The effect of Noisy Miners on small bush birds: an unofficial cull and its outcome

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This paper documents the bird community in a small (~15 ha) patch of remnant woodland New South Wales sheep–wheat belt (i) before Noisy Miners *Manorina melanocephala* were abundant in the patch (1972–79), (ii) after a dense miner colony became established (1980–1990), (iii) after the miners were removed (1991–92) and, subsequently, (iv) while extensive, dense plantings of native trees became established (1992–2006). Bird species richness in the patch was, respectively, 64, 18, 45 and 83 species in each time period. Totals for small (<120 g) bush birds, mostly insectivorous passerines, were 26, 0, 22 and 46 species in the respective time periods. Although this was an unofficial, unreplicated and uncontrolled activity, the results support those of previous similar studies that indicate that Noisy Miners are a major contributor to the local decline of many woodland birds. The results also affirm the value of a shrub layer to small birds.

Key words: Remnant woodland; Species richness; Noisy Miners; Aggressive exclusion; Revegetation

INTRODUCTION

THIS paper concerns the issue of an expanding native species and its impact on wildlife communities. The Noisy Miner *Manorina melanocephala* is a large, endemic Australian honeyeater (Meliphagidae); it is one of the winners in human-altered landscapes, thriving and increasing to superabundance in partly cleared and otherwise modified eucalypt open forests and woodlands of eastern Australia. Miners live in dense colonies, and attack heterospecific birds (especially other insectivores) that try to venture into the colony's territory. By their competitive exclusion, miners have a negative effect on populations of smaller insectivorous passerines, and also (unlike other birds, by farming psyllid lerps instead of eating the whole sap-sucking insect with its sugary covering) they negatively affect tree health in remnant woodlands (see, for example, Higgins *et al.* 2001 and Low 2002 for reviews). Miners have increased in density within their original range, rather than expanding their gross geographic range, although they have likely expanded locally into some forest or woodland types, particularly remnants in agricultural landscapes, where the original understorey has been removed. Their range overlaps that of many of the threatened and declining woodland passerines in the eastern Australian sheep–wheat belt.

The impact of Noisy Miners on the diversity and abundance of small insectivorous passerines is well documented (reviewed by Catterall 2004; Hannah *et al.* 2007; Maron 2007). The evidence has come from comparisons of the bird communities in the presence or absence of miners (Dow 1997; Loyn 1987), including the New England region (Barrett *et al.* 1994), and from removal experiments in two study areas in woodland in Victoria (Grey *et al.* 1997, 1998). Miners are particularly able to dominate small, degraded or linear patches lacking a shrub layer, and vegetation in urban areas (Ford and Bell 1982; Catterall 2004). They are also nest predators (Major *et al.* 1996; Piper *et al.* 2002). This paper documents the bird community of a site in remnant woodland in the New South Wales sheep–wheat belt before miners were abundant in the patch, after a dense miner colony became established, after the miners had been removed and, subsequently, while extensive, dense plantings of native trees and shrubs became established.

As the miner removal activity in this study was unofficial and unsanctioned, the landholders or precise locations are not identified here. Publication does not imply endorsement or condonement of illegal culling of a protected species, but that aspect of the landholder's action ought not to preclude dissemination of data that should be made available to land managers and fauna authorities. This paper concentrates on the ecological aspects of the case, and leaves the ethical considerations to other forums (e.g., see Low 2007; Lunney *et al.* 2007).

STUDY AREA AND METHODS

The study site was on private land among rural-residential holdings ('5-acre blocks') in the Armidale district (30°30'2 S, 151°40'2 E), on the New England Tablelands of NSW. The study area is described elsewhere (Debus *et al.* 2006). The site comprised two adjoining smallholdings with a contiguous patch (~15 ha, including four

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other neighbouring blocks) of remnant Blakely's Red Gum *Eucalyptus blakelyi*–Yellow Box *E. melliodora* grassy woodland, amid cleared or partly cleared paddocks grazed by sheep or cattle.

