Birds of the Black Rock area near Martins Creek in the Hunter Valley (1999-2013)

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This paper demonstrates how keeping bird lists during loosely structured walks in the foothills near Paterson in the Hunter Valley over a 15-year period provided a valuable record of the local bird population. 124 species were recorded, primarily woodland and open country species. Seasonal and long-term annual trends in occurrence are discussed. The area contains pockets of habitat suitable for species like the Double-barred Finch and Speckled Warbler which are becoming scarce in the Paterson area. Swift Parrots occurred occasionally and Rainbow Bee-eaters in late summer.

INTRODUCTION

The Black Rock area near Martins Creek supports many of the open country and woodland birds found in the Paterson area of the Hunter Valley in NSW. Over a 15-year period I made regular visits to the area and accumulated an inventory of the bird population. This paper discusses the composition of the diverse bird population of the area.

Sightings of Swift Parrots, a threatened species, were the motivation for initiating long-term monitoring involving periodic visits to the area, particularly during winter months.

METHODS

I walked up Black Rock Road from the junction with Barford Lane to the junction with Fitness's Road, a distance of 1.5km. During the first km the road passes through cleared farmland with a few dwellings and three small dams. In this stretch roadside vegetation, including mature trees, provided important bird habitat. Over the next 0.5km the road climbed through an unfenced area, where there was a variety of woodland, grassland and wet gully habitats. I then walked approximately 0.5km to the crest of Fitness's Road (~100m ASL), before descending through privately owned open woodland to the continuation of Black Rock Road approximately 0.5km beyond the Fitness's Road junction. The return journey to Barford Lane initially passes through a stand of mature eucalypt woodland. Two dams in this area and leakage from a reservoir tank (now repaired) provided permanent water in this segment. The total distance walked was approximately 5km. The area is shown in **Figure 1**.

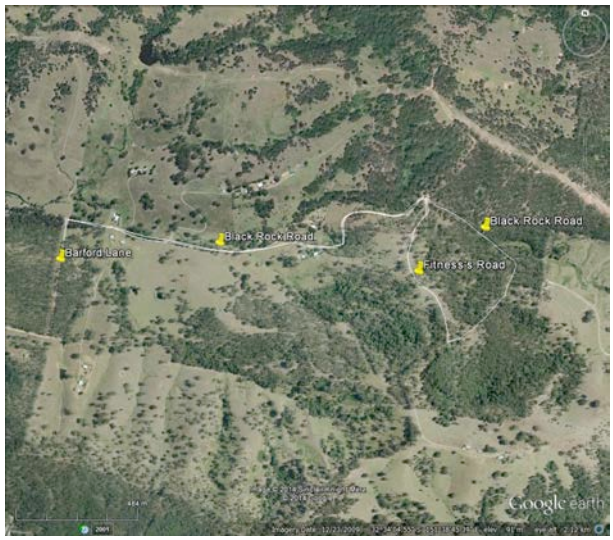

Figure 1. Survey route in Black Rock area.

Visits were made in the morning and typically involved 2 to 3 hours. A bird list, based on species seen and heard during each visit, was submitted to the BirdLife Australia (BLA) Birdata archive as a 5km survey (site ID 97476) centred on 32.568S 151.649E. While rigid survey protocols were not used the visits were conducted following the same route enabling meaningful comparisons of the frequency of occurrence of different species.

Reporting rates (RR), the frequency a species occurred during the visits, were used to indicate the relative abundance of bird species. For instance, an experienced bird observer would have a 90% chance of seeing or hearing a species with a 90% RR during a visit to the Black Rock area.

However, the seasonal timing of visits was not structured, complicating the interpretation of trends in seasonal and long-term annual occurrence.

To assist the interpretation of results, RRs in this study were compared with those for the Hunter Region extracted from Birdata for the almost identical period 1998-2012. The results in this study, submitted as 5km radius surveys, were compared with the combined 500m and 5km radius survey data submitted to Birdata.

RESULTS

Between 1999 and 2013, 104 visits were made to the study area. The number of surveys, mean list lengths, mean number of species recorded for each of the three-year periods of the study (five in total), and the ratio of summer/winter surveys are shown in **Table 1**. The highest intensity of observation was during the first three years (1999-2000). Species diversity was greatest at the beginning (49.3 and 48.6 species/visit) and during the last three years (46.5 species/visit).

One hundred and twenty four species were recorded, some regularly and others on just a few or even a single occasion. The full species list in taxonomic order is contained in **Appendix 1**, with a break-down of RRs for successive three-year periods. The results presented below and the ensuing discussion are primarily concerned with birds which occurred regularly.

Very Common Species (RR >80%)

Approximately one fifth of the species were in this category (**Table 2**), including 23 with a RR > 80%. Two summer migrants, White-throated Gerygone *Gerygone albogularis* RR 48.1% and Rufous Whistler *Pachycephala rufiventris* RR 44.2% were accorded very common status for the summer period, although there were several interesting records of the former species involving late departures and early arrival. The mean ratio of RR (%) in this study compared to the whole Hunter Region was 3.3, with two species Yellow-tufted Honeyeater *Lichenostomus melanops* and Jacky Winter *Microeca fascinans* at least double the mean ratio.

Table 1. Summary of visits, mean list length and number of bird species recorded during visits to the Black Rock area near Martins Creek between 1999 and 2013.

	1999/2001	2002/2004	2005/2007	2008/2010	2011/2013	1999/2013
Number of surveys	35	19	13	15	22	104
Mean list length	49.3	48.6	46.0	41.6	46.5	47.1
Number of species recorded	122	119	96	87	100	124
Summer/winter survey ratio*	1.3	1.4	0.9	0.7	1.0	1.1

*Summer defined as September to February, the main period when summer migrants are present.

