

# THE PRACTICE OF WILDLIFE FEEDING IN SUBURBAN BRISBANE

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Wildlife feeding is a frequently debated topic that generates polarised views but literature relating to the practice is rare. This study provides the extent of wildlife feeding in Brisbane, highlighting common practices associated with feeding in a suburban setting. A questionnaire, delivered to 400 Brisbane residents, asked questions about the species being fed, the food being provided and frequency of feeding. A second section of the survey aimed to gain some insight into the respondent's perception of the practice of wildlife feeding.

Of the 34 per cent of respondents who replied to the survey, 37 per cent indicated they fed wildlife, with the majority doing so between daily or weekly intervals and throughout the whole year. A significant proportion (58%) of feeders were found to use inappropriate foods such as bread. The species most commonly fed were large carnivorous/omnivorous birds such as Australian Magpies and butcherbirds. There were strongly divided opinions on the practice of wildlife feeding. Most non-feeding survey respondents stated that they did not approve of the practice and stated that wildlife did not benefit from feeding, while, not unexpectedly, the majority of feeding respondents gave the opposite opinion. Both feeding and a small percentage of non-feeding respondents agreed that if feeding was to take place appropriate guidelines should be followed. As it appears inevitable that feeding wildlife will persist, readily available information on the correct procedures should be made available to the parties involved.

## INTRODUCTION

Opinions on the practice of wildlife feeding are widely divergent, with some parties actively promoting the practise while others denounce it for many reasons including the harm done to the species being fed. The subject is frequently debated and has led to considerable discussion among relevant parties such as private householders and wildlife agencies (see Hunter 2001; Jones and Howard 2001; Natrass 2001; Low 2002). There is some evidence suggesting that certain wildlife feeding practises may result in a variety of negative outcomes for the species in question. For example, malnourishment caused by eating inappropriate foods (Cannon 1979; Skira and Smith 1991), disease spread by unhygienic food stations (Brittingham and Temple 1988) or dependence on the food resource (Cannon 1984), are among the most common impacts cited by opponents of the practice (see Green and Higgenbottom 2001 for review). Despite such evidence it appears to be a common and widespread activity particularly within suburban areas throughout the world (Cowie and Hinsley 1987; Brittingham and Temple 1988; Cowie and Hinsley 1988). During the 1980s, for example, it was estimated that US\$200 million was spent annually in the United States on commercial birdseed to feed wild birds, and many millions more on associated equipment such as nest boxes and bird feeders (Deis 1982).

Among other reasons, proponents of wildlife feeding argue that feeding wildlife may enable certain species to survive in areas degraded by human development (Howard and Jones, in press). In some situations, supplementary feeding of wildlife has been used to aid the recovery of

threatened species (Wilbur *et al.* 1974) and enhance survival of populations. Many agencies and authorities in Northern Hemisphere countries actively promote the practise of wildlife feeding as a significant conservation activity (e.g. see Cannon 2000). In the United Kingdom, organisations such as the British Trust for Ornithology advises suburban residents on how to provide supplementary food and water during periods when natural food resources may be limited, most obviously during the Northern winter (Cannon 2000). Such feeding has been shown to improve the survival rate and health of wintering birds (Kallander 1981; Grubb and Cimprich 1990) and supplementary food is known to be important in the diets of many suburban birds (Fitzpatrick 1995). A positive feature suggested for wildlife feeding, which does not directly benefit the species receiving the food, is related to the attitudes associated or developed as a result of their involvement in this practice. For example, wildlife feeders may then take a greater interest in wider environmental issues of greater conservation significance (Cannon 1999).

In Australia, while there are few policies explicitly addressing the feeding of wildlife in urban settings, the practice is currently discouraged by many wildlife agencies (e.g. Platt 1999). Cannon (1999), in a review of urban wildlife conservation, remarked, 'Generally, the more conservation-minded and knowledgeable individuals in Australia do not feed wildlife in their garden'. Despite this, and the implicit opposition of many agencies to wildlife feeding, it appears to be a common practice (Thomas 2000; McLees 2001). However, statistics on the actual numbers of people feeding wildlife is rare. The only figures available for Australian cities are those of Thomas (2000),

who determined that 38 per cent of a random sample of 200 households in Brisbane used food to attract wildlife to their house yard, and McLees (2001) who reported a higher feeding rate of 57 per cent in a study carried out in the metropolitan Melbourne area.

The aim of the current study was to provide quantitative data on the extent and types of practices being carried out by suburban wildlife feeders in metropolitan Brisbane. In doing so we hope to discern the prevalence of potential harmful practices, to provide a basis for comparative studies in other locations and assist in the formulation of guidelines for those involved in feeding (see Howard and Jones, in press).

