

A successful long-distance aerial pursuit of an Australian Raven *Corvus coronoides* by a Brown Goshawk *Accipiter fasciatus*

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Abstract. The Brown Goshawk *Accipiter fasciatus* has a variable diet comprising mainly avian prey and mammals, and most observations suggest that it employs a range of ambush tactics but rarely uses long-distance aerial pursuits. Here I document a rare instance of a successful long-distance aerial pursuit of an Australian Raven *Corvus coronoides* by a Brown Goshawk, on 29 March 2015, on Broughton Island, New South Wales. After multiple unsuccessful aerial attacks, the Goshawk eventually succeeded. Although corvids are abundant and widespread throughout Australia and are within the preferred avian prey size range, they are rarely observed in the Goshawk's diet. Two ecological factors probably contributed to this observation: (1) there is little woodland here and thus little concealment for ambush tactics and (2) prey availability on Broughton Island and the surrounding islands has been altered by programs to eradicate pest mammals, thereby limiting the prey available to this species in this area.

Introduction

The Brown Goshawk *Accipiter fasciatus* is a raptor of heavy build and moderate size that is relatively common throughout most of Australia (Debus 2012). Its abundance has increased in certain areas due to the proliferation of potential prey items (introduced mammals), but has decreased in areas that have been heavily cleared for urban development and have had extensive programs to control exotic mammals (Olsen & Marples 1992).

Accipiters have a variable diet that is dependent on prey availability and habitat (Tornberg & Colpaert 2001). Early dietary and morphometric studies suggested primarily avian prey, but recent studies indicate a more general diet when a high abundance of exotic mammals is present (Olsen & Marples 1992). In fringing urban areas and pasture lands, Brown Goshawks have a high proportion of introduced mammals, especially Black Rats *Rattus rattus* and Rabbits *Oryctolagus cuniculus*, in the diet (Burton & Olsen 1997a). It is also clear that birds are an important food item (Olsen *et al.* 1990; Burton & Olsen 1997b). For example, Aumann (1988a) found that in open woodland areas 50% of the dietary biomass of this species was made up of avian prey. Avian species preyed on are typically medium to large, such as Eastern Rosellas *Platycercus eximius*, kookaburras *Dacelo* spp., and Rock Doves *Columba livia* (Aumann 1988b; Burton & Olsen 1997b; Olsen *et al.* 2006). However, despite being of a similar size, corvids are comparatively rarely preyed on (Olsen *et al.* 2006).

Most observations of hunting Brown Goshawks indicate that they employ a range of ambush tactics and will hunt from perched positions, ground positions, and aerially using fast contour-hunting (Aumann 1988b; Olsen *et al.* 1990). In comparison, long-distance aerial pursuits of avian prey are rarely recorded and represent <3% of all documented hunting observations (see Table 1). The tactics and techniques of this species engaged in aerial pursuits have never been documented. In this article I

document a rare instance of a successful long-distance aerial pursuit of an Australian Raven *Corvus coronoides* by a Brown Goshawk and discuss possible factors that might have contributed to this observation.

Observation

While surveying Green and Golden Bell Frogs *Litoria aurea* on 27–30 March 2015 on Broughton Island (just off the coast of Myall Lakes National Park, New South Wales), I observed an aerial pursuit of an Australian Raven by a raptor. This occurred at 1615 h on 29 March at Little Poverty Beach just outside the national park rangers' hut (32°37'S, 152°20'E). Based on its plumage and size comparisons with the Raven, the raptor was an adult male Brown Goshawk.

Initially the Goshawk pursued the Raven in a westerly direction, at first observing the Raven from behind, then gathering speed and making contact with it in what appeared to be a beak-first attack. The Raven changed angle after the first observed attack, and proceeded to dive (Figure 1). The Goshawk appeared easily faster than the Raven in diving flight, and again made aggressive contact using its beak.

The Raven once again changed direction, this time angling north-west and slightly upwards. The Goshawk circled to adjust its position and once again pursued the Raven, this time coming from below (Frame 1, Figure 2). In between Frames 4 and 5 (Figure 2), the Goshawk attempted to attack the Raven but missed. The Raven appeared to flap its wings faster and faster as the Goshawk approached. After this attack, the Goshawk let the Raven gain a lead before closing the distance for another attack. At this stage, the interaction was proceeding further out in the bay and it was impossible to obtain distinct images with a camera. Further observations were made with binoculars. On the sixth and final attack, as the Goshawk approached the Raven, the former outstretched its talons and grasped the Raven in mid air. The Raven did not appear to be

Table 1. Hunting methods reported for the Brown Goshawk. Hunting methods follow Baker-Gabb (1980), with the addition of the long-distance pursuit category. No. refers to the minimum count of hunting observations reported across all references per category, including cases where only counts of prey items were reported.

