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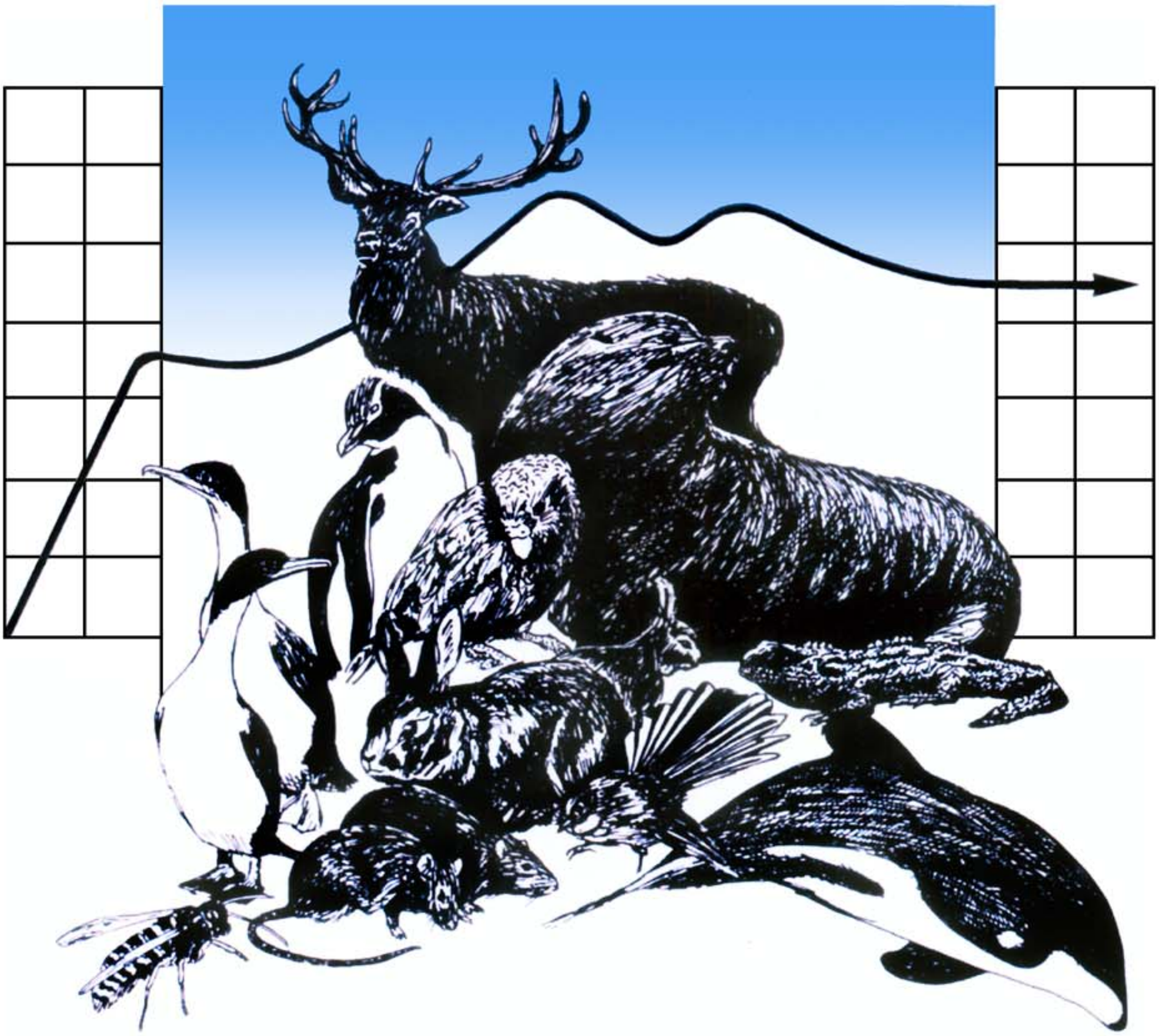

# WILDLIFE MANAGEMENT

# Nest site selection of the New Zealand fantail (*Rhipidura fugilinosa*) on South Island production land.

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## Executive Summary

The breeding behaviour of the New Zealand fantail *Rhipidura fugilinosa* has been studied on both mainland New Zealand and on offshore Islands, however, these studies have solely focussed on fantails on reserve land. Two thirds of New Zealand's landscape is outside of reserve land, with much of it on production farm land, meaning that much of the research to date has missed the majority of potential fantail habitat. ARGOS is a research group focussed on understanding the resilience of farms in New Zealand. It is anticipated that a number of focal species will be used as indicators of a farms changing management. The fantail has been identified as a favoured potential focal species. It is important to understand the breeding behaviour of fantails on production land in order to determine their suitability as an indicator species.