## METHODS

As part of a larger study examining potential food resources (natural and human provided) available to avifauna within suburban environments and their possible ecological effects, 20 sites were selected from throughout southern Brisbane. These sites were suburban areas of about one square kilometre in area, each containing house blocks and some parkland. No sites contained high-rise buildings or industrial areas. At each of these sites, questionnaire surveys were hand delivered to a total of 20 houses, randomly chosen within each suburban area, giving a total of 400 surveys. The main section of the questionnaire aimed to collect quantitative data relating to the extent of wildlife feeding and on the practices used during feeding. We were specifically interested in collecting information relating to what species were being fed, whether people targeted certain species for feeding, what food was provided, how much was provided, how often, and at what times of year.

The remainder of the survey consisted of three open-ended questions, aimed at providing an opportunity for people to express their opinions about the practice of wildlife feeding. The three questions were: 'Do you agree with wildlife feeding?', 'Do you think there are benefits from feeding wildlife and if so what?' and 'Has the abundance of wildlife changed in your area over the years?' It was hoped that this section would highlight any areas of confusion or lack of knowledge that may exist with respect to the practices of wildlife feeding.

## RESULTS

From the 400 surveys delivered, 134 residents replied, giving a 34 per cent response rate. From returned surveys we initially separated those who feed wildlife from those who do not. Of the 134 returned surveys, 37 per cent (50 respondents) were engaged in feeding wildlife of some kind.

### Which species are being fed?

Respondents who indicated that they fed wildlife were asked to list the species that fed from the food they provided. A total of 22 species was mentioned, although the number visiting a specific feeding station varied greatly (mean number of species visiting feeders was 3.3 plus or minus 1.8 s.d. per respondent). Table 1 shows that certain species or groups of species are represented more than others. The Australian Magpie *Gymnorhina tibicen*, closely followed by butcherbirds (Grey *Cracticus torquatus* and Pied Butcherbirds *Cracticus nigrogularis* are combined, as respondents did not reliably distinguish between them), was by far the most commonly fed bird. When combined with the Laughing Kookaburra *Dacelo novaeguineae* and Torresian Crow *Corvus orru*, these carnivorous/omnivorous species were fed by 66 per cent of respondents.

Psittaciform species such as lorikeets, cockatoos and rosellas were also commonly fed, being mentioned by 40 per cent of respondents. Columbiform species (Crested Pigeon *Ocyphaps lophotes*, Spotted Turtle-dove *Streptopelia chinensis* and Rock Dove *Columba livia*) also comprised a major group, mentioned by 26 per cent of respondents. Interestingly, the list of species being fed included only three introduced species (Spotted Turtle-dove, Rock Dove and House Sparrow *Parus domesticus*) and three species that are commonly perceived as pest or nuisance species, the Torresian Crow, the Noisy Miner *Manorina melanocephala* and the Australian White Ibis *Threskiornis molucca*.

Although Table 1 contains primarily avian species, the Blue-tongued Lizard *Tiliqua scincoides* and especially the Common Brushtail Possum *Trichosurus vulpecula* were also mentioned. It would appear that respondents who fed these two species did so with particular foods to attract these species. Certain birds were also targeted: over a quarter (27%) of respondents stated that they intentionally provided food to attract specific species (Table 1) and in many cases actively discouraged other species that tried to consume the food provided. Australian Magpies and Common Brushtail Possums were the most frequently mentioned for specific feeding followed by kookaburras; all other species mentioned as being specifically fed were mentioned by a single respondent.

### What food is being provided?

Food provision was dominated by three food types (Table 2). Bread was the most commonly provided food, with 58 per cent of respondents providing this food type.

TABLE 1

Species mentioned as being fed by respondents from Brisbane. Percentages of respondents feeding, both, non-specific, where feeders fed several species, and also specific where feeding targeted certain individual species.  
† = introduced species.

