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Predation of an adult Russet-tailed Thrush on its nest by a Carpet Python and a review of snake predation of adult birds

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The literature on predation of birds' eggs and nestlings is voluminous, but there are few published records of predation of adult birds in Australia by animals other than raptors and non-indigenous, carnivorous mammals. Here we report observations of an adult Russet-tailed Thrush *Zoothera heinei* being consumed on its nest by a Carpet Python *Morelia spilota* while its presumed mate watched, and review the literature on predation of adult birds by snakes.

INTRODUCTION

The importance of predation as a selection pressure on birds can be gauged by the plethora of anti-predator defence strategies that have evolved (Lima 1993; Caro 2005) and the apparent effect of the risk of predation on nest attentiveness and provisioning rates (Ghalambor and Martin 2001; Martin 2002; Hua *et al.* 2014). However, whilst predation of eggs and nestlings has received much attention globally, comparatively little is known about the predation of adult birds (Pettingill1976; Lima 2009). The simplest explanation for this disparity is that nests can be continuously monitored to determine the fate of their occupants, whereas observations of predation of free-flying birds usually occur unpredictably in space and time. Consequently, much is known about rates of nest predation and types of nest predators (Colombelli-Négrel and Kleindorfer 2009; Reidy and Thompson 2012; Remeš *et al.* 2012; Guppy *et al.* 2014, 2017), yet our understanding of the rates of predation of free-flying birds and the types of predators involved is poor (e.g. O'Donnell 2006).

In Australia, arguably the best known natural predators of adult birds are raptors, notably the goshawks and falcons (Saunders 1982, 1988; Marchant and Higgins 1993; Olsen 1995; Olsen *et al.* 2006). Although best known as a nest predator (e.g. Major *et al.* 1996), the Pied Currawong *Strepera graculina* also preys upon free-flying birds (Prawiradilaga 1994; Bayly and Blumstein 2001). In addition, the Grey Butcherbird *Cracticus torquatus* has been observed killing adults of more than 20 species of birds (Higgins *et al.* 2006), and Fulton (2006) witnessed Australian Magpies *Cracticus tibicen* killing juvenile honeyeaters at bird baths. Among introduced predators, Feral Cats *Felis cattus* and Red Foxes *Vulpes vulpes* are known, mainly from analyses of stomach contents, to take adults of many native bird species (Palmer 1995; Martin *et al.* 1996; Barratt 1997; Read and Bowen 2001; Davis *et al.* 2015), but the site of predation is rarely known. In addition to taking nestling Red-tailed Black Cockatoos *Calyptorhynchus banksia* and Carnaby's Black Cockatoos *C. latirostris*, Feral Cats have been observed taking adults of the latter species on their nests (Saunders 2006, pers. comm.).

Snakes are frequent predators of birds and their nests in the New World (Weatherhead and Blouin-Demers 2004; Stake *et al.* 2005; Ellison and Ribic 2012; DeGregorio *et al.* 2014, 2016). In Australia, by contrast, wild birds and their eggs are rarely eaten by snakes, apart from pythons and the arboreal Brown Tree Snake *Boiga irregularis* (f. Colubridae), which is also notorious among aviculturists as a predator of caged birds (Shine 1977; Vestjens 1977; Slip and Shine 1988; Shine 1991a, b; Fearn *et al.* 2001; Guppy *et al.* 2017).

Here we document a Carpet Python *Morelia spilota* eating an adult Russet-tailed Thrush *Zoothera heinei* on its nest and review the literature on snakes as predators of adult birds.

STUDY SITE AND OBSERVATIONS

The Russet-tailed Thrush occurs on the seaboard of northern New South Wales and Queensland. The present observation took place close to the Maiala Rainforest walking track (27º20' S, 152º46' E; 650 m above sea level) near Mount Glorious in D'Aguilar National Park, *c.*50 km northwest of Brisbane, Queensland. The vegetation is sub-tropical rainforest, except for remnants of a Hoop Pine *Araucaria cunninghamii,* plantation established in the early 1900s. The upper canopy reaches 60 m.

