

# Avifaunal disarray from a single despotic species

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## Project Objectives

The composition of many eastern Australian woodland and forest bird assemblages is controlled by a single, hyper-aggressive native bird, the noisy miner *Manorina melanoccephala*. Also referred to as a 'reverse keystone' species, the noisy miner aggressively excludes almost all small-bodied bird species from its territories, with large effects on the composition and diversity of entire bird assemblages (Dow 1977; Loyn 1987; Piper and Catterall 2003; Mac Nally et al. 2012). This exclusion results in a shift from an assemblage with diverse foraging strategies to one predictably dominated by large-bodied and ground-foraging species, and a high proportion of avian predators of vertebrates (Major et al. 2001). The noisy miner's wide distribution, large effect on other birds, and positive response to anthropogenic landscape change are a potent combination, potentially leading to widespread and pervasive ecological effects. However, despite numerous regional-scale studies, there has been no broad-scale synthesis of the scale, drivers and consequences of the phenomenon. This working group harnessed diverse existing datasets and using them to develop and test models of noisy miner occupancy and impacts, leading to new management approaches.

The main objectives of the working group were to:

1. develop conceptual models of the anthropogenic and natural factors that facilitate noisy miner domination,
2. test these models using datasets compiled from multiple separate studies across eastern Australia,
3. evaluate whether and where the incidence of noisy miners is increasing, and
4. develop recommendations for management responses to noisy miners which identify where action to control noisy miner impacts is necessary, and which approaches are most cost-effective.

## Methods

Based on a review of the literature and expert opinion collated during two workshops, we built two conceptual models. The first considered how anthropogenic and natural factors relate to site occupancy by the noisy miner, and the second considered how noisy miner occupancy affects other bird species, and how consequent effects may cascade through ecosystems. We collated a dataset comprising 2,488 sites across eastern Australia and used it to test the key relationships in the conceptual models. We also used presence data from 51,980 sites in 37 IBRA bioregions from the BirdLife Australia Atlas dataset to estimate overall and bioregion-specific trends in noisy miner reporting rates between 1998-2012. In workshop 2, we drew upon the preliminary modeling results and expert knowledge to develop a set of recommendations for the management of noisy miners in where they are an important threatening process.

## Major Findings

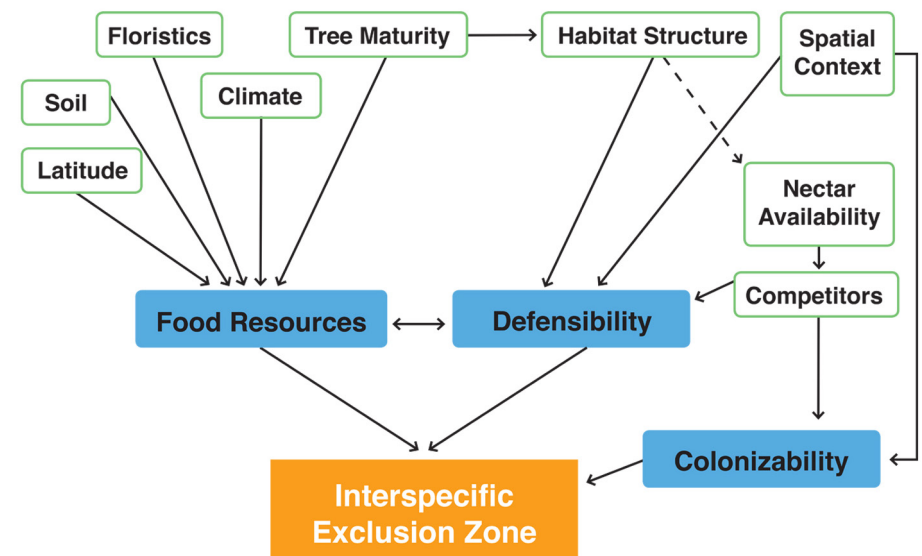
The review and analyses of our collated datasets based on the conceptual model confirmed that the noisy miner is advantaged by habitat fragmentation and structural simplification—habitat changes that facilitate detection and interception of potential competitors by noisy miners (Figure 1). Woodlands dominated by leafless or small-leaved tree species are less likely to be occupied by noisy miners, regardless of structure or context.

Based on our review, we concluded that there is:

- a strong causal link between the noisy miner and depressed richness and abundance of smaller birds, particularly nectarivores and insectivores;
- moderate evidence of an association with larger bird species and reduced tree condition stemming from impaired control of insect herbivore populations; and
- a plausible negative effect on plant reproduction through altered pollination services and seed dispersal.