Species Fed	Non-specific feeders (%)	Specific feeders (%)
AVIAN		
Australian Magpie <i>Gymnorhina tibicen</i>	54	25
Grey and Pied Butcherbirds <i>Cracticus</i> spp.	42	8.3
Rainbow and Scaly breasted Lorikeets <i>Trichoglossus</i> spp.	24	8.3
Spotted Turtle-dove <i>Streptopelia chinensis</i> <sup>†</sup>	18	0
Pale-headed Rosella <i>Platycereus adscitus</i>	18	0
Laughing Kookaburra <i>Dacelo novaeguineae</i>	16	16.6
Torresian Crow <i>Corvus orru</i>	12	0
Noisy Miner <i>Manorina melanocephala</i>	8	0
Rock Dove <i>Columba livia</i> <sup>†</sup>	6	0
Australian Magpie-lark <i>Grallina cyanoleuca</i>	6	0
Duck unspecified species	6	8.3
House Sparrow <i>Parus domesticus</i> <sup>†</sup>	4	0
Sulphur-crested Cockatoo <i>Cacatua galerita</i>	4	0
Galah <i>Cacatua roseicapilla</i>	4	0
Blue-faced Honeyeater <i>Entomyzon cyanotis</i>	2	0
Spangled Drongo <i>Dicrurus bracteatus</i>	2	0
Grey Shrike-thrush <i>Colluricincla harmonica</i>	2	0
Australian White Ibis <i>Threskiornis molucca</i>	2	0
Willie Wagtail <i>Rhipidura leucophrys</i>	2	0
Crested Pigeon <i>Ocyphaps lophotes</i>	2	0
NON-AVIAN		
Common Brush-tail Possum <i>Trichosurus vulpecula</i>	0	25
Blue-tongued Lizard <i>Tiliqua scincoides</i>	0	8.3

TABLE 2

Types of food provided and the percentage of respondents providing these types of foods.

Food type	% of respondents feeding
Bread	58
Mince	32
Seed	22
Cheese	22
Commercial feed mix	20
Scraps	19
Fruit/veg	10
Steak	8
Dog/cat food	6
Honey/water	4
Sausage	4
Live food	2
Native flowers	2
Biscuits	2
Ham	2
Miscellaneous meat	2

Meat-based foods were well represented in the data, with mince being provided by 32 per cent of wildlife feeders. Seed was also a common food. We separated seeds into two types: commercial seed mix, specifically produced to feed birds; and other seeds, such as husked sunflower seeds and peanuts, that are not sold specifically for consumption by birds. When these two categories are combined, seeds were provided by 42 per cent of wildlife feeders. We also asked the respondents to estimate the amount of food they were providing at each feed. Although we provided standard units of measurement to be used, the respondents used a variety of measurements. It was felt the resulting data could not be used to reliably indicate amounts of food being provided.

#### Frequency and seasonality of feeding

To gain further insight into the extent of feeding, we asked each wildlife feeder how often they provided food and if they provided more food at certain times of the year in favour of others. Sixty-eight per cent of respondents stated that they provided food for wildlife between once daily and once weekly, with the remainder indicating that feeding was practiced only occasionally (Fig. 1a). Most respondents fed wildlife throughout the whole year and only a small minority fed only at certain periods of the year (Fig. 1b). Interestingly, of the people who choose to feed at specific times of the year, none chose to feed during winter, the commonly perceived lean period (for natural food), also the respondents did not give any reasoning for choosing the feeding periods they did.

#### Respondents perceptions of wildlife feeding

In the final section of the questionnaire, we posed three open-ended questions aimed at obtaining some indication of personal attitudes towards wildlife feeding with respect to support for the practice, whether wildlife benefit from feeding, and perceptions of wildlife abundances in the respondents' local area.

#### Support for wildlife feeding

Respondents to the questionnaire were asked, 'Do you agree with the practice of wildlife feeding?' Ninety-four

