
Living with a dangerous neighbour: Australian magpies in a suburban environment

Darryl N. Jones

INTRODUCTION

Interest in the ecology and conservation of wildlife living in urban environments is currently growing rapidly (Gilbert 1989). Today, urban planners and wildlife managers may call upon a vast amount of scientific information as they deal with conflicts, develop conservation schemes, or advise residents on methods of encouraging wildlife into yards. It was not always so easy. In one of the first detailed studies of urban bird communities, the late J. T. Emlen made the observation that urban and suburban environments were commonly shunned by field ornithologists (Emlen 1974). Despite this neglect, he argued that, "The establishment of cities may be regarded as ecological experiments. . . [in which] the structure and balance of the new communities will reflect not only the nature of these local resources and features, but also *the interactions of the species that converge on them*" (my emphasis) (Emlen 1974). Emlen's study of urban birds, conducted 27 years ago in the streets and surrounding deserts of Tucson, Arizona was to become an influential work in establishing serious investigations of wildlife in urban areas.

One of Emlen's main concerns was the potential impact of introduced species on the local native species. This remains a primary concern in much of urban ecology. Competition for breeding sites, mortality due to introduced predators, impacts of weed invasions, for example, continue to be studied closely (Gilbert 1989). More recently, however, the converse has become of considerable concern: the impact of native species on one of the dominant resident species, *Homo sapiens*. Throughout the world, a wide variety of wildlife species are invad-

ing the cities, exploiting the often abundant foods and shelter available and occupying numerous artificial habitats (Munyenembe et al. 1989). While many of these species appear to have occupied vacant niches within the synthetic urban environment, others have had a decidedly negative influence on humans and their habitats (e.g. McAninch 1995; Berwick and Saharia 1995).

Perhaps the most serious of these human-wildlife interactions concerns species with the capacity for causing, either directly or indirectly, serious injury or disease. In Australia, by far the most important urban wildlife species to be involved in potentially injurious interactions with humans is the Australian magpie (*Gymnorhina tibicen*). Every year, breeding magpies attack large numbers of people passing near the birds' nest trees (Jones 1996; Cilento and Jones 1999). However, it is only a minority of birds (and these are almost always the males) which attack humans; most magpies live amicably among humans (Cilento and Jones 1999). Because of the many serious injuries that result from these attacks, managers have traditionally undertaken lethal control actions, usually in the form of shooting. This method of control remains the most common management action in rural areas and small towns, but shooting has recently become highly controversial in many cities (Jones and Thomas 1999). We have shown (Jones and Thomas 1998) that, contrary to the assumptions of many managers, a clear majority of people that had been attacked did not support lethal control methods. Indeed, despite their well-known reputations as a dangerous species, magpies remain widely admired and appreciated

Author's address: Suburban Wildlife Research Group, Australian School of Environmental Studies, Griffith University, Nathan Qld. 4111 Australia.

(Rowley 1974).

Although the species' general behaviour and ecology has been studied in detail over many decades (Robinson 1956; Carrick 1972; Brown and Veltman 1987; Farabaugh et al. 1992; Hughes et al. 1996), the phenomenon of attacks on humans has only recently been the subject of detailed studies (Cilento 1995; Cilento and Jones 1999). Consequently, management has tended to be based on personal experiences and anecdote. The lack of reliable information remains a serious impediment to understanding a complex conflict, and undermines attempts to develop a comprehensive management plan for this species.

Being strongly territorial, pairs or groups of Australian magpies effectively occupy all suitable habitats within the suburbs; almost every recreational park and area of vacant land supports magpies (Jones et al. 1997; Jones and Finn 1999). Australian magpies typically forage on the lawns and grassed areas that also are the open spaces intensively used by suburban people for recreation. In such circumstances, interactions between the birds and humans, both positive and negative, are frequent and inevitable (Jones and Thomas 1998).

