Australian Field Ornithology 2019, **36**, 132–136
http://dx.doi.org/10.20938/afo36132136

Using raptors to disperse pest birds in Victoria

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Abstract. Birds are considered to be pests when they damage infrastructure and crops as well as being a health risk and a social nuisance. Here we detail some case studies where we used trained raptors to disperse populations of pest Long-billed *Cacatua tenuirostris* and Little Corellas *C. sanguinea*, Sulphur-crested Cockatoos *C. galerita* and Silver Gulls *Chroicocephalus novaehollandiae* in Victoria. We describe the situations where the technique works best and compare it with other methods of managing pest birds. Using raptors to disperse pest birds seems to be a cost-effective management tool only when the target area is small, the period over which damage occurs is limited, and when the damage caused by the pest species is costly.

Introduction

Pest birds in Australia cause extensive losses in agricultural production (Bomford & Sinclair 2002); in 2005–2006, birds are estimated to have caused approximately $290 million damage to horticulture (Tracey *et al.* 2007). In some circumstances, some bird species can also be considered a nuisance in urban areas, disrupting sporting events, cultural activities and airport operations, damaging infrastructure such as buildings and recreation spaces, including golf courses and cricket fields, and they can be a public health hazard (Erickson *et al*. 1990; Bomford & Sinclair 2002; Temby 2005; Soldatini *et al*. 2007; Cook *et al*. 2008; Chessell 2010; De Vault *et al*. 2013).

Traditional methods of managing pest birds involve lethal and non-lethal techniques. Birds may be killed by poisoning, trapping (and subsequent killing) and shooting. However, community attitudes against killing have strengthened, especially towards native birds, even when those birds are causing damage to human enterprises (DuBois *et al*. 2017). Movements such as 'compassionate conservation' (Bekoff *et al*. 2013; Wallach *et al*. 2018) are influencing communities to seek alternative, non-harmful methods to manage the problems that pest birds incur. Non-lethal techniques include exclusion netting, providing decoy food sources to lure birds away from target crops, habitat manipulation, trapping and relocating birds and scaring the pest birds away from the sites that require protection (Bomford & Sinclair 2002; Baxter & Allen 2006; Tracey *et al.* 2007; De Vault *et al.* 2013).

Trained raptors have been used to manage pest birds at airports, sporting grounds and rubbish tips (Olsen 1994; Baxter & Allan 2006; Cook *et al*. 2008), with varying levels of success. Cook *et al*. (2008) found raptors effective at dispersing gulls (European Herring Gull *Larus argentatus*, Lesser Black-backed Gull *L. fuscus* and Black-headed Gull *Chroicocephalus ridibundus*) at British landfill sites, especially when falcons and hawks were permitted to kill the target species. In agricultural areas, falcons (Lanner Falcon *Falco biarmicus* and Saker Falcon *F. cherrugi*) have been successfully used to reduce faecal contamination and browsing of leafy greens by pest species in the United States of America (Navarro-Gonzales & Jay-Russell 2016). In New Zealand, Kross *et al.* (2011) found that flying New Zealand Falcons *F. novaeseelandiae* over vineyards significantly reduced the number of introduced passerine birds consuming grapes pre-harvest and decreased the number of grapes taken by birds. In general, the success of using falcons to control high densities of nuisance birds seems to depend on site-specific conditions, the species concerned, alternative food sources and habitat, and whether some of the pest birds are killed (Cook *et al*. 2008; Navarro-Gonzales & Jay-Russell 2016).

In this paper, we describe some field trials in Victoria, Australia, where trained raptors have been used to disperse native birds that were causing damage to sporting assets and events, buildings and an Almond *Prunus dulcis* farm. We describe those situations in which the use of raptors was successful and when their use was unsuccessful and thus consider the advantages and disadvantages of this method of managing conflicts with birds.

Methods

The raptors used in this study were the Wedge-tailed Eagle *Aquila audax*, Brown Goshawk *Accipiter fasciatus*, Eastern Barn Owl *Tyto alba delicatula*, Masked Owl *T. novaehollandiae*, Barking Owl *Ninox connivens* and Peregrine Falcon *Falco peregrinus*. The birds were all held at Full Flight Birds of Prey premises at Miners Rest, Victoria.

