

Observations of Predation, Nest-predation and Other Disturbance Events at Dryandra, South-western Australia I: Birds as Predators

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Summary

I describe 16 predation and other disturbance events including the predation of birds and reintroduced mammals, nest-predation and the theft of nest-material. The Grey Shrike-thrush *Colluricincla harmonica* was identified as an important nest-predator, being responsible for four nest-disturbance events. Nest-material was stolen from a variety of active nests, causing some of them to fail; observed thefts involved physical contact between Australian Magpies *Gymnorhina tibicen* and Yellow-plumed Honeyeaters *Lichenostomus ornatus*; and a Rufous Treecreeper *Climacteris rufa* broke the eggs and destroyed the nest of Willie Wagtails *Rhipidura leucophrys*. Wedge-tailed Eagles *Aquila audax* were detected preying on reintroduced Boodies *Bettongia lesueur*. All observations were made at Dryandra Woodland, a 27 000-ha remnant of woodland 160 km south-east of Perth, in south-western Australia. This site retains an almost full community of animals that have declined or disappeared from the surrounding wheatbelt, and has large areas of old-growth woodland. The context of each event is discussed in relation to the broader background of a 3-year community-wide study of Dryandra's birds, which involved continuous monitoring throughout each breeding season.

Introduction

Nest-predation is considered the major cause of nest-failure in passerines that build open nests (Lack 1954; Skutch 1966; Ricklefs 1969; Martin 1992). However, the theft of nest-material and other predation events are infrequently reported because they are rarely witnessed and generally occur over only a few seconds (Skutch 1966; Major & Gowing 1994). Snap-shot cameras and video monitoring have become widely used methods for monitoring nest-predation (e.g. Major 1991; Brown *et al.* 1998; Berry 2002; Fulton in press a). They are advantageous in that they can continuously monitor nests. However, they cannot provide information from outside their field of view nor can they monitor animals as these move through the landscape. Direct observations can capture the peripheral information that surrounds an event, placing the event in context. Context can include spatial, temporal and behavioural data about the species involved and it can help to identify the reason for the event when the motive is not simply predatory.

The identity of nest-predators in Australia is poorly understood. Some important nest-predators have been identified: for example, the Pied Currawong *Strepera graculina* in south-eastern Australia (Major *et al.* 1996; Fulton & Ford 2001), and the Grey Shrike-thrush *Colluricincla harmonica* and Common Brushtail Possum *Trichosurus vulpecula* in south-eastern and south-western Australia and in New Zealand (Brown *et al.* 1993; Major *et al.* 1999; Piper *et al.* 2002; Zanette 2002; Fulton in press a). A suite of unidentified small birds has also been proposed as important nest-predators (Fulton & Ford 2001), and collectively they may be at least as important as well-recognised nest-predators such as currawongs *Strepera* spp. (Fulton & Ford 2001; Fulton in press a).

This study aimed to identify predators responsible for predation and nest-predation at Dryandra, 160 km south-east of Perth, Western Australia. It also aimed to develop an understanding of the motive for the event, e.g. was the intention predation of eggs and nestlings as food, to destroy the nest to defend a territory, or for the theft of nest-material? The array of predators detected and reasons for their attacks highlight the complexity of community interactions at this site, where native assemblages of flora and fauna are still intact.

Methods

Scientific names for mammals were taken from Strahan (2002) and for birds from Christidis & Boles (1994). The date format used here is dd/mm/yy.

Study site

Dryandra Woodland (Dryandra) is ~ 160 km south-east of Perth (32°48'S, 117°0'E), on the western side of the Western Australian Wheatbelt. It is composed of a series of large woodland fragments, which are separated by agricultural land and scattered over an east-west distance of ~ 35 km. Its total area is ~ 27 000 ha (DCLM 1995).

Dryandra holds an almost full complement of bird species of original native woodland, including those lost from woodland remnants of the cleared central Wheatbelt (Recher & Davis 1998). Dryandra also retains remnant populations of animals that have otherwise been extirpated from the region, and some mammalian species extinct elsewhere on the mainland have been reintroduced to Dryandra (Friend & Thomas 1994; Friend *et al.* 2001), although the Dingo *Canis lupus dingo* is no longer present. Fox *Vulpes vulpes* control using 1080 poison-baiting has been undertaken at Dryandra since 1982 to facilitate reintroductions of native mammals (Friend 1990). Occasional surveys for Cats *Felis catus* using call and scent lures have shown that they are not abundant at Dryandra (Friend & Thomas 1994).