This paper provides a concise overview of the human-magpie conflict and provides details of recent work aimed at investigating the suburban environments in which the conflict occurs. The work was conducted in Brisbane, a city of one million inhabitants, located in subtropical Queensland, Australia. In particular, the paper attempts to (1) describe patterns of magpie attacks in a suburban environment, and (2) discern whether features of the bird's biophysical and human-related environments correlate with attacks.

METHODS

This paper provides an overview as well as describes new findings. The data is derived from a variety of sources. Ecological and behaviour studies are described in detail below, while the more general information on the patterns of attack comes from data collected by the Queensland National Parks and Wildlife Service (QNPWS), or previously published reports (Jones et al. 1997; Jones and Thomas 1998).

Study Species

The Australian magpie is a crow-sized passerine somewhat ecologically similar to the blue jay (*Cyanocitta cristata*). It is widely distributed throughout most of Australia and has been successfully introduced to New Zealand (Blakers et al. 1984). Historically, it was found in most open habitats (Blakers et al. 1984). The clearing of large areas for

agricultural and pastoral development greatly favoured this species, whose preferred habitat is broad areas of short grass interspersed with tall trees suitable for nesting (Carrick 1972). Suburban development has provided vast areas of well-maintained lawns interspersed with trees, alternative food resources including intentional feeding by householders (Jones et al. 1997).

Magpies are a resident and sedentary species, occupying all-purpose territories that are defended throughout the year-round (Carrick 1972). Breeding groups numbering 2-20 adults defend territories of 3-40 ha, territory size being primarily a product of habitat quality rather than group size (Hughes and Mather 1991). There is a north-south gradation in group size and sociality. Most birds in the Brisbane region breed mainly as pairs, while birds in more temperate regions breed communally in much larger groups (Hughes et al. 1996). All group members participate in territorial defense, frequently cooperating to drive out trespassing conspecifics (Brown and Veltman 1987). The groups actively attack and expel potential predators detected within the territory (McIlroy 1968; Cilento and Jones 1999).

Australian magpies are naturally an extremely aggressive species. Brown and Veltman (1987) note that almost all social behaviours are associated with antagonistic interactions, which are directed against conspecifics and heterospecifics. Fatal attacks on a wide variety of avian species, many harmless, are common (McIlroy 1968; Paton 1977).

During the breeding season, mainly July to November, attacks on territorial intruders are most intense, peaking immediately prior to the young leaving the nest (Cilento and Jones 1999). Although both males and females attack heterospecifics, males almost exclusively attack humans (Cilento and Jones 1999).

Study Sites

General Patterns — General information on magpie attacks is based on agency data and is relevant for the entire Greater Brisbane region (27° S, 152° E). Between 200 and 450 attack reports are received by the QNPWS (and subsequently sent to the author) each year. These contain details of the location of the attack and resulting injuries. These reports, in combination with data contained in recent studies, especially Cilento 1995, were used to determine the patterns of magpie attacks in the Brisbane area. Data for nine years (1986-89 and 1994-98) has been used in this section.

Ecological and Behavioural Studies — Intensive studies of suburban magpies were made in 5 sites within southern Brisbane, each identified by the suburb in which they were located: Corinda; Holland Park West; Coopers Plains; Mansfield and

Wishart. The size of the sites ranged from 116 ha to 375 ha. Sites were selected as representing regular suburban areas in Brisbane, though limited to southern suburbs for logistical reasons. All sites included some parks and small areas of treed vacant land, but did not include large commercial or industrial areas. All sites were dominated by blocks of 1-2 story domestic dwellings. Some large arterial roads pass through the site. Schools and child-care establishments were found in most sites.

Because almost all magpie attacks occur within a relatively small zone around the nest tree, a radius of less than 100m, (Cilento 1995), it is important to investigate this area in some detail. For a square area of 100m² centered on each nest, the following information was obtained: distances to foraging areas, pedestrian paths, and nearest neighbouring magpie nest (m); the total area occupied by mown grass, rough grass, bare or road, and thicket (%); and estimates of the total foraging area available within the pairs territory (m²). In addition, notes were made of the proximity of the nest to schools, child-care centres, and any other places of human concentration.

