

Smaller bird species in decline in the south-west Hunter? The lessons of ten years of atlas data

Harold Tarrant
School of Humanities and Social Science
University of Newcastle, NSW 2308, Australia

Doyles Creek and Martindale to the west of Jerrys Plains support a wide variety of bird species including birds which are Vulnerable and at the edge of their distribution in the Hunter Region. While the first ten years of atlassing data for 4 sites in this area by no means reveal a bleak picture overall, some smaller species, such as fairy-wrens and grass finches have been in sharp decline at some sites. A major factor that must here be considered is the depth of the 2006 drought, though declines are not even across all sites and other factors must also be involved, some more local. Fortunately the typical woodland bird species may be more resilient; for instance the Diamond Firetail *Stagonopleura guttata* is now the most regularly recorded finch at these sites. The repeated surveys also reflect some of the changes that have been affecting the Hunter more generally, including the spread of species like the Spiny-cheeked Honeyeater *Acanthagenys rufogularis* from the west. While many of the trends were intuitively appreciated during the study, the analysis of ten years of data involved in preparing this paper reinforced my impressions in some cases, and drew my attention to other important facts that had previously not been noticed at all. I append information concerning increases and decreases in reporting rates at two Doyles Creek sites.

INTRODUCTION

When approached for an article about the changes that were evident in my bird survey results for four sites in the south-west of the Hunter Region, two each at Martindale and Doyles Creek, I thought that it ought not to be a problem—as long as I could recover data that I had lost since putting in my Birds Australia (BA) Atlas reports. I was particularly interested in establishing what changes had taken place over the years, and had no doubts that there had indeed been many changes over the wider area, particularly regarding the appearance of new species. Supporting such changes from my survey data, based on four small areas, seemed a genuine challenge, though as it turned out less difficult than explaining the changes.

METHODS

Surveys were conducted at a number of sites west of Jerrys Plains using the BA Atlas protocols (Barrett *et al.* 2003). Most surveys involved the 2ha 20 min search approach. However in some instances a larger area was surveyed for a slightly extended period of time. Both methods involved compiling a list of all bird species present. Except where reports were made also to the Hunter Bird Observers Club (HBOC), numbers were not noted. Where possible I made seasonal visits over a ten-year period commencing in December 1998. Emphasis was placed on achieving continuity at four sites, the results of which are the subject of this paper.

However, other sites were monitored less frequently in order to increase coverage of the area. Of the four primary sites the Doyles Creek locations (DC1, DC2) are both open woodland, with good habitat connections to the Wollemi National Park on the south, but bordering partially cleared woodland to the north; they are about two km apart, approximately one km either side of Doyles Creek itself. The Martindale sites (MD1, MD2) are at road bridges for easy access. Both include a section of creek and riparian vegetation, with the better site (MD2) having acacia scrub on one corner, open land on another, and fields with scattered trees up to the Wollemi National Park on the east side.

Surveys were almost always carried out alone, between the hours of 7.00am and 10.00am for consistency. I have avoided days that promised to give a poor indication of the species present, whether through wind, rain, or excessive heat. If I saw reason not to expect the survey to be useful because of adverse conditions at the site, I have not done a survey at that time. I was absent for five months of 2006, but there has been better coverage since, particularly at Doyles Creek, and my main focus will be on post-2006 changes. The total number of surveys conducted is shown in **Table 1**.

Table 1. Surveys conducted in the south-west Hunter Region

Site	1998-2005	late 2006	2007 to Aug 08
DC1	46	4	12
DC2	37	2	12
MD1	31	1	5
MD2	41	4	7

RESULTS AND DISCUSSION

General

As will be observed from the data discussed, Doyles Creek and Martindale have substantial and very interesting bird populations. For instance I regularly recorded some 14 & 18 species during the surveys at Doyles Creek, with some 15 & 20 at Martindale. These included several species that are listed on the NSW Threatened Species Conservation Act as Vulnerable, such as Diamond Firetail *Stagonopleura guttata*, Hooded Robin *Melanodryas cucullata*, and Painted Honeyeater *Grantiella picta* or at the edge of their range such as White-browed Babbler *Pomatostomus superciliosus* and Spiny-cheeked Honeyeater *Acanthagenys rufogularis*. It may be worth noting that Red-capped Robin *Petroica goodenovii* and Chestnut-rumped Heathwren *Hylacola pyrrhopygia* were also recorded once each at DC2 and either MD2 or DC1, while Turquoise Parrot *Neophema pulchella* was once recorded at DC1. On another occasion I saw a *Neophema* that did not appear to me compatible with this species—rather it resembled a female Blue-winged Parrot *Neophema chrysostoma*, perhaps an escaped bird but in the company of other unidentified *Neophemas*. Glossy Black-Cockatoo *Calyptorhynchus lathami* and Gang-gang Cockatoo *Callocephalon fimbriatum* were recorded once at DC2 and MD2 respectively. A wide variety of raptor species included a Spotted Harrier *Circus assimilis* at MD1, where a Black-tailed Native-hen *Tribonyx ventralis* was also recorded once.

The primary focus of what now follows will be on the changes that the data can support. However, the **Appendix** contains, for Doyles Creek, lists of all species recorded *at least twice* prior to 2006 and *all* birds recorded since, together with an analysis of changes in their reporting rates since 2006, which was a year of very low rainfall. As there are no previous detailed studies for this area the **Appendix** provides an important record of the birds occurring in that area. It is intended to present similar data for the Martindale area in a subsequent paper.