The landholder resident on property A kept a bird list for his section of the remnant (~12 ha) from 1972 to 1979, when Noisy Miners were present but not dominant (no data on miner numbers, but low), noting which bird species were variously resident, breeding, summer visitors or winter visitors. A dense Noisy Miner colony became established in 1980, and from this time the neighbouring landholder on property B kept a bird list for his own property (~2 ha), also noting which species were variously resident, breeding, summer visitors, winter visitors, occasional visitors or flying over. The two subject properties were contiguous, with a common boundary of ~300 m, and property A partly encircled B, so there was much overlap in the area searched.

In 1991–92 landholder B culled the nucleus of the Noisy Miner colony from his property and 100 m into surrounding neighbours' land (i.e., ~10 ha), by .22 rifle. Thus, most of the colony in the 15-ha remnant was removed by the creation of a sink. From 1992 onwards, he also started dense plantings of native (though not necessarily locally indigenous) trees and shrubs: 500 plants on his place (or 250/ha). Culling of miners continued until 1995 (250–300 culled in total), and occasionally since then, at a low rate (~10 per year) to prevent a new colony from establishing. From 1991 to 2006 landholder B maintained the bird list, supplemented in August 1991 by a resumption of listing by landholder A (on property A). Both landholders were competent amateur ornithologists, as determined by discussions with landholder A (a scientist in the biology field), and during bird-watching excursions with landholder B (an academic, though a non-scientist).

Table 1. Bird list for a rural woodland remnant near Armidale, NSW, in four time periods: (1) 1972–79 before dense Noisy Miner colony established; (2) 1980–1990, while miners dominant in patch; (3) 1991–92 when 300 miners culled; (4) 1992–2006 while miners kept suppressed and enhancement plantings of native trees and shrubs established. + = observed (no data on status); R = resident; V = visitor; B = breeding; S = spring–summer; W = autumn–winter; A = aerial (seen overhead only); U = uncommon/rare; C = common/abundant. State-listed threatened species (vulnerable) in bold; other decliners underlined (see Debus *et al.* 2006). *Introduced species.

Species	Few miners	Miner colony	Cull	Planting
Black-shouldered Kite *Elanus axillaris*	C		V	V
Whistling Kite *Haliastur sphenurus*		A	A	A
Brown Goshawk *Accipiter fasciatus*			+	
Collared Sparrowhawk *Accipiter cirrhocephalus*				V
Wedge-tailed Eagle *Aquila audax*	U			
Little Eagle *Hieraaetus morphnoides*	R			
Brown Falcon *Falco berigora*	A			V
Black Falcon *Falco subniger*				SV
Nankeen Kestrel *Falco cenchroides*	CR	A	A	R
Common Bronzewing *Phaps chalcoptera*				V
Crested Pigeon *Ocyphaps lophotes*	+		V	R
Diamond Dove *Geopelia cuneata*	+			
Yellow-tailed Black-Cockatoo *Calyptorhynchus funereus*	+	V	V	V
Galah *Cacatua roseicapilla*	R	R	R	R
Sulphur-crested Cockatoo *Cacatua galerita*		V	V	V
Musk Lorikeet *Glossopsitta concinna*				W
Little Lorikeet *Glossopsitta pusilla*	+			
Australian King-Parrot *Alisterus scapularis*	+			V
Crimson Rosella *Platycercus elegans*	R	R	R	R
Eastern Rosella *Platycercus eximius*	CR	R	R	R
Red-rumped Parrot *Psephotus haematonotus*	R			V
Pallid Cuckoo *Cuculus pallidus*	S		V	S
Fan-tailed Cuckoo *Cacomantis flabelliformis*				V
Bronze-cuckoo *Chrysococcyx* sp.				V
Common Koel *Eudynamys scolopacea*				V
Channel-billed Cuckoo *Scythrops novaehollandiae*		V	V	V
Barking Owl *Ninox connivens*				V
Southern Boobook *Ninox novaeseelandiae*				V
Tawny Frogmouth *Podargus strigoides*	R	B	B	B
White-throated Needletail *Hirundapus caudacutus*		A	A	AS
Laughing Kookaburra *Dacelo novaeguineae*	CR	R	R	R
Sacred Kingfisher *Todiramphus sanctus*	+			V
Dollarbird *Eurystomus orientalis*	S	S	S	SB
White-throated Treecreeper *Cormobates leucophaeus*	+		+	V
Superb Fairy-wren *Malurus cyaneus*	C			B
Spotted Pardalote *Pardalotus punctatus*				V
Striated Pardalote *Pardalotus striatus*			V	R
White-browed Scrubwren *Sericornis frontalis*				V