Various methods of scaring pest birds were used. Most commonly, a raptor was released from one human trainer and flown to another trainer, who provided it with a food reward. The raptors did not actually capture any of the pest birds that were to be dispersed. The distance flown depended on the site and where the pest birds were aggregating. On most occasions, the target flocks were concentrated in a discrete area and the raptor was flown

over the length of this site. When the target birds were feeding on the ground, the raptor was flown ~3 m above ground level; when feeding in trees, the raptor was flown ~3 m above the trees.

At other times, a raptor was held on a trainer's hand and either encouraged to flap its wings, or to just sit on the hand in line of sight of the birds to be dispersed.

The case studies reported here were all situated in Victoria in urban environments, except for an almond farm near Mildura, on the Murray River in north-western Victoria.

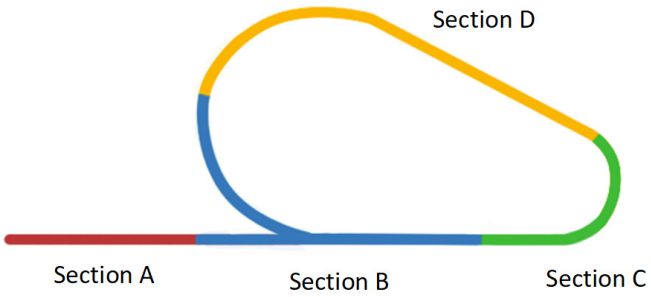

Figure 1. Diagram of Flemington Racecourse, Melbourne, Victoria. Raptors were not flown over Section D. Track circumference = 2312 m.

Results

Melbourne Cup Carnival

On 30 March 2015, a horse race at Melbourne's Sandown course was declared void after a flock of hundreds of Silver Gulls *Chroicocephalus novaehollandiae* spooked the racehorses in the home straight. Two of the jockeys were hospitalised (Anon. 2015).

The Melbourne Cup Racing Carnival is one of Australia's top sporting highlights, with millions of dollars both wagered on the races and in prize money. The Victoria Racing Club was fearful that a similar event to that at Sandown during the four race days of the Carnival could cause irreparable reputational damage, severe financial losses and injury to horses and jockeys. Silver Gulls are attracted to food scraps and available water at the race courses.

Full Flight Birds of Prey was engaged to use raptors to disperse birds on the tracks before each of the 37 races held over the 4 days. We used the opportunity to use different raptors as well as counting Silver Gulls on the track 5–10 minutes before each race and during the race itself. We did not count the Gulls beside the race track (in the public area or in the space enclosed by the elliptical track), but on most occasions hundreds of Gulls were seen in the marquee areas or flying overhead.

The trials were carried out over four successive years of the Melbourne Cup Racing Carnival (2015–2018). One bird of prey was flown over about half of the course (where the Silver Gulls congregated) immediately before each race. The raptors used over the years have been Wedge-tailed Eagle, Brown Goshawk, Eastern Barn Owl, Masked Owl, Barking Owl and Peregrine Falcon. They were released by a handler near the start of the race and trained to fly to another handler at the end of the trial distance of ~1000–1400 m. The Flemington Racecourse has a circumference of 2312 m but one section (D in Figure 1) of ~1300 m was not used in the trial as Gulls were absent, and this part of the track was furthest away from the people watching the event. For some races, a straight section (A) was used for 'chute' races of <1400 m in which horses begin the race in a straight line.

The dispersal of the Silver Gulls was successful, with no Gulls ever found on the race track during the 37 races after the raptor fly-overs in each of the 4 years. Furthermore, when a raptor flew overhead, Gulls in the public areas off the track also took flight and dispersed for a short time, but never on to the track. On occasions, Gulls were found on the track before a race and before the raptor fly-overs. In 2016, the highest number of Gulls observed on the track was 23 before Race 10 on Melbourne Cup Day. In 2017, 44 Gulls were counted on the track before Race 9 on Emirates Stakes Day and, in 2018, 20 Gulls were seen on the track on two occasions. All species of raptors were effective in dispersing the Gulls from the track, although there were insufficient data for statistical comparisons of the effectiveness between raptor species. The Cup Carnival races were all held during the daytime. There was no disruption to the horse races caused by Gulls. No injuries or deaths of the raptors or Gulls were observed during the trials and Gulls were not seen harassing the raptors.