Observations of the behaviour of birds were made during 30 minute watches of 44 focal pairs from all sites, made at least twice during each phase of the nesting cycle (nest building, incubation, nestlings, and fledglings). All human intruders were noted and the reaction of birds, made separately for sex, recorded in detail (see Cilento and Jones 1999, Jones and Finn 1999 for further details).

RESULTS

Seasonal Patterns of Magpie Attacks on Humans

Magpie attacks on humans were extremely seasonal. Based on agency reports, magpies in Brisbane attacked between July and January. However, there was a distinct peak in August-October each year, a period which accounted for 93% (of 2143 reports for nine years) of all reports. The annual mean (\pm SD) for reports received was 289.7 \pm 80.8 (range: 192-453) reports per year. These reports do not always represent individual birds; some birds are reported multiple times. Assuming 5% over-reporting (D. Jones unpubl. data), I estimate that an average of about 270 aggressive birds are reported annually for Brisbane.

The pattern of reports closely matches both the rate of attacks and the phase of breeding. These figures demonstrate that magpies are most likely to attack humans while there are chicks in the nest and that the rate and intensity of these attacks increases as the chicks grow, peaking immediately prior to fledglings leaving the nest. The attacks occurring much later in the season are almost entirely associated with re-nesting pairs.

Types of injuries

During most attacks on humans, magpies do not make physical contact. A typical attack involves distinctive alarm calling, wing-drooping and a direct flight toward the intruder from behind which ends with a swallow swoop, avoiding the victim by several meters (Cilento 1995; Jones and Cilento 1999). By far the majority of attacks are of this type and are rarely reported (Jones and Thomas 1999).

Contact attacks (which are reported!) involve a similar preparation and flight but with the bird hitting the intruder with its breast or wings or, more commonly, pecking the cheeks, ears or neck with the bill at the point of closest contact (Cilento 1995). These attacks are the regular type used in attacking cyclists. Almost all of these attacks are from behind the intruder (Cilento 1995).

Much less often, certain birds also attack the intruder's face directly from in front. Our observations and the recollections of victims suggest, very strongly, that these birds are deliberately targeting the eyes.

During 1998, from a total of 453 reports (for about 430 aggressive birds), 8.5% of complainants mentioned some form of injury. All of these involved the drawing of blood, usually from minor injuries to the neck, back, shoulders, ears or face. Thirteen complainants specified eye or near-eye injuries, and in 7 cases, the injuries resulted from children falling off bicycles while attempting to avoid the attack.

Density of suburban magpies

Each of the 5 suburban sites supported breeding populations of magpies. The density of nesting magpie pairs varied from 0.15 birds per ha to 0.04 birds per ha. Although the mean density of birds for all sites was 0.12 \pm 0.06 birds per ha, 2 of the sites (Mansfield and Wishart) had very low numbers of magpies (0.04 and 0.05 birds/ha, due to the small number of suitable nest trees (Jones et al. 1997). This contrasts markedly with the other 3 sites where the density of birds was very similar: 0.15; 0.17; and 0.18 birds per ha. Thus, Brisbane magpies were found in 2 densities, high and low, with the low density sites having 35.4-44 ha per pair and the high density sites having 11-13 ha per pair.

This data includes only nesting pairs of magpies. Any population of magpies will also include significant numbers of non-breeding birds living a somewhat marginal existence on the periphery of breeding territories. These non-breeders are found in many locations throughout Brisbane, in loose groups of from perhaps ten to 40, and are termed 'flocks' by Carrick (1972). In this study, the only flock known to occur within a site was a group of about 20-30 mainly young birds living in the Corinda area. When these birds are added to the breeding population, the

density of all magpies is close to 0.2 birds per ha.

How many suburban magpies were aggressive? — The selection of study sites was made independently of knowledge of the presence of magpies. This allowed an unbiased survey to be made of the proportion of aggressive magpies within the 5 populations.

