

OBSERVATIONS ON THE PRE-DAWN SINGING OF THE AUSTRALIAN MAGPIE *Gymnorhina tibicen tibicen*

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This study investigated the pre-dawn song of four male Australian Magpies *Gymnorhina tibicen tibicen* resident in a north Brisbane suburb; one bird over three breeding seasons (2001–2003), the other three birds for one breeding season (2003). Pre-dawn singing by a solitary male magpie commenced in late July with a peak of both early song start and song duration in September, after which both declined until cessation in October/ November. This pre-dawn song started and almost always ended before dawn and was sung continuously every morning for varying periods of time but never from the nest tree. It began as a low volume song during the first weeks of the breeding season while the eggs were being laid and increased in volume within a few weeks to a clear and widely audible song in early to mid August while the eggs and/or chicks were in the nest. This song continued until late October–early November when it became discontinuous and was interspersed with challenging territorial calls.

INTRODUCTION

Australian Magpies *Gymnorhina tibicen tibicen* are distributed throughout southern and eastern Australia and have been introduced to both islands of New Zealand (Jones 2002). They thrive in open habitats, foraging on pasturelands with available nest trees and consequently find urban areas with trees and grassy lawns very suitable to their way of life. The Australian Magpie is highly territorial, possesses complex social behaviour and has an extensive song repertoire. Because of its commonness and the ease with which it can be approached and observed, it has been the subject of much research. Published studies include assessment of their ability to learn and share songs, their ecology, behaviour, reproductive cycle and growth patterns (e.g. Robinson 1956; Carrick 1972; Brown *et al.* 1988). Jones (2002) noted that 52 papers on the Australian Magpie had been published up until 1995, however none included observations of pre-dawn singing.

It is now accepted that there are eight subspecies of this species (Schodde and Mason 1999) and the Brisbane birds described in this report are considered to be the nominate race Black-backed Australian Magpie *Gymnorhina tibicen tibicen* (Kaplan 2004).

This study details the pre-dawn singing of four male magpies at Chermside, a northern suburb of Brisbane, Queensland during three consecutive breeding seasons.

STUDY AREA AND METHODS

Chermside (27°23'S, 153°01'E) is an urban area ten kilometres north of the Brisbane Central Business District. It is characterized by moderate to high-density single dwellings with lot sizes varying from 0.1 to 0.5 hectares. Lawns, gardens and parks are common. One male magpie (Sam) was monitored for three consecutive breeding seasons (92 observations from 1 August to 30 December 2001, 130 observations from 26 April to 27 December 2002 and 63 observations from mid-February to 6 December 2003). The breeding season was designated from late July to late September with most magpies building nests in late July or early August, laying their first eggs early in August and feeding chicks until late September (Jones 2002; Kaplan 2004). Two other males (Brad and Chas) were monitored for the 2003 breeding season (Brad for 33

observations and Chas 25 observations), and a fourth male (Norm) from 21 June until 23 September (11 observations), when the bird adopted a new song site and could not be monitored. Each bird was observed either once or twice a week until two weeks after singing ceased when monitoring was reduced to once a week only.

All four territories were surrounded by residential housing and three were less than 220 metres from a major arterial road. Sam occupied a one hectare mown grass Brisbane city council park with occasional trees (mainly *Eucalyptus* spp.) around its perimeter and approximately 30 suburban gardens. His song tree overlooked the park. Brad occupied part of a larger park; also with mown grass and occasional trees and his morning song tree was 350 metres south-east of Sam's morning song tree. Chas occupied part of the extensive, mown grass grounds of the Prince Charles/Holy Spirit Hospital complex and each morning he sang from a car park handrail, which was 270 metres west of Sam's song tree. Norm's morning song tree was in a similar but smaller suburban council park and was 340 metres north of Sam's song tree.

The 480 metre distance between Chas and Brad's song trees was probably too great a separation for them to hear each other's territorial calls but each could be heard by Sam. Norm could not be heard by any of the other three because of an intervening hill.

This study examines data on 'songs' and not 'calls'. Songs are clearly differentiated from calls as the latter are generally short, simple and uttered by both sexes at all times of the year. Additionally, calls are considered to be associated with specific actions and situations; for example, predator warning calls, food whereabouts indicators, attack and flight (Johnson 2003). Songs on the other hand are longer and more complex and are generally restricted to male passerines during the breeding season (Johnson 2003). Brown *et al.* (1988) showed that magpie daytime songs are sequences of syllables, which vary greatly from bird to bird. Syllables are defined as a sound that produces a single, complete and distinct impression, uninterrupted by silences greater than two centiseconds (Johnson 2003).