Difficulties in Interpretation of Trends

First, I had never envisaged using the data to write a paper on changes in bird populations. The original motivation for the work was to provide surveys for the BA Atlas project, and I have usually tried to undertake and submit a 20-minute survey of each site every season as requested by

the Atlas organisers. However, I have occasionally missed a survey, particularly from December 05 to May 06 when I was overseas. Surveys at one Doyles Creek site (DC2) started slightly after the others, in September 1999 as opposed to December 1998. All sites were surveyed in August 2008, this being the final survey used for the preparation of this article. Sometimes I have done surveys more frequently, particularly in the spring; some but not all extra surveys have been reported, thus maintaining a fairly constant monitoring effort. Occasional minor deviations in survey methods are unlikely to have introduced the kind of bias that would invalidate the general conclusions drawn, given the pronounced nature of many of the trends.

Second, one must allow for some ‘human error’. For instance I may have become more effective as time has gone on. This would pertain particularly to calls that I have become more familiar with, and perhaps with species that could be easily confused visually, such as Buff-rumped Thornbill *Acanthiza reguloides* and Yellow-rumped Thornbill *Acanthiza chrysorrhoa*. However, although ensuring correct identification of species like the thornbills (which I discuss below) is important, I place greater emphasis on ensuring that a comprehensive species list is obtained for the site (i.e. that elusive species are located and recorded, which is facilitated by knowledge of their calls, behaviour and habitat preferences). In the case of the thornbills there is no doubt that Buff-rumped are very uncommon at all four of the regularly monitored sites, while there is another site near Jerrys Plains at which I have recorded them much more regularly. In general, even if I had been less skilled in visual recognition of dry-country species at first, new birds for a given site have most often drawn my initial attention by their relatively unfamiliar call, so that it is likely that they have indeed been new birds rather than previously overlooked species.

One is even less inclined to suspect oneself of overlooking birds that are now disappearing from one’s list. In my two Martindale sites, one by the road bridge just after the school (32° 27' 56" S, 150° 40' 00" E) (MD1), and the other further up the valley at the Medhurst Bridge (32° 30' 51" S, 150° 41' 36" E) (MD2), there has been a notable fall-off of some of the smaller species, and above all of certain finch species. I was quite sure that I have been finding far fewer finches and missing out on them far more often, and I was attributing this above all to the difficulties these species experienced at the height of the drought, and to the habitat degradation that still affects these sites.

A greater challenge is that of correctly identifying the causes of change. When one notices changes in the patterns of one's results that cannot easily be attributed to one's methods of data-collection, does one simply point to underlying trends towards expansion or diminution of range, or should one look for immediate hostile conditions, such as habitat loss, drought, and absence of food on the one hand, or profuse flowering of eucalypts, abundance of mistletoe-berries, or insect plagues on the other. A range of causes may be involved because the optimal ecological requirements of each species are unique. These changes may actually relate to changing conditions in alternative habitat elsewhere rather than to anything happening at the site concerned.

Drought and other Varying Conditions

The major habitat-change visible at the sites has been due to the drought, with Martindale Creek and Doyles Creek dry for long periods. Lack of food and drought are often, though not always, closely connected, with lack of food continuing to be a problem both for nectar-feeders and for insect-eaters for some time after the drought has broken. For some species, however, the sites may seem preferable to their customary habitat, while for others the thinning of low vegetation may present an opportunity. Drought-induced movements need to be distinguished from longer-term changes in the distribution. The extent of the recent droughts in 2002 and 2006 is evident from the Bureau of Meteorology's rainfall figures. These are found at <http://www.bom.gov.au/index.shtml>, last consulted by myself on 10 January 2009. Some figures are available for Doyles Creek, but with several missing months in the figures which I have consulted they have been less helpful than those for nearby Jerrys Plains, which go back over 100 years, and include only three gaps in years relevant to this study (November 1999, July 2000, and December 2006). I am unsure of the reason for this, since my notes made from the Bureau's site at an earlier stage gave 91.1, 37.0, and 33.1 mm for these months. Assuming these figures to be correct, 2006 saw as little as 370.9mm fall in this area, with only 1888, 1939, 1944, 1957 and 1980 yielding lower rainfall. The published annual median rainfall for this weather station is 644.1 and the mean 640.4 mm. The second lowest figure during the ten years over which I collected data was 557.2mm in 2002, when April to October was especially dry, but in the eighteen months from December 2005 to May 2007 only July and September 2006 and March 2007 reached or exceeded the mean. In this period it was the two summer

periods (December to February) that were particularly dry, a fact that must have proved particularly difficult for many birds. Apart from 2002 and 2006, only 2005, with 641.2mm, came close to falling below mean and median annual rainfall.

It seems reasonable to suggest that the 2006 rainfall figures were severe enough to have an adverse impact upon some of the species in the area. This appears to have been the case, for the absence of some species has followed these disastrous conditions. However, this absence could in some cases have other explanations. If it has been merely a matter of drought, then losses will hopefully be only a temporary phenomenon. Certainly the rainfall figures do not point to a long-term drying out of the area, since the annual average for the period 1999–2007 was around 677mm, while it had been around 637mm for 1990-98. In fact 2007 produced the best rains since 1962, while 2008 was also a moderately good year for rain in the area.