All events were witnessed while I stood in the open, during daylight hours. Field binoculars were used to detect detail such as what a bird was carrying in its beak. Some of the birds were known to me individually, some over the three seasons, by their association with their territories, nests and fledglings. My detailed knowledge of the birds came from spending most daylight hours in the field each day throughout the breeding season (August to January inclusive) for 3 years, 2002–03, 2003–04 and 2004–05.

Results and discussion

Theft of nest-material

1. 4/9/03 Two Red Wattlebirds *Anthochaera carunculata* stole nest-material from a Yellow-plumed Honeyeater's *Lichenostomus ornatus* nest, at sunset during a period of 15 minutes. The nest had been completed that day, but no eggs had been laid. The Wattlebirds ignored the consistent and close harassment by the two Honeyeaters, which included contact with the Wattlebird that was pulling the nest apart. This Wattlebird punched its beak into the centre of the nest many times over 12 seconds and snatched a beakful of fine nest-lining, then flew away pursued by the Honeyeaters. The Honeyeaters returned, and one started to pull the nest apart and relocate the material, making only two trips before stopping. Both Wattlebirds returned within a few minutes and made repeated attempts to gain access over ~ 10 minutes, but were kept away from the nest by the Honeyeaters. In spite of this disturbance, the Honeyeaters continued with the nest and fledged two young 36 days later.
2. 26/09/03 Two Brown-headed Honeyeaters *Meliphreptus brevirostris* took nest-material from a Red-capped Robin's *Petroica goodenovii* nest, from which young had fledged only 30 minutes before. Both Honeyeaters went to the nest together, although in stages: one perched ~ 10 cm away and the other, while

perched on the rim, repeatedly stabbed into its centre and gathered up grey down and nest-lining. Hobbs (1990) described the same pecking action of Brown-headed Honeyeaters at a Red-capped Robin's nest as egg-predation. In that case a broken egg was detected in the nest. Future observers should be careful to note the outcome of disturbance events such as this, and not presume that egg-predation could be the only explanation for these actions.

3. 12/10/03 A Rufous Treecreeper *Climacteris rufa* dislodged a Willie Wagtail *Rhipidura leucophrys* nest and broke the eggs while it was stealing nest-material. The second and third eggs had been laid over the 2 days before this raid. The two Wagtails were absent from the area for 2–3 minutes before the raid, and returned 5 minutes after it. It is common for some pairs of Willie Wagtails to leave the nest unattended for ~ 10 minutes (pers. obs.). The raid lasted less than a minute as a male Treecreeper flew directly to the nest, perched beside and pecked into it; the nest was torn off its substrate and fell as a complete cup to the ground. The Treecreeper snatched all the basal material that had formed the nest's foundation, then noticed the observer; it hopped ~ 20 cm along the branch, paused for ~ 30 seconds, then flew directly to its nest in an adjacent tree, ~ 20 m away. I inspected the Wagtail nest after the Treecreeper had departed: one egg had a small puncture from the Treecreeper's beak, and another was almost broken in two and leaking its contents, although no puncture marks were detected despite close inspection, indicating that it probably broke from the fall (~ 1 m). The third egg was intact. Had a snap-shot camera captured images, these would indicate that the Treecreeper had depredated the eggs and not that it stole the nest-material; they also could not have identified that the predator was the Willie Wagtails' nearest neighbour.

Nest-predation

4. 9/11/02 A Brown Goshawk *Accipiter fasciatus* carried a Willie Wagtail nestling (in its right foot) through the tree-canopy (~ 15 m high), while it was continually pursued and harassed by an adult Willie Wagtail. The nestling's plumage and size indicated that it may have just fledged or would have fledged soon. The Goshawk perched once 10 m in front of me and once more ~ 50 m away, moving on each time as I approached, but it did not seem too bothered by the pestering of the adult Wagtail. I observed them travel ~ 300 m, and the adult Wagtail had not relented in its pursuit as they flew out of sight.
5. 17/9/03 Two Australian Magpies *Gymnorhina tibicen* entered a cluster of leaves twice, in ~ 50 seconds, where a Yellow-plumed Honeyeater nest was situated; the nest was ~ 60% built and had no lining in place. Two Honeyeaters defended the nest, hovering over the Magpies, calling and making contact with them. The Magpies could not have known, without close inspection, that the nest was unfinished. Australian Magpies usually forage on the ground (Carrick 1972; Floyd & Woodland 1981; Higgins *et al.* 2006). In this case both male and female Magpies flew directly from the ground to the Honeyeater nest in the canopy (11.3 m high in a 12.8-m tree); they had probably seen the Honeyeaters making many trips to the same position. They were evidently not stealing nest-material because they had not begun building their own nest, which was not commenced until two weeks later (unpublished data). The Honeyeater nest was damaged (torn and partly dislodged) by the Magpies, which had plenty of time to take nest-material, but they left after their second foray with no nest-material visible in their beaks. Between forays they had perched just outside the leaf cluster and were continually harassed. Magpies are generally not aggressive to smaller