A total of 118 breeding magpies (or 59 pairs) were observed in detail in the 5 sites. Of these, only 11 birds displayed definite aggressive behaviour toward humans. This represents a figure of 9% of nesting magpies or 18.6% of all pairs. The distribution of aggressive birds within the suburbs was not, however, equal. Two of the sites, Holland Park West and Wishart, though having a total of 22 pairs between them, had no aggressive birds. In both the Corinda and Mansfield sites, 16% of birds were aggressive, though the latter only supported 3 pairs.

Environmental Features near Magpie Nests

At present, there is no obvious reason evident for the aggression of certain magpies towards humans. It is important, therefore, to investigate all possible influences on the birds. One set of possible influences may be features of the physical environment in the area surrounding the nest. Environmental features were measured in the areas surrounding the nests of breeding suburban magpies, comparing the locations of aggressive to non-aggressive birds. However, none of the 8 features compared were statistically different for these 2 groups.

Human-related Features near Magpie Nests

There are 3 main ways in which humans commonly interact with humans: by passing through the nest vicinity; by feeding the birds; and by aggravating the birds. The latter is extremely difficult to assess: most aggravation occurs out of sight of observers. It is possible, however, to investigate the general relationship between magpie aggression and human feeding, and magpie aggression in relation to concentrations of human activity.

Are magpies fed by humans more likely to be aggressive?

About 65% of the magpie pairs were known to utilize food provided by humans. There was no difference in the percentage of aggressive or non-aggressive birds that were fed.

Are magpies that experience high human traffic more likely to be aggressive?

This question was investigated in 2 ways. First, the percentage of aggressive and non-aggressive magpies nesting near centres of human concentration was determined. This proportion was higher for aggressives (67%) than for non-aggressives (43%),

but this was not significant (test of proportions, $n=44$).

The second aspect concerned the large number of schools from which aggressive magpies had been reported. A simple questionnaire was administered to all state schools in the Brisbane region, requesting information on the incidence of magpie attacks. Of the total of 167 replies, 38% reported that magpies were a current problem.

DISCUSSION

Most people growing up in Australia have been attacked by a magpie at some time during their lives (Jones 1996). For many, magpie attacks are an annual event. Interestingly, there is a significant gender difference: 90% of males compared to 70% of females have been attacked (Jones and Thomas 1999). The ubiquity and familiarity of these interactions seem to have resulted in a remarkable level of tolerance and even humour among the general public. Such attitudes seem less appropriate when the numbers of attacks and injuries are tallied. Despite its seemingly trivial nature (to some), magpie attacks on humans remains a very serious urban wildlife issue in Australia.

Patterns of Magpie Attack

The seasonal pattern and concentration of reports and attacks to a 3 month period corresponded closely to the presence of chicks in the nest. It is a pattern virtually identical to pattern of attacks occurring in Canberra, the only other city undertaking similar studies (ACT Parks and Conservation Service 1998).

However, our attempt to determine whether particular aspects of the bird's breeding environments were correlated with likelihood of attacks on humans was not fruitful. Aggressive and non-aggressive birds lived in virtually identical habitats, including concentrations of humans, and were equally likely to accept food from humans.

Although this comparison was not significant, the study has provided the first description of ecological features of suburban magpies. Although this is a very well researched species (e.g. Robinson 1956; Carrick 1972; Hughes et al. 1996), all previous work has been conducted in rural locations, normally far outside urban areas. The phenomenon of magpie attacks of humans is, however, almost entirely suburban in geography, and an understanding of the species use of the suburban environment is essential.

Reliable data on injury rates resulting from magpie attacks are almost nonexistent. Nonetheless, the nature of the attacks and the potential for more serious injuries is always high. Typically, most attacks on people are in the form of shallow non-

contact swoops. However, as the season progresses, the intensity of attacks increases, as evidenced by higher rates of attack (Cilento and Jones 1999), and, for a proportion of the aggressive birds, an increased likelihood of contact between the bird and the intruder (Jones et al. 1980, Jones et al. in press).