Temporary factors impacting on a site can be unrelated to rainfall and quite brief, as exemplified by experience at a Doyles Creek site where some over-enthusiastic pruning of the roadside shrubs resulted in a noticeable reduction of species recorded. Furthermore, at one of my Martindale sites (MD1) I have tended to see fewer small species after grass has been slashed in areas close to the road. At the other site a temporary influx may occur when there is a good crop of mistletoe in the area. Substantial numbers of Mistletoebirds *Dicaeum hirundinaceum* may be present, followed if one is lucky by the appearance of Painted Honeyeaters. Given such fluctuations of conditions ten years of data is actually less than I should like.

Drought and other deteriorating conditions must not be blamed for every obvious change in reporting rates. My records show a period of considerable loyalty of a pair of Restless Flycatchers *Myiagra inquieta* to my MD1 site. After being recorded 17 times in 22 surveys between March 2000 and November 2004, they have been recorded only twice there since. However, since August 2004 a pair of Restless Flycatchers has been recorded on 23 out of 28 visits to DC2. A single Restless Flycatcher was once similarly loyal to Bolwarra Sewage Treatment Works during the winter only. In 2000, for instance, it was recorded every month from April to August. Its failure to return one year marked the end of my records in this regularly surveyed area. With a *site-loyal species* such as this, and with each site being only 2ha in area, the

loss of one resident pair cannot be taken as a valid indication of a species in decline regionally. There may be other sites locally where it continues to thrive.

To take a much rarer species, I have often, since 2001, been able to find White-browed Babbler at my DC1 site, generally between four and six birds. They once also appeared at DC2 (Stuart 2001). These records might have given the impression that this species is commoner in the general area than Grey-crowned Babbler *Pomatostomus temporalis*, but I have recorded the latter species at five widely separated sites between Jerrys Plains and Yarrawa, and the White-browed at only two sites two kilometres apart. This might be the only colony for some distance, and if it had disappeared at Doyles Creek in 2006 (fortunately it did not) this might have led to the drying up of Hunter records east of about Giants Creek to judge from records this century (Stuart 2000-06), arousing the suspicion that a regularly recorded species had succumbed to devastating drought. In fact something similar, but less dramatic, did happen in the case of Bell Miners. A colony used to be at the edge of the DC1 survey area, and so the species was usually recorded there, but I last heard them there in June 2006; now my trips to the south-west of the Hunter Region no longer record this species. However, as it is said that this species is 'subject to sudden short-range re-locations' (Pizzey & Doyle 1980, p. 323), there is no need to think that the birds are either dead or far away. Their absence can be explained in terms of the regular behaviour of this species.

Expansions and Contractions

In recent years reports to HBOC have strongly suggested changes in the range of various species, usually involving a spread east towards the coast or south down the coast. In most cases the species concerned have not appeared at my sites. However, there has, this decade, been a sharp increase in the reporting of Spiny-cheeked Honeyeaters, initially in the Giants Creek area, but moving east (Stuart 2000-06). For several years this bird failed to appear in my survey area, though by about 2004 I was receiving suspected glimpses of it near the Goulburn River at Yarrawa. Recently, however, the bird was encountered for two surveys running at my DC2 survey area during the winter of 2008, and it has since occurred at MD1. Given the agreement of this fact with a clear trend in recent reporting, one must assume that this bird is adapting well to the Hunter, and while drought

further west may at times be a catalyst to its movements there seems to be a steady underlying drift east. The related Striped Honeyeater *Plectrohyncha lanceolata*, likewise missing from coastal east Victoria and the NSW South Coast in the published Atlas (Barrett *et al.* 2003), is also a bird that seems to be spreading in the west and central districts of the Hunter. In this case I note from my records that it was first recorded at the DC2 site in 2000, at DC1 and MD2 in 2002, and at MD1 in 2005, and it is still being frequently recorded. It is most unlikely that unusual weather conditions or abundance of food can explain its steady spread.

A word might be said about the appearance of White-browed Woodswallows *Artamus superciliosus* in November 2003. Birds were recorded over the spring/summer period at both my DC sites, and in Martindale by another observer, with breeding behaviours noted (Stuart 2003-04). Since then I have seen birds at DC1 in December 2006 and February 2007, and at both Doyles Creek sites during September to December 2007, when the feeding of fledged young was again noted (Stuart 2008). They did not reappear in spring 2008. However, more analysis of surveys for the spring/summer of 2008/09 is needed to clarify what the post-drought position will be in these cases. I see no patterns here, and would not question the bird's current published Hunter status as 'uncommon irruptive visitor'.

Small Species: Worrying Trends

I have far fewer qualms about drawing some preliminary conclusions about species that are both residents and reasonably common when looked at across the Region as a whole. If a single unusual bird appears once at a single site in a given year it cannot be held to be evidence of a pattern of movement into the Hunter, and could rather be evidence of habitat-loss elsewhere. Again one should not postulate population-movements if a small sedentary population has established itself at a given site, when there are no nearby sites at which it may be found. Yet if records for the Superb Fairy-wren *Malurus cyaneus* fall by half across a number of sites in the same area over time, say from a 60% reporting rate for quarterly surveys to a 30% rate, then one has cause for concern that the bird may be under pressure. Since birdwatchers may pay less attention to familiar species, the data may alert them to meaningful increases and decreases. What do my figures for Superb Fairy-wren show? Take Doyles Creek for instance (**Table 2**):

Table 2. Superb Fairy-wrens at Doyles Creek (*data in parentheses are the values for individual sites).