birds at Dryandra and were unlikely to be attempting to exclude them from their territory (Fulton in press b). Since this pair was not nesting at the time of this attack, they were most likely in search of egg or nestling prey for themselves. The Honeyeater nest was abandoned, with no repairs attempted. Aston (1978) described a similar disturbance by Magpies at a Magpie-lark *Grallina cyanoleuca* nest that was being built; these raids were also not for the purpose of material theft, as Magpies do not use mud.

6. 29/12/03 A Yellow-plumed Honeyeater broke a Common Quail *Coturnix coturnix* egg in an artificial ground nest (unpublished data). The egg was punctured and, although the yolk still smelled fresh, the egg was left uneaten. The Honeyeater then flew directly back to its nest, which was situated almost directly above (9.8 m), where it had commenced incubating eggs the same day. Davis & Recher (2002) reported that the Yellow-plumed Honeyeater is aggressive towards other birds and may exclude other species from its breeding area. This bird was probably defending its breeding territory by breaking the Quail egg, because it did not attempt to eat the contents of the egg.
7. 25/11/03 A Grey Shrike-thrush closely approached a Restless Flycatcher *Myiagra inquieta* nest, which contained two large nestlings that fledged 5 days later. The Shrike-thrush perched 2 m from the nest, then proceeded directly to within 3 cm of the nest before both male and female Flycatchers attacked it and chased it for 9 seconds.
8. 1/12/03 A male Grey Shrike-thrush depredated an artificial nest. It was calling ~ 30 m from the nest and then flew directly to the nest and called again. It looked into the nest and then pecked an artificial clay egg five times, tearing pieces of clay and dropping them to the ground, over ~ 2 minutes. It perched on the nest probably to get a better purchase (the clay egg was tied into the nest by wire), but the nest had not yet been firmly secured in the tree (Jam Wattle *Acacia acuminata*) and it fell. The Shrike-thrush, which fell with it ~ 1 m to the ground, looked into the nest again and then flew 15 m away and foraged for invertebrates, snatching one off decaying wood on the ground. When it was pecking at the clay egg a Western Gerygone *Gerygone fusca*, which had a nest with young nestlings ~ 10 m away, perched 1.5 m above the Shrike-thrush and squawked at it for 12 seconds. The Shrike-thrush did not react.
9. 7/11/03 A male Grey Shrike-thrush took eggs from the nest of a Common Bronzewing *Phaps chalcoptera*. It was detected probing the nest where I had been able to see two eggs previously, and the adult Bronzewing had been sitting ~ 15 minutes before. The Shrike-thrush left the nest as I came within 25 m; I could no longer see the eggs, and the Bronzewing was not on the nest when checked several times that day and daily for a further 9 days. The sitting Bronzewing had previously been recorded off the nest for 2 hours; such long absences may increase the vulnerability of eggs to predators. The two egg-predation events described here (8 and 9) occurred within 50 m of each other, most likely by the same Shrike-thrush (a territorial species at Dryandra).
10. 27/9/02 A Grey Shrike-thrush closely approached Blue-breasted Fairy-wrens *Malurus pulcherrimus* as they called loudly within 3 m of their nest. Five Fairy-wrens (two males, three females) gave distraction calls and displays as I approached. All five were within 3 m of the nest and displaying loudly while perched in the open, and not from within the surrounding shrubs. The nest contained three young nestlings and was situated in a dead *Gastrolobium* shrub; the colour of the nest closely matched the dead shrub. When the Shrike-thrush