During their attacks on people, many aggressive magpies target the head and often the face of the intruder. This is a feature common in the close-range anti-predator behaviour of many species of birds (Curio 1993). This greatly increases the potential for serious injury. For humans, reliable data is difficult to obtain, numerous eyes are lost or permanently damaged by magpie attacks in Australia annually (Horsburgh et al. 1992; Sutherland 1995). Our result of about 9% of attacks, resulting in some form of injury, is lower than that of early findings for Canberra where Jones et al. (1980) estimated 25-30% of attacks involving contact resulted in some form of injury requiring attention. This difference may simply relate to methods of reporting. Certainly preliminary comparisons do not suggest that Canberran magpies are any more dangerous than those of Brisbane (P. Higgenbotham pers. comm.).

Why Do Magpies Attack Humans?

Although we are far from understanding the causes of this interaction, the patterns of attacks described here strongly suggest that this behaviour is a form of brood defense. The seasonal increase on rate of attacks and intensity closely resembles that found for a large number of species (Montgomerie and Weatherhead 1988). The generalized pattern from these studies is one of steadily increasing response to a potential predator, peaking when the nestlings are largest, and waning rapidly following fledging. The interpretation of this trend has resulted in considerable debate (e.g., Knight and Temple 1986a,b; Montgomerie and Weatherhead 1988; McLean and Rhodes 1991; Curio 1993), the details of which are beyond the scope of this paper. However, the findings of Knight and Temple (1986a, b) show that this trend in intensity of nest defense may best be explained as a result of the repeated exposure of the birds to a familiar intruder who continuously withdraws without harm. Although Knight and Temple (1986b) were primarily concerned with reinterpreting the results of experimental studies of nest defense, I believe that their explanation may have important implications for understanding magpie aggression towards humans.

Suburban magpies have lived for many generations in close proximity to high densities of humans. Large numbers of these birds also rely on human-provided foods, especially during the nestling phase; in Brisbane, we found that more than half of the pairs fed their chicks a diet of mainly cheese and

ground beef (Jones et al. 1997). In such circumstances, humans and magpies obviously coexist without incident, most birds demonstrating clear habituation to the presence of humans (sensu Whittaker and Knight 1998).

For some individual birds, however, this waning of response to the repeated, familiar stimuli of humans may be arrested or reversed should the humans' activities be interpreted by the birds as being potentially or actually harmful to their young. Such a response would be much more likely when the nestlings are present in the nest, and in Australian magpies, is more likely to involve the male (Brown and Veltman 1987). We do not, as yet, know what types of human activities might elicit this type of response, but it is likely that behaviours and stances directed directly toward the nest could be involved as shown in other studies (Knight and Temple 1986b).

However, it is also possible that entirely innocent or benign activities by humans might be involved in the origins of this interaction. Knight and Temple (1986b) draw attention to the positive feedback received by birds attacking an intruder when it leaves rapidly, seemingly in response to the attack. This explanation may be part of the explanation for the large number of magpies that attack mail delivery personnel throughout Australia. This phenomenon is regarded as one of the primarily workplace health and safety issues for these workers (W. Martin pers. comm). These people, dressed identically, make extremely predictable movements (on small motorcycles) most days along precise routes throughout the suburbs. The large numbers of magpies that attack these people do not appear to target any other humans.

A complete understanding of the origins, causes and ontogeny of magpie attacks on humans will require a major research effort from a number of perspectives. Among the variables that are already under consideration are: prior aggravation by humans (being tested experimentally); individual aggressive tendency; testosterone levels; relatedness to other aggressives; and the opportunity to learn from other aggressive birds.

Meanwhile, of course, mitigation of the conflict must continue. Agencies are currently experiencing the inevitable pressure of public scrutiny, and are attempting to cope with the multiple and often sharply divergent stakeholder demands (Decker et al. 1996). One major benefit from this pressure has been a willingness to reassess the strategies traditionally used in conflicts such as this (Jones and Finn 1999; Thomas and Jones in press) and to seek community input and ownership of management plans. Such openness is seen increasingly as essential for agency respectability and credibility if not survival (Decker and Enck 1996).

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