

Adaptation of Behaviour by Two Bird Species as a Result of Habituation to Humans

by B.M. METCALF, S.J.J.F. DAVIES and P.G. LADD

School of Environmental Science, Murdoch University, Murdoch,
Western Australia 6150

Summary

Over a number of years it has been noticed that two bird species, Carnaby's Cockatoo *Calyptorhynchus latirostris* and the Grey Currawong *Strepera versicolor*, have begun to repopulate areas from which they had fled with the advent of European settlement. The flight-initiation distance (FID) of these species in these areas was compared with that from areas with a minimal human presence. The median FID was significantly less for birds from 'urban' areas compared with birds from 'rural' areas. Both species learn habituation to humans. It is likely in the Grey Currawong that this behaviour is either learned from adults by the young individuals that establish new territories in areas closer to human habitation, or is the result of a process of selection favouring individuals which ignore human disturbance and therefore have more time to care for offspring. In Carnaby's Cockatoo the habituation that is apparent in urban areas is modified by a return to increased wariness in areas where breeding occurs. This may be related to cockatoos being more cautious when caring for young than they would be when lacking this responsibility in urban areas.

Introduction

Evading predation is one of the foremost concerns of any prey animal (Ydenberg & Dill 1986). This task affects much of a prey animal's behavioural patterns, influencing factors such as where and how it eats and forages. One of the main indicators of threat perception exhibited by prey animals in their interactions with predators is the flight-initiation distance (FID). This distance is defined by Kramer & Bonenfant (1997) as being 'the distance from a predator at which a prey begins to flee'. The behaviour is thought to be governed by the economic hypothesis, where a prey animal is constantly taking into account a variety of factors to decide whether to stay or flee (Dill & Ydenberg 1986).

The FID appears to vary according to factors such as the direction the predator approaches, distance to cover or refuge (Dill & Houtman 1989, Hughes & Ward 1993, Kramer & Bonenfant 1997), predator approach velocity, food availability (Ydenberg & Dill 1986, Lima & Dill 1990, Brown *et al.* 1994), predator risk (i.e. the risk a particular predator species poses to the prey individual, Ydenberg & Dill 1986) and prey species group size (Dill & Ydenberg 1986, Ydenberg & Dill 1986).

It has been observed over a number of years that both Carnaby's Cockatoo *Calyptorhynchus latirostris* and the Grey Currawong *Strepera versicolor* appear to have repopulated areas from which they had previously fled as a result of human encroachment (SJJFD pers. obs.). This study examined the FID of these two species in the south-west of Western Australia, to establish whether the FID was less for those individuals in areas with a high intensity of human activity or presence compared with those in areas with lower human activity or presence.

Grey Currawongs are large territorial birds that inhabit eucalypt forests, woodlands, mallee and heath, and feed on large insects and orchard fruit (Blakers *et al.* 1984). They are mostly solitary or occur in pairs but have been seen in groups of up to seven. They reportedly retreated from the Wheatbelt Region of the south-west of Western Australia in the 1940s but have since returned (Serventy & Whittell 1976).

Carnaby's Cockatoo is a large, mostly granivorous bird, which inhabits eucalypt forests, *Banksia* woodlands and pine plantations. This cockatoo species has disappeared from much of its former range in the Wheatbelt, owing to the extensive clearing and destruction of its natural habitat (Saunders 1980).

Methods

Study sites

All sites used in this study were selected opportunistically due to the widespread but sporadic occurrence of the two species (Figure 1). Sites were classified according to the intensity of human activity or presence in the area:

Alpha areas had a high intensity of human activity or presence

Beta areas had a low intensity of human activity or presence (see Appendix A for site descriptions).

