Science for Saving Species

Research findings factsheet

Project 4.2

Threatened Species Recovery Hub

National Environmental Science Programme

Assessing the impacts of invasive species: Hollow-nesting birds in Tasmania

In brief

Invasive alien birds are found across many areas of Australia. Many of these introduced birds use cavities, an important breeding resource for cavity nesting species. In Tasmania alone there are 27 species of hollow-nesting birds, including three threatened species and seven invasive hollow-nesting bird species. The logging of big old trees with cavities and the addition of invasive species has likely led to increased competition over the limited resource. However, the impact of most of these invasive species has not been studied. Therefore, we set out to explore the known and theoretical interaction network between the cavity breeding birds in Tasmania, and to identify which native species are likely impacted by the addition of non-native species.

We discovered that, overall, native hollow-nesting species are likely facing increased levels of competitive for nesting sites as a result of non-native species introductions. Such competition is likely to decrease breeding opportunities for native species, including some of Tasmania's threatened and endemic species.

Orange-bellied swift parrot in nest box. Image: ANU

Background

Predicting the impacts of invasive species is difficult at large spatial scales. This is because the interactions between invasive species and native species vary across different species, between different locations, over time and in relation to other pressures such as habitat loss, extensive fires, climatic events and drought.

Given that conservation and management work is almost always conducted under limited budgets and time, being able to quantify where and when invasive species are having a significant impact on local species is vital for effectively managing and prioritising actions to address threats posed by invasive species.

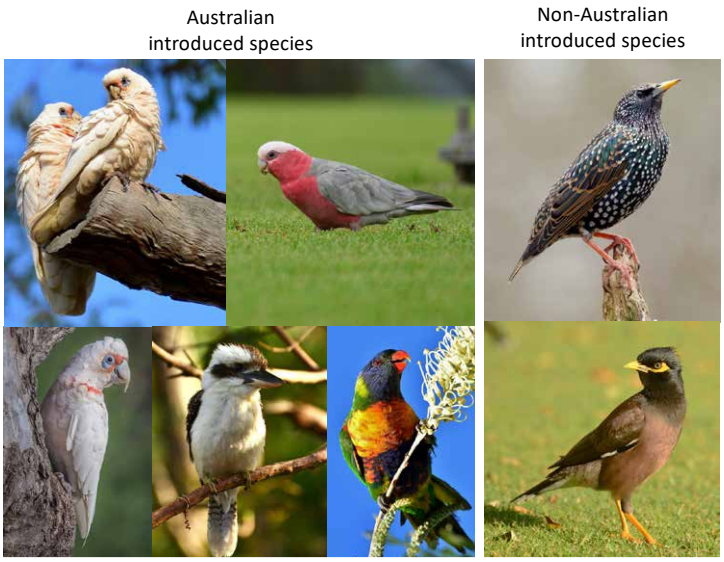
In Australia, around 15% of all birds require tree hollows for nesting and breeding, which is a high proportion compared to bird communities in other parts of the world. While we know from previous research that the impact of invasive cavity-nesting species on the native species that require similar nest sites, the exact impact of most individual invasive hollow-nesting species remains unknown. A better understanding of which species share nest-site requirements could help inform where invasive species impacts are occurring, especially where behavioural studies on invasive–native species interactions have not been done.

The University of Queensland Australia

Australian National University

Tasmania's non-native birds

Tasmania is home to 27 hollow-nesting bird species including seven invasive species of hollow-nesting birds (Figure 1). Many of the introduced species come from the Australian mainland, including the little corella, long-billed corella, laughing kookaburra, galah and rainbow lorikeet. The two non-Australian invasive species are the common myna and the common starling. Of all of the invasive species, only the common starling's impact has been recorded, specifically competing for nest boxes with orange-bellied parrots and swift parrots (see Figure 2). However, with the other invasive birds covering much of the island, new approaches are needed to predict where they might be impacting native birds.



LEFT: Figure 1. There are seven introduced hollow-nesting species in Tasmania, making up 26% of the entire hollow-nesting bird community. Competition for nesting space is the primary impact of invasive hollow-nesting birds in Tasmania. Predicting and assessing the impacts on specific threatened species (forty-spotted pardalote, orange-bellied parrot and swift parrot) as well as its endemic species (e.g., the green rosella) is critical for prioritising mitigation actions.

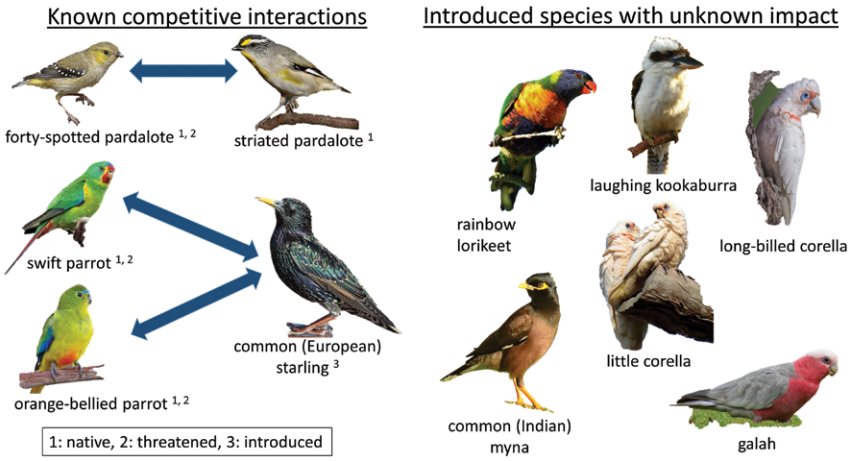


Figure 2

What we did

We reviewed published information on inter-species interactions, such as documented competition for nesting hollows or habitat. We compiled data on the traits of hollowing nesting birds in Tasmania, such as:

- bird body size
- nesting months
- hollow preferences (cavity entrance size, cavity type)
- if they are obligate tree-hollow breeders or will also use other nest types.