Many weeks of regular monitoring of the various characteristics of the pre-dawn songs made each Chermside bird's song recognizable. Because of the continuation of these song characteristics throughout the seasons, it was assumed that the same bird, Sam, continued to occupy the same territory during 2001, 2002 and 2003, and that the other three males were the same birds throughout the 2003 season.

Confirmation of the sex of the singing bird was possible as the clean white nape of the male (Pizzetti and Knight 1997; Simpson and Day 1984) was visible in the pre-dawn due to nearby artificial lighting.

Data were usually collected six mornings a week by the same observer. Pre-dawn song start time and song duration were noted and an estimate of the loudness of the song as 'soft' or 'loud' was applied as consistently as possible for the three seasons. Additionally, each morning, an estimate was made of the percentage cloud cover prevailing at the start of each song session. Observations began prior to the birds singing (1 to 2 hours before sunrise) and ended when the singing bird left the song perch, usually to begin foraging.

Civil twilight was chosen as the starting time reference point because it was closer to the start of the pre-dawn song than sunrise. Civil twilight occurs when the sun is at a depression angle of six degrees below the horizon and its timing was calculated utilizing data available from the Geoscience Australia 'sunrisenset' web page. At Chermiside (latitude S 27°) civil twilight is approximately 30 minutes earlier than sunrise though this varies by plus or minus three minutes between 1 June and 1 December. This seasonal variation is acceptable as all records are timed to the nearest minute. The practical effect of civil twilight is that only bright stars are visible and that every day activities are difficult without artificial light, even though broad outlines are visible (Johnson 2003).

Moonrise times and phase status were calculated using data available on the Geoscience Australia 'moonphases' web page.

Song start times and duration were compared among years and birds using one-way ANOVA with post-hoc Tukey HSD tests. A value of $P < 0.05$ has been accepted as significant.

RESULTS

Flocks

The assistance of 'helpers' is referred to by Kaplan (2004), and flocks of magpies are mentioned by Jones (2002) but these four pairs of Chermiside birds did not have helpers, nor were flocks of birds seen in the area. On the other hand, Sam's first fledglings were still within his territory while his second clutch was being brooded. The presence of these offspring accords with Jones' (2002) observations of magpie group sizes in southern Queensland.

Pre-dawn song

Observations of the four magpies showed that they were silent during pre-dawn until close to the start of the breeding season, and were again silent after its conclusion. The pre-dawn song consisted of a continuous series of syllables, sung by a single magpie. Each syllable was separated by a pause of usually less than five seconds though it extended from 0.5 to 15 seconds. During a morning's song session some birds sang an apparently random sequence of syllables while others sometimes sang repetitive sequences.

Song seasonality

The first songs were heard in early/mid July and they all ceased in late October/early November (Table 1). The song cessation dates for three consecutive years for Sam were very consistent. Daily observations during 2001 and 2002 showed song cessation on 11 November and 10 November respectively. To clarify this coincidence of dates Sam was monitored each morning between 8 November and 12 November in 2003. He sang on 11 November 2003, and was not heard before dawn again in 2003. Brad and Chas were last heard singing on 20 October 2003, and 24 October 2003 respectively while Norm was out of earshot by this time.

This pre-dawn song starting time varied through the season but always began before civil twilight and almost always ended before sunrise (Table 1). The earliest start before civil twilight tended to be towards the end of the season (late September-early October) except for Brad (mid-August).

Song duration

There was a significant difference among years in the duration of Sam's song ($F = 11.9$, d.f. = 2, 211, $P < 0.001$). These differences occurred between 2001 and 2003 ($P < 0.001$) and between 2002 and 2003 ($P < 0.001$) but not between 2001 and 2002 ($P = 0.90$) (Table 2a).

Song duration (Table 2b) varied among the four magpies ($F = 3.6$, d.f. = 3, 97, $P < 0.016$) but the only significant pairwise difference ($P = 0.01$) was between Brad and Sam (Table 2c).