Table 2. Very commonly recorded species (RR>80%)

Common Name	Scientific Name	RR (%) This study	RR (%) Hunter Region	RR Ratio Black Rock/Hunter
Superb Fairy-wren	*Malurus cyaneus*	100	49.4	2.0
Yellow-faced Honeyeater	*Lichenostomus chrysops*	99.0	38.1	2.6
Lewin's Honeyeater	*Meliphaga lewinii*	98.1	30.1	3.3
Australian Magpie	*Cracticus tibicen*	98.1	58.4	1.7
Grey Fantail	*Rhipidura albiscapa*	97.1	45.5	2.1
Eastern Rosella	*Platycercus eximius*	96.2	42.7	2.3
Spotted Pardalote	*Pardalotus punctatus*	95.2	26	3.7
Eastern Whipbird	*Psophodes olivaceus*	95.2	29.7	3.2
Noisy Miner	*Manorina melanocephala*	94.2	35.4	2.7
Australian Raven	*Corvus coronoides*	93.3	45	2.1
Laughing Kookaburra	*Dacelo novaeguineae*	92.3	44.1	2.1

Table 2. Very commonly recorded species (RR>80%) continued

Common Name	Scientific Name	RR (%) This study	RR (%) Hunter Region	RR Ratio Black Rock/Hunter
Grey Shrike-thrush	*Colluricincla harmonica*	92.3	29.4	3.1
Jacky Winter	*Microeca fascinans*	90.4	12.5	7.2
Masked Lapwing	*Vanellus miles*	89.4	47.2	1.9
Willie Wagtail	*Rhipidura leucophrys*	89.4	46.1	1.9
White-browed Scrubwren	*Sericornis frontalis*	88.5	26.9	3.3
Striated Pardalote	*Pardalotus striatus*	86.5	17.1	5.1
Australian Wood Duck	*Chenonetta jubata*	85.6	30.7	2.8
Red Wattlebird	*Anthochaera carunculata*	85.6	20.1	4.3
Pied Butcherbird	*Cracticus nigrogularis*	85.6	29.4	2.9
Welcome Swallow	*Hirundo neoxena*	85.6	43.9	1.9
Yellow-tufted Honeyeater	*Lichenostomus melanops*	81.7	7.3	11.2
Eastern Spinebill	*Acanthorhynchus tenuirostris*	80.8	25.7	3.1
White-throated Gerygone*	*Gerygone albogularis*	48.1	12.5	3.8
Rufous Whistler*	*Pachycephala rufiventris*	44.2	20	2.2

*Summer Visitor

Commonly recorded species (RR 40 to 79%)

Just over 25% of all the species recorded fell in this category, with 29 having a RR in the range 40 to 79%. If their RR values are doubled, three summer migrants also merit inclusion; Sacred Kingfisher *Todiramphus sanctus* 22.1%, Channel-billed Cuckoo *Scythrops novaehollandiae* 21.2% and Dollarbird *Eurystomus orientalis* 20.2%. Variations in the RR ratio indicated several species with disproportionately high values (e.g. Wonga Pigeon *Leucosarcia picata* 6.4 and Double-barred Finch *Taeniopygia bichenovii* 5.6) as well as species with abnormally low values (e.g. Brown Thornbill *Acanthiza apicalis* 1.8) compared with the average of 3.1 for this group of species (**Table 3**).

Table 3. Commonly recorded species (RR 40 to 79%)

Common Name	Scientific Name	RR (%) This study	RR (%) Hunter Region	RR Ratio Black Rock/Hunter
Eastern Yellow Robin	*Eopsaltria australis*	79.8	28	2.9
Magpie-lark	*Grallina cyanoleuca*	78.8	47	1.7
Red-browed Finch	*Neochmia temporalis*	78.8	32.5	2.4
Crested Pigeon	*Ocyphaps lophotes*	77.9	30.4	2.6
Golden Whistler	*Pachycephala pectoralis*	76.9	28.4	2.7
Dusky Moorhen	*Gallinula tenebrosa*	75	17.7	4.2
Grey Butcherbird	*Cracticus torquatus*	74	31.3	2.4
Bar-shouldered Dove	*Geopelia humeralis*	71.2	20.7	3.4
Yellow Thornbill	*Acanthiza nana*	70.2	26.7	2.6
Striated Thornbill	*Acanthiza lineata*	68.3	13.8	4.9
Pied Currawong	*Strepera graculina*	67.3	15.5	4.3
Wonga Pigeon	*Leucosarcia picata*	66.3	10.3	6.4
Satin Bowerbird	*Ptilonorhynchus violaceus*	66.3	19	3.5
Silvereye	*Zosterops lateralis*	66.3	29.3	2.3
Variegated Fairy-wren	*Malurus lamberti*	63.5	16.7	3.8
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	63.5	36.1	1.8
Australian King-Parrot	*Alisterus scapularis*	59.6	17.9	3.3

Table 3. Commonly recorded species (RR 40 to 79%) continued.

Common Name	Scientific Name	RR (%) This study	RR (%) Hunter Region	RR Ratio Black Rock/Hunter
Brown Thornbill	*Acanthiza apicalis*	53.8	30.6	1.8
White-naped Honeyeater	*Melithreptus lunatus*	53.8	10.9	4.9
Mistletoebird	*Dicaeum hirundinaceum*	52.9	11.8	4.5
Noisy Friarbird	*Philemon corniculatus*	49	23.4	2.1
Double-barred Finch	*Taeniopygia bichenovii*	49	8.7	5.6
Galah	*Eolophus roseicapillus*	48.1	32.5	1.5
Speckled Warbler	*Chthonicola sagittata*	46.2	14.4	3.2
Little Lorikeet	*Glossopsitta pusilla*	43.3	8.5	5.1
Crimson Rosella	*Platycercus elegans*	43.3	14	3.1
White-throated Treecreeper	*Cormobates leucophaea*	42.3	22.3	1.9
Fan-tailed Cuckoo	*Cacomantis flabelliformis*	40.4	17.9	2.3
Olive-backed Oriole	*Oriolus sagittatus*	40.4	15.5	2.6
Sacred Kingfisher*	*Todiramphus sanctus*	22.1	15.6	1.4
Channel-billed Cuckoo*	*Scythrops novaehollandiae*	21.2	10.3	2.1
Dollarbird*	*Eurystomus orientalis*	20.2	13.7	1.5