Table 1. — continued

Species	Few miners	Miner colony	Cull	Planting
Speckled Warbler *Chthonicola sagittata*				V
Weebill *Smicrornis brevirostris*				V
White-throated Gerygone *Gerygone olivacea*				S
Brown Thornbill *Acanthiza pusilla*				R
Buff-rumped Thornbill *Acanthiza reguloides*	+			R
Yellow-rumped Thornbill *Acanthiza chrysorrhoa*	+		V	B
Yellow Thornbill *Acanthiza nana*				V
Striated Thornbill *Acanthiza lineata*				B
Red Wattlebird *Anthochaera carunculata*	RB		V	B
Noisy Friarbird *Philemon corniculatus*	S		V	SB
Noisy Miner *Manorina melanocephala*	RB	B	B	B
Yellow-faced Honeyeater *Lichenostomus chrysops*	B		V	B
White-eared Honeyeater *Lichenostomus leucotis*				R
Fuscous Honeyeater *Lichenostomus fuscus*	RB			
White-plumed Honeyeater *Lichenostomus penicillatus*				V
Brown-headed Honeyeater *Melithreptus brevirostris*				R
White-naped Honeyeater *Melithreptus lunatus*	+		+	R
Eastern Spinebill *Acanthorhynchus tenuirostris*			V	B
Jacky Winter *Microeca fascinans*	+			
Scarlet Robin *Petroica multicolor*	+			S
Varied Sittella *Daphoenositta chrysoptera*			V	V
Crested Shrike-tit *Falcunculus frontatus*	+			
Golden Whistler *Pachycephala pectoralis*			V	W
Rufous Whistler *Pachycephala rufiventris*			V	B
Grey Shrike-thrush *Colluricincla harmonica*				R
Leaden Flycatcher *Myiagra rubecula*	+		V	V
Restless Flycatcher *Myiagra inquieta*	+		V	V
Magpie-lark *Grallina cyanoleuca*	R			R
Rufous Fantail *Rhipidura rufifrons*				V
Grey Fantail *Rhipidura fuliginosa*			V	R
Willie Wagtail *Rhipidura leucophrys*	CB		V	R
Black-faced Cuckoo-shrike *Coracina novaehollandiae*	CR		V	B
White-winged Triller *Lalage sueurii*				SB
Olive-backed Oriole *Oriolus sagittatus*	S		V	B
White-browed Woodswallow *Artamus superciliosus*			A	A
Dusky Woodswallow *Artamus cyanopterus*	CB		A	A
Grey Butcherbird *Cracticus torquatus*	CR	B	B	B
Pied Butcherbird *Cracticus nigrogularis*	B			R
Australian Magpie *Gymnorhina tibicen*	CB	B	B	B
Pied Currawong *Strepera graculina*	W	V	V	V
Australian Raven *Corvus coronoides*	R	V	V	V
Forest Raven *Corvus tasmanicus*	+			
Torresian Crow *Corvus orru*	+			
White-winged Chough *Corcorax melanoramphos*				W
Satin Bowerbird *Ptilonorhynchus violaceus*				W
Richard's Pipit *Anthus novaeseelandiae*	+			B
*European Goldfinch *Carduelis carduelis*	+			V
Zebra Finch *Taeniopygia guttata*	C			
Double-barred Finch *Taeniopygia bichenovii*				B
Red-browed Finch *Neochmia temporalis*	+			V
Diamond Firetail *Stagonopleura guttata*	C			
Mistletoebird *Dicaeum hirundinaceum*	+		V	R
Welcome Swallow *Hirundo neoxena*		A	A	A
Rufous Songlark *Cincloramphus mathewsi*	S		S	S
Silvereye *Zosterops lateralis*			V	V
*Common Blackbird *Turdus merula*				B
*Common Starling *Sturnus vulgaris*	+		V	V
Totals	64	18	45	83
Total small bush birds	26	0	22	46