Survey periods	1998-2005	Late 2006	2007-2008
No. of surveys, Doyles Creek [DC1, DC2]	83 [46, 37]*	6 [4, 2]*	24 [12, 12]*
Superb Fairy-wren records [DC1, DC2]	59 [35, 24]*	2 [2, 0]*	6 [0, 6]*
Reporting Rate	71%	33%	25%

Here the rate of reporting is now only just over a third of what it previously was. This decline would surely be a serious worry if it could not plausibly be attributed to the drought with potential for

future recovery as conditions improve. But as **Table 3** will show, these results have certainly not been duplicated at Martindale:

Table 3. Superb Fairy-wrens at Martindale

Survey periods	1998-2005	Late 2006	2007-2008
No. of surveys, Martindale [MD1, MD2]	72 [31, 41]	5 [1, 4]	12 [5, 7]
Superb Fairy-wren records [MD1, MD2]	48 [15, 33]	3 [1, 2]	8 [4, 4]
Reporting Rate	67%	60%	67%

The Martindale surveys point to an almost surprisingly constant rate of reporting. I have difficulty in explaining the increased resilience of Superb Fairy-wrens at the Martindale sites. There seems to be no corresponding increase of other small species competing for the same ecological slot at the Doyles Creek sites, though one may point to the fact that the DC1 site at which the change has been more marked is rather higher, raised up from creek level, so that (a) water shortages are probably more acute than at other sites, and (b) it is natural for the birds to move slightly down the slope towards creek level.

Recent investigation has encountered birds some 500-800 metres down the slope, at a site for which I have few historical records. One might also suspect that the decline at Doyles Creek sites has been accelerated by the activity of the smaller cuckoo-species, since the Shining Bronze-Cuckoo *Chalcites lucidus* and Horsfield's Bronze-Cuckoo *Chalcites basalis* have experienced a higher rate of reporting in recent years at the drier DC1 site. In **Table 4** I include figures for Martindale and the DC 2 site (which only had Shining Bronze-Cuckoo). Note that the first numeric column is for a five-year period:

Table 4. Number of records of bronze-cuckoos.

Species	Site	98-02	2003	2004	2005	2006	2007	2008
Shining	DC 1	1	1	1	0	0	1	1
Shining	DC2	0	0	0	1	0	1	0
Shining	M'dale	2	0	2	2	0	1	0
Horsfield's	DC 1	1	0	0	1	1	2	1
Horsfield's	M'dale	1	0	1	1	0	0	0
TOTAL	ALL	5	1	4	5	1	5	2

It would seem that there has been a spike in the activities of the bronze-cuckoo species from 2004 to spring 2005. This may have lasted until spring 2007, since 2006 figures are based on a reduced number of surveys. The spike beginning in spring 2004 might conceivably have contributed to the reduction of species used as hosts, such as fairy-wrens and thornbills. In the case of fairy-wrens,

however, it is obvious that one might have expected a similar fall-off at Martindale if this were the case, but no such decline eventuated. The cuckoo theory thus remains unproven, and cuckoo activity can scarcely be the only factor involved.

The overall rate of thornbill reporting has dropped more evenly in the two locations since 2006: at

Doyles Creek from 0.29 species recorded per survey to 0.21, down 28%; and from 1.04 species per survey in Martindale to 0.67, down 36%. This means that recording rates have fallen by over a quarter at the former, and over a third at the latter. At Doyles Creek my figures show a decline of Yellow-rumped Thornbills as early as 2002, which was a drought year. Another species that has been recorded less frequently from this earlier date is the Grey Fantail *Rhipidura albiscapa*. Pre-2006 records for this species at MD1 and MD2 (5 in each instance) are confined to 2002-03 and 1999-2002, and at DC1 and DC2 they are confined to 2000-01 (10) and 2000-02 (4). There was a single record at DC1 in December 2006, but otherwise the species has not been recorded since in any survey up to the end of 2008. However, since the species was recorded only once for any site prior to

2000 (i.e. once in twenty surveys altogether), it seems that they are only found at such sites under favourable conditions. In contrast reporting rates for the related, but larger, Willie Wagtail *Rhipidura leucophrys* have shown only minor variation. A decrease from 73% reporting rate to 46% was noted in Martindale during the 2006 to August 2008 period, but the rate since then has risen again to 80%. Rates for pardalotes, though they have shown interesting local variation, establish no overall trend.

Finches have been a matter of serious concern to me of late. The declining rate of reporting is dramatic enough in Martindale, my previous 'finch-haven', to be obvious without any data, but let us see what all the data show (**Table 5**):

Table 5. Records of finches over all four sites [DC1, DC2, MD1, MD2]

Survey periods		1998-2005	Late 2006	2007-08
No. of surveys		155 [46,37,31,41]	11 [4,2,1,4]	36 [12,12,5,7]
Zebra Finch	<i>Taeniopygia guttata</i>	35 [0,0,4,31]	1 [0,0,0,1]	1 [0,0,0,1]
Double-barred Finch	<i>Taeniopygia bichenovii</i>	80 [27,10,11,32]	3 [1,0,0,2]	7 [1,0,1,5]
Red-browed Finch	<i>Neochmia temporalis</i>	12 [4,3,1,4]	1 [1,0,0,0]	0
Diamond Firetail	<i>Stagonopleura guttata</i>	27 [14,9,0,4]	3 [2,0,0,1]	11 [5,4,0,2]
Plum-headed Finch	<i>Neochmia modesta</i>	2 [0,0,0,2]	0	0

The reporting rate for the Vulnerable woodland species (Diamond Firetail) has *increased* from 17% to 30% by August 2008; the species commonest near the coast, the Red-browed Finch, has virtually disappeared (though in Doyles Creek it may still be found at sites close by); the Zebra Finch is faring nearly as badly, down from 23% to 4%; and the Double-barred Finch has suffered a significant decline, down from 52% to 21%. Amazingly, from winter 2006 I have been recording Diamond Firetail more frequently overall at these regular survey sites than all the other finches combined! This agrees with my overall impression that the more specialist dry woodland species have not declined in numbers at these sites as much as the more adaptable species.