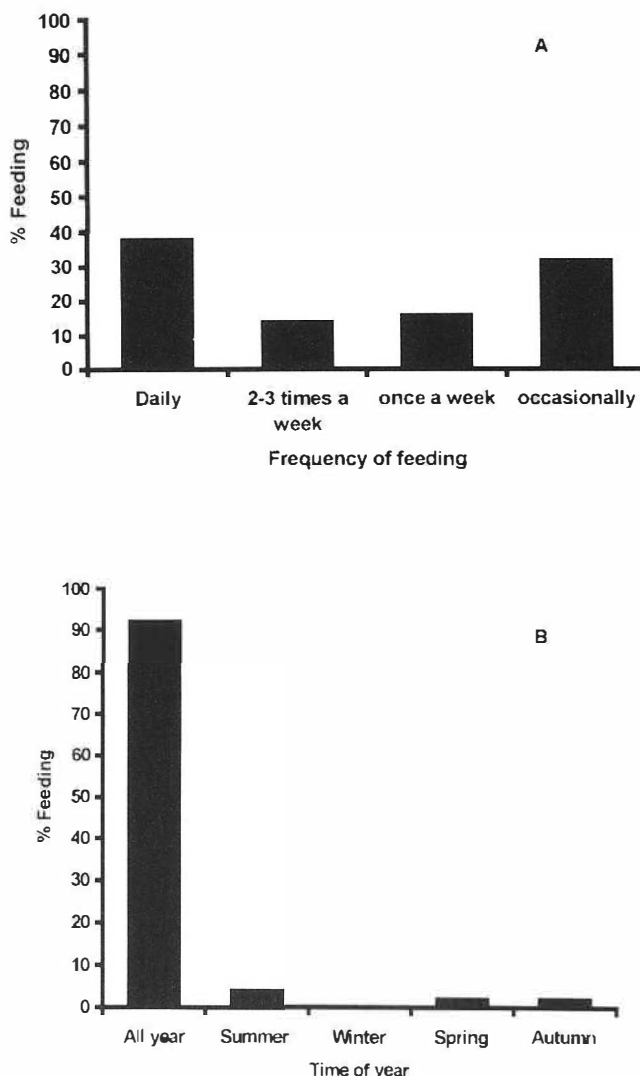


Figure 1. Frequency of wildlife feeding (a) and seasonality of wildlife feeding (b) reported by respondents from Brisbane.

per cent (Table 3) of the 39 wildlife feeding respondents who answered this question said that they thought wildlife feeding was acceptable (Table 3), but of these, 71 per cent ( $n = 27$ ) said it was only acceptable if correct practices were adhered to. We then examined the information provided by the wildlife feeders who said correct practices must be adhered to, to see if they were actually carrying out any inappropriate practices themselves. We classified inappropriate practices as either (1) providing inappropriate food for the species in question (e.g. bread,) or (2)

TABLE 3

Respondents responses to the question 'Do you agree with the practice of wildlife feeding?'

Responses	Feeders (n = 38)	Non-feeders (n = 77)
Yes	23% (9)	3.9% (3)
Yes, but only with correct procedure	71% (27)	20.7% (16)
No	5.1% (2)	72% (56)
Don't know	2.5% (1)	2.5% (2)

providing food too frequently (e.g. daily) (Kraschnefski 1999; Orams 2002). Of the 27 wildlife feeders who said that feeding was only acceptable when correct practises were adhered to, 18 were themselves carrying out a practice that had the potential to harm the species being fed.

Non-feeding respondents' opinions differed greatly from those of the feeders, with 72 per cent (Table 3) stating that feeding was not an acceptable practice. The majority of the remaining non-feeding respondents said they thought feeding was acceptable only if appropriate procedures were followed. In addition many of the non-feeding respondents described in some detail their concerns about the practice. These included a concern for fed species becoming dependent on the food source, nuisance species proliferating at the expense of other species, and the species being fed changing their natural behaviours.

#### *Perceived benefits of wildlife feeding*

Respondents were asked: 'Do you think there are benefits from feeding wildlife and, if so, what?' There were very different views with regard to perceived benefits from wildlife feeding (Table 4). The majority of non-feeders either answered 'no' or 'don't know' to the above question whereas most respondents engaged in feeding stated that feeding benefited the wildlife. The main benefit given by respondents was associated with a perceived lack of natural food resulting from suburban/urban development. Twenty-seven per cent of feeding respondents also indicated that feeding lessened aggressive responses from certain species, notably the Australian Magpie. Although the respondents who said that wildlife did not benefit from feeding were not asked to justify their answers, many provided comments, the most common being 'feeding was an unnatural practice' and that it 'upset the balance of nature.'

TABLE 4

Respondents responses to the question 'Do you think there are benefits from feeding wildlife?'

Responses	Feeders (n = 36)	Non-feeders (n = 75)
Yes	66% (24)	12% (9)
No	16.6% (6)	66% (50)
Don't know	16.6%(6)	21% (16)

#### *Perceived changes to abundance of wildlife*

The question 'Has the abundance of wildlife changed in your area over the years?' was included to gain some insight into whether respondents perceived that there had been a proliferation of certain species or demise of others in their locality. This is not meant as a true measure of species population change in the localities studied but more as an insight into the respondent's casual observations on possible population changes.

Both feeders and non-feeders (54%) felt there has been a change in abundances of local wildlife, with the majority citing increases in certain species. Torresian Crows and Australian Magpies were most frequently thought to have increased over time. Other examples of increasing species included the Australian White Ibis, various Psittaciform

species (most respondents were not specific about the species), butcherbirds and Noisy Miners. The respondents' responses about species in decline were less clear, with the majority of respondents simply indicating that they thought, for example, that small birds had declined over the years. However, two introduced species, the House Sparrow and the European Starling *Sturnus vulgaris* were mentioned as possibly in decline.