Song start time

There was a significant difference among years (Table 3a) in Sam's start times relative to civil twilight ($F = 14.1$, d.f. = 2, 211, $P < 0.001$). These differences occurred between 2001 and 2003 ($P < 0.001$) and between 2002 and 2003, ($P < 0.001$) but not between 2001 and 2002 ($P = 0.71$).

There was a significant difference among birds in start times relative to civil twilight ($F = 16.4$, d.f. = 3, 97, $P < 0.001$). These differences occurred between Sam and Brad, and marginally between Sam and Norm but not other combinations of individuals (Table 3b).

Song loudness

For the initial weeks of the breeding season all four birds sang a low volume (soft) soliloquy, almost certainly not audible to any magpie unless nearby. Even with minimal early morning background noise, singing at this volume

TABLE 1

Date of first and last song heard, song duration (minutes), and song start (minutes before civil twilight) for one individual (Sam) for 2001/2002/2003; and for three other Australian Magpies for 2003.

	Sam 2001	Sam 2002	Sam 2003	Brad 2003	Chas 2003	Norm 2003
Date of first song heard	Not known	6 July	9 July	19 July	22 July	17 July
Date of last song heard	11 November	10 November	11 November	20 October	24 October	Not known
Longest song session	72 mins (20 September)	63 mins (6 August)	63 mins (22 September)	67 mins (5 and 14 August)	60 mins (22 September)	62 mins (7 August)
Earliest song start	89 mins (20 September)	60 mins (3 October)	67 mins (22 September)	68 mins (19 August)	69 mins (30 September)	72 mins (23 September)

TABLE 2

Details of song duration for four Australian Magpies.

(a) Song duration for Sam			
2001	2002	2003	
Mean = 33 mins	Mean = 37 mins	Mean = 23 mins	

(b) Song duration for all four birds in 2003			
Brad	Chas	Norm	Sam
Mean = 41 mins	Mean = 26 mins	Mean = 30 mins	Mean = 24 mins

(c) Pairwise comparisons (Turkey HSD) of song duration (minutes) for all four birds in 2003.			
	Chas	Norm	Sam
Brad	P = 0.12	P = 0.63	P = 0.01
Chas		P = 0.87	P = 0.99
Norm			P = 0.15

TABLE 3

Details of song start time.

(a) Song start time for Sam (minutes before civil twilight).			
2001	2002	2003	
mean = 33 mins	mean = 35 mins	mean = 22 mins	

(b) Pairwise comparisons (Tukey HSD) of song start time for four birds in 2003.			
	Chas	Norm	Sam
Brad	P = 0.31	P = 0.94	P < 0.001
Chas		P = 0.78	P = 0.36
Norm			P < 0.06

was barely audible to the human observer at a distance greater than 60–70 metres. Using a constant estimate of ‘soft’ and ‘loud’ song volume, data for all birds (Table 4) show that three to four weeks after the first low volume song, the volume of each bird increased virtually overnight to a carrying and widely audible song that clearly advertised his presence and, presumably, his ‘ownership’ of the territory. For instance, on 22 September, Chas was singing from a power pole on the edge of his territory nearest to Sam and was just audible at Sam’s song tree, a distance of 223 metres (pers. obs.). An increased volume song was then given every morning of the breeding season until late October/early November when it became more and more interspersed with loud, challenging calls until its cessation.

Song site

No bird under observation sang from his nest tree. Each male had a favoured song tree but all four birds on various occasions, after starting their pre-dawn song session, moved to at least one different site, sometimes more, and continued singing. All of these alternative sites were within 100 metres of the favoured song tree. The majority of these movements occurred during July and August (Table 5). The

distances from nest tree to the song tree were 85 metres, 53 metres and 43 metres for Brad, Chas and Sam respectively. Norm sang from a tree behind a house, which made measurement impossible, but the two sites were estimated to be about 100 metres apart.

During the 2003 breeding season the four birds sang from an alternative site to that of the song tree 27 mornings out of a total of 97 observed morning singing sessions.

Moon phase

The possibility that some of the variations in the song start time or in song duration might be associated with the lunar cycle was investigated by calculating correlations between the song times and the day of the lunar cycle, which was scored between 1 for the new moon and 14 for the full moon. Sam’s data for 2003 showed weak but significant Spearman rank negative correlations between song duration and lunar phase ($r_s = -0.307$, $n = 53$, $p = 0.013$) and between song start and lunar phase ($r_s = -0.328$, $n = 53$, $p < 0.01$) however, no correlations were found in 2002 ($r_s = 0.072$, $n = 102$, $p > 0.2$); song start ($r_s = -0.049$, $n = 102$, $p > 0.3$). Therefore it does not appear that the lunar cycle has influenced either start time or duration.