One danger to finch populations that several other species do not have to contend with is trapping. A location at which seed was being provided, presumably in conjunction with trapping, for Double-barred Finches (and perhaps others) has been observed at DC1, and this may be linked to the disappearance of that species there. It is also

tempting to speculate that the decline may, in the case of the Double-barred Finch (which is 'mostly sedentary, but nomadic in response to dry conditions' (Pizzey & Doyle 1980, p. 372)), and some other species, be due to their becoming *nomadic when conditions deteriorate*, but I have no insights as to their likely destination. In fact over the relevant period I have found fewer finches at other sites west of Maitland where I could once record flocks of around twenty birds.

In the case of the Zebra Finch the Hunter Region Annual Bird Report (Stuart 1999-2007) suggests that around two thirds of the reports of flocks of 20 or more have come from the general area of Jerrys Plains and Denman. Even ignoring the large flocks often reported at Arrowfield in 1999-2000, twelve reports from this area were noted over this period, five of which came from Apple Tree Flat and four from Martindale. None of these came from the drought years 2002 and 2006, while in the year that followed there was a single report of a large (50+) flock from the area. Curiously the August 2007 report was from Medhurst Bridge Martindale,

the site here known as MD2. This might suggest that while conditions remained poor, birds that remained in the area were forming flocks that were larger and more nomadic, but it would require further verification.

I have concentrated on the post-2006 disappearance of smaller species, but some larger species are also affected. One example of a much larger bird that I had not recorded at Martindale sites from 2006 to August 2008 [13 surveys], but recorded 11 times from 2000 to 2005 [71 surveys], is the Black-shouldered Kite *Elanus axillaris*; possibly its prey had become much rarer near these sites as a consequence of the dry conditions. My impression is that it had become much scarcer also along Jones Reserve Road in the Bureen area, where raptors had tended to congregate in the past. However, this species had returned to MD1 by the end of 2008. By comparison Nankeen Kestrels *Falco cenchroides*, were recorded in Martindale in August 2007 and August 2008—this is not a significant drop from pre-2006 recording levels.

I hope this selection of data will convince others of the desirability of collecting and retaining regular data on sites for a considerable period. There remains much work to be done in order to assess whether the impact of the 2006 drought has long-lasting effects on the bird population, and which

species will fully recover. While some trends are already beginning to emerge, I hope to be able to offer further thoughts on these matters (and with a particular focus on Martindale) after the collection of another year or two of data—which I shall now be collecting with a much greater awareness of what my surveys can reveal. I hope also to be able to improve my coverage of Doyles Creek by quarterly surveys of other selected sites.

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Appendix: Rates of Decrease or Increase at the two Doyles Creek Sites

While recent data for Martindale sites has complicated the picture too much for me to be ready yet to present similar data, I should like to show how the 2006 to August 2008 reporting rates at the Doyles Creek sites differ from the 1998-2005 rates. All species recorded in the surveys between 2006 and August 2008 are listed, as are any recorded *at least twice* before. Species experiencing the biggest fall in reporting rate appear at the top. A negative figure in the column headed '% fall' indicates an increase in reporting rates. The final column labelled 'comment' is a partially subjective status summary often not wholly supported by the data offered, but this is because it also takes into full account monthly surveys

September-December 2008. Wherever the term 'disappeared' has been used it means that the species has failed to be recorded in all four of these surveys and the term 'recovered' indicates that the downwards trend has now begun to reverse.

While readers will form their own view of what falls or increases are significant, the results of Chi-squared calculations kindly carried out by Mike Newman yield a very high probability of significance at DC1 only in the case of species marked with an asterisk. I applied the test to the less dramatic results for DC2, but there appear to be no comparable falls or increases at that site.

