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Cooperative breeding and reversal of sex roles at a Grey Butcherbird *Cracticus torquatus* nest

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Abstract. The Grey Butcherbird *Cracticus torquatus* is a common and widespread bird found across much of Australia, but its breeding biology is incompletely known, with no dedicated studies having been conducted. Opportunistic observations at a Grey Butcherbird nest in Brisbane, Queensland, are presented. In particular, two rarely reported breeding behaviours of this species are described: cooperative breeding involving an immature helper, and reversal of sex roles by the adults, with a male observed brooding on two occasions.

Introduction

The Grey Butcherbird *Cracticus torquatus* (Passeriformes: Artamidae) is a common species throughout much of its broad range, including in suburban Brisbane, Queensland, where there is evidence to suggest that it is increasing in abundance (Campbell *et al.* 2022). However, despite its wide range and typically high abundance, its breeding biology is not comprehensively known (Higgins *et al.* 2006). No major studies have been conducted and most knowledge is compiled from opportunistic observations of breeding activity across the species' range.

Cooperative breeding is a term used to describe alloparental care during the breeding season in animals. In birds, this typically involves one or more 'helper birds' that aid the two parents in caring for the nest and chicks (Arnold & Owens 1998). Despite being a rare phenomenon across the entire avian phylogeny (Arnold & Owens 1998), it is relatively common in Australia and has been extensively studied here (Rowley 1976; Dow 1980; Ford *et al.* 1988). Many Australian birds are facultative cooperative breeders, with only occasional reports of helpers at nests (Higgins *et al.* 2006). The Grey Butcherbird is one such species, with only a handful of earlier observations of cooperative breeding, all involving immature helpers assumed to be young from previous breeding seasons (Higgins *et al.* 2006).

Current knowledge suggests that the role of each adult Grey Butcherbird during the breeding season is well defined, with only minor variation across nests (Higgins *et al.* 2006). Both the male and the female are typically involved during nest building, feeding of young and maintenance of the nest, but only the female incubates and broods (Higgins *et al.* 2006). Such allocation of sex roles is fairly typical of species in the Artamidae, although variation among species is noted, and the division of care is more equal in some species than in others (Higgins *et al.* 2006). Very few instances of role reversal are described in Grey Butcherbirds.

This paper describes opportunistic observations made at a Grey Butcherbird nest at a suburban park on the north side of Brisbane in October 2022. Particular mention is made of two breeding behaviours with few previous records in this species: cooperative breeding and reversal of typical sex roles. These behaviours are discussed and placed within the context of cooperative breeding and sex role reversal across the entire Artamidae.

Study area and methods

The nest studied was in Grange Forest Park, Brisbane (–27.416, 153.011), a small (~20 ha) suburban park with mixed remnant bushland, riparian vegetation, and open areas used for public recreation. Approximately 100 bird species have been recorded from the park (eBird: https://ebird.org/australia/hotspot/L2319892); I have observed 90 across 36 visits in 2018–2023. Grey Butcherbirds are frequently encountered, with several territories scattered throughout the area. The nest observed here was ~3 m above the ground, located in a small ornamental paperbark *Melaleuca* sp. tree, between a shared pedestrian/bike path and fenced dog-off-leash area.

The nest was found on 3 October 2022, during a typical afternoon birdwatching survey of the reserve. It was monitored a further five times over the following 2 weeks; the last observation was on 18 October, when there was no evidence of breeding behaviour there, although the nest structure remained intact. Observations generally lasted 10–20 minutes, and all were made in the afternoon between 1400 and 1700 h.

Grey Butcherbirds show only slight sexual dimorphism, but adults can be sexed by the shape and size of the white loral spot (Menkhorst *et al.* 2017). In males the loral spot is neat, round and does not extend to the eye, whereas in females it is less neat, extending to the eye and typically spreading around and below it. Immature birds have varying (depending on age and moult) amounts of brown in their plumage and are easily separated from adults as a result (Menkhorst *et al.* 2017). These identification features allowed for the individual identification of the three birds at this nest.

Results

Evidence of breeding behaviour was surveyed on six visits between 3 and 18 October 2022. The chick was not seen after 16 October and its ultimate fate was unknown.