TABLE 4

Date of song start, volume increase from low to normal volume and song end for all birds.

	Sam 2001	Sam 2002	Sam 2003	Brad 2003	Chas 2003	Norm 2003
Song start at low volume	Not known	6 July	9 July	19 July	22 July	17 July
Volume increase	Not known	6 August	28 July	6 August	31 July	25 July
Song end	11 November	10 November	11 November	22 October	28 October	Not known

TABLE 5
Number of mornings during 2003 when more than one song site was used.

	Brad	Chas	Norm	Sam	Total
July	1	2	0	4	7
August	4	3	2	3	12
September	1	1	0	2	4
October	0	1	Not known	2	3
November	0	0	Not known	1	1
Total	6	7	2	12	27
Total number of observation mornings	18	14	11	54	97

Cloud cover

Zammuto and James (1982) in a study of environmental factors that affect first vocalization times in an Ozark Mountain forested area, show that sunrise and light intensity account for 92 per cent of the variance in first vocalization time, however, there was little significance in Spearman correlation tests that were run over the daily estimates of percentage cloud cover in this study. The exception was a five per cent significance level for "Norm: Cloud vs Duration" but, Norm had moved out of earshot on 1 September and had the smallest sample size (11 observations) which includes two 'zero' observations when he did not sing.

Rain

No continual rain occurred during the 2003 early morning observations and showers occurred on only three mornings. This had little affect on song duration, as Sam's song duration during showers on 16 August was shorter and on 7 and 19 October it was longer.

Vehicular traffic

Chas sang from a kerb side handrail adjoining a car park and cars entering the nearby underground car park passed within 1.5 metres of him while he sang without his song faltering in any way. On a number of occasions the observer set up a microphone within 5 metres of three of these magpies during their song sequence, and on only one occasion was the singing bird disturbed.

Other birds

Other species such as Torresian Crows *Corvus orru*, Laughing Kookaburras *Dacelo novaeguineae*, Grey Butcherbirds *Cracticus torquatus* and Pied Butcherbirds *C. nigrogularis*, plus Common Koels *Eudynamis scolopacea* from late September onward, called from various distances throughout the magpies' song with no apparent disturbance to the song flow. Flocks of Noisy Miners *Manorina melanocephala* frequently clustered around the singing magpie with no discernible change to its song.

Repeat nesting

Both Brad and Sam re-nested in 2003 with no apparent change to the song end dates recorded in 2001 and 2002. Brad's replacement nest was first observed on 29 September after extremely strong winds on 27 September and the subsequent two chicks were still in the nest on 12 November, long after Brad's pre-dawn song was last

heard on 20 October. Sam's song ceased on 11 November 2003 even though the female was still brooding a second clutch in a second nest about 150 metres south-west of their first, and their two 2003 season chicks were still being fed.

Jones (2002) states that alterations to the standard breeding timetable occur when nests are lost or chicks perish and that in those circumstances, second or even third clutches are produced, however, repeat nesting seems to be limited to suburban areas. Even so, the fact that one magpie had fledglings being fed in addition to a clutch being brooded; and that a second magpie had chicks being fed in the nest when both pre-dawn songs ceased for the year indicates that this pre-dawn song is independent of both the nesting behaviour of the female and the status of the nest.

DISCUSSION

Even though the dawn chorus is a widely studied phenomenon. (e.g. Robinson 1949, 1956; Brown *et al.* 1988; Sanderson and Crouch 1993; Keast 1994; Slagsvold 1996; Dabelsteen *et al.* 1998; Johnson 2003; Gorissen and Eens 2004) little research has examined pre-dawn singing. One study by Johnson (2003) does present detailed observations and analysis of a pre-dawn song, however, it refers specifically to the Grey Butcherbird.