Doyles Creek Site DC1: 32° 30' 31" S, 150° 47' 44" E

Species name	Scientific Name	1998 to 2005	% rate	2006 to Aug 08	% rate	% fall	Comment
Bell Miner	<i>Manorina melanophrys</i>	31	69	1	06	63*	disappeared
Superb Fairy-wren	<i>Malurus cyaneus</i>	33	73	3	19	54*	disappeared
Double-barred Finch	<i>Taeniopygia bichenovii</i>	26	58	1	07	51*	disappeared
Jacky Winter	<i>Microeca fascians</i>	34	76	8	50	26	recovered
Grey Fantail	<i>Rhipidura albiscapa</i>	10	22	1	07	15	disappeared
Pied Butcherbird	<i>Cracticus nigrogularis</i>	13	29	2	14	15	disappeared
Eastern Yellow Robin	<i>Eopsaltria australis</i>	15	33	3	19	14	reduced
Fan-tailed Cuckoo	<i>Cacomantis flabelliformis</i>	6	13	0	00	13	uncertain
Speckled Warbler	<i>Chthonicola sagittata</i>	9	20	1	07	13	uncertain
Olive-backed Oriole	<i>Oriolus sagittatus</i>	12	27	2	14	13	recovered
Laughing Kookaburra	<i>Dacelo novaeguineae</i>	11	24	2	14	10	recovered
Bar-shouldered Dove	<i>Geopelia humeralis</i>	13	29	3	19	10	uncertain
Rufous Whistler	<i>Pachycephala rufiventris</i>	27	60	8	50	10	recovered
Brown Quail	<i>Coturnix ypsilophora</i>	4	09	0	00	09	uncertain
Australian King-Parrot	<i>Alisterus scapularis</i>	7	16	1	07	09	disappeared
Dusky Woodswallow	<i>Artamus cyanopterus</i>	23	51	7	44	07	reduced
Welcome Swallow	<i>Hirundo neoxena</i>	3	07	0	00	07	uncertain
White-throated Gerygone	<i>Gerygone albogularis</i>	3	07	0	00	07	uncertain
Scarlet Honeyeater	<i>Myzomela sanguinolenta</i>	3	07	0	00	07	uncertain
White-winged Chough	<i>Corcorax melanorhamphos</i>	14	31	4	25	06	steady
Eastern Rosella	<i>Platycercus eximius</i>	22	49	7	44	05	reduced
Crested Pigeon	<i>Ocyphaps lophotes</i>	2	04	0	00	04	—
Black-shouldered Kite	<i>Elanus axillaris</i>	2	04	0	00	04	—
Nankeen Kestrel	<i>Falco cenchroides</i>	2	04	0	00	04	—
Crimson Rosella	<i>Platycercus elegans</i>	2	04	0	00	04	—
Red-backed Kingfisher	<i>Todiramphus pyrrhopygius</i>	2	04	0	00	04	—
Pallid Cuckoo	<i>Cacomantis pallidus</i>	2	04	0	00	04	—
Magpie-Lark	<i>Grallina cyanoleuca</i>	2	04	0	00	04	—
White-browed Scrubwren	<i>Sericornis frontalis</i>	2	04	0	00	04	—
Chestnut-rumped Heathwren	<i>Hylacola pyrrhopygia</i>	2	04	0	00	04	—
Yellow-faced Honeyeater	<i>Lichenostomus chrysops</i>	13	29	4	25	04	—
White-plumed Honeyeater	<i>Lichenostomus penicillatus</i>	38	84	13	81	03	steady
Red-browed Finch	<i>Neochmia temporalis</i>	4	09	1	07	02	uncertain
Rufous Songlark	<i>Cincloramphus mathewsi</i>	7	16	2	14	02	steady
Noisy Miner	<i>Manorina melanocephala</i>	7	16	2	14	02	steady
Mistletoebird	<i>Dicaeum hirundinaceum</i>	23	51	8	50	01	steady
Galah	<i>Colophus roseicapilla</i>	3	07	1	07	00	steady
Common Koel	<i>Eudynamis orientalis</i>	3	07	1	07	00	steady
Yellow Thornbill	<i>Acanthiza nana</i>	3	07	1	07	00	steady
Little Lorikeet	<i>Glossopsitta pusilla</i>	6	13	2	14	- 01	steady
Tree Martin	<i>Petrochelidon nigricans</i>	6	13	2	14	- 01	steady
Golden Whistler	<i>Pachycephala pectoralis</i>	6	13	2	14	- 01	steady
Weebill	<i>Smicromis brevirostris</i>	6	13	2	14	- 01	steady
Eastern Spinebill	<i>Acanthorhynchus tenuirostris</i>	6	13	2	14	- 01	steady
Diamond Firetail	<i>Stagonopleura guttata</i>	13	29	5	31	- 02	steady
Dollarbird	<i>Eurystomus orientalis</i>	2	04	1	07	- 03	—

Doyles Creek Site DC1: 32° 30' 31" S, 150° 47' 44" E (cont.)