When one or more Grey Currawongs or Carnaby's Cockatoos were located, their flight-initiation distance (FID) was measured by an observer approaching the birds until they took flight. At this point, the angle between the line joining the (stationary) bird's former position to the observer's current position and the distance from the observer to the point directly

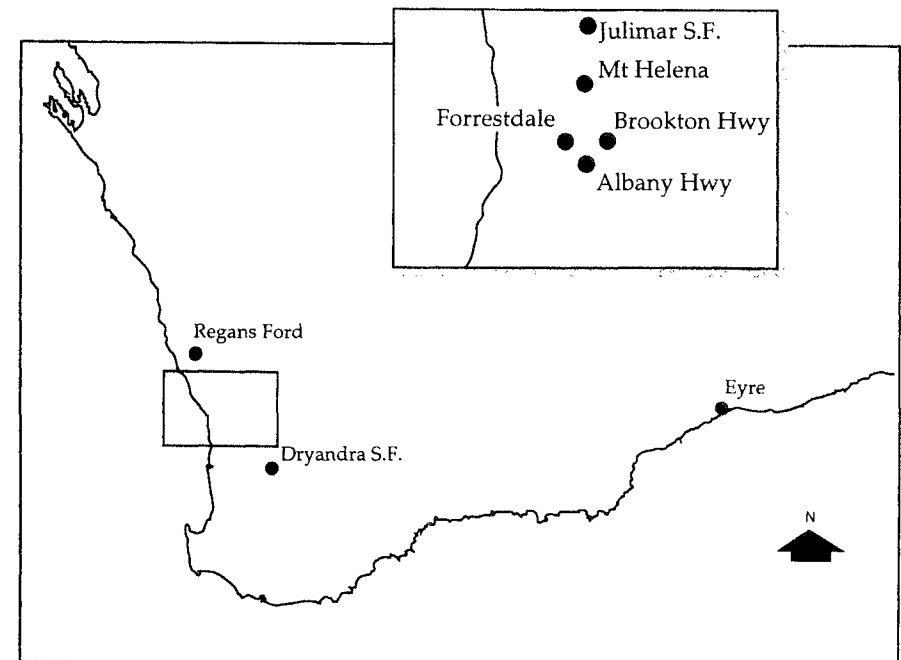


Figure 1. Location of study sites in south-western Western Australia.

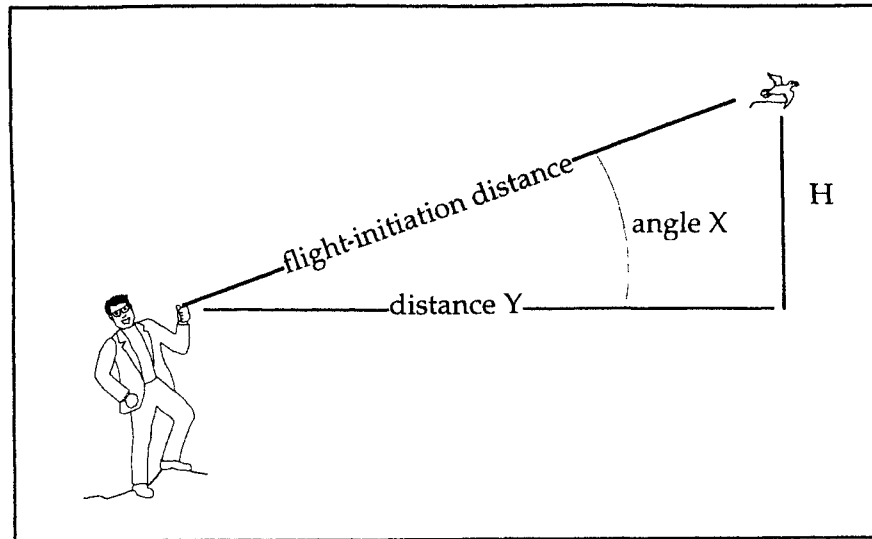


Figure 2. Measurements used to calculate the flight-initiation distance.

Table 1

Comparison of Grey Currawong and Carnaby's Cockatoo behaviour in alpha and beta areas. (a) Flight-initiation distance (FID) of birds that flew away on approach. (b) Comparison of a bird's height (H) in vegetation if it did not fly with the FID of birds that did move. F = FID for birds that flew away, NF = height above ground for birds that did not fly away, NA = not available, NS = not significant.