At 15:54 hrs on 18 December 2015, while conducting a nest survey of the area, PAR was distracted by an unfamiliar sound, which proved to be the calls of a Russet-tailed Thrush. The bird was in a Giant Stinging Tree *Dendrocnide excelsa* on the side of a gully, and was moving from branch to branch in an apparently agitated manner, while uttering harsh, mechanical notes ("tek") at *c.*3 s intervals for 2 min. The trunk of the tree had broken off 8 m from the ground, at which point it had sprouted four near vertical stems, which extended its height to 14 m. The diameter of the trunk at breast height was *c.*20 cm and some buttress roots were present at its base.

Two minutes later, a Carpet Python was observed at the junction of the broken trunk and the four sprouting stems, where a nest was also evident. The nest was recognised as that of a Russet-tailed Thrush, being a large, bowl-shaped structure of

woven moss, *c.*250 mm wide x 150 mm deep. The calling bird did not approach the snake, always remaining 1–2 m from the nest. A camera (Canon EOS 7D), fitted with a 18-300 mm lens, was quickly set up on a tripod to record video footage of the event.

The python was *c.*3 m in length, and *c.*30 cm of its anterior body lay around the top of the nest, while its posterior body was wrapped around a horizontal branch (Fig. 1). Its neck was arched and its head, with mouth open, was pointing down into the nest. It twisted its head from side to side, then withdrew it from the nest. It then became clear that it was holding an adult thrush in its mouth. The python's teeth gripped the thrush by the head, but the bird's body and part of its bill were clearly visible.

Moving its head backwards, the python withdrew the bird from the nest c.150 mm and rested with the anterior part of its body in an 'S' shape. It then started to slowly swallow the bird's head and neck. Straightening the anterior part of its body, it pulled the bird completely from the nest and began to swallow the anterior part of its body by alternately retracting and straightening its own head and neck. The animals were obscured from view for 1.5 min, after which the anterior part of the python could be seen moving backwards with its head raised to almost vertical. At this stage, only the rump, legs and tail of the bird were visible (Fig. 1b). The duration of the event from the time when the python withdrew the bird from the nest until the bird was fully ingested (Fig. 1c) was 9.9 min.

DISCUSSION

Direct observations of predation of adult birds by vertebrates other than birds are rare, presumably partly because mammalian and many reptilian predators are largely nocturnal. Our observation of a Russet-tailed Thrush being taken by a snake is unusual in that it involves an adult bird on its nest. The height of the nest and stinging leaf hairs of the nest tree precluded examination of the nest contents after the event, so we do not know whether it contained eggs or young. Nor is it known if the victim was incubating or brooding at the time of the attack. If it was, it was presumably a female, as only this sex incubates and broods in this species (Higgins *et al.* 2006). At two studied nests, the female incubated for 85% of daylight hours, and the male guarded the nest for a further 9% of the time (R. Donaghey in Higgins *et al.* 2006). During the 14-day nestling period, young were brooded for 40-76% of daylight hours up to Day 12 at one nest and up to Day 8 at another (R. Donaghey in Higgins *et al.* 2006). Assuming the nest reported in this paper was similarly attended, it is surprising that the arrival of a large snake went unnoticed by the parents, unless it occurred at night.

Other examples of predation of adult birds on nests

In New Zealand, hole-nesting forest birds, such as the Yellowhead *Mohoua ochrocephala*, North Island Saddleback *Philesturnus carunculatus rufusater,* and Kaka *Nestor meridionalis*, are particularly vulnerable to predation by introduced, carnivorous mammals because they have few predator-avoidance behaviours (Lovegrove 1996; O'Donnell 1996; Innes *et al.* 2010). As only females incubate in these species, predation at nests can result in an 'excess' of males in the surviving population. On the other hand, in Spain, male Kentish Plovers *Charadrius alexandrinus* were killed by mammals more often than were females when incubating eggs,