*Summer visitor

Moderately common species (RR 20 to 39%)

Just over 15% of the species recorded fall into this category; with 12 species having a RR in the range 20 to 39%, and a further 6 summer migrants; Cicadabird *Coracina tenuirostris* 19.2%, Eastern Koel 19.2%, Black-faced Monarch 17.3%, Leaden Flycatcher *Myiagra rubecula* 16.3%, Rainbow Bee-eater *Merops ornatus* 13.5% and Rufous Fantail *Rhipidura rufifrons* 11.5% added. In this category there was one obvious change in status of a species, Bell Miners *Manorina melanophrys* colonising the gully at the junction of Black Rock and Fitness's Road during the last six years of the study. The White-bellied Cuckoo-shrike *Coracina papuensis* had a high RR ratio of 8.0 compared with an average of 2.6 for this group (**Table 4**). In contrast waterbirds had low values; White-faced Heron *Egretta novaehollandiae* 0.5 and Purple Swamphen *Porphyrio porphyrio* 0.9.

Table 4. Moderately commonly recorded species (RR 20 to 39%)

Common Name	Scientific Name	RR (%) This study	RR (%) Hunter Region	RR Ratio Black Rock/Hunter
Pacific Black Duck	*Anas superciliosa*	37.5	37.0	1.0
Cattle Egret	*Ardea intermedia*	36.5	20.1	1.8
Bell Miner	*Manorina melanophrys*	34.6	12.5	2.8
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	30.8	13.4	2.3
Scarlet Honeyeater	*Myzomela sanguinolenta*	27.9	11.4	2.4
Rainbow Lorikeet	*Trichoglossus haematodus*	26.9	22.1	1.2
Pheasant Coucal	*Centropus phasianinus*	25.0	9.1	2.7
White-bellied Cuckoo-shrike	*Coracina papuensis*	24.0	3.0	8.0
Buff-rumped Thornbill	*Acanthiza reguloides*	23.1	5.6	4.1
White-faced Heron	*Egretta novaehollandiae*	21.2	43.4	0.5
Varied Sittella	*Daphoenositta chrysoptera*	21.2	8.2	2.6
Purple Swamphen	*Porphyrio porphyrio*	20.2	23.3	0.9
Cicadabird*	*Coracina tenuirostris*	19.2	4.5	4.3
Eastern Koel*	*Eudynamys orientalis*	19.2	12.0	1.6
Black-faced Monarch*	*Monarcha melanopsis*	17.3	7.2	2.4
Leaden Flycatcher*	*Myiagra rubecula*	16.3	6.6	2.5
Rainbow Bee-eater*	*Merops ornatus*	13.5	3.9	3.5
Rufous Fantail*	*Rhipidura rufifrons*	11.5	7.3	1.6

*Summer visitor

Uncommon and occasional species (RR <20%)

The remaining 50 species fall into this category, and for 12 species there was only a single occurrence (see **Appendix**, where species are listed in descending order of reporting rate; i.e. uncommon and occasional species are last).

DISCUSSION

List length/survey was typically in the range 40 to 50 species throughout the 15 years' duration of the project (**Table 1**). In the following sections the more commonly observed species (RR>20%) are discussed in comparison with RR found throughout the Hunter Region. This approach allows species, for which the Black Rock area is a "hot spot", to be highlighted. Similarly, it identifies species which are under-represented at Black Rock. The ratio of RR values in this study compared to Birdata for the Hunter Region is typically 3 (**Tables 2** to **4**). This is a consequence of the greater survey effort in these surveys (i.e. a large area and diversity of habitat sampled over a longer period of time than in a typical Birdata survey).

Two factors contribute to very high RR values for resident species; species which are abundant and well distributed throughout the area and secondly the extent to which they advertise their presence. Consequently, variations in RR magnitudes between species may reflect differences in species detectability as well as absence. Large and highly vocal species are more easily detected than small skulking birds. Seasonal variations in vocal activity must also be taken into account as well as the unstructured timing of the surveys (see variations in summer to winter survey activity in **Table 1**).

Very common species (RR>80%)

Species in this category are mostly residents, seasonal in the case of migrants. For this group of birds (**Table 2**) variations in RR are mainly associated with differences in species abundance and detectability rather than their intermittent occurrence in the study area.

The Superb Fairy-wren *Malurus cyaneus* was the only species observed on every visit, closely followed by Yellow-faced Honeyeater *Lichenostomus chrysops*, Lewin's Honeyeater *Meliphaga lewinii*, Australian Magpie *Cracticus tibicen*, Grey Fantail *Rhipidura albiscapa*, Eastern Rosella *Platycercus eximius*, Spotted Pardalote *Pardalotus punctatus* and Eastern Whipbird *Psophodes olivaceus*. The mix of these species, individually favouring different habitats including open country, grassland, open forest and wet gullies, illustrates the variety of habitat in the Black Rock area. All had RRs >95% and are recognised to be common and widely distributed residents of the Hunter Region (Stuart 2013). All, except two, of the 23 resident species with RRs >80% fit this mould. Jacky Winter, although widespread in the Hunter Region, is considered a usual rather than a common resident and the Yellow-tufted Honeyeater is described as occasionally, but widely recorded in the Hunter Region (Stuart 2013). Both had abnormally high RR ratios (**Table 2**) compared with the mean ratio of 3.3 for this group of birds, suggesting that Black Rock provides specialised habitat for these species. Throughout the study a colony of Yellow-tufted Honeyeaters was located on Black Rock Road just beyond the junction with Fitness's Road. Towards the end of the study a colony of Bell Miners formed in an adjacent gully and this seemed to force the Yellow-tufted Honeyeaters to shift their foraging range into more open woodland.