Hunting method	Description	No.	Reference
Ground-hunting	Attack from terrestrial position	24	Batey (1907); Stokes (1973); Aumann (1988b); Burton & Olsen (1997c)
Fast contour-hunting	Ambush in an aerial position <15 m from ground, using environment for concealment	24	Fletcher (1918); Baker-Gabb (1980); Mooney (1981); Aumann (1988b); Burton & Olsen (1997c); Olsen <i>et al.</i> (2006)
Flushing from cover	Opportunistically ambush prey disturbed from cover	5	Mooney (1987); Aumann (1988b); Ward & Smith (2003)
Long-distance pursuit	Long-distance aerial pursuit after ambush fails; prey pursued >100 m	4	Aumann (1988b); Tollan (1989); this paper
Perch-hunting	Opportunistically ambush prey from a perched location where raptor is either concealed or unconcealed	64	Carter (1903); Salter (1960) Czechura (1979); Baker-Gabb (1980); Aumann (1988b); Burton & Olsen (1997a,c); Olsen <i>et al.</i> (2006); Riddell (2011)
Soaring and prospecting	Soar >15 m above ground or soar without concealment over large areas in search of prey, followed by aerial attack	14	Baker-Gabb (1980); Aumann (1988b); Burton & Olsen (1997c); Layton (2005)
Unknown/other		2	Stokes (1973); Bounds (1996)



Figure 1. First sequence of pursuit showing diving tactics of Australian Raven to escape predation by a Brown Goshawk, Broughton Island, New South Wales, 29 March 2015. Ordered from Frames 1-4. Photos: C.T. Beranek



Figure 2. Second sequence of pursuit of Australian Raven by Brown Goshawk, Broughton Island, New South Wales, 29 March 2015. Ordered from Frames 1-6, with Frame 6 being the final image taken of this interaction. Photos: C.T. Beranek

struggling to break free and looked limp; presumably it was either dead or exhausted. The Goshawk flew with its prey over the eastern headland of Little Poverty Beach and was not seen again. The pursuit occurred over ~120 m and lasted for nearly 1 minute.

Discussion

Long-distance aerial pursuits by Brown Goshawks are rarely observed, but the few documented show some trends. All have involved an adult male Goshawk (Aumann 1988b; Tollan 1989), as in the present observation. Male goshawks are more agile and less bulky than females, and therefore are more likely to engage in energy-intensive aerial pursuits (Olsen *et al.* 1990). Another trend observed in aerial pursuits by Brown Goshawks is the pursuit of prey until capture, or the prey escapes via shelter (Burton & Olsen 1997c). The present observation conforms with this behaviour, as the Raven had no chance to escape and shelter from the attack but did manage to aerially evade and withstand initial attacks (Figures 1–2). As expected, the Goshawk persisted until the Raven was captured.

Corvids are abundant and widespread throughout Australia and are within the preferred avian prey size range for the Brown Goshawk, yet are rarely observed in this raptor's diet (Olsen *et al.* 2006). Brown Goshawks are frequently recorded to take medium-to-large birds of similar size to the Australian Raven (Aumann 1988a; Burton & Olsen 1997a). Despite this, only one study has documented predation on corvids, when an adult male and adult female Brown Goshawk were observed ambush-hunting Australian Ravens and Little Ravens *Corvus mellori* from their nest in Melbourne (Aumann 1988c). Given both the rarity of predation on corvids, and the relative rarity of long-distance pursuits, by the Brown Goshawk (see Table 1), it is worth considering the ecological context of the present observation.

Two ecological factors have likely contributed to this exceptional observation: habitat structure and prey availability. The surrounding area (within a radius of 5 km) where the aerial attack was observed has little woodland and offers little concealment for ambush tactics (Hindwood & D'Ombrian 1960). Brown Goshawks prefer to use ambush tactics to hunt prey and often use woodland habitat for concealment (Aumann 1988b). Habitat on Broughton Island therefore offers relatively limited opportunity for the ambush tactics of this species.

Prey availability on Broughton Island and the surrounding islands has recently been altered because of extensive programs to eradicate pest mammals, most likely affecting the diet of Brown Goshawks there. Broughton Island and the surrounding islands had an epidemic of European Rabbits and Black Rats from as early as 1906, but extensive eradication programs eliminated both species from Broughton Island and the surrounding islands to the extent that none were detected in December 2010 (Priddel *et al.* 2011). If in high abundance, these introduced mammals can constitute a large proportion of the Brown Goshawk diet (Aumann 1988a), and therefore would have provided a reliable food source for >100 years on Broughton Island. The eradication of these species has left the Goshawks to rely more heavily on other prey items present on the island, such as birds, reptiles and frogs, of

which birds are likely the most preferred (Aumann 1988a; Olsen *et al.* 1990).

In summary, it seems plausible that both the lack of suitable ambush-hunting habitat and the suppression of mammalian prey through pest control have contributed to the unusual hunting behaviour described here. Given the commercial, conservation and amenity incentives for pest eradication, there are likely to be opportunities for future studies to investigate raptor responses to broad-scale control of introduced mammals.