Figure 1a. *Python at nest of Russet-tailed Thrush.*
(Photographer for all images, P.A. Robson)

Figure 1b. *Python swallowing adult Russet-tailed Thrush, of which only legs and tail can be seen.*

Figure 1b. *Carpet Python after fully ingesting the thrush, showing a bulge below the neck.*

because they incubated at night when visibility was reduced (Amat and Masero 2004). Omnivorous Ship Rats *Rattus rattus* also frequently kill nesting adults of small bird species, such as New Zealand Robins *Petroica australis* (35 g) and Tomtits *P. macrocepha* (11 g) (Brown 1997). In Texas, USA, video monitoring of nests of the endangered Golden-cheeked Warbler *Dendroica chrysoparia*, suggested that up to 15% of incubating females were depredated on the nest by ratsnakes *Elaphe* spp. (f. Colubridae) at night (Reidy *et al.* 2009).

In Australia, we know of only three species in which adult birds have been depredated on their nests. An adult female Carnaby's Black Cockatoo was preyed upon by a 2 m-long Carpet Python in its nest-hole (Dawson *et al.* 2011). The python was unable to leave the hollow for at least two days, due to the large bulge in its stomach caused by the presence of the ingested cockatoo. Weighing in the range of 560–790 g, this cockatoo is by far the largest native bird ever recorded as a prey item of Carpet Pythons (see below). In Tasmania, introduced Sugar Gliders *Petaurus breviceps* killed and ate the incubating female in 83% of Swift Parrot *Lathamus discolor* nests in which the eggs were also consumed (Stojanovic *et al.* 2014). Sugar gliders also killed and ate the incubating female and all eggs in three nests of Tree Martins *Petrochelidon nigricans* (Stojanovic *et al.* 2014).

Snakes as predators of adult birds

Not surprisingly, birds and their eggs are eaten more by arboreal snakes than by terrestrial ones (Shine 1983). The arboreal Brown Tree Snake was responsible for the near extermination of the entire avifauna of the Pacific island of Guam after its introduction after the Second World War (Savidge 1987; Shine 1991a; Rodda *et al.* 1997). Yet as this snake is mainly nocturnal, direct observations of prey capture by it are rare. The Shedao pit-viper *Gloydius shedaoensis*, is an arboreal sit-and-wait ambusher that feeds primarily on birds; like pythons, it uses heat-sensitive facial pits that provide infrared images of "warm-blooded" vertebrates (Goris 2011), as well as vison, to detect and recognise prey (Shine and Li-Xin 2002). However, the diet of the partly arboreal Aesculapian snake *Elaphe longissimi* was found to consist of terrestrial mammals and lizards, suggesting that it is risky to draw conclusions about the diets of snakes based on their foraging niche (Luiselli and Rugiero 1993).

Pythons (f. Boidae) are sit-and-wait predators that lie in ambush in one place, often for long periods (Slip and Shine 1988; Shine and Fitzgerald 1996). Tidemann *et al.* (1992) observed an Olive Python *Liasis olivaceus* at a water-filled rock-hole near Katherine, Northern Territory, over 8 h on one day, and recorded four birds being taken by it as prey, namely a Long-tailed Finch *Poephila acuticauda*, a Masked Finch *P. personata*, a Cockatiel *Nymphicus hollandicus* and a Galah *Eolophus roseicapillus*. It also made an unsuccessful strike at an Australian Magpie-lark *Grallina cyanoleuca.* Near Sydney, New South Wales, where they foraged primarily on the ground, Carpet Pythons fed almost entirely on mammals, and only 9% of prey items (n=57) were birds (of unspecified age) (Slip and Shine 1988). In a rural area of north-eastern New South Wales, where this species was primarily arboreal, 25% of a total of 83 prey items comprised goose eggs (n=7), unidentified nestlings (n=3) and adult birds (n=11), all but two of which were of domestic or other caged species (Shine and Fitzgerald 1996). In suburban Brisbane, however, birds were the most commonly recorded prey (Fearn *et al.* 2001): 56 birds, presumably adults, belonging to 18 species of birds were found in the gut contents of 32 Carpet Pythons, although 51 (91%) were domestic or caged birds that had a limited opportunity to evade capture. A domestic duck (2.3–5.0 kg) and chicken (500 g–1.6 kg) were the largest items, and the largest wild native bird was a Pheasant Coucal *Centropus phasianinus* (350 g) (Fearn *et al.* 2001). Of nine identified bird species eaten by a sample of Western Australian Carpet Pythons, the Grey Fantail *Rhipidura albiscapa* (8 g) was the smallest, and the Brush Bronzewing *Phaps elegans* (198 g) the largest (Pearson *et al.* 2002). Whether some of these birds were taken on their nests is unknown. The Russet-tailed Thrush weighing 71–96 g (Higgins *et al.* 2006) certainly fits within the wide range of prey sizes taken by this python species.