This study looked at the nest site selection of fantails found on 12 farms in Banks Peninsula, Oamaru, Outram, and the Catlins, in the South Island of New Zealand. Results show that fantails chose a variety of tree species in which to nest, although most were native species, nests were found in pine and eucalypts. Nest height varied from 1.2 to 11m compared to the tree height of 2.5 to 19 m. The distance from the nest to the edge of the habitat patch was within 20m for all nests illustrating how fantails have benefited form the clearing of land as they prefer edge habitats despite the overall size of the habitat patch.

These findings support previous studies on fantail breeding behaviour. Given the wide variety of habitat types found on New Zealand production land, it is important that a focal species is able to survive and breed in a range of habitats. In order to further determine whether the fantail will be an appropriate indicator, additional studies on their breeding success is required, as well as determining whether changing management on the farm has an effect on survival and breeding rates.

## Introduction

The Fantail (*Rhipidura fugilinosa*) is found throughout New Zealand with the subspecies *Rhipidura fugilinosa fugilinosa* occurring in the South Island (Powlesland 1982). The breeding behaviour of New Zealand fantails was first recorded by Blackburn in 1965. This study followed two breeding pairs over two seasons, resulting in a general understanding of the details of breeding activity and timing. Fantails have a long breeding season with a short breeding cycle, producing large numbers of young in a season, sometimes at the expense of parental care (McLean & Jenkins 1980). The breeding season for Fantails is generally described as from August to February (Powlesland 1982) although a study by McLean (1984) found that breeding did not begin until October. The studies on breeding fantails in varying locations around New Zealand (Blackburn 1965; McLean 1980), including offshore islands (McLean 1984; McLean & Jenkins 1980), show that the timing of breeding and breeding success varies between locations and years. Mainland birds appear to have a longer breeding season, with more nests and greater success compared to offshore island birds, which have a short breeding season (late September to early December) with only one successful nest (McLean 1984).

Two-thirds of New Zealand's land area lies outside of reserves, with much of it tied up in production land (Moller *et al.* 2005). Despite this, most current conservation research and management focuses on reserve areas, rather than the more modified landscapes (Moller *et al.* 2005). Although highly fragmented, production landscapes in New Zealand are typically fertile and warm, providing an ideal habitat for native species (Moller *et al.* 2005). The Agriculture Research Group on Sustainability (ARGOS) aims to assess the sustainability and socio-ecological resilience of farms and orchards throughout New Zealand (Moller *et al.* 2005). The ultimate goal is to assist landholders to increase farm sustainability and resilience through research across different farming sectors and management approaches. A large subset of farms in the ARGOS programme are sheep/beef farms throughout the South Island. One aim of this research is to identify a range of species that can be used as focal species on production landscapes, as indicators of the ecosystems response to changing farm management.

Birds are regarded as good indicators of ecosystem resilience as their abundance is a potential indicator of cascading changes in resilience across trophic levels (Furness *et al.* 1993). Differing farm management practices, including herbicide use and grazing intensity, result in a reduction in abundance of insects ( Kreuss & Tscharntke 2002), leading to a reduction in food for insectivorous birds. This reduction of food leads to reduced survival and breeding success (Newton 2004). Therefore, an insectivorous bird can be used as an indicator for the quality of an entire ecosystem.

The fantail is a potential focal species. The clearing of land for farming purposes results in fragmentation of natural habitats (Lambeck 1997). The resulting 'edge effects' such as changing vegetation characteristics and predator-prey relationships, greatly affect species distributions in the area (Berry 2001). As the fantail is recognised as a forest-edge and open-country species (Berry 2001; Howe 1984) it is expected that farmland with remnant bush patches would be ideal habitat for fantails. Being an insectivore, the fantail does not require specific vegetation for its survival, being seen in all types of native and introduced tree species, including pine plantations (Falla *et al.* 1993) and gorse (Williams & Karl 2002). They are frequently seen foraging in the open grassland areas (Berry 2001). This expected high abundance of a highly recognizable species makes the fantail a potentially ideal candidate for use as an indicator species on farmland throughout New Zealand.

