 4. Feral Cat detections over the day, 2018-2022. N = 78 events over 4015 camera trap days at 3 GBB bowers and 9 TBBB courts.

(Woinarski *et al.* 2019, p23 Fig. 2.2). Rodents are also attracted to courts, where they feed on the fruit pulp and seeds defecated by male birds from perches above the court (Frith & Frith 2004; p74). The presence of rodents could play a role in cats' attentiveness to courts.

This limited study suggests that, at this site at least, Feral Cats do not pose a threat to Golden or Tooth-billed Bowerbirds.

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References

- Amo L, Visser ME, van Oers K. 2011. Smelling out predators is innate in birds. *Ardea* 99: 177-184.
- Bengsen AJ, Algar D, *et al.* 2016. Feral cat home-range size varies predictably with landscape productivity and population density. *Journal of Zoology* 298: 112-120.
- Bruce T, Williams SE, Amin R, L'Hotellier F. 2022. Laying low: Rugged lowland rainforest preferred by feral cats in the Australian Wet Tropics. *Ecology and Evolution* 12: e9105.
- Feldman HN. 1994. Methods of scent marking in the domestic cat. *Canadian Journal of Zoology* 72: 1093-1099.
- Frith CB, Frith DW. 1994. Courts and seasonal activities at them by male tooth-billed bowerbirds, *Scenopoeetes dentirostris* (Ptilonorhynchidae). *Memoirs of the Queensland Museum* 37: 121-145.
- Frith CB, Frith DW. 2000. Attendance levels and behaviour at bowers by male Golden Bowerbirds, *Prionodura newtoniana* (Ptilonorhynchidae). *Memoirs of the Queensland Museum* 45: 317-341.
- Frith CB, Frith DW. 2004. *The Bowerbirds: Ptilonorhynchidae*. Oxford University Press: Oxford.
- Hicks RE, Larned A, Borgia G. 2013. Bower paint removal leads to reduced female visits, suggesting bower paint functions as a chemical signal. *Animal Behaviour* 85: 1209-1215.
- Rowland J, Hoskin CJ, Burnett S. 2020. Distribution and diet of feral cats (*Felis catus*) in the Wet Tropics of north-eastern Australia, with a focus on the upland rainforest. *Wildlife Research* 47: 649-659.
- Whittaker DJ. 2022. *The Secret Perfume of Birds. Uncovering the Science of Avian Scent*. John Hopkins University Press.
- Woinarski JCZ, Legge SM, Dickman CR. 2019. *Cats in Australia: Companion and Killer*. CSIRO Publishing: Clayton South, Victoria.