Australian Open Tennis Tournament, Melbourne

The Australian Open Tennis Tournament is another iconic sporting event in the Australian sporting calendar. It is held at Melbourne Park in January each year and usually lasts 18 days. Silver Gulls cause considerable concern to the event organisers, mainly because of defaecation on the courts and spectators especially during the evening. They are attracted to the many insects that visit the site because of the strong overhead lights used on the outside courts. Also, hot air rising from the show courts helps the insects rise to the lights, and the Gulls then circle overhead to feed. The Gulls also come to ground seeking out those insects that fall, and are also attracted to food left by patrons. Another problem is that low-flying Gulls can disrupt a game and interfere with telecasts of the event.

Raptors were used to disperse Silver Gulls over 3 years of the Australian Open (2016–2018). The same raptor species were flown over the outside courts as used in the horse races already described, except that Barn Owls were unavailable for use. No Gulls remained on the courts' surfaces after the raptors flew over the courts, and mostly Gulls did not return to the courts that night. If one or two Gulls did return, another raptor fly-over quickly dispersed them. Raptors were also flown over the courts at hourly intervals even when no Gulls were present near the surface as this was a requirement of Tennis Australia. The Masked Owls were flown only at night.

Approximately 100 Silver Gulls could be seen flying 50–100 m above the ground regularly throughout the 18-day tournaments each year, but these were not deemed to cause disturbance to the event or the spectators.

Typically, as the event progressed, there were many fewer instances of Gulls settling on the courts; most Gulls that landed flew off again immediately. All raptor species were effective in dispersing the Gulls, with the Masked Owl producing the most rapid response although, again, there were insufficient data for statistical comparisons. Use of the Wedge-tailed Eagle generated media interest (Marshall 2016).

Tournament officials also noted fewer Gulls on the court after the tournament had finished than before it commenced.

Almond farm, Swan Hill

Olam's almond farm comprises 11 separate blocks of orchard and is located 120 km east of Mildura. Its total area is 12,000 ha. The farm blocks are large; the biggest has 320,000 almond trees. Flocks of Long-billed Corellas *Cacatua tenuirostris* and smaller numbers of Sulphur-crested Cockatoos *C. galerita* (hereafter called parrots) cause damage to the crop. The parrots roost overnight in trees along the River Murray and fly to feed on the almonds during the day. The highest densities of parrots on the farms occur in the mornings.

The parrots accessed the farm blocks in certain transit routes from the river. About 400 parrots flew to the farm blocks each morning and late afternoon. In 2017, trials began using a Wedge-tailed Eagle to fly from the river to three adjoining farms along specific transit routes. Three periods of fly-overs, each lasting 6 days, were conducted during the pre-harvest period. Fly-overs consisted of the handlers releasing and receiving the Eagle over a distance of ~200 m at a height of 3–5 m during early morning and late afternoon when the parrots were most actively flying to the almond trees and also during late morning when some parrots were attempting to return to the orchard. The parrots quickly returned to the river habitat after each fly-over rather than dispersing further inland to the other farm blocks. As the trial progressed, fewer parrots attempted to access the orchards. After the 18 days of fly-overs, the parrots did not return to farm blocks until several months later, when harvesting had finished.

In 2018, we repeated the trial. Again, ~400 parrots attempted to fly to the orchard each day, especially in the early morning and late afternoon. This time, low numbers (<10) of Long-billed Corellas returned during the trial. We thus checked the farms every 30 minutes during the 6-day period and flew the Wedge-tailed Eagle an additional time if parrots were seen in the almond trees, instead of just flying the Eagle once more during the day late in the morning. This was effective and after the 6 days no parrots were foraging in the orchards.

Importantly, we observed opportunistically that smaller, non-target birds did not respond to the Eagle flying overhead.

The management of pest parrots at this farm is consistent with the company's sustainability ethic of 'Growing Responsibly' that involves causing as little damage to ecosystems as possible (Olam Group 2019). The company thus prefers using a non-lethal control mechanism that relies on changing the parrots' behaviour.