first arrived it looked in areas where the Fairy-wrens were calling, then it searched an area $\sim 2 \text{ m}^2$ while moving about on the ground and peering in different directions. It searched for ~ 30 seconds and did not appear to find the nest, although it came within 2 m of it. During its search the Shrike-thrush came within 30 cm of two different Fairy-wrens, which called loudly and continuously but were not seen feigning injury while the Shrike-thrush was present. They may not have feigned injury because Shrike-thrushes are potential predators of small adult birds; Shrike-thrushes have been recorded taking adult Superb Fairy-wrens *M. cyaneus* (Tilt 1962), although Red-backed Fairy-wrens *M. melanocephalus* displayed and feigned injury when a Shrike-thrush took their nestling (Ramsay & Ramsay 2002). The calling may have distracted the Shrike-thrush, preventing it from finding the nest. My presence, ~ 3 m from this event, probably caused the Shrike-thrush to discontinue its search. It is also possible that the Shrike-thrush was just responding to the commotion and was not specifically searching for a nest. Slagsvold (1984) suggested that mobbing predators might not simply deter them, but also attract other predators. In this case, the Fairy-wrens undoubtedly considered me a threat to their nestlings—their calling and distraction displays attracted the Shrike-thrush, which otherwise might not have approached so closely.

Birds killing other birds

11. 11/10/03 In Dryandra Village Australian Magpies mobbed and killed a male Brown Goshawk that had attacked one of their nests situated in a Marri *Corymbia calophylla* tree. The Magpies had two active nests, in the same tree, with large nestlings close to fledging at the time (Fulton in press b). The Magpies forced the Goshawk to the ground and continued to attack it; the latter was rescued by Department of Conservation and Land Management (CALM) employees, but died overnight from its injuries (Brian Macmahon pers. comm.).
12. 20/12/02 A male Australian Magpie killed a juvenile White-naped Honeyeater *Melithreptus lunatus* at a bird-bath in the woodland village. The juvenile Honeyeater had a bright-orange gape, indicating that it had fledged only recently. The Magpie caught the Honeyeater as it drank and then carried it under the nearest shrub, ~ 3 m away, and pulled off one of its wings. Other Magpies surrounded the shrub and squawked loudly.
13. 4/2/05 A male Australian Magpie killed a juvenile Brown-headed Honeyeater that had become too wet in a bird-bath to fly. The temperature was 45°C and the shallower baths had dried out. The juvenile Honeyeater was trapped in deep water in a larger container, and was unable to get out. I retrieved it and placed it on a branch of a tree, but it fell to the ground and was immediately snatched up by the Magpie, which flew out of sight with it (> 50 m) pursued by other Magpies. Events 12 and 13 involved the same social group of Magpies that maintained a territory encompassing 12 water-containers in a house garden at Dryandra. Both of the honeyeater species attacked (events 12 and 13) were commonly present at bird-baths in the presence of Magpies. There were no observations of adult honeyeaters being attacked by Magpies, which were generally aggressive only to larger birds such as goshawks and eagles (Fulton in press a). In these instances Magpies were opportunistic predators, taking advantage of an incapacitated juvenile Brown-headed and a juvenile White-naped Honeyeater, both of which had probably fledged only recently and had not yet developed anti-predator strategies. Magpies have also been reported taking small free-flying birds (Higgins *et al.* 2006).