Species name	Scientific Name	1998 to 2005	% rate	2006 to Aug 08	% rate	% fall	Comment
Varied Sittella	<i>Daphoenositta chrysoptera</i>	2	04	1	07	- 03	—
Yellow-tufted Honeyeater	<i>Lichenostomus melanops</i>	10	22	4	25	- 03	steady
Common Bronzewing	<i>Phaps chalcoptera</i>	5	11	2	14	- 03	steady
Australian Wood Duck	<i>Chenonetta jubata</i>	5	11	2	14	- 03	steady
Rainbow Bee-eater	<i>Merops ornatus</i>	1	02	1	06	- 04	steady
Striated Thornbill	<i>Acanthiza lineata</i>	1	02	1	07	- 05	—
Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>	1	02	1	07	- 05	—
Masked Woodswallow	<i>Artamus personatus</i>	1	02	1	07	- 05	—
Wedge-tailed Eagle	<i>Aquila audax</i>	4	09	2	14	- 05	steady
Eastern Whipbird	<i>Psophodes olivaceus</i>	4	09	2	14	- 05	steady
Spotted Pardalote	<i>Pardalotus punctatus</i>	6	13	3	19	- 06	steady
Australian Magpie	<i>Cracticus tibicen</i>	17	38	7	44	- 06	steady
Yellow-tailed Black-Cockatoo	<i>Calyptorhynchus funereus</i>	0	0	1	07	- 07	—
Leaden Flycatcher	<i>Myiagra rubecula</i>	0	0	1	07	- 07	—
Hooded Robin	<i>Melanodryas cucullata</i>	0	0	1	07	- 07	—
Australasian Figbird	<i>Sphecotheres vieilloti</i>	0	0	1	07	- 07	—
Shining Bronze-Cuckoo	<i>Chalcites lucidus</i>	3	07	2	14	- 07	increased
Noisy Friarbird	<i>Philemon corniculatus</i>	16	36	7	44	- 08	steady
Crested Shrike-tit	<i>Falcunculus frontatus</i>	7	16	4	25	- 09	steady
Willie Wagtail	<i>Rhipidura leucophrys</i>	21	47	9	56	- 09	steady
Peaceful Dove	<i>Geopelia striata</i>	24	53	10	63	- 10	increased
Channel-billed Cuckoo	<i>Scythrops novaehollandiae</i>	2	04	2	14	- 10	—
Pied Currawong	<i>Strepera graculina</i>	12	27	6	38	- 11	increased
Brown Thornbill	<i>Acanthiza pusilla</i>	1	02	2	14	- 12	—
Brown-headed Honeyeater	<i>Melithreptus brevirostris</i>	1	02	2	14	- 12	—
Sulphur-crested Cockatoo	<i>Cacatua galerita</i>	3	07	3	19	- 12	steady
Brown Treecreeper	<i>Climacteris picumnus</i>	5	11	4	25	- 14	increased
Restless Flycatcher	<i>Myiagra inquieta</i>	7	16	5	31	- 15	slipped back
Black-faced Cuckoo-Shrike	<i>Coracina novaehollandiae</i>	4	09	4	25	- 16	increased
White-throated Treecreeper	<i>Cormobates leucophaea</i>	1	02	3	19	- 17	increased
Australian Raven	<i>Corvus coronoides</i>	26	58	12	75	- 17	increased
White-browed Babbler	<i>Pomatostomus superciliosus</i>	14	31	8	50	- 19	increased
Grey Butcherbird	<i>Cracticus torquatus</i>	1	02	3	21	- 19	increased
Horsfield's Bronze-Cuckoo	<i>Chalcites basalus</i>	2	04	4	25	- 21	slipped back
White-browed Woodswallow	<i>Artamus superciliosus</i>	0	0	3	21	- 21	irruptive
Striated Pardalote	<i>Pardalotus striatus</i>	14	31	9	56	- 25	increased
Grey Shrike-thrush	<i>Colluricincla harmonica</i>	14	31	10	63	- 32	increased
Striped Honeyeater	<i>Plectorhyncha lanceolata</i>	6	13	9	56	- 43*	increased

Doyles Creek Site DC2: 32° 30' 33" S, 150° 48' 22" E

Species name	Scientific name	1998 to 2005	% rate	2006 to Aug 08	% rate	% fall	Comment
Striated Pardalote	<i>Pardalotus striatus</i>	13	35	2	13	22	reduced
Superb Fairy-wren	<i>Malurus cyaneus</i>	24	65	7	44	21	reduced
Eastern Rosella	<i>Platycercus eximius</i>	17	46	4	25	21	recovering
Yellow-faced Honeyeater	<i>Lichenostomus chrysops</i>	10	27	1	06	21	reduced
Double-barred Finch	<i>Taeniopygia bichenovii</i>	10	27	1	06	21	reduced
Grey Shrike-thrush	<i>Colluricincla harmonica</i>	12	32	2	13	19	reduced
Yellow Thornbill	<i>Acanthiza nana</i>	7	19	0	00	19	disappeared
Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>	7	19	0	00	19	disappeared
Rufous Whistler	<i>Pachycephala rufiventris</i>	20	54	6	38	16	recovered
Wonga Pigeon	<i>Leucosarcia melanoleuca</i>	6	16	0	00	16	disappeared
Australian Raven	<i>Corvus coronoides</i>	36	97	13	81	16	reduced
Speckled Warbler	<i>Chthonicola sagittata</i>	5	14	0	00	14	disappeared
Eastern Spinebill	<i>Acanthorhynchus tenuirostris</i>	5	14	0	00	14	disappeared
White-winged Chough	<i>Corcorax melanorhamphos</i>	9	24	2	13	11	steady
Jacky Winter	<i>Microeca fascinaris</i>	32	86	12	75	11	steady
Eastern Koel	<i>Eudynamis orientalis</i>	4	11	0	00	11	—
Grey Fantail	<i>Rhipidura aliscapa</i>	4	11	0	00	11	disappeared
Weebill	<i>Smicromis brevirostris</i>	6	16	1	06	10	reduced
Olive-backed Oriole	<i>Oriolus sagittatus</i>	6	16	1	06	10	steady
Channel-billed Cuckoo	<i>Scythrops novaehollandiae</i>	3	08	0	00	08	—
Tree Martin	<i>Petrochelidon nigricans</i>	3	08	0	00	08	steady
Golden Whistler	<i>Pachycephala pectoralis</i>	3	08	0	00	08	reduced
Silvereye	<i>Zosterops lateralis</i>	3	08	0	00	08	reduced
Red-browed Finch	<i>Neochmia temporalis</i>	3	08	0	00	08	reduced
Spotted Dove	<i>Streptopelia chinensis</i>	3	08	0	00	08	reduced
Mistletoebird	<i>Dicaeum hirundinaceum</i>	14	38	5	31	07	steady
Black-faced Cuckoo-Shrike	<i>Coracina novaehollandiae</i>	7	19	2	13	06	reduced
Intermediate Egret	<i>Ardea intermedia</i>	2	05	0	00	05	—
Peregrine Falcon	<i>Falco peregrinus</i>	2	05	0	00	05	—
Leaden Flycatcher	<i>Myiagra rubecula</i>	2	05	0	00	05	—
White-throated Gerygone	<i>Gerygone albugularis</i>	2	05	0	00	05	reduced
Western Gerygone	<i>Gerygone fusca</i>	2	05	0	00	05	reduced
Brown Thornbill	<i>Acanthiza pusilla</i>	2	05	0	00	05	reduced
Brown Treecreeper	<i>Climacteris picumnus</i>	2	05	0	00	05	recovered
Crested Shrike-tit	<i>Falcunculus frontatus</i>	4	11	1	06	05	reduced
Willie Wagtail	<i>Rhipidura leucophrys</i>	27	73	11	69	04	recovered
Pied Butcherbird	<i>Cracticus nigrogularis</i>	13	35	5	31	04	steady
Hooded Robin	<i>Melanodryas cucullata</i>	8	22	3	19	03	reduced
Magpie-Lark	<i>Grallina cyanoleuca</i>	3	08	1	06	02	reduced
Spotted Pardalote	<i>Pardalotus punctatus</i>	3	08	1	06	02	reduced
Australian Wood Duck	<i>Chenonetta jubata</i>	5	14	2	13	01	steady
Grey Butcherbird	<i>Cracticus torquatus</i>	5	14	2	13	01	steady
Noisy Miner	<i>Manorina melanocephala</i>	2	05	1	06	- 01	steady
Eastern Yellow Robin	<i>Eopsaltria australis</i>	8	22	4	25	- 03	steady
White-necked Heron	<i>Ardea pacifica</i>	1	03	1	06	- 03	steady
Grey Goshawk	<i>Accipiter novaehollandiae</i>	1	03	1	06	- 03	—
Wedge-tailed Eagle	<i>Aquila audax</i>	1	03	1	06	- 03	—
Little Lorikeet	<i>Glossopsitta pusilla</i>	1	03	1	06	- 03	—
Crimson Rosella	<i>Platycercus elegans</i>	1	03	1	06	- 03	—
Sulphur-crested Cockatoo	<i>Cacatua galerita</i>	24	65	11	69	- 04	steady