Golf course and a school in Melbourne

Corellas cause extensive damage to golf courses where they eat bulbs, grass seeds and grasses and can rip up large areas of greens. In 1995, a Victorian Parliamentary Committee recommended management by shooting corellas (suggesting shooters disguise themselves as golfers and carry rifles in their golf bags) and sounding alarm calls (Environment and Natural Resources Committee 1995).

In April 2018, we flew a Wedge-tailed Eagle or a Brown Goshawk over a golf course in Melbourne's south-east to disperse Little Corellas *Cacatua sanguinea* that were causing damage to the course putting greens. The Corellas were especially abundant around a small dam on the course. If no Corellas were observed on the greens near the dam, the raptor was not flown. Checks were made up to six times a day for five consecutive days. A maximum of 50 Corellas was observed at any one time. In all cases, they dispersed when the raptor was flown. Initially, Corellas returned in lower numbers within 1 hour but, as the week progressed, they returned less frequently, and by the fifth day none were observed on the golf course.

Little Corellas remained absent from the golf course for 8 months after the raptor fly-overs but returned in small numbers thereafter. Repeated use of the Wedge-tailed Eagle then quickly dispersed them.

Little Corellas were also causing damage to the trees and sporting fields of a school in south-eastern Melbourne, in 2018. Flocks of up to 400 Corellas were observed. Three raptors (Wedge-tailed Eagle, Brown Goshawk and Masked Owl) were flown daily for 4 days in July until Corellas no longer appeared at the site. When a large flock of Corellas returned to the school 2 weeks later, the Eagle was held on the hand and encouraged to flap its wings. On hearing the flapping noise, the Corellas dispersed. After 2 days, no Corellas were seen and they had not returned by the end of the year.

Apartment blocks, Frankston and Caroline Springs

Long-billed Corellas can cause damage to buildings (Environment and Natural Resources Committee 1995). In 2016, a flock of ~300 Corellas was damaging an apartment block in Caroline Springs, an outer suburb in Melbourne's north-west. The birds were chewing wires, rubber seals and window seals, defaecating on the building and its grounds, and their screeching was annoying guests. We used one Barking Owl and one Wedge-tailed Eagle over three consecutive mornings at the site and all three of the techniques previously described: fly-overs by the raptors, encouraging the raptors to flap their wings, and holding the raptors still in the hand. Flying the raptor over the site proved the most effective in dispersing the Corellas. However, by the third morning it was necessary only to have the Eagle flap its wings to disperse the Corellas. After 2 months, no Corellas had returned to the site.

At another apartment block in Frankston, an outer south-eastern suburb of Melbourne, Silver Gulls roosting on the roof of an apartment block could not be dispersed by flying raptors over the building. The Gulls were nesting on the

roof and were fiercely protective of their young, readily mobbing the raptors that were used.

Discussion and conclusions

Pest birds are considered to be those that cause damage to or interfere with human activities. From the birds' perspective, they are simply exploiting an available resource.

Traditional methods of limiting damage to crops by foraging birds have involved poisoning, shooting, capture and killing, exclusion, scaring by noises or models, relocation and habitat manipulation (Bomford & Sinclair 2002). Each technique has limitations. Poisoning, by luring the pest birds to toxic baits such as poisoned grain, can kill non-target species including other birds and mammals (Eason *et al*. 2002). Typically, the pest birds are free-fed the poison-free material for some weeks before poison is used to kill the birds (Bomford & Sinclair 2002).

Shooting pest vertebrates has been a common control technique in Australia. A review of shooting to control bird damage found that although it was widely used, it was expensive, time-consuming and largely ineffective (Fleming 1990). Trapping and relocating pest birds is also expensive and, where it has been tried, has been found to be ineffective. For example, Australian Brush-turkeys *Alectura lathami* returned at a high rate when relocated 6 km from a Hoop Pine *Araucaria cunninghamii* plantation (Keys 1990).

There is also growing community concern about inflicting suffering or death on wild animals. This is especially manifest in the movement to adopt methodologies consistent with compassionate conservation principles. Non-lethal means of managing conflict are thus ethically and socially preferable, although Rohwer & Marris (2019) argued that the preservation of biodiversity cannot always be reconciled with compassion.