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REFERENCES

Amat, J. A. and Masero, J. A. (2004). Predation risk on incubating adults constrains the choice of thermally favourable nest sites in a plover. *Animal Behaviour* **67**: 293-300.

Barratt, D. G. (1997). Predation by house cats *Felis catus* (L) in Canberra, Australia. I. Prey composition and preference. *Wildlife Research* **24**: 263-277.

Bayly, K. L. and Blumstein, D. T. (2001). Pied Currawongs and the decline of native birds. *Emu* **101**: 199-204.

Brown, K. P. (1997). Predation at nests of two New Zealand endemic passerines: implications for bird community restoration. *Pacific Conservation Biology* **3**: 91-98.

Caro, T. M. (2005). *Antipredator Defenses in Birds and Mammals*. University of Chicago Press, Chicago.

Colombelli-Négrel, D. and Kleindorfer, S. (2009). Nest height, nest concealment, and predator type predict nest predation in Superb Fairy-wrens (*Malurus cyaneus*). *Ecological Research* **24**: 921-928.

Davis, N. E., Forsyth, D. M., Triggs, B., Pascoe, C., Benshemesh, J., Robley, A., Lawrence, J., Ritchie, E. G., Nimmo, D. G. and Lumsden, L. F. (2015). Interspecific and geographic variation in the diets of sympatric carnivores: dingoes/wild dogs and red foxes in south-eastern Australia. *PLoS ONE* **10**(3): e0120975. doi:10.1371/journal.pone.0120975

Dawson, R., Saunders, D.A. and Mawson, P. (2011). The vulnerable and the endangered: Carpet Python predation on a breeding female Carnaby's Black Cockatoo. *Australian Zoologist* **35**: 679-680.

Degregorio, B. A., Chiavacci, S. J., Benson, T. J., Sperry, J. H. and Weatherhead, P. J. (2016). Nest predators of North American birds: continental patterns and implications. *BioScience* **66**: 655-665.

DeGregorio, B. A., Chiavacci, S. J., Weatherhead, P. J., Willson, J. D., Benson, T. J. and Sperry, J. H. (2014). Snake predation on North American bird nests: culprits, patterns and future directions. *Journal of Avian Biology* **45**: 325-333.

Ellison, K. S. and Ribic, C. A. (2012). Nest defense: grassland bird responses to snakes. In: *Video surveillance of nesting birds*. *Studies in Avian Biology (no. 43)* (Eds. C. A. Ribie, F. R. Thompson III and P. J. Pietz). Pp. 149-160. University of California Press, Berkeley, California.

Fearn, S., Robinson, B., Sambono, J. and Shine, R. (2001). Pythons in the pergola: the ecology of 'nuisance' carpet pythons (*Morelia spilota*) from suburban habitats in south-eastern Queensland. *Wildlife Research* **28:** 573-579.

Fulton, G.R. (2006). Observations of predation, nest-predation and other disturbance events at Dryandra, South-western Australia, I: birds as predators. *Australian Field Ornithology* **23**: 144-151.