Commonly recorded species (RR 40 to 79%)

All 29 non-migratory species in this category were recorded a number of times in each three-year period and in most cases RR varied little between years. Many of these species, particularly those with the higher RRs, are resident and just less abundant and more difficult to detect. However, there were indications that some species declined in the third period (2005-2007), only partially recovering subsequently (see variations in RR values for three-year periods in the **Appendix**). Examples include the Variegated Fairy-wren *Malurus lamberti* and Fan-tailed Cuckoo *Cacomantis flabelliformis*.

Species well represented at Black Rock compared with the rest of the Hunter Region, with a higher than mean RR ratio of 3.1 (**Table 3**), included Wonga Pigeon *Leucosarcia picata* 6.4, Double-barred Finch *Taeniopygia bichenovii* 5.6 and Little Lorikeet *Glossopsitta pusilla* 5.1. The Wonga Pigeon is frequently heard calling, but seldom seen. Black Rock is one of the areas near Paterson where the Double-barred Finch can be regularly located. It is usually found at the sides of Black Rock Road in the last km before the junction with Fitness's Road, in groups of up to 20 and was nest building there in November 2013. It has become

increasingly scarce in the Paterson area and has disappeared from the woodland at Green Wattle Creek during the last five years (Newman 2009 and unpublished information). The RR ratio comparison probably understates the importance of the occurrence of this species at Black Rock, which is near the eastern edge of its range in the Hunter Region. The Double-barred Finch is less abundant in the Paterson area than in core habitat to the west (Newman unpublished analysis of Birdata observations). Similar comment can be made concerning the Speckled Warbler *Chthonicola sagittata* (ratio 3.2), a threatened species discussed in a subsequent section. The Little Lorikeet is an example of a species which occurs intermittently in the area (Newman 2009), and is discussed in the section on threatened species.

A number of species in this group appear under-represented in the area based on the RR ratio. These include Sacred Kingfisher 1.4, Dollarbird 1.5, and Galah *Eolophus roseicapillus* 1.5, Magpie-lark *Grallina cyanoleuca* 1.7 and Brown Thornbill 1.8. Lack of nest sites may contribute to the scarcity of the Sacred Kingfisher, Dollarbird and Galah, a situation exacerbated by the ongoing clearing of trees in an area with limited nest hollows. The Magpie-lark and Brown Thornbill are more difficult to explain as both are easily detected, the former frequenting open areas and both having frequently used characteristic calls. There appears to be habitat suitable for both species.

The seasonal variation of RR for the Olive-backed Oriole *Oriolus sagittatus* (**Figure 2**) suggests it occurs less frequently between February and August. While this could indicate the partial movement of birds from the Black Rock area, an alternative explanation is that the species calls less frequently outside the breeding season and consequently is detected less. Some credence for the latter explanation is provided by increased detection during the May-June period, possibly associated with a late autumnal increase in song activity. However, the most plausible interpretation may involve a combination of both explanations. In Victoria Emison *et al.* (1987) found that Orioles were summer migrants with a few remaining in winter. However, although most birds did not leave until March or April reporting rates declined sharply after December, probably because after nesting the Orioles cease calling. The view that the Olive-backed Oriole is a partial migrant in the Hunter Region is supported by the results of the NSW Bird Atlas which indicate movements away from coastal areas during the winter months (Dick Cooper pers. comm.).

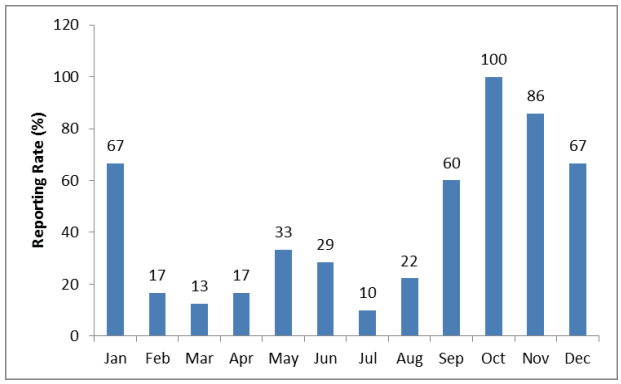

Figure 2. Seasonal variation in reporting rate of Olive-backed Orioles in the Black Rock area 1999-2012.

Moderately common species (RR 20 to 39%)

Species in this category are probably intermittently present. Exceptions include the Bell Miner, which since colonising the area, has been recorded on every survey and is currently a very common species (RR>80%). The Pheasant Coucal *Centropus phasianinus* is also probably permanently present, being primarily detected when calling during the breeding season and seldom seen. Like the Olive-backed Oriole it is almost certainly under-recorded outside the breeding season.

The White-bellied Cuckoo-shrike *Coracina papuensis*, with a RR ratio of 8 compared to a mean value of 2.6 for the other species in this category (**Table 4**), favours the woodland area on Black Rock Road beyond the Fitness's Road junction. The Buff-rumped Thornbill *Acanthiza reguloides* with a RR ratio of 4.2, while relatively frequently present at Black Rock, is generally scarce in the Paterson area. Like the Speckled Warbler and Double-barred Finch, it is near the eastern edge of its local distribution. The Cicadabird, ratio 4.3, is another species apparently suited to the area, however this may be a consequence of under-recording by observers not familiar with its call.