## DISCUSSION

This study determined that 37 per cent of survey respondents fed wildlife. This figure is similar (c.f. 38%) to the earlier independent study for Brisbane (Thomas 2000) and is less than the figure of 57 per cent recently obtained for suburban Melbourne (see McLees 2001). Overseas wildlife feeding studies have recorded figures of 52 per cent (Cowie and Hinsley 1988), 34 per cent (Brittingham and Temple 1988) and 40 per cent (Cowie and Hinsley 1987) for householders living in suburban areas who feed wildlife. However, it must be emphasized that as each of these studies used different methods, such comparisons are of relatively little quantitative value. More importantly, these studies confirm that wildlife feeding in suburban areas is a common practice throughout the western world. It must also be noted that a certain bias could be evident from our study, and possibly other similar studies, resulting from non-respondents. Wildlife feeders may be more likely to respond to the survey due to their interest in the subject, whereas non-feeders who may have no particular interest in the subject (except those with strong views against it) may simply not return the survey. This may result in a situation where the majority of the wildlife feeders respond to the survey and only a small portion of non-feeders respond to the survey. The resulting effect on our data would be to lower the percentage of wildlife feeders obtained. Alternatively many wildlife feeders may not respond to the survey due to the agencies' discouragement of the practice and may fear repercussions from informing an academic institution of their participation in this discouraged practice (evidenced by comments received from wildlife feeding respondents); this would then result in the wildlife feeding percentage being higher than the 37 per cent we recorded. Although it is impossible to know exactly the motivations for non-respondents, it is plausible that both of the above situations may be happening. We feel our figure of 37 per cent represents a good estimate of the percentage of wildlife feeders in suburban Brisbane.

Avian species were shown to be the main recipients of wildlife feeding in suburban areas. The species mentioned (Table 1) were typical suburban birds found in developed suburbs in south-east Queensland (Catterall *et al.* 1991). The most common non-avian species mentioned, the Blue-tongued Lizard (Koenig *et al.* 2001) and the Common Brushtail Possum (McKay and Winter 1989) are also well known suburban species. Certain species appear to be more frequent recipients of human provided food than others. Magpies and butcherbirds were the most commonly fed birds mentioned during this study. Many feeders said they targeted such species and, in some cases, actively excluded all other species from the food provided. Despite some of

the magpies' less endearing habits (Jones 2002), it appears that the magpies' bold nature and ability to habituate to the presence of humans (pers. obs.), makes them frequent recipients of human-provided food. Survey respondents expressed great satisfaction in being able to feed a 'wild' bird at such close quarters and provided foods specifically to target these species.

Aesthetic appeal and general abundance in the suburban environment (Catterall *et al.* 1991) are probably the main reasons for the large numbers of Psittaciform species, particularly Rainbow Lorikeets *Trichoglossus haematodus* and Pale-headed Rosellas *Platycercus adscitus*, being well represented in the study. These species are not as generalist in their food requirements as magpies and butcherbirds, but were able to exploit a variety of food sources provided by the feeders. Many respondents indicated they provided food they thought would attract these species (seeds, etc). Columbiforms (both native and introduced species) were also fairly frequent recipients of food at feeders, however none of the respondents indicated that they aimed specifically to attract these species. Rather the frequency of pigeons and doves being mentioned is almost certainly a result of the large quantities of seed-based foods being provided (see below) for Psittaciform species.

The bird groups coming to suburban feeding stations in this study contrast markedly with those mentioned in Northern Hemisphere studies. Carnivorous/omnivorous species (such as magpies, butcherbirds, corvids and kookaburras) dominate in Australia, while in the Northern Hemisphere, the species feeders attract are smaller omnivorous/granivorous species, such as tits, finches and buntings (see e.g. Dies 1982; Cannon 2000).

#### Areas of concern

##### FOOD

The study showed that many birds are fed inappropriate foods. Alarmingly, bread was by far the most commonly provided food for wildlife (58% of respondents). Bread has been associated with digestive and gut problems in birds. Carbohydrates are relatively scarce in carnivorous and insectivorous birds' natural diets and the consumption of high carbohydrate foods such as bread can lead to lactic acidosis, which is the build up of acid derived from fermenting food that has built up in the animal's gut (Kraschnefski 1999).

Meat products also featured heavily in the menu of provided foods, and were offered to specifically attract the carnivorous species. Meat can be appropriate for magpies and butcherbirds; however, the types of meat varied in quality and suitability. Of concern are meat products with high fat content, such as low-grade mince and processed meats such as hams and sausage. If used as a primary food, the animals' diet would be deficient in calcium that ultimately can lead to the softening of bones and beaks (Stanley and Siepen 1996).