Ghalambor, C. K. and Martin, T. E. (2001). Fecundity-survival trade-offs and parental risk-taking in birds. *Science* **292**: 494-497.

Goris, R.C. (2011). Infrared organs of snakes: an integral part of vision. *Journal of Herpetology* **45**: 2-14.

Guppy, M., Guppy, S., Priddel, D. and Fullagar, P. (2014). Nest predators of a woodland bird community in South-east Australia. *Australian Zoologist* **37**: 105-116.

Guppy, M., Guppy, S., Marchant, R., Priddel, D., Carlile, N. and Fullagar, P. A. (2017). Nest predation of woodland birds in south-east Australia: importance of unexpected predators. *Emu* **117**: 92-96.

Higgins, P. J., Peter, J. M. and Cowling, S. J. (Eds.) (2006). *Handbook of Australian, New Zealand and Antarctic Birds, Volume 7: Boatbill to Starlings*. Oxford University Press, Melbourne, Australia.

Hua, F., Sieving, K. E., Fletcher Jr, R. J. and Wright, C. A. (2014). Increased perception of predation risk to adults and offspring alters avian reproductive strategy and performance. *Behavioural Ecology* **25**: 509-519.

Innes, J., Kelly, D., Overton, J. M. and Gillies, C. (2010). Predation and other factors currently limiting New Zealand forest birds. *New Zealand Journal of Ecology* **34**: 86-114.

Lima, S. L. (1993). Ecological and evolutionary perspectives on escape from predatory attack: a survey of North American birds. *Wilson Bulletin* **105**: 1-47.

Lima, S. L. (2009). Predators and the breeding bird: behavioural and reproductive flexibility under the risk of predation. *Biological Reviews* **84**: 485-513.

Lovegrove, T.G. (1996). A comparison of the effects of predation by Norway (*Rattus norvegicus*) and Polynesian rats (*R. exulans*) on the saddleback (*Philesturnus carunculatus*). *Notornis* **43:** 91-112.

Luiselli, L. and Rugiero, L. (1993). Food habits of the Aesculapian snake, *Elaphe longissima*, in central Italy: do arboreal snakes eat more birds? *Journal of Herpetology* **27**: 116-117.

Major, R. E., Gowing, G. and 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.

Marchant, S. and Higgins, P.J. (Eds.) (1993). *Handbook of Australian, New Zealand and Antarctic Birds, Volume 2: Raptors to Lapwings*. Oxford University Press, Melbourne.

Martin, G. R., Twigg, L. E. and Robinson, D. J. (1996). Comparison of the diet of feral cats from rural and pastoral Western Australia. *Wildlife Research* **23**: 475-84.

Martin, T. E. (2002). A new view of avian life-history evolution tested on an incubation paradox. *Proceedings of the Royal Society of London B* **269**: 309-316.

O'Donnell, C. F. J. (1996). Predators and the decline of New Zealand forest birds: An introduction to the hole-nesting bird and predator programme. *New Zealand Journal of Zoology* **23**: 213-219.

Olsen, J., Fuentes, E., Rose, A. B. and Trost, S. (2006). Food and hunting of eight breeding raptors near Canberra, 1990–1994. *Australian Field Ornithology* **23**: 77-95.

Olsen, P. (1995). *Australian Birds of Prey*. UNSW Press, Sydney.

Palmer, R.A. (1995). Diet of the Red Fox *(Vulpes vulpes)* in south-western Queensland. *Rangelands Journal* **17**: 99-108.

Pearson, D., Shine, R. and How, R. (2002). Sex-specific niche partitioning and sexual size dimorphism in Australian pythons (*Morelia spilota imbricata*). *Biological Journal of the Linnean Society* **77:** 113-125.

Pettingill, O.S., Jr. (1976). Observed acts of predation on birds in northern Lower Michigan. *Living Bird* **15**: 33-41.