The occurrence of the Rainbow Bee-eater is fascinating; 13 of the 14 records occurred between 30 December and mid-March, when the species was usually seen hawking insects along Fitness's Road at the highest point in the study area (~100 m ASL). These records suggest a post-breeding dispersal to higher ground before the northern migration occurs. Bee-eaters breed along the banks

of the Paterson and Allyn Rivers. The single September record probably involved birds on southern passage.

Waterbirds are disadvantaged by the lack of suitable habitat; Purple Swamphens *Porphyrio porphyrio* (RR ratio 0.9) occurred intermittently on a small pond permanently occupied by Dusky Moorhens *Gallinula tenebrosa*. White-faced Herons (RR ratio 0.5) also occurred intermittently, often foraging in paddocks. A Buff-banded Rail *Gallirallus philippensis* was recorded on three occasions between February 2002 and April 2006 in creek-side vegetation immediately above Barford Lane and at the dam occupied by the Dusky Moorhens. It was probably resident during this period.

Changes in Species Status

The mean list length for the period 2008-2010 (41.6 species/visit) was 15% lower than for the first six years of the study 1999-2004. During the next three years the list length increased, but remained 4.2% below the 49.1 species/visit during 1999-2001. These variations suggest that the species diversity of the bird population in the Black Rock area may have undergone a decline followed by a partial recovery. However, the differences were not statistically significant at the p=0.05 level and were subject to seasonal bias because there was a lower proportion of summer surveys in the 2008-2010 period (**Table 1**) which generate longer lists. The number of species recorded in the first two three-year periods (**Table 1**) again suggests a decline in species diversity followed by partial recovery. However, this trend is biased by an increased number of summer surveys, which generate long bird lists, being conducted in the initial years of the project.

Trends in the temporal variation of RR for individual species included species which declined and partially recovered (**Figures 3** and **4**), species which peaked mid-study (**Figure 5**), species which declined without recovery and species which colonised the area (**Figure 6**).

The trends shown by the Speckled Warbler, Buff-rumped Thornbill and Varied Sittella *Daphoenositta chrysoptera* (**Figure 3**) all involve a marked decline in RR during the period 2008-2010, followed by a partial recovery during the subsequent three years.

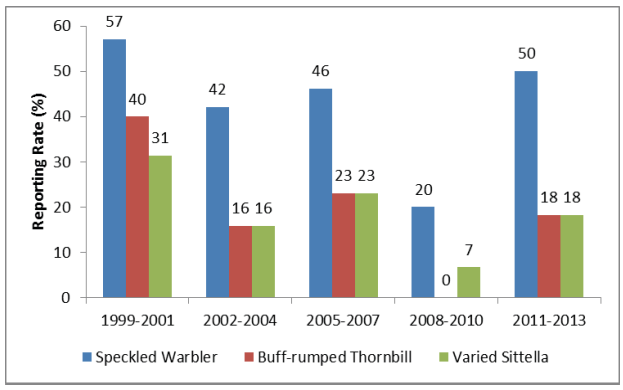

Figure 3. Variations in the reporting rates of three species, which declined during 2008-2010, followed by a partial recovery in 2011-2013.

The Fan-tailed Cuckoo showed a similar decline and partial recovery (**Figure 4**). This effect was even more pronounced in the case of the Shining Bronze-cuckoo *Chalcites lucidus* and Pallid Cuckoo *Cacomantis pallidus*, which were primarily recorded in the first three-year period, with a possible partial recovery in the last six years. However, the evidence for these species is tenuous because of the small number of records.

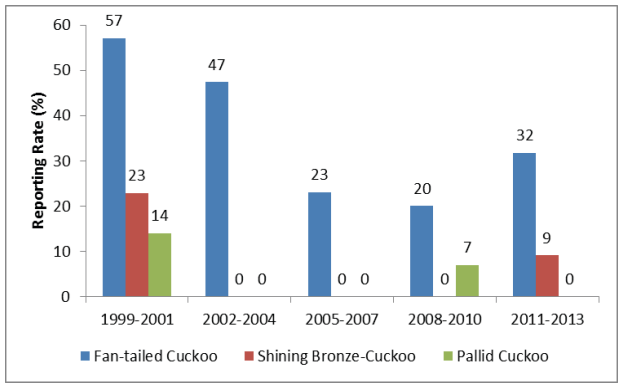

Figure 4. Decline in reporting rates of three cuckoo species during the middle of the study, followed by indications of a partial recovery.

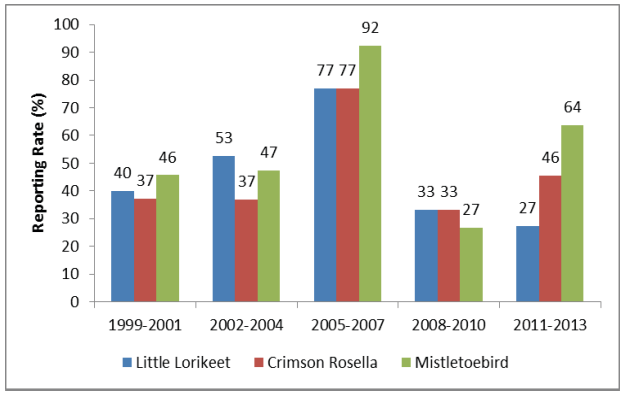

Figure 5. Three species, Little Lorikeet, Crimson Rosella and Mistletoebird, with reporting rates peaking during 2005-2007.

In contrast the trends for the Little Lorikeet, Crimson Rosella and Mistletoebird peaked in 2005-2007, the middle of the study (**Figure 5**).

The Bell Miner was rarely recorded before it colonised a gully near the junction of Black Rock and Fitness's Roads in 2008-2010 (**Figure 6)**. In contrast the White-winged Chough *Corcorax melanorhamphos* and Brown-headed Honeyeater *Melithreptus brevirostris* declined after being moderately common during the first nine years; neither species was recorded in the last three years of the study.