Doyles Creek Site DC2: 32 ° 30' 33" S, 150° 48' 22" E (cont.)

Species name	Scientific name	1998 to 2005	% rate	2006 to Aug 08	% rate	% fall	Comment
White-browed Woodswallow	<i>Artamus superciliosus</i>	3	08	2	13	- 05	irruptive
Welcome Swallow	<i>Hirundo neoxena</i>	5	14	3	19	- 05	steady
Brown Quail	<i>Coturnix ypsilophora</i>	0	00	1	06	- 06	—
Australasian Figbird	<i>Sphecotheres vieilloti</i>	0	00	1	06	- 06	—
Brown-headed Honeyeater	<i>Melithreptus brevirostris</i>	0	00	1	06	- 06	—
Noisy Friarbird	<i>Philemon corniculatus</i>	9	24	5	31	- 07	steady
Crested Pigeon	<i>Ocyphaps lophotes</i>	4	11	3	19	- 08	steady
Galah	<i>Colophus roseicapilla</i>	4	11	3	19	- 08	steady
Striped Honeyeater	<i>Plectorhyncha lanceolata</i>	20	54	10	63	- 09	increased
Shining Bronze-Cuckoo	<i>Cacomantis lucidus</i>	1	03	2	13	- 10	—
Grey-crowned Babbler	<i>Pomatostmus temporalis</i>	1	03	2	13	- 10	increased
White-throated Treecreeper	<i>Cormobates leucophaeus</i>	1	03	2	13	- 10	—
Little Eagle	<i>Hieraaetus morphnoides</i>	0	00	2	13	- 13	—
Spiny-Cheeked Honeyeater	<i>Acanthagenys rufogularis</i>	0	00	2	13	- 13	—
Pallid Cuckoo	<i>Cacomantis pallidus</i>	2	05	3	19	- 14	increased
Australian Magpie	<i>Cracticus tibicen</i>	18	49	10	63	- 15	steady
White-plumed Honeyeater	<i>Lichenostomus penicillatus</i>	29	78	15	94	- 16	increased
Laughing Kookaburra	<i>Dacelo novaeguineae</i>	3	08	4	25	- 17	increased
Rainbow Bee-eater	<i>Merops ornatus</i>	3	08	4	25	- 17	increased
White-winged Triller	<i>Lalage sueurii</i>	7	19	6	38	- 19	increased
Diamond Firetail	<i>Stagonopleura guttata</i>	9	24	7	44	- 20	increased
Australian King-Parrot	<i>Alisterus scapularis</i>	2	05	4	25	- 20	increased
Rufous Songlark	<i>Cincloramphus mathewsi</i>	2	05	4	25	- 20	increased
Pied Currawong	<i>Strepera graculina</i>	5	14	6	38	- 24	increased
Peaceful Dove	<i>Geopelia striata</i>	21	57	13	81	- 24	increased
Dusky Woodswallow	<i>Artamus cyanopterus</i>	11	30	9	56	- 26	slipped back
Bar-shouldered Dove	<i>Geopelia humeralis</i>	5	14	7	44	- 30	increased
Restless Flycatcher	<i>Myiagra inquieta</i>	14	38	11	69	- 31	increased
Red-rumped Parrot	<i>Psephotus haematonotus</i>	0	00	5	31	- 31	increased