Habitat manipulation includes planting crops away from potential roost- and nest-sites of pest birds. In the almond farm case study here, this is impractical as the farm adjoins the riparian vegetation of the Murray River. In other sites, it may be possible to either plant crops away from trees and powerlines or remove fringing trees. Other means of manipulating habitat to make it less desirable for foraging birds is to reduce the clear view the birds have of their surroundings and thus of potential predators (Ford 1990).

Scaring birds by using loud noises (e.g. gas guns), alarm calls and predator calls have been deemed largely ineffectual (Bomford & Sinclair 2002), especially when the noises are played regularly. A review of scaring devices found that they may reduce bird damage in certain circumstances, but only if "they are started early, used infrequently and irregularly, moved often, incorporate random effects, and are reinforced with real danger (usually shooting) and include consideration of the biology and behaviour of the target species" (Bomford & Sinclair 2002, p. 41). Models of prey species have been found to be ineffective in deterring pest birds (Bomford 1990). Harris *et al.* (2017) also reported optical deterrents had the least impact on numbers of Rock Doves *Columba livia* when different techniques were used to exclude the birds from sites at a university campus in South Africa.

Scaring the birds can also actually increase damage to crops. This has been observed, for example, when birds that are feeding in an orchard drop the fruit they are consuming when the scare device activates and pick another when they return (Fleming *et al.* 1990; Ford 1990).

There have been few reports of flying raptors to disperse crop-feeding birds (Daugovish & Yamamoto 2008; Navarro-Gonzales & Jay-Russell 2016; Harris *et al*. 2017). These studies found that falcons can be successful in dispersing pest birds, but that the degree of success is usually site-specific and dependent on many factors such as the crop types, habitat (e.g. availability of shelter), season and the target species' behaviour. Use of raptors to scare away other birds is expensive and requires specialist skills of the handlers and much training of the raptors. Sometimes pest birds simply return to the site when the threat has disappeared (Harris *et al*. 2017), especially when they are nesting and rearing chicks at the site.

Our field trials have demonstrated that trained raptors can be effective in dispersing flocks of pest birds. The raptors are most effective when flown over the site in question but can also be effective when they are held in the hand or held and made to flap their wings. Use of raptors seems to be most effective when the birds are causing damage in a localised area over a specific time period. We also found that raptors can effectively disperse flocks of parrots on sporting fields and on one building when the raptors are flown on several successive days. The technique was not effective, however, when used to try to disperse nesting Silver Gulls. Gulls are often considered difficult to disperse; Soldatini *et al*. (2007, p. 338) described *Larus* spp. as "highly social and intuitive" when testing the efficacy of three systems used to deter gulls (Black-headed and Yellow-legged Gulls *L. michahellis*) from scavenging at refuse dumps in Italy. Silver Gulls have also proved difficult to disperse at Sydney airport using Peregrine Falcons (Olsen 1994). More work also needs to be undertaken on whether the effects of raptors on resident birds is the same as for migratory or transient flocks.

Our trials involved using a minimum of two expert handlers and several species of raptor, and all were effective in dispersing Long-billed and Little Corellas, Sulphur-crested Cockatoos and Silver Gulls (except for those Gulls nesting on the apartment roof). Using raptors to manage pest birds is thus relatively expensive and is only cost-effective when the period of dispersal required is limited, the target area is not large and the potential damage is costly.

This technique has other advantages. Non-target species (especially small birds) seem not to be affected. As the targeted birds are not killed, the technique is considered to be humane and exemplifies compassionate conservation practice. Finally, the technique has environmental advantages. Poison is not left out to harm target wild birds and non-target species or to leach into the soil, vegetation is not destroyed to reduce habitat of the target bird populations, and finally there is no loud noise pollution affecting nearby areas.

In urban areas, birds can become pests because of additional resources that humans provide. This may be in the form of waste dumps, food left on sporting fields and humans feeding birds. Management of human behaviour may thus represent a more cost-effective strategy in mitigating the deleterious impact of pest birds.

Acknowledgements

The trials were conducted under Wildlife Research Permit 10007595 from the Department of Environment, Lands, Water and Planning and Animal Ethics Approval 14-016 from Federation University Australia. Full Flight Birds of Prey has a Displayer's Licence (12529570) and received income from the trials. We thank Drs Anne Wallis, Arian Wallach and Stephen Debus for their helpful comments on the manuscript.

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Received 24 March 2019, accepted 23 June 2019, published online 3 October 2019