Seed was offered regularly, although few of the birds targeted included seed as a major part of their natural diet. Many of the seeds types provided to the birds, such as sunflower and sorghum seeds, are high in protein and

oil, excessive amounts of which could lead to health problems (Dengate 1997). In addition, many commercial seed products contain artificial preservatives and pesticides and are held together with wood glue (Platt 1999); although non-toxic, this material does not form a part of the birds' natural diet. A secondary problem is the potential for waste seed to germinate and introduce exotic plant species to the surrounding environment.

A small but significant proportion of our respondents attracted lorikeets with honey and water. A basic mix of honey and water, if used in preference to other natural foods, does not provide all the requirements essential to health (Cannon 1979). Nectar-feeding birds receive a variety of complex sugar compounds from native flowers that are absent from simpler-human provided equivalents. As a result it has been suggested Rainbow Lorikeets can develop stunted feathers making them unable to fly (Stanley and Siepen 1996); however, the prevalence of this condition within suburban populations is not well documented. Certain commercial preparations are available as a substitute for basic honey and water mixes and would be a better alternative.

##### HYGIENE

A major concern of wildlife feeding is that of hygiene at feed stations. It has been shown that poor hygiene practices have contributed to the transmission of diseases such as psittacosis and psittacine beak and feather disease (Brittingham and Temple 1988) and are thought to perpetuate through contact at feed stations (Low 2002). A recent die-off of Rainbow Lorikeets within Queensland (N. Young, pers. comm.) was attributed to a bacterial infection transmitted by lorikeets visiting backyard feeders. Problems occur when food is allowed to mix with faeces left by visiting birds, and the disease was thought to have spread by transmission from the birds' feet (N. Young, pers. comm.). During our study we did not receive any information relating specifically to hygiene. However, a study by Howard and Jones (in press) also within suburban Brisbane, showed unhygienic practices such as feeding on an unclean platform and feeding waste seed from aviaries to wild birds was prevalent.

##### FREQUENCY OF FEEDING

Many of the problems associated with feeding would be minimised if the feeding events were infrequent. Our data, however, show this not to be the case. Thirty eight percent of wildlife feeders undertake the practice daily, and for 90 per cent of respondents, it continues throughout the year. Noteworthy, of the 38 per cent of feeders feeding daily, all were shown to be feeding bread, a food recognized as inappropriate and potentially harmful to avian species (Kraschnefski 1999). In other countries where wildlife feeding takes place certain periods are favoured for wildlife feeding. In the Northern Hemisphere, winter is predominantly the period when most wildlife feeders provide food, primarily in order to ensure winter survival and health during periods when food is not so plentiful (Grubb and Cimprich 1990). The lack of seasonality of feeding in our wildlife feeders may represent different motivations in respect to the reasons people feed wildlife.

## POPULATION CHANGES

A concern often raised when the implications of wildlife feeding are being considered is that of the proliferation of certain, typically larger and aggressive species at the expense of smaller, less aggressive species. From our data, there appears to be some evidence to support this. Australian Magpies, butcherbirds, kookaburras and Noisy Miners, all species noted for their aggressive behaviour towards other species, featured on our list of common recipients of human provided foods. The feeding of these species may increase the density of such birds and subsequently could lead to lower numbers of smaller birds within these suburban areas. However, without further study it cannot be assumed to be as a result of wildlife feeding.

A species occasionally mentioned as visiting feeding stations in Brisbane was the Torresian Crow. When respondents were asked to comment on perceived wildlife changes within their areas, this was the most commonly mentioned species that appeared to have increased in this area. Crows may be utilizing unintentional food sources such as waste food, and food provided for other animals, such as pets and magpies. Detailed studies are needed to confirm the increase in crow numbers and the reason for this increase. Nonetheless, these perceptions are consistent with evidence of a worldwide trend for increases in corvid species especially in urbanized areas (Marzluff *et al.* 2001). A similar situation may be occurring with the Australian White Ibis, not regularly a recipient of intentional feeding (in house yards), but described by our survey respondents as being a species that appears to be increasing in numbers (Low 2002).

When respondents were asked to comment on possible decreases in bird populations many stated that they thought small birds had declined, although they were not specific about which species. The introduced House Sparrow was, however, mentioned as a species thought to be on the decline. This observation is supported by Woodall (1996), who documented a decline in this species and attributed it to the increase in Noisy Miner populations throughout suburban Brisbane. In Townsville, a similar situation was documented by Jones and Wieneke (2000), this time the decline being attributed to an increase in the introduced Common Myna *Acridotheres tristis*.