Area types	Grey Currawong		Carnaby's Cockatoo				
	Alpha	Beta	Alpha	Beta			
(a) FID							
Mean FID±SE (m)	12.0±1.97	32.6±2.80	11.5±0.85	26.3±3.50			
No. of FID measurements	23	29	23	12			
Variance	89.5	216.3	16.7	147.2			
Mann-Whitney U-test U-value	75		37				
Probability	P<0.05		P<0.05				
(b) Comparison of FID for birds that flew away on approach (F) with height (H) for birds that did not fly away on approach (NF)							
Mean±SE (m)	F 12.0 ±1.97	NF 10.9 ±2.75	NA	F 11.5 ±0.85	NF 9.0 ±1.03	F 26.3 ±3.50	NF 14.3 ±0.88
No. of measurements	23	5		23	22	12	15
Variance	89.5	37.9		16.7	24.4	147.2	11.5
Mann-Whitney U-test U-value	57			182.5		36	
Probability	NS			NS		P<0.05	

beneath the bird's former position were both measured. These two measurements are denoted as angle x and distance y in Figure 2. The oblique FID was calculated from the trigonometric formula:

$$FID = (1/\cos \text{ angle } x) (\text{distance } y)$$

A comparison was also made between the height of bird(s) when first observed and whether or not they moved, because in some cases birds did not fly away. The height (H) of the bird(s) above the ground was calculated using the following formula:

$$H = (\tan \text{ angle } x) (\text{distance } y)$$

The Mann-Whitney U test was used to test the significance of the differences between alpha and beta areas.

Results

The mean FID for Grey Currawongs in beta areas was 20 m greater than in alpha areas ($U = 75, P<0.05$; Table 1). This was a larger difference than for Carnaby's Cockatoo where the FID was only 15 m greater in beta areas than in alpha areas (although still statistically significant; $U = 37, P<0.05$).

The mean vertical distance between a bird and observer at which the bird did not fly away was less than the oblique FID for both species but was only significantly different for Carnaby's Cockatoo in the beta areas. In this case the vertical FID was considerably smaller than the oblique FID. Carnaby's Cockatoo would allow a much closer approach if it was higher than 14 m above the ground. There were insufficient records to test the Grey Currawong in beta areas.

Discussion

Grey Currawong

This study shows that Grey Currawongs in areas where they are exposed to human activity have a shorter FID than those from areas where human activity is less or absent.

The Grey Currawong is a resident species, maintaining a large permanent territory to which it confines its activities. Birds which occupy territories that abut areas of high human activity are little molested by humans and therefore have the opportunity to perceive that human activity is innocuous. Similar habituation to innocuous stimuli has been noted in other bird species. Owens (1977) observed that Brent Geese *Branta bernicla bernicla* quickly became habituated to most noises, taking flight when originally exposed to the sound of gun shots but soon learning to ignore them if no associated danger was perceived. On the other hand, birds from beta areas seldom contact humans. According to the economic hypothesis the distance at which it is worth fleeing from an object posing a threat is related to the degree of threat posed by that object (Ydenberg & Dill 1986, Ellard 1996). Because humans are seen so seldom by beta-area birds, habituation has had little opportunity to occur. The difference between the FID of alpha and beta birds may therefore depend upon learning by the individual (Recarte & Vincent 1998). The fact that the species is now reoccupying the parts of its range in urban areas from which it had fled in the past may indicate that relative indifference to humans is passed on as learned behaviour to the offspring, which eventually have to establish new territories.

Carnaby's Cockatoo

The results for Carnaby's Cockatoo are similar to those for the Grey Currawong: birds in alpha areas, where they have been exposed to intense human activity, show a shorter FID than those birds occupying beta areas, where there is less human activity.

Unlike the Grey Currawong, Carnaby's Cockatoo is a migrant that nests in farming and forest areas with little human activity and spends the summer around urban areas (Blakers *et al.* 1984). It is therefore interesting that they appear to have learnt that humans seldom molest them in their summer range but are much warier when breeding. Despite being habituated to humans in urban areas, complacency in nursery areas is lower.