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References

- Aumann, T. (1988a). The diet of the Brown Goshawk, *Accipiter fasciatus*, in southeastern Australia. *Wildlife Research* **15**, 587–594.
- Aumann, T. (1988b). Foraging behaviour of the Brown Goshawk (*Accipiter fasciatus*) in southeastern Australia. *Journal of Raptor Research* **22**, 17–21.
- Aumann, T. (1988c). Breeding behaviour of the Brown Goshawk *Accipiter fasciatus*. *Australian Bird Watcher* **12**, 258–267.
- Baker-Gabb, D.J. (1980). Raptor prey record scheme - an ARA project proposal. *Australian Raptor Association News* **1**, 9–12.
- Batey, I. (1907). On fifteen thousand acres: Its birdlife sixty years ago. *Emu* **7**, 1–17.
- Bounds, J. (1996). Brown Goshawk takes Common Myna. *Canberra Bird Notes* **21**, 12–13.
- Burton, A.M. & Olsen, P. (1997a). Niche partitioning by two sympatric goshawks in the Australian wet tropics: Breeding-season diet. *Wildlife Research* **24**, 45–52.
- Burton, A.M. & Olsen, P.D. (1997b). A note on inter- and intraspecific differences in the diets of sympatric Brown Goshawks and Grey Goshawks during the non-breeding season. *Australian Bird Watcher* **17**, 138–141.
- Burton, A.M. & Olsen, P. (1997c). A note on hunting behaviour of two sympatric goshawks in the Australian Wet Tropics. *Australian Bird Watcher* **17**, 126–129.
- Carter, T. (1903). Birds occurring in the region of the North-West Cape. Part I. *Emu* **3**, 30–38.
- Czechura, G. (1979). Observations on quail-hunting strategies in some Australian raptors (Aves: Falconiformes). *Sunbird* **10**, 59–66.
- Debus, S.J.S. (2012). *Birds of Prey of Australia: A Field Guide*. CSIRO Publishing & BirdLife Australia, Melbourne.
- Fletcher, J.A. (1918). Bird notes from the Boat Harbour (Tasmania) district. *Emu* **18**, 96–101.
- Hindwood, K.A. & D'Ombrian, A.F. (1960). Breeding of the Short-tailed Shearwater, *Puffinus tenuirostris*, and other seabirds on Broughton Island, NSW. *Emu* **60**, 147–154.
- Layton, J.K. (2005). Brown Goshawk attempts to take cat. *Canberra Bird Notes* **30**, 88.
- Mooney, N. (1981). Raptors hunting roosting starlings. *Australian Raptor Association News* **2**, 11.
- Mooney, N. (1987). Brown Goshawk hunts swifts. *Australian Raptor Association News* **8**, 53.
- Olsen, J., Fuentes, E., Rose, A.B. & Trost, S. (2006). Food hunting of eight breeding raptors near Canberra, 1990–1994. *Australian Field Ornithology* **23**, 77–95.
- Olsen, P. & Marples, T. (1992). Alteration of the clutch size of raptors in response to a change in prey availability: Evidence from control of a broad-scale rabbit infestation. *Wildlife Research* **19**, 129–135.

- Olsen, P.D., Debus, S.J.S., Czechura, G.V. & Mooney, N.J. (1990). Comparative feeding ecology of the Grey Goshawk *Accipiter novaehollandiae* and Brown Goshawk *Accipiter fasciatus*. *Australian Bird Watcher* **13**, 178–192.
- Priddel, D., Carlile, N., Wilkinson, I. & Wheeler, R. (2011). Eradication of exotic mammals from offshore islands in New South Wales, Australia. In: IUCN (Eds). *Island Invasives: Eradication and Management*, pp. 337–344. Gland, Switzerland.
- Riddell, W. (2011). Double brooding by the Brown Goshawk *Accipiter fasciatus* in the Northern Territory. *Australian Field Ornithology* **28**, 92–93.
- Salter, B.E. (1960). A goshawk in the garden. *Bird Observer* **345**, 3.
- Stokes, T. (1973). Feeding behaviour of an immature Brown Goshawk. *Canberra Bird Notes* **2**, 8–9.
- Tollan, A. (1989). Goshawks hunting megapodes. *Australian Raptor Association News* **10**, 13.
- Tornberg, R. & Colpaert, A. (2001). Survival, ranging, habitat choice and diet of the Northern Goshawk *Accipiter gentilis* during winter in Northern Finland. *Ibis* **143**, 41–50.
- Ward, M.J. & Smith, J.G. (2003). Brown Goshawk *Accipiter fasciatus* attacking a Green Pygmy-goose *Nettapus pulchellus* over and in water. *Australian Field Ornithology* **20**, 105–106.
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