We modelled the breeding niche (nesting preferences) of all 27 hollow-nesting bird species in Tasmania and assessed the level of niche overlap between every possible combination of native and invasive species.
We identified species combinations with: a) documented inter-species competition; and/or b) predicted high levels of breeding niche overlap. In combination this allowed us to identify which species are likely to be competing for nesting sites and where, and the predicted level of this interaction.

Research aims

This study aimed to examine the theoretical breeding competition among native and introduced cavity nesting birds in Tasmania and review which invasive and native species are likely to interact most frequently around nesting sites. Our overarching aim was to identify where and when the impacts of invasive species impacts are most likely to take place – that is, where management action is most needed.

Key findings

Non-native species share nest-site preferences and/or compete with 13 native species (65% of the native cavity-nesting community in Tasmania), including the threatened swift parrot, orange-bellied parrot and masked owl. This suggests that most native species are likely facing higher levels of competition and therefore potentially reduced opportunities for breeding as a result of non-native species introductions.

The Critically Endangered swift parrot is likely to face the most competition from invasive species; there is a high level of predicted breeding niche overlap between the common myna and common starling. While the common starling is widespread across Tasmania, the common myna has not yet established breeding populations so efforts to prevent its establishment are warranted.

The Critically Endangered orange-bellied parrot likely faces substantial competition for breeding hollows with several native species including swift parrots, blue-winged parrots and Australian owlet nightjars and non-native species such as the common starling. The impact of this competition is exacerbated when suitable hollows are limited, and designing suitable nest boxes for these species that also exclude competitors could be a useful management approach to increasing the nesting opportunities.

The Endangered forty-spotted pardalote does not face direct niche overlap and competition from invasive species, but it faces competition and predicted breeding niche overlap with the striated pardalote and the tree martin. In turn, the tree martin is impacted by the native owlet-nightjar and invasive laughing kookaburra, so there may be indirect effects.

There had been little previous field research on how competition influences the nest-site choice and habitat use of many common species, including several endemic birds.

Only around a tenth of the native species (11.5%) we predict are facing increased competition have been studied in the field, highlighting the lack of information available to conservation managers. Our models are intended to improve how we can predict the impact of poorly studied invasive birds across Australia in particular, helping us understand where and when significant impacts on native hollow-dependent species are likely to take place.

Invasive species	Tasmanian species facing high levels of competitive impact
Common myna	Swift parrot*, green rosella, Tasmanian boobook, musk lorikeet, chestnut teal, Australian owlet-nightjar, eastern rosella
Common starling	Swift parrot*, eastern rosella, orange-bellied parrot*, Australian owlet-nightjar, blue-winged parrot, green rosella, masked owl, chestnut teal, Australian wood duck, tree marti
Galah	Yellow-tailed black-cockatoo, masked owl, nankeen kestrel, Tasmanian boobook
Laughing kookaburra	Masked owl, nankeen kestrel, sulphur-crested cockatoo, yellow-tailed black-cockatoo, tree martin
Little corella	Sulphur-crested cockatoo
Long-billed corella	Sulphur-crested cockatoo, green rosella, Australian shelduck
Rainbow lorikeet	Blue-winged parrot, eastern rosella

Table 1. Invasive hollow-nesting bird species in Tasmania and the native hollow-nesting species with which there are high levels of competition. Impact is assessed based on competitive impacts documented in the literature and predicted level of breeding niche overlap (bold).
** = threatened species*

Implications and recommendations

By developing models of species competition, we can help identify areas where the potential impact of invasive species is likely to be the highest. Given the addition of seven new species to the local communities and consequent increase in complex competition, finding novel methods of predicting where and when the impacts will occur, and which species will dominate over others, is urgently needed.

The common myna makes regular incursions to Tasmania and, while it is not yet breeding on the island, our work shows that it is likely to compete with many native species and that the programs that prevent them from establishing are justified.

The high impact of the invasive common starling, including on threatened species, calls for further research to determine exactly how significant the competition from this bird is in the field. As both these invasive birds do well in modified habitats, management efforts towards them will likely be beneficial for native species nesting in increasingly common native-modified habitats.

With the continuing fragmentation of Tasmania's natural landscapes, the impacts of increased competition are likely to be significant in edge habitats, which will tend to increase in area due to ongoing logging, increasingly frequent fires, the expansion of agricultural and urban land use, and given that many non-native species first establish in altered habitats. In order to conserve native hollow-nesting species, native forest, especially old growth, and older/dead trees with hollows in rural landscapes must be protected. In select areas with high abundance of feral cavity-nesting species, control of select species should be considered.

Beyond Australia, invasive hollow-nesting birds are a problem in many countries, and the models we are developing can be applied to any community with sufficient data on nesting preferences. This can help improve predictions of the impacts of invasive species globally.

A young swift parrot. Image: ANU

Cited material

Rogers, A.M., Shaw, J., Webb, M., Kark, S. 2020. Incorporating species interaction networks into conservation: The cavity-breeding bird community of Tasmania as a case study. In prep.

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