Prawiradilaga, D. M. (1994). Caching behaviour of breeding Pied Currawongs. *Australian Bird Watcher* **15**: 275-276.

Read, J. and Bowen, Z. (2001). Population dynamics, diet and aspects of the biology of feral cats and foxes in arid South Australia. *Wildlife Research* **28**: 195-203.

Reidy, J. L., Stake, M. M. and Thompson III, F. R. (2009). Nocturnal predation of females on nests: an important source of mortality for golden-cheeked warblers? *Wilson Journal of Ornithology* **121**: 416-421.

Reidy, J.L. and Thompson III, F.R. (2012). Predatory identity can explain nest predation patterns. In: *Video surveillance of nesting birds*. *Studies in Avian Biology (no. 43)* (Eds. C. A. Ribie, F. R. Thompson III and P. J. Pietz). Pp. 135-148. University of California Press, Berkeley, California.

Remeš, V., Matysioková, B. and 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.

Rodda, G. H., Fritts, T. H. and Chiszar, D. (1997). The disappearance of Guam's wildlife. *BioScience* **47**: 565-574.

Saunders, D. A. (1982). The breeding behaviour and biology of the short-billed form of the White-tailed Black Cockatoo *Calyptorhynchus funereus. Ibis* **124**: 422-455.

Saunders, D. A. (1988). Patagial tags: do benefits outweigh risks to the animal? *Australian Wildlife Research* **15**: 565-569.

Saunders, D. A. (2006). Cats and cockatoo chicks. In: *The state of Australia's birds 2006. Invasive species* (Eds. P Olsen, A. Silcocks and M. Weston), p. 13. Birds Australia, Melbourne.

Savidge, J. A. (1987). Extinction of an island forest avifauna by an introduced snake. *Ecology* **68**: 660-668.

Shine, R. (1977). Habitats, diets and sympatry in snakes: a study from Australia. *Canadian Journal of Zoology* **55**: 1118–1128.

Shine, R. (1983). Arboreality in snakes: ecology of the Australian elapid genus *Hoplocephalus*. *Copeia* **1**: 198-205.

Shine, R. (1991a). *Australian Snakes: a Natural History*. Reed Books, Balgowlah, NSW.

Shine, R. (1991b). Strangers in a strange land: ecology of the Australian colubrid snakes. *Copeia* **1991:** 120-131.

Shine, R. and Fitzgerald, M. (1996). Large snakes in a mosaic rural landscape: the ecology of carpet pythons, *Morelia spilota* (Serpentes: Pythonidae) in coastal eastern Australia. *Biological Conservation* **76**: 113-122.

Shine, R. and Li-Xin, S. (2002). Arboreal ambush site selection by pit-vipers *Gloydius shedaoensis. Animal Behaviour* **63**: 565-576.

Slip, D.J. and Shine, R. (1988). Feeding habits of the Diamond Python, *Morelia s. spilota*: ambush predation by a Boid snake. *Journal of Herpetology* **22**: 323-330.

Stake, M. M., Thompson, F. R. III, Faaborg, J. and Burhans, D. E. (2005). Patterns of snake predation at songbird nests in Missouri and Texas. *Journal of Herpetology* **39**: 215-222.

Stojanovic, D., Webb, M., Alderman, R., Porfirio, L. and Heinsohn, R. (2014). Discovery of a novel predator reveals extreme but highly variable mortality for an endangered bird. *Diversity and Distributions* **20:** 1200-1207.

Tidemann, S. C., Palmer, C., Boyden, J. and Hunt, T. (1992). Predation on Gouldian Finch by reptiles. *Corella* **16**: 105-110.

Vestjens, W. J. M. (1977). Reptilian predation on birds and eggs at Lake Cowal, NSW. *Emu* **77:** 36-37.

Weatherhead, P. J. and Blouin-Demers, G. (2004). Understanding avian nest predation: why ornithologists should study snakes. *Journal of Avian Biology* **35**: 185-190.