The observers' bird identifications (Table 1) are taken at face value, as their lists are consistent with local survey data collected by more experienced ornithologists. For instance the Diamond Dove, although the most unusual record, is plausible as that species occurs occasionally (Debus *et al.* 2006).

RESULTS

Sixty-four species of birds, including 26 species of mostly small and medium passerines (<120 g) of a size susceptible to Noisy Miner attack, were observed by landholder A, in 1972–79, before the Noisy Miner colony became

established (Table 1, which gives scientific names). Some of these small passerines nested around his house. Only 18 species of birds were observed by landholder B in 1980–1990, during the time the miner colony dominated the patch; these were all either of a size able to withstand Noisy Miner attack, or were aerial foragers and not vulnerable to miner attack. Even the Red Wattlebird and Noisy Friarbird (large and aggressive honeyeaters) were not observed during the period of peak miner dominance.

After the miners were culled, in 1991–92, 45 species of birds were observed by landholder B (plus landholder A in August 1991), including 22 passerines of a size susceptible to miner attack and formerly absent when the patch was dominated by miners. As commented by landholder A, the small bush birds quickly returned in the absence of the miners. Since the tree- and shrub-planting programme was underway and the miners were kept suppressed, from 1992 onwards, the bird list for property B has increased to 83 species, including 46 species of small bush birds (Table 1). For many of the small bush birds, their status also improved from visitor in 1991–92 to resident or breeding in 1992–2006 (Table 1). Shrubs planted included a high proportion of non-eucalypts, such as wattles *Acacia* spp.

Landholder A stated that many of the small birds, such as kingfishers, songlarks, honeyeaters, fairy-wrens and Willie Wagtails, disappeared as the miners increased to become one of the most abundant species in 1979. He said that he did not keep a bird list for the 1980s because the miners had driven all the summer passerines away (he observed miner aggression against small birds), and the only birds left were residents large enough to resist the miners. He observed that eucalypt regrowth initially provided nesting sites for honeyeaters, but there were effectively no nesting insectivores at the peak of the miner numbers. For the 1970s he described fairy-wrens and Dusky Woodswallows as common, and Zebra Finches and Diamond Firetails as very numerous (which contrasts with the present situation, with woodswallows declining, Zebra Finch absent and firetail threatened: Debus *et al.* 2006; Debus pers. obs.). Conversely, the Laughing Kookaburra was rated initially as uncommon, but became common by 1979, and the Grey Butcherbird was rated as common by 1979. Species that benefited from the cull and/or revegetation included many of the decliners in the sheep-wheat belt and a threatened species, the Speckled Warbler (Table 1). The increased prey base and/or dense revegetation may also have attracted the *Accipiter* hawks (particularly the Collared Sparrowhawk) and the threatened Barking Owl, albeit as occasional visitors.

The number of miners culled in 1991–95, 250–300 individuals from the 15-ha patch (or ~20 per ha over 5 years), conveys some impression of the potential population of this species in dense colonies. Although the cull achieved a great reduction in miner density (that required follow-up to maintain), it did not result in total elimination of miners from the patch.