Robinson (1956) reported on observations made of Australian Magpies (race *dorsalis*) resident on a Western Australian pastoral property between 1943 and 1956 and stated that, while 'dusk song' is a short stereotyped carol of even tone repeated with monotonous regularity, 'dawn song' appears to have a slightly louder and richer tone and is first heard at the beginning of the breeding season about an hour before sunrise when it is still quite dark, and that these songs are sung by a lone male magpie from seclusion. This solitary singing concurs with the Chermside observations, however Robinson (1956) then described another 'dawn song' in which many males join and culminates with "the songs of hundreds of male magpies within a mile radius, blended together" (p. 282). This has no parallel in the present Chermside study.

In an extended study of the Australian Magpie in the north island of New Zealand, Brown *et al.* (1988) report that group members sing together almost continuously on moonlight nights in the breeding season and repeatedly during the dawn chorus, but they do not report solitary singing.

Australian Magpies in Belair National Park, Adelaide, sing a monotonous 'nocturnal song' that can be heard occasionally at any time of the night, but continuously in

the hour or two before dawn (Sanderson and Crouch 1993). In this study from 1986 to 1991 they found that the song extended for about three months from July each year. They also noted a 'dawn song', which contains similar fundamental frequencies to a 'territorial song', but is so stereotyped that birds giving this song from different locations sound similar. This song stops at first light and is replaced by loud carols. This stereotyped song is in direct contrast to the four Chermshire songs, which are readily differentiated by an accustomed ear.

The Chermshire study showed no equivalent to these group song bouts as all four birds sang alone with a seasonal peak and decline in the activity, and each was one of a pair, not part of a group. It should also be borne in mind that the previous studies investigated races other than *G. t. tibicen*.

Quiet singing, as a widespread phenomenon during the breeding season of song birds in the northern hemisphere, was studied by Dabelsteen *et al.* (1998) and they suggested that 'quiet song' has developed to reduce the incidence of interrupted mating, either within or outside the mated pair. They then theorize that the peak occurrence of quiet singing will coincide with "periods of pronounced background noise complicating the detection of the quiet songs" (p. 100). The low volume song in this study took place during the quietest hours of the day (i.e. within the 24 hours) and thus negates their 'pronounced background noise' theory. Pre-dawn darkness precluded any sightings of mating, interrupted or otherwise.

Mate behavioural influence by vocal signals during the dawn chorus of male and female Great Tits *Parus major* was studied by Gorissen and Eens (2004), however, the present study noted only very rare instances of the nesting female magpie either calling to or answering the singing male and never discerned either bird influencing the other.

Robinson (1949) states that dawn song, as distinct from early morning song, is only sung by mature male magpies during the breeding season from early August until early November. Jones (2002) states that the first eggs are laid during the first half of August, with "... remarkably little variation in the timing of these phases for magpies throughout Australia" (p. 41). This egg laying date indicates that mating must take place while the low volume song is in use, and that the louder, widely audible song is used while eggs and/or chicks are in the nest.

Hughes *et al.* (2003) demonstrate through DNA analysis that 82 per cent extra-group paternity occurred in a Western Australian population of 43 juvenile and 66 non-juvenile magpies. This is the highest occurrence yet recorded in any bird species and because of the renowned territoriality of the magpie they conclude, "the most likely explanation is that extra-group mating occurs during the pre-dawn period" (p. 3447).

If it is postulated that the louder pre-dawn song later in the season is a territorial statement then it could be further postulated that the male's early season quiet call acts as a lure to female magpies during their fertile, pre-laying period. The male decision to sing from more than one site happens most often during July/August which coincides with the

usual first-half of the August egg laying period (Jones 2002) with conception one or two days earlier (Kaplan 2004). Song sites distant from the nest tree may be chosen to facilitate pre-dawn forays by the female whose behaviour was not observed during this study. Further, there would be little interference from adjoining males, as they are also singing quietly in their own territory. Magpies have been shown by Floyd and Woodland (1981) to have hearing that is sufficiently acute to locate grubs moving in the soil beneath grass, so a female bird moving between territories would be able to locate a 'crooning' male. During this Chermshire study there were occasional instances of wing noise being heard in or near the song tree but pre-dawn darkness and foliage density made it difficult to see the flying bird.

Radio tracking showed that all young produced by tracked female Superb Fairy-wrens were sired by extra-group males, which they visited during pre-dawn forays (Double and Cockburn 2000). Radio tracking of female magpies, together with DNA analysis could ascertain whether paternity is as widely scattered in the magpie from eastern Australia with its small social groups, as it has proven to be in the Western Australian magpie population.

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