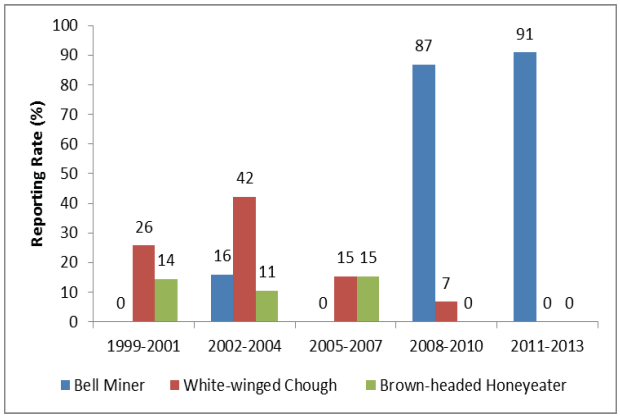

Figure 6. Comparison of reporting rate trends of Bell Miners, an increasing species and the White-winged Chough and Brown-headed Honeyeater, declining species.

With the exception of the increase in the Bell Miner, there were insufficient results to demonstrate statistically robust changes in status at the p=0.05 level. However, in some cases trends suggest changes with viable biological explanations, as discussed below.

The Hunter Region and the Paterson district experience highly variable rainfall patterns. Both seasonal and annual variations in rainfall are potential drivers of changes in the status of bird populations. In a local study I discussed how these influenced Grey Fantail numbers (Newman 2012b). In that analysis it was shown that an extended period of drought both in and external to the Paterson area with its climax in 2006, adversely affected the local fantail population with a subsequent recovery from 2008 onwards. Thus drought conditions provide a plausible explanation of the trends reported in this section. However, there will be subtle differences in the mechanism by which each species is impacted. For instance, sparse resident species (e.g. Speckled Warbler) may die out and unless there is good connectivity to core populations, local extinction may become permanent, particularly for sedentary species. For more mobile species, there may be a temporary population shift to other regions where superior conditions exist. The cuckoos may fit this pattern.

Threatened Species

Seven species listed under the NSW Threatened Species Act 1995 were recorded during the study. An additional species is known to have occurred historically.

The Little Lorikeet, a vulnerable species, was regularly recorded (RR 43.3%), but most frequently during the 2005-2007 period (RR 76.9%). It mainly occurred in mature eucalypts on Black Rock Road about 200m past the Fitness's Road junction, which was the area favoured by the Swift Parrots *Lathamus discolor* in the winter of 2000.

Swift Parrots (RR 5.6 %), an endangered species, were recorded during six successive visits between 23/7/2000 and 27/8/2000, when up to 20 were present, feeding in flowering gums on Black Rock Road 200m beyond the Fitness's Road junction. There was only one subsequent record on 24/8/2007, which was in open woodland approximately 200m from the previous sightings. These records are consistent with a view that Swift Parrots return to favoured areas after periods of prolonged absence (M. Roderick pers. comm.). Unfortunately clearing, involving the removal of mature trees, has occurred recently in both these areas, although some suitable habitat remains.

Speckled Warblers *Chthonicola sagittata* (RR 46.2%), listed as vulnerable, were recorded regularly, except between 2008 and 2010 when the RR (20%) fell to less than half its normal level before recovering in 2011-2013 (**Figure 2**). The Speckled Warbler has specialised habitat requirements, favouring wooded areas with some shrubs and limited ground cover (Newman 2010a & 2012a). At Black Rock, in the absence of grazing, grass cover probably becomes too dense for this species, limiting its foraging opportunities.

Black-chinned Honeyeaters *Melithreptus gularis* (RR 1.9%), listed as vulnerable, were only recorded in August 2000 and September 2001. This is consistent with the species' status as an occasional visitor to the Paterson area as opposed to a resident species elsewhere in the Hunter Region (Newman 2007 & 2009).

Grey-crowned Babblers *Pomatostomus temporalis* (RR 1.0%), another vulnerable species, were first recorded on the 104th visit on Black Rock Road at a location just after the Barford Lane junction. Four babblers were foraging in an area where the roadside vegetation had been modified by removing the entire understorey. The resulting park-like habitat with tall eucalypts was ideal for Noisy Miners *Manorina melanocephala*, which were harassing the babblers. Babblers are resident on Black Rock Road below Barford Lane in acreage gardens; so the above observation demonstrates the opportunistic response of the species to annex habitat favourable to them when it becomes available.

Varied Sittellas *Daphoenositta chrysoptera* (RR 21.2%), listed as vulnerable, were recorded sporadically (**Appendix 1**), consistent with other studies in the Paterson area (Newman 2010a). In these studies, the impression gained was of a species, which was locally nomadic, rather than holding a fixed territory indefinitely. It was also suggested that the species was declining in the Hunter Region (Newman 2010b). Although temporal variations in RR in this study suggest a possible decline, with a lower RR (6.7%) in 2008-2010 (**Figure 2**), the observed differences were not statistically conclusive.

There is a historical record of the critically endangered Regent Honeyeater *Anthochaera phrygia* for the area (Lyn Walsh pers. comm.).

CONCLUSIONS

This study demonstrates the value of recording birds over a sustained period while bird watching during an extended walk. Even though the surveys were conducted in a consistent, rather than rigidly structured manner, they have provided valuable insights into the status of the bird populations of the area. Not only has a comprehensive inventory of the birds of Black Rock been documented, but it has been possible to quantify how often the 124 species were recorded; over half occurred relatively frequently (RR>20%) throughout the study.