Figure 1. Grey Butcherbirds, Grange Forest Park, Brisbane, 2022 (a) Adult male (note neat loral spot anterior to eye) brooding on nest, 3 October; (b) Immature helper (note brown plumage) observed in the territory, 3 October; (c) Adult female (note extended loral spot) perching in the territory after swooping a nearby dog, 5 October; (d) Adult male brooding on nest with immature helper nearby, 5 October. Photos: Louis J. Backstrom

Breeding behaviour observed for each bird – male, female, immature helper, and nestling/fledgling – is presented in Table 1 and in Figures 1–3. Other details are described below.

Courtship and nest building

Courtship and nest building were not observed. By the time that the nest was discovered (3 October), nest building had finished, and no signs of courtship were observed during any visit.

Brooding

Brooding was observed only on the first two visits (3 and 5 October). On both occasions, this was done exclusively by the male (Figures 1a, d).

Aggression

Aggressive behaviour was observed only once, against a dog running off–leash at the adjacent fenced dog–off–leash area. During this incident (5 October), the female and immature helper both made several swoops at the dog, while the male stopped brooding at the nest and did not return for at least 10 minutes. No other aggressive interactions (against dogs, people, or other birds) were observed.

Feeding of young

Direct feeding of young was observed twice: once by the female (9 October: Figure 2a) and once by the immature helper (12 October: Figure 2d). On the first two visits (3 and 5 October), the helper was observed feeding the male, although it is unknown whether these meals were later regurgitated for the chick.

Figure 2. Grey Butcherbirds, Grange Forest Park, Brisbane, 2022 (a) Adult female feeding a spider to chick, 9 October (chick was not seen on earlier occasions); (b) Adult female guarding the nest while the chick begs, 9 October; (c) Immature helper at nest carolling to adult Butcherbirds nearby, 9 October; (d) Immature helper feeding a grub to the chick, 12 October; (e) Immature helper Grey Butcherbird removing faecal sac, 12 October; (f) Adult male in the territory, 16 October. Photos: Louis J. Backstrom

Figure 3. Grey Butcherbirds, Forest Grange Park, Brisbane, 2022 (a) New fledgling sitting on a branch in the nest tree, 16 October; (b) New fledgling stretching its wings, 16 October; (c) Adult male in the territory, 18 October. Photos: Louis J. Backstrom

Other behaviours at nest

Other behaviours observed at the nest were as follows. On 9 October, the female was seen guarding the nest while the chick begged for food (Figure 2b). On 12 October, after the chick had been fed by the immature helper, it was seen to defaecate, and the faecal sac was promptly removed by the helper (Figure 2e). On 16 October, the chick was observed sitting outside the nest but still in the nest tree (Figure 3a), and stretched its wings several times (Figure 3b), likely in advance of an attempted first flight. This was the last time that the chick was observed.

Other behaviours in the territory

The two adults (female, Figure 1c; male, Figures 2f, 3c) and immature helper (Figure 1b) were frequently observed within the territory but away from the nest tree. In most cases they were observed perching in various trees (immature helper on 3 October, female on 5 October, male and immature helper on 9 October, male on 16 and 18 October). On one occasion (9 October), the helper was seen and heard carolling (Figure 2c). Neither adult was ever seen or heard singing, although other Grey Butcherbirds in other territories throughout the reserve were frequently heard calling.

Discussion

This paper describes a series of observations at a Grey Butcherbird nest in October 2022. Several infrequently reported breeding behaviours were observed over the course of my six visits to the nest, most notably cooperative breeding involving an immature helper, and reversal of typical sex roles, with an adult male observed brooding at the nest on two occasions. As these observations were opportunistic, they represent an incomplete picture of the entire breeding event. Courtship and nest building were not observed, for example, and the ultimate fate of the fledgling was unknown; it was not observed after 16 October. Nevertheless, the behaviours observed add

Table 1. Breeding behaviour of Grey Butcherbirds on six observation days, Grange Forest Park, Brisbane, October 2022. Dates are given as day.month.

Date, eBird Checklist no.	*Adult female*	*Adult male*	*Immature helper*	*Young*	*Notes*
3.10 S119881990	Not seen	Brooding young on nest (Figure 1a)	Feeding adult male at nest, perching in territory (Figure 1b)	Calling from within nest (not seen)	Two other Grey Butcherbirds calling throughout reserve
5.10 S119987803	Swooping dog in territory, perching in territory (Figure 1c)	Brooding young on nest (Figure 1d), Left nest during dog incident	Feeding adult male, perching near nest (Figure 1d), swooping dog	Not seen	Adult male not seen to return to nest for at least 10 minutes
9.10 S120284335	Feeding young (Figure 2a), guarding nest (Figure 2b)	Perching in territory	Perching in territory, carolling at nest (Figure 2c)	Eating spider. (Figure 2a), begging (Figure 2b)	First definitive sighting of young
12.10 S120529499	Not seen	Not seen	Feeding young (Figure 2d), removing faecal sac (Figure 2e)	Eating grub (Figure 2d), defaecating	Neither adult seen, one other Grey Butcherbird calling in reserve
16.10 S120752152	Not seen	Perching in territory (Figure 2f)	Not seen	Sitting in nest tree (Figure 3a), stretching wings (Figure 3b)	Chick fledged
18.10 S120874904	Not seen	Perching in territory (Figure 3c)	Not seen	Not seen	No Grey Butcherbirds observed in or around nest tree but one calling in reserve