Birds preying on mammals

14. 11/9/04 An immature Brown Goshawk caught and killed a Rabbit *Oryctolagus cuniculus* next to a woodpile in a grassy field that forms most of a territory defended by a social group of Magpies (not the same group as events 11–13), which then had three active nests with eggs. An adult female Goshawk took the Rabbit from the immature Goshawk, but stayed on the ground next to the woodpile. All 10 Magpies in the group then mobbed both Goshawks, which retreated into cover of the woodpile. After 2 minutes, the immature Goshawk left the area pursued by the Magpies. An Australian Raven *Corvus coronoides* confronted the female Goshawk, which did not act aggressively to the Raven although the latter moved to within 1 m of it. The Raven left after ~ 1 minute, but during this time it had puffed up its plumage in a dominance display, described by Heinrich (1989) in Common Ravens *C. corax* as a display intended to bluff conspecifics from a carcass. I approached the Goshawk after ~ 5 minutes, during which time the Goshawk had begun to eat the Rabbit. The Goshawk watched as I moved into view and took flight as I stepped over a fence and into the field, ~ 30 m from the woodpile. Its flight was not laboured although the Rabbit, which appeared large in relation to the hawk's size, was held only by its right leg. The Goshawk flew to cover near the top of pine trees (20 m high and 50 m away) and was immediately pursued by all 10 Magpies. The unlaboured flight of the Goshawk suggested that it could catch, and perhaps carry, prey as large as a well-grown Rabbit (> 1 kg; Strahan 2002). Goshawks take Rabbits commonly and have been reported taking Brown Hares *Lepus capensis* (> 3 kg; Strahan 2002; see also Marchant & Higgins 1993). At Dryandra, endangered Boobies *Bettongia lesueur*, Woylies *B. penicillata* and Bilbies *Macrotis lagotis* have been reintroduced; their average weights range from 1.3 to 2.0 kg (Strahan 2002). Numbats *Myrmecobius fasciatus* are also present and have a maximum weight of 715 g (Strahan 2002). These weights are comparable to or less than adult Rabbits and Hares, indicating that the Goshawk could be a predator of these species. Other observed avian predators of the Numbat include Wedge-tailed Eagle *Aquila audax*, Little Eagle *Hieraetus morphnoides*, Brown Falcon *Falco berigora*, and, reportedly, Collared Sparrowhawk *Accipiter cirrhocephalus* (Neil Thomas pers. comm.), although the last was more likely a Brown Goshawk (S. Debus pers. comm.).
15. 16/7/04, 0700 h Two CALM employees witnessed a Wedge-tailed Eagle taking off from a laterite breakaway (escarpment) just outside a fenced enclosure, gripping a Boodie. Boodies are presumed extinct on mainland Australia (Strahan 2002) and there have been some attempts to reintroduce them at Dryandra. A CALM employee sounded a car horn and the Eagle dropped the Boodie, whose body was collected; it was judged to be a fresh kill that had only recently been taken from the enclosure (Brian Macmahon pers. comm.).
16. 30/11/04 A Wedge-tailed Eagle flew from the ground, just after sunrise, in the same enclosure. A freshly killed, decapitated carcass of a Boodie was detected where the Eagle had been (Brian Macmahon pers. comm.). An Eagle's nest was situated ~ 800 m to 1 km away, and a radio-tracking collar from a Boodie was found in a tree 30 m from this nest along with fresh, and older, Boodie skeletal remains (Brian Macmahon pers. comm.).

General discussion

A variety of passerine species has been detected taking nest-material from

active and disused nests (Brown & Brown 1986; Ley *et al.* 1997; Fulton in press a). Birds expend considerable time and energy to find and collect nest-material, and they can reduce these costs by taking nesting material from their neighbours. However, there is a risk of injury associated with stealing nest-material from active nests. In two of the three observations discussed here nest-material was taken from active nests; one event involved physical contact between the species involved and the other resulted in the destruction of eggs. These events indicate that the theft of nest-material is important to nesting birds, and that they are prepared to risk injury or are prepared to destroy the nests and eggs of other birds in stealing nest-material, and the owners appear prepared to take risks to defend their nests.

The Grey Shrike-thrush was identified at four nest-disturbance events: closely approaching Restless Flycatcher nestlings and a Blue-breasted Fairy-wren's nest, depredated eggs of the Common Bronzewing, and depredated a clay egg at an artificial cup-nest. It has also been identified as the most widespread nest-predator by the use of cameras at artificial nests at Dryandra (Fulton in press a), has been detected raiding a Rufous Treecreeper's nest (probably for eggs), at Dryandra (Gary Luck pers. comm.), and has been identified as a nest-predator in south-eastern Australia (Major *et al.* 1999; Berry 2002; Higgins & Peter 2003). More detailed studies are needed to assess its importance as a nest-predator.

The Wedge-tailed Eagle was identified as a predator of the reintroduced Boodie at Dryandra. This is unsurprising, as Eagles were recorded taking Boodies and other endangered mammals from enclosures at Shark Bay, WA (Richards & Short 1998). They have also been observed taking Rufous Bettongs *Aepyprymnus rufescens* in dense forests (Baker-Gabb 1984; Fawckner 1991). The Boodie is listed as Vulnerable (D2) and likely to become extinct (IUCN 2004; Edwards 2005). Greater understanding of predators and predator assemblages is needed at release sites of endangered fauna. It may also be necessary to manage native species, such as Wedge-tailed Eagles, at such sites. A review of predators before the reintroduction of endangered species may help to mitigate further losses.

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