High effort surveys generating long species lists, as used in this study, capture locally sparse species at low reporting rates (e.g. Varied Sittella, Buff-rumped Thornbill and Double-barred Finch), which are often missed in less comprehensive surveys (e.g. BLA's standard 2ha-20 minute survey). Although the trends for such species (**Figures 3, 4, 5** and **6**) may lack statistical robustness because of small sample sizes they may still provide a valid indication of changes in species' status. The Black Rock study area, as has been pointed out, is on the eastern edge of the local range of several species, which are more abundant further inland. For these species Black Rock is a marginal area and local populations may be particularly sensitive to change at the regional level, providing a valuable litmus test for the health of these species (i.e. local extinctions at the edge of the range may indicate a widespread regional contraction in range). The database generated in this study provides a basis for the future testing of present indications. Will Double-barred Finches and Speckled Warblers become locally extinct or fully recover and even exceed 1991-2001 levels?

ACKNOWLEDGEMENTS

The author thanks Michael Griffiths for access to his property. Allan Richardson and Dick Cooper are thanked for helpful comments on the manuscript and especially for information related to the Olive-backed Oriole.

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APPENDIX 1

Bird Species recorded in Black Rock, Martins Creek area between 1999 and 2013, sorted in descending order of overall frequency of occurrence (reporting rate).

Species	1999/2001	2002/2004	2005/2007	2008/2010	2011/2013	1999/2013
Superb Fairy-wren	100.0	100.0	100.0	100.0	100.0	100.0
Yellow-faced Honeyeater	100.0	94.7	100.0	100.0	100.0	99.0
Lewin's Honeyeater	100.0	100.0	92.3	100.0	95.5	98.1
Australian Magpie	100.0	89.5	100.0	100.0	100.0	98.1
Grey Fantail	97.1	100.0	92.3	93.3	100.0	97.1
Eastern Rosella	100.0	100.0	92.3	80.0	100.0	96.2
Spotted Pardalote	100.0	100.0	100.0	86.7	86.4	95.2
Eastern Whipbird	100.0	94.7	100.0	80.0	95.5	95.2
Noisy Miner	97.1	89.5	92.3	100.0	90.9	94.2
Australian Raven	100.0	89.5	92.3	86.7	90.9	93.3
Laughing Kookaburra	97.1	89.5	76.9	86.7	100.0	92.3
Grey Shrike-thrush	97.1	89.5	100.0	80.0	90.9	92.3
Jacky Winter	100.0	100.0	84.6	60.0	90.9	90.4
Masked Lapwing	91.4	89.5	84.6	80.0	95.5	89.4
Willie Wagtail	91.4	94.7	84.6	73.3	95.5	89.4
White-browed Scrubwren	91.4	94.7	92.3	86.7	77.3	88.5
Striated Pardalote	94.3	94.7	76.9	80.0	77.3	86.5
Australian Wood Duck	94.3	89.5	76.9	53.3	95.5	85.6
Red Wattlebird	94.3	89.5	100.0	66.7	72.7	85.6
Pied Butcherbird	80.0	84.2	76.9	93.3	95.5	85.6
Welcome Swallow	88.6	89.5	92.3	66.7	86.4	85.6
Yellow-tufted Honeyeater	85.7	73.7	84.6	80.0	81.8	81.7
Eastern Spinebill	82.9	78.9	84.6	73.3	81.8	80.8
Eastern Yellow Robin	85.7	84.2	69.2	66.7	81.8	79.8
Magpie-lark	97.1	84.2	76.9	53.3	63.6	78.8
Red-browed Finch	80.0	89.5	84.6	53.3	81.8	78.8
Crested Pigeon	77.1	94.7	84.6	66.7	68.2	77.9
Golden Whistler	74.3	73.7	76.9	80.0	81.8	76.9
Dusky Moorhen	91.4	78.9	61.5	33.3	81.8	75.0
Grey Butcherbird	68.6	89.5	61.5	60.0	86.4	74.0
Bar-shouldered Dove	68.6	73.7	84.6	73.3	63.6	71.2
Yellow Thornbill	80.0	78.9	46.2	66.7	63.6	70.2
Striated Thornbill	74.3	63.2	53.8	86.7	59.1	68.3
Pied Currawong	88.6	68.4	61.5	46.7	50.0	67.3
Wonga Pigeon	71.4	73.7	69.2	60.0	54.5	66.3
Satin Bowerbird	82.9	52.6	61.5	60.0	59.1	66.3
Silvereye	62.9	68.4	69.2	60.0	72.7	66.3
Variegated Fairy-wren	74.3	78.9	46.2	53.3	50.0	63.5

Appendix 1: Bird Species recorded in Black Rock, Martins Creek area between 1999 and 2013, sorted in descending order of overall frequency of occurrence (reporting rate) (continued).