DISCUSSION

The results demonstrate a direct effect of the establishment of a dense miner colony, and the subsequent reduction in miner numbers, on the diversity of the small bush-bird community in the patch. They also demonstrate an ongoing benefit to bush birds of providing cover in the form of dense native shrubs. These results are consistent with previous studies on the impact of Noisy Miners on the small bush-bird community in remnant vegetation, and the benefit of a shrub layer (mostly non-eucalypt) to bush birds (see Catterall 2004; Hastings and Beattie 2006; Hannah *et al.* 2007; Maron 2007). However, the situation described here does not allow one to disentangle the relative importance of the Noisy Miner and the presence of a shrub layer. Earlier miner removals had recolonisation of degraded sites by small bush birds without the understorey being restored (Grey *et al.* 1997, 1998), and the data herein (Table 1) are consistent with that result. That is, bush birds probably returned because the miners were culled, but might not necessarily have returned if trees and shrubs were planted but miners were not culled.

Species that were recorded on property A in 1972–79, and lost when the miners invaded, could still be found around Armidale in the relevant time period (1980s and 1990s) in other patches of healthy woodland lacking miners (Debus *et al.* 2006). That is, the results of this study were site and context specific rather than district-wide, and closely followed trends in the miner population in the subject patch. However, a few of those species have since declined district-wide, for example, Fuscous Honeyeater, Diamond Firetail (Debus *et al.* 2006; H. Ford pers. comm.). The Fuscous Honeyeater has disappeared from suburban Armidale, where it was common in the late 1970s and 1980s (H. Ford pers. comm.): a situation perhaps linked to an increase in Noisy Miners.

Limitations of this study include the fact that it was not a strictly controlled or replicated scientific experiment with data collected in a fully systematic manner, including bird densities, and there was no simultaneous comparison in nearby control patches with and without miners. Bird records were incidental to the landholders'

daily routines, and the bird lists for each time period may be incomplete. Also, since 1992 the effect of miner removal has been confounded by the provision of shrub cover, and perhaps landholder B's bird-watching skills have improved. Nevertheless, there are clear trends evident in species richness of small bush birds before, during and after the period of miner dominance, and subsequently with enhanced habitat values in the patch while miners were also kept suppressed. Despite these limitations, the results indicate that the dramatic increase in numbers and diversity of insectivorous birds after more rigorously controlled and monitored studies in Victoria (Grey *et al.* 1997, 1998) probably apply elsewhere in the woodlands of eastern Australia. A more rigorous study, in New England or elsewhere, could test the conclusions and regional applicability of this study (see Ehrlich 2007 on the value of such studies).

Together with the results of other studies on the impact of Noisy Miners on bush birds, particularly in remnant vegetation where landholders may wish to conserve biodiversity, this study provides some support for declaring the Noisy Miner as a key threatening process, and perhaps delisting it as a protected species (or, alternatively, instigating a procedure for rapid approval of culls). There is much evidence that removal or discouragement of miners benefits avian diversity. Of course, miner density is only a symptom of a larger problem—the loss of habitat diversity—and enhancement of the non-eucalypt shrub layer in degraded woodland, or in replanting projects, will also discourage miners as well as benefit small bush birds (Hastings and Beattie 2006).

ACKNOWLEDGEMENTS

I thank the two landholders, who must remain anonymous, for their attention to detail in keeping bird lists through the relevant time periods, and in making the data available for publication. I also thank Sofia Dodds for facilitating the initial drafting of this paper, and Mike Clarke, Hugh Ford, Graham Fulton, Ian McLean, Harry Recher and an anonymous referee for comments on drafts.

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Editorial note: reporting results from an unsanctioned cull

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As Associate Editor of Pacific Conservation Biology I wish to underline that this journal

does not condone or support the illegal or unethical culling of any animals. Publishing this paper is not intended as an endorsement or encouragement of illegal or unethical methodologies. In particular, I do not want other researchers to assume that it is acceptable or justifiable to perform illegal or unsanctioned culls. There is a rule of law for reasons and there are appropriate ways to cull both ethically and legally, not liking the rules does not exempt one from them (Fulton and Ford 2001). I am well aware that some journals would refuse to publish this paper on the basis that the cull was not sanctioned by an ethics committee. However, in this case the author has simply piggybacked onto a cull that was conducted outside an experimental or scientific framework. In this case, I considered the results worth reporting even though they arose from an unsanctioned cull.

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