to limited observations of the breeding behaviour of this species.

Cooperative breeding

Cooperative breeding in Grey Butcherbirds is known from only a few reports and most references in the literature refer to a single report documented by Rowley (1976). This observation and two others from the RAOU Nest Record Scheme are noted by Higgins *et al.* (2006), with all three records referring to immature birds (assumed to be young from the previous breeding season) helping around the nest, either through incubation, feeding, or defence. In contrast, Johnson (2003) stated that there are 10 records of more than three birds at a nest documented in the Nest Record Scheme, but it is unclear whether any of these records (beyond the two described by Higgins *et al.* 2006) explicitly refer to cooperative breeding. This conflict is discussed by Hedley & Holland (2018), who also described a fourth definitive observation of cooperative breeding. A further report of possible cooperative feeding, described by Gibson (2019), appears to be unrelated to breeding activity. My observations therefore represent a fifth confirmed record of cooperative breeding for the species. As with the other four records, it refers to an individual immature bird (likely from the previous breeding season) as the sole helper. The observation of this helper removing a faecal sac from the nest is apparently novel, but unsurprising as both the male and female are known to share this duty (Higgins *et al.* 2006).

Although rare in Grey Butcherbirds, cooperative breeding is relatively common across the Artamidae. It has been reported in at least seven woodswallow *Artamus* species, three typical butcherbirds *Cracticus* spp., Australian Magpie *Gymnorhina tibicen* and Black Butcherbird *Melloria quoyi*, although the frequency of cooperative breeding varies significantly between species and most are likely to be facultative cooperative breeders (Storr 1953; Clunie 1976; Rowley 1976, 1999, 2000; Dow 1980; Coates 1985; Johnson 2003; Higgins *et al.* 2006; Gosper 2012; Vyas & Upadhyay 2015; Ashton 2017; Pike *et al.* 2019). No reports of cooperative breeding are known from any species of peltops *Peltops* spp. or currawong *Strepera* spp. Johnson (2003) suggested that cooperative breeding may be incipient in Grey Butcherbirds, although, given their suggestion of cooperative breeding as an ancestral state in the Australian passerine evolutionary history it seems more likely that cooperative breeding has been lost as a typical behaviour at some point in the species' evolutionary past. However, the absence of any systematic studies on the evolutionary history of breeding behaviours in the Artamidae leave this question unsolved, and an area for further research.

Reversal of typical sex roles

As with cooperative breeding, reversal of typical sex roles in Grey Butcherbirds during breeding is also known only from a few reports. Higgins *et al.* (2006, p. 496) stated that "only [the] female broods", although both male and female share in feeding young. Only a single instance of an adult male brooding is described from the RAOU Nest Record Scheme (Higgins *et al.* 2006). No other reports of male brooding could be found for this species. The observations documented in this paper therefore represent the second confirmed record of male brooding for this species. Feeding of young is often shared between male and female, although females are typically responsible for the majority of feeding (Higgins *et al.* 2006; Hedley & Holland 2018). My observations support this: the male was not observed directly feeding the chick although both the female and immature helper were seen doing so. Nest maintenance (removal of faecal sacs etc.) is also typically shared between male and female (Higgins *et al.* 2006). In the present study, however, neither adult was observed removing a faecal sac; only the immature helper was observed doing so. Nest defence appeared to be shared between the three birds, with all three seen perched throughout the territory on various occasions (presumably as sentries) and two birds (adult female and immature helper) observed swooping a dog in the nearby fenced dog-off-leash area on one occasion.

Conclusion

Although widespread and common, the breeding biology of the Grey Butcherbird remains incompletely known. The opportunistic observations presented here give an incomplete picture of the entire breeding event but provide some valuable insight into the breeding biology of this poorly studied species.

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