Species	**1999/2001**	**2002/2004**	**2005/2007**	**2008/2010**	**2011/2013**	**1999/2013**
Black-faced Cuckoo-shrike	68.6	63.2	69.2	53.3	59.1	63.5
Australian King-Parrot	74.3	47.4	61.5	60.0	45.5	59.6
Brown Thornbill	42.9	52.6	61.5	53.3	68.2	53.8
White-naped Honeyeater	65.7	47.4	69.2	46.7	36.4	53.8
Mistletoebird	45.7	47.4	92.3	26.7	63.6	52.9
Noisy Friarbird	40.0	63.2	61.5	40.0	50.0	49.0
Double-barred Finch	31.4	68.4	69.2	33.3	59.1	49.0
Galah	54.3	42.1	53.8	26.7	54.5	48.1
White-throated Gerygone	48.6	52.6	46.2	60.0	36.4	48.1
Speckled Warbler	57.1	42.1	46.2	20.0	50.0	46.2
Rufous Whistler	51.4	63.2	30.8	33.3	31.8	44.2
Little Lorikeet	40.0	52.6	76.9	33.3	27.3	43.3
Crimson Rosella	37.1	36.8	76.9	33.3	45.5	43.3
White-throated Treecreeper	51.4	31.6	15.4	26.7	63.6	42.3
Fan-tailed Cuckoo	57.1	47.4	23.1	20.0	31.8	40.4
Olive-backed Oriole	31.4	36.8	61.5	40.0	45.5	40.4
Pacific Black Duck	54.3	42.1	7.7	13.3	40.9	37.5
Cattle Egret	54.3	52.6	15.4	13.3	22.7	36.5
Bell Miner	0.0	15.8	0.0	86.7	90.9	34.6
Yellow-rumped Thornbill	34.3	52.6	23.1	26.7	13.6	30.8
Scarlet Honeyeater	22.9	36.8	23.1	20.0	36.4	27.9
Rainbow Lorikeet	2.9	5.3	23.1	53.3	68.2	26.9
Pheasant Coucal	22.9	26.3	23.1	33.3	22.7	25.0
White-bellied Cuckoo-shrike	20.0	10.5	15.4	53.3	27.3	24.0
Buff-rumped Thornbill	40.0	15.8	23.1	0.0	18.2	23.1
Sacred Kingfisher	25.7	15.8	15.4	33.3	18.2	22.1
White-faced Heron	20.0	31.6	23.1	6.7	22.7	21.2
Channel-billed Cuckoo	17.1	21.1	23.1	26.7	22.7	21.2
Varied Sittella	31.4	15.8	23.1	6.7	18.2	21.2
Purple Swamphen	5.7	0.0	7.7	53.3	45.5	20.2
Dollarbird	20.0	15.8	0.0	40.0	22.7	20.2
Brown Gerygone	14.3	36.8	0.0	13.3	27.3	19.2
White-winged Chough	25.7	42.1	15.4	6.7	0.0	19.2
Wedge-tailed Eagle	25.7	15.8	15.4	0.0	4.5	14.4
Yellow-tailed Black-Cockatoo	5.7	36.8	23.1	0.0	4.5	12.5
Musk Lorikeet	0.0	10.5	30.8	33.3	4.5	11.5
Crested Shrike-tit	14.3	5.3	15.4	13.3	9.1	11.5
Common Myna	2.9	26.3	7.7	13.3	13.6	11.5
Little Pied Cormorant	14.3	5.3	15.4	0.0	9.1	9.6
Shining Bronze-Cuckoo	22.9	0.0	0.0	0.0	9.1	9.6
Brown Cuckoo-Dove	2.9	10.5	7.7	13.3	13.6	8.7
Brush Cuckoo	8.6	15.8	7.7	6.7	4.5	8.7
Brown-headed Honeyeater	14.3	10.5	15.4	0.0	0.0	8.7
Dusky Woodswallow	5.7	5.3	15.4	6.7	9.1	7.7
Grey Teal	14.3	5.3	7.7	0.0	0.0	6.7

Appendix 1: Bird Species recorded in Black Rock, Martins Creek area between 1999 and 2013, sorted in descending order of overall frequency of occurrence (reporting rate) (continued).

Species	1999/2001	2002/2004	2005/2007	2008/2010	2011/2013	1999/2013
Straw-necked Ibis	5.7	5.3	23.1	0.0	4.5	6.7
Fuscous Honeyeater	11.4	5.3	7.7	6.7	0.0	6.7
Brown Falcon	11.4	10.5	0.0	0.0	0.0	5.8
Swift Parrot	17.1	0.0	0.0	0.0	0.0	5.8
Pallid Cuckoo	14.3	0.0	0.0	6.7	0.0	5.8
Topknot Pigeon	8.6	0.0	15.4	0.0	0.0	4.8
White-throated Needletail	8.6	5.3	0.0	0.0	4.5	4.8
Painted Button-quail	2.9	0.0	7.7	13.3	4.5	4.8
Grey Goshawk	5.7	10.5	0.0	0.0	0.0	3.8
Nankeen Kestrel	5.7	0.0	0.0	0.0	9.1	3.8
Sulphur-crested Cockatoo	2.9	5.3	7.7	0.0	4.5	3.8
Green Catbird	5.7	0.0	7.7	0.0	4.5	3.8
Regent Bowerbird	5.7	0.0	0.0	0.0	9.1	3.8
White-necked Heron	2.9	5.3	0.0	0.0	4.5	2.9
Brown Goshawk	0.0	10.5	0.0	0.0	4.5	2.9
Buff-banded Rail	0.0	10.5	7.7	0.0	0.0	2.9
Australasian Figbird	0.0	0.0	7.7	0.0	9.1	2.9
Brown Quail	0.0	5.3	0.0	0.0	4.5	1.9
White-headed Pigeon	2.9	0.0	0.0	6.7	0.0	1.9
Scaly-breasted Lorikeet	0.0	0.0	0.0	6.7	4.5	1.9
Black-chinned Honeyeater	5.7	0.0	0.0	0.0	0.0	1.9
Torresian Crow	0.0	5.3	0.0	6.7	0.0	1.9
Restless Flycatcher	0.0	0.0	15.4	0.0	0.0	1.9
Spotted Dove	0.0	5.3	0.0	0.0	0.0	1.0
Great Cormorant	0.0	5.3	0.0	0.0	0.0	1.0
Australian Pelican	2.9	0.0	0.0	0.0	0.0	1.0
Eastern Great Egret	0.0	0.0	7.7	0.0	0.0	1.0
Royal Spoonbill	2.9	0.0	0.0	0.0	0.0	1.0
Black-shouldered Kite	0.0	0.0	0.0	0.0	4.5	1.0
Pacific Baza	2.9	0.0	0.0	0.0	0.0	1.0
Australian Hobby	0.0	0.0	0.0	0.0	4.5	1.0
Little Corella	0.0	0.0	7.7	0.0	0.0	1.0
White-winged Triller	0.0	0.0	0.0	6.7	0.0	1.0
Rose Robin	2.9	0.0	0.0	0.0	0.0	1.0
Tree Martin	0.0	0.0	0.0	0.0	4.5	1.0