## Conclusions and recommendations

Because of the high rates of feeding evidenced by this study, its almost year round occurrence (daily in some cases), and the high incidence of inappropriate foods such as bread being provided, there is cause for legitimate concern. As it is likely that similar practices are occurring throughout the cities of Australia, the implications are national in scope (e.g. McLees 2001). Our study indicates that wildlife feeders, and a small percent of non-feeders, felt that feeding was acceptable provided suitable practices were adhered to. Despite this apparent view, many wildlife feeders were engaged in practices likely to harm the animals being fed. This suggests that there is a lack of readily available information about the best practices for wildlife feeding. Furthermore the public is often exposed to confusing and conflicting opinions concerning the

acceptability of wildlife feeding. For example, in many national parks wildlife agencies have erected extensive signage clearly describing wildlife feeding as being inappropriate, while nearby private establishments (such as resorts, lodges and kiosks) actively encourage the feeding of wildlife and even sell the food. Moreover, there is a similar polarity of views within literature available to the public. Numerous publications promoting the establishment of 'habitat gardens' describe foods that can be used for wildlife feeding, views again at variance with agency materials explaining the dangers of doing so (e.g. Hutchison 1999; Platt 1999).

One may argue that the impact of feeding on bird populations is minimal compared to that caused by suburban development itself. Moreover, the positive impacts of feeding may outweigh the negatives; many people gain a lot of pleasure from the practice and may develop a greater understanding of the environment as a result (Howard and Jones, in press). Many of the people contacted during this survey said that as a result of the close contact they have gained with the animals they feed, they have been motivated to learn more about wildlife and wildlife related issues. However, when the feeding practices have the potential to impact entire populations rather than individuals, as may occur with the spread of disease, one must consider if the positives really do outweigh the negatives.

It may also be argued that the species included in this study are all widespread and tolerant of human disturbance and therefore the conservation implications from possible negative effects of wildlife feeding may not at first be clear. Cannon (1999) made an important distinction between urban habitats in countries such as the United Kingdom and Australia: in developed European countries, native habitat has been so severely degraded for many hundreds, possibly thousands of years, that the suburban garden is now considered an important habitat and often supports endangered species. For example, the Song Thrush *Turdus philomelos*, a bird of medium conservation concern in the United Kingdom, has been shown to have 71.5 per cent of its territories within suburban gardens (Cannon 1999). Within Australia most of suburban habitats are vastly different from native bushland habitats and do not favour endangered or specialist species (Catterall *et al.* 1991). However, given the alarming rate of deforestation within Australia and the gradual transition from European style gardens to more native gardens, it is possible that in the future suburban habitats may become a more valued habitat and the negative effects of wildlife feeding more significant.

Wildlife feeding in some form is likely to continue in suburban Australia. If so, rather than an unpoliceable and potentially controversial agency campaign to ban it (Howard and Jones, in press), we suggest that well researched guidelines, outlining acceptable practices and explaining the hazards, be developed and promulgated. Wildlife feeders should also be made aware of alternative methods of attracting wildlife to their gardens, in the form of native gardening. Finally further research aimed at identifying the actual influences (both positive and negative effects) of wildlife feeding is clearly needed.