The analysis of trends in reporting rate revealed that:

- noisy miners have become increasingly prevalent in nine bioregions since 1998 (Figure 2)
- the evidence of increased prevalence was limited to sites close to the edges of forest and woodland
- there was no substantial evidence that reporting rates increased in any bioregion



**Figure 1:** Conceptual model of the interspecific exclusion zone – the area defended by a colony of noisy miners.

## Key papers or products

Maron, M., Grey, M. J., Catterall, C. P., Major, R. E., Oliver, D. L., Clarke, M. F., Loyn, R. H., Mac Nally, R., Davidson, I., Thomson, J. R. (2013) Avifaunal disarray due to a single despotic species. *Diversity and Distributions* doi: 10.1111/ddi.12128

Ingwersen, D., Robinson, D., Maron, M., Grey, M. J., Catterall, C. P., Major, R. E., Oliver, D. L., Clarke, M. F., Loyn, R. H., Mac Nally, R., Davidson, I., Thomson, J. R. (in prep) Managing a despot: managing the threat of noisy miners in eastern Australia.

One additional manuscript led by J. Thomson (details tba)

Nomination for 'Decline in woodland and forest birds due to aggressive exclusion by abundant Noisy Miners' as a Key Threatening Process under the NSW Threatened Species Conservation Act

Nomination for 'Aggressive exclusion of birds from potential woodland and forest habitat by overabundant noisy miners *Manorina melanocephala*' as a Key Threatening Process under the Federal EPBC Act

## How will this affect Australian ecosystem science and management?

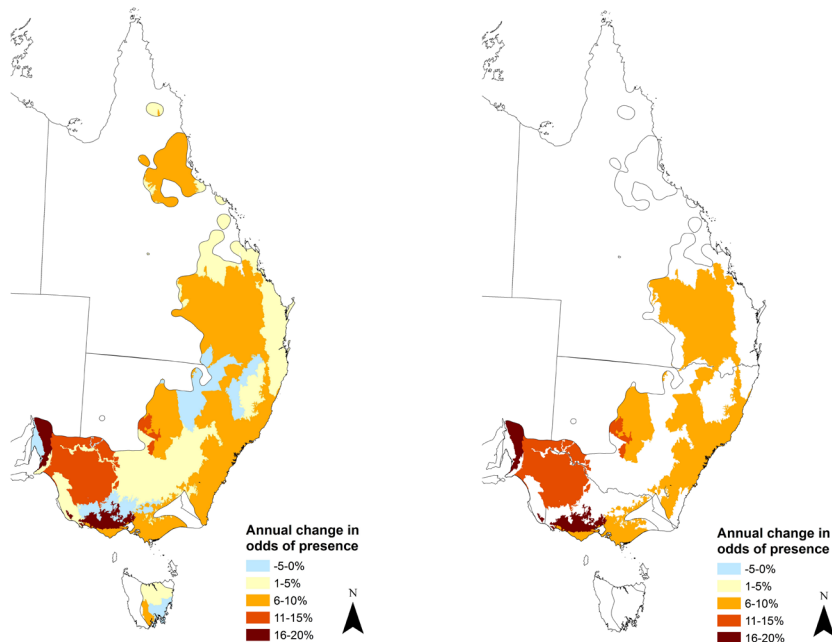
The synthesis produced by the working group documents a syndrome of avifaunal disarray accompanied by disruption of ecosystem processes that could result in irrevocable loss of species and habitats across over a third of a continent. If successful, the Key Threatening Process nominations informed by the group's work will provide a basis for consideration of more targeted management, potentially facilitated by a national Threat Abatement Plan. The collaboration among key researchers has led to the development of an outline for a large-scale research proposal to explore direct control approaches, to be pursued in the near future. Through the involvement of land managers, policymakers and researchers, as well as several presentations at conferences and community seminars, the working group has substantially increased the profile of this important process. As manuscripts and management guidelines are published, we anticipate an increasing influence on ecosystem management and intend to form an ongoing advisory group covering management of all three problematic *Manorina* species (noisy, bell and yellow-throated miners).

## References

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- Major, R. E., Christie, F. J. and Gowing, G. 2001. Influence of remnant and landscape attributes on Australian woodland bird communities. *Biological Conservation* 102, 47-66.

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## Major Findings (Continued)



**Figure 2:** Results of analysis of trends in reporting rate (proportion of surveys in which the species was detected) based on BirdLife Australia Atlas data according to IBRA Bioregion between 1998-2012. The map on the left is the estimated annual change in the chance of detecting noisy miners during a survey at a site; the map on the right shows the estimates for only those regions in which the probability of a change was at least 90%.

The options for managing noisy miners differ among regions and vegetation types. In some areas, restoration works to restore structural complexity may also reduce habitat suitability for noisy miners and, over time, exclude the species, allowing recolonisation by small birds. However, there is evidence that direct control of noisy miners through shooting could be relatively low-cost, quickly effective, and long-lasting. The group recommended that direct control may be desirable where the site has been evaluated as having NMs present and causing an ecological problem, there a reasonable probability of measurable recovery of target species/assemblage; and the land manager has agreed to access for long-term monitoring of the site.

The working group also contributed to the nominations of aggressive exclusion by noisy miners as a Key Threatening Process under both the NSW Threatened Species Conservation Act and the Environment Protection and Biodiversity Conservation Act. Preliminary determinations by the committees in both cases support the listings.