The relationship between the FID and the height (H) of the bird in vegetation when first observed is harder to understand. It may be that experienced birds have recognised that humans seldom leave the ground. A similar situation was noted during fieldwork on the interactions between Grey Currawongs and vehicles. The Australian Raven *Corvus coronoides* scavenging on roadsides behaved similarly by ignoring vehicles passing at speeds of 70–110 km/h, yet took flight when a vehicle slowed down or stopped (BMM pers. obs.). This is contradictory to the findings in several predator–prey studies where the prey's FID increased with an increase in a predator's approach velocity (Rand 1964). These birds appear to have recognised that a passing vehicle poses less of a threat than a slowing or stopping vehicle, which may result in humans emerging at close range.

Several other factors have also been recognised as affecting the FID. Previous studies have shown that animals will decrease the FID for the opportunity of an increased feeding rate (Lima & Dill 1990, Brown *et al.* 1994). Prey group size has also been shown to have an effect, although how it affects FID varies for different species (Ydenberg & Dill 1986). Some species show an increase in FID with an increase in group size (Owens 1977, Kenward 1978), some show a minimum or maximum FID at an intermediate group size (Siegfried & Underhill 1975, Krebs & Barnard 1980), and others show no change in FID according to group size (Lazarus 1979, van Schaik *et al.* 1982). An additional factor may be that adults which are caring for young become more wary (increase FID) than when they have only themselves to consider.

The behaviour of Grey Currawongs and Carnaby's Cockatoos differs between areas of intense human activity and areas where human activity is minimal. It is likely that the effect is from the habituation of individual birds. However it is also possible, particularly in resident Grey Currawongs, that selection has favoured individuals that are tolerant of harmless human activity, thereby lowering the FID of these birds because birds that are less wary have more time to feed or to guard against more compelling threats.

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Appendix A*Site descriptions*

Site descriptions include the site's classification (i.e. alpha or beta), predominant vegetation types (e.g. Marri *Eucalyptus calophylla*, Jarrah *E. marginata*, pine plantation) and which of the two bird species was recorded there (i.e. Carnaby's Cockatoo and/or Grey Currawong).

Albany Highway–Monodnocks State Forest and Gleneagle State Forest

These sites were classified as beta sites even though there is an almost constant human presence in the form of vehicle movement on the highway. The reason for this is that the birds have little direct interaction with humans themselves; rather, they interact with the vehicles. The vegetation at these sites consisted primarily of Marri–Jarrah Forest with small areas of pine plantations. Both bird species were present.

Brand Highway–Regans Ford

This site was classified as a beta site for the same reason given for the Albany Highway sites. The vegetation on the road verge was *Banksia* woodland, and only Carnaby's Cockatoo was recorded.

Brookton Highway-Illawara State Forest and Christmas Tree Well

These sites were classified as beta sites for the same reason given for the Albany Highway sites. The vegetation consisted of three types: Marri-Jarrah forest, Wandoo *E. wandoo* woodlands and pine plantations. Both species were present.

Dryandra State Forest (Narrogin)

This site was divided into two areas; the first surrounding the village was an alpha area, whilst the second in the north-western corner of the main block was a beta area. Because of the territorial nature of the Grey Currawong (Blakers *et al.* 1984), it was deemed that the Currawongs recorded in these two areas would remain within them and conform to the classifications. The vegetation of this site consists primarily of Wandoo woodland with some small Mallet *E. astringens* plantations. Carnaby's Cockatoo was not observed here.

Eyre Bird Observatory

This site, although located within the coastal mallee of the Nuytsland Nature Reserve, was classified as an alpha site, due to the close proximity of the Observatory itself. The Grey Currawongs (the only species of the two to be recorded at this site) that were recorded there had a territory that surrounded the Observatory, and therefore were subject to an almost constant human presence.

Julimar State Forest

This site was classified as a beta site, owing to minimal human presence. Only Carnaby's Cockatoo was recorded, from areas of pine plantation and Marri-*Dryandra* woodland.

Mt Helena

This site was classified as an alpha site, owing to its location in the rural-urban fringe and the constant presence of humans within the area. Both Carnaby's Cockatoo and the Grey Currawong were recorded. The vegetation of the area consisted of Marri-Jarrah forest, pine plantation, orchards and agricultural pastures.

Forrestdale-Nicholson Road

This site was classified as an alpha site for the same reason as given for Mt Helena. Only Carnaby's Cockatoo was recorded, in areas of *Banksia* woodland.

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