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## REFERENCES

- Brittingham, T. A. and Temple, A. (1988). Avian disease and winter bird feeding. *The Passenger Pigeon* 50: 195–203.
- Cannon, C. E. (1979). Observations on the food and energy requirements of Rainbow Lorikeets *Trichoglossus haematodus* (Aves: Psittacidae). *Aust. Wildl. Res.* 6: 337–346.
- Cannon, C. E. (1984). Movements of lorikeets with an artificially supplemented diet. *Aust. Wildl. Res.* 11: 173–179.
- Cannon, A. (1999). The significance of private gardens for bird conservation. *Bird Conserv. Int.* 9: 287–297.
- Cannon, A. (2000). Garden Birdwatch Handbook. (British Trust for Ornithology: Thetford.)
- Catterall, C. P., Green R. J. and Jones D. N. (1991). Habitat use by birds across a forest-suburb interface in Brisbane: implications for corridors. In 'Nature Conservation 2: The Role Of Corridors.' (Eds. D. Saunders and R. J. Hobbs.) (Surrey Beatty & Sons: Sydney.)
- Cowie, R. J. and Hinsley, S. A. (1987). Breeding success of Blue Tits and Great Tits in suburban gardens. *Ardea* 75: 81–90.
- Cowie, R. J. and Hinsley, S. A. (1988). Feeding ecology of Great Tits (*Parus major*) and Blue Tits (*Parus caeruleus*) breeding in suburban gardens. *J. Anim. Ecol.* 57: 611–626.
- Deis, R. (1982). Is bird feeding a no-no? *Defenders* 57: 17–18.
- Dengate, J. (1997). Attracting birds to your garden in Australia. (Frenches Forest: New South Wales.)
- Fitzpatrick, S. (1995). Utilisation of provisioned peanuts by suburban tits in Belfast. *Irish Birds* 5: 299–304.
- Green, R. J. and Higgenbottom, K. (2000). The effects of non-consumptive wildlife tourism on free-ranging wildlife: a review. *Pac. Cons. Bio.* 6: 183–197.
- Grubb, T. C. and Cimprich, D. A. (1990). Supplementary food improves the nutritional condition of wintering woodland birds: evidence from pitlochronology. *Ornis. Scand.* 21: 277–281.
- Howard, P. and Jones, D. J. (in press). The meaning of feeding: A qualitative study of practices and reasons for feeding wildlife in urban southeast Queensland. In 'Urban Wildlife: More than meets the eye!' (Eds. S. K. Burgin and D. Lunney.) (Royal Zoological Society of N.S.W., Sydney.)
- Hunter, J. (2001). Urban antics: to feed or not to feed. *Landscape* 17: 54.
- Hutchison, F. (1993). 'Creating a native garden for birds.' (Simon Schuster: Sydney.)
- Jones, D. N. (2002). 'Magpie Alert: Learning to Live with a Wild Neighbour.' (University of New South Wales Press: Sydney.)
- Jones, D. N. and Howard P. (2001). Feeding wildlife. An indecent obsession. *Wild. Aust.* 38: 18–20.
- Jones, D. J. and Wieneke, J. (2000). The suburban bird community of Townsville revisited: changes over 16 years. *Corella* 24: 53–60.
- Kallander, H. (1981). The effects of provision of food in winter on a population of the Great Tit *parus major* and the Blue Tit *P. caeruleus*. *Ornis. Scand.* 12: 244–248.
- Knight, R. L. and Anderson, D. P. (1990). Effects of supplementary feeding on an avian scavenging guild. *Wild. Soc. Bull.* 18: 388–394.
- Koenig, J., Shine, R. and Shea, G. (2001). The ecology of an Australian reptile icon: How do blue-tongued lizards (*Tiliqua scincoides*) survive in suburbia? *Wildlife Res.* 28: 215–227.
- Kraschnefski, K. (1999). Encountering wildlife without feeding. Queensland National Parks and Wildlife Service. Land for wildlife Note 15.
- Low, T. (2002). 'The New Nature.' (Viking: Melbourne.)
- McKay, G. M. and Winter, J. W. (1989). Phalangeridae. In 'Fauna of Australia: Mammalia.' (Eds. D. W. Walton and B. J. Richardson.) (AGPS: Canberra.)
- McLees, B. (2001). Feeding Wildlife. Right or Wrong. (B.Sc. Honours thesis, Deakin University: Melbourne.)
- Marzluff, J. M., McGowan, K. J., Donnelly, R. and Knight, R. L. (2001). Causes and consequences of expanding American crow populations. In 'Avian Ecology and Conservation in an Urbanizing World.' (Eds. J. M. Marzluff, R. Bowman and R. Donnelly). Pp. 331–363. (Kluwer Academic Publishers: Norwell.)
- Natras, R. (2001). To feed or not to feed. *Wild. Aust.* 38: 22.
- Orams, M. B. (2002). Feeding wildlife as a tourism attraction: a review of issues and impacts. *Tourism Management* 23: 281–293.
- Platt, S. (1999). Encountering wildlife without feeding. Victorian National Parks and Wildlife Service. Land for wildlife Note 0035.
- Skira, I. and Smith, S. (1991). Feeding wildlife in national parks. *Proceedings of the fifth Australian Seminar on National Parks and Wildlife* (Tasmania, Australia.)
- Stanley, J. and Siepen, G. (1996). Please don't feed the animals. *Ranger.* 35: 22–24.
- Thomas, L. (2000). Wildlife and humans in a suburban setting. New approaches to the management of positive and negative interactions. (PhD thesis, Griffith University: Brisbane.)
- Wilbur, S. R., Carrier, W. D. and Borneman, J. C. (1974). Supplementary feeding program for California condors. *J. Wildl. Manage.* 38: 343–346.
- Woodall, P. E. (1996). Limits to the distribution of the house Sparrow *Passer domesticus* in suburban Brisbane, Australia. *Ibis* 138: 337–340.