It is believed that the choice of a nest site may influence an individuals survival and fecundity, as well as a populations structure and growth rate (Citta & Lindberg 2007; Clark *et al.* 2004). In order to determine whether fantails can be reliably used as an indicator species on farms in New Zealand it is important to understand the type of nest sites they require. As an indicator species, the fantail would need to be able to breed in the variety of habitats found on New Zealand farms.

This study aims to investigate the nest site selection by fantails on South Island sheep and beef farms. The farms investigated are located in Banks Peninsula, Oamaru, Outram, and the Catlins. While various studies have investigated fantail breeding behaviour, the nest site selection of fantails on private farmland, rather than reserve or public land, has yet to be investigated.

# Methods

## Study Sites

This study was undertaken on farms in four farm clusters in the South Island currently being researched by ARGOS. The clusters were located in Banks Peninsula, Oamaru, Outram, and the Catlins. There were three farms in each cluster. Farms within a cluster are within 25 km of one another and contain similar altitude, rainfall, and soil characteristics. Habitat is variable throughout the farms, ranging from highly modified habitat including pine plantations, through to large remnant native forest stands.

## Nest location

The farm clusters were visited three times between November 2007 and February 2008. All farms were visited at least twice over the three visits. Some farms were not able to be visited in November due to lambing.

Fantails were randomly encountered as point counts were taken throughout the farm for a concurrent study. As described by Blackburn (1965) the activity of nesting fantails discloses the location of the nest relatively easily. The adults tend to continue with their activities despite the presence of a person. These fantails were followed for approximately ten minutes in order to locate their nest. Successfully locating a nest usually occurred within 20 minutes. If the fantail disappeared from sight and could no longer be located, or if it flew to an inaccessible location the search was abandoned.

Once the nest was located a number of factors were noted. These included GPS location, tree species, tree height, percentage the tree species took of the total habitat, distance from the edge of the habitat patch, nest height and location within the tree, whether the nest was in use, and the presence of fledglings. Trees were identified from Salmon (1996) and Salmon (1999).

ARGOS has existing ArcGIS maps for each of the farms, with information on habitat patch size. The nest site locations were added to these maps in order to determine the corresponding habitat patch size.

## Results

A total of 19 nests were located over the course of the study. Of these, eight were currently occupied with a brooding adult; others were either being completed, or the chicks had fledged.

Habitat type included grazed and ungrazed native bush, manuka stands, pine plantations, and a eucalypte hedge row. Tree species used was determined for all nests (table 1). Nest height varied from 1.2 to 11m (fig.1) with a mean height (± SD) of 5.69 ± 3.2 m, compared to the tree height of 2.5 to 19 m. The distance from the nest to the edge of the habitat patch ranged from 0 to 25 m with a mean of 9.91 ± 8.8m. ArcGIS analysis (fig. 3) gave habitat patch size ranges from 0.23 to 50.86 ha with a mean of 22.95 ± 19.1ha. There was no correlation between patch size and distance from the edge (fig. 2).

TABLE 1: Tree species and nest data for fantail nests found on 12 farms in Banks Peninsula, Oamaru, Outram, and the Catlins, as part of the ARGOS study.

| Tree species | Mean height (m) | Use of each species (%) | Mean nest height (m) |
|---|---|---|---|
| Pine (*Pinus radiata*) | 18.5 | 10 | 11 |
| Kaikomako (*Pennantia corymbosa*) | 3.5 | 10 | 2.75 |
| Rohuta (*Neomyrtus pedunculata*) | 2.5 | 5 | 1.2 |
| Manuka (*Leptospermum scoparium*) | 7.8 | 26 | 4.2 |
| Horopito (*Pseudowintera axillaris*) | 9 | 5 | 8 |
| Gum (*Eucalyptus sp.*) | 16 | 5 | 10 |
| Matipo (*Myrsine divaricatal*) | 5.25 | 10 | 3.75 |
| Haumakaroa (*Pseudopanax simplex*) | 4.5 | 5 | 4 |
| Five finger (*Pseudopanax arboreus*) | 8.5 | 10 | 8.25 |
| Mahoe (*Melicytus ramiflorus*) | 11 | 5 | 9 |
| Broadleaf (*Griselina littoralis*) | 9 | 5 | 3.5 |
| Total | 8.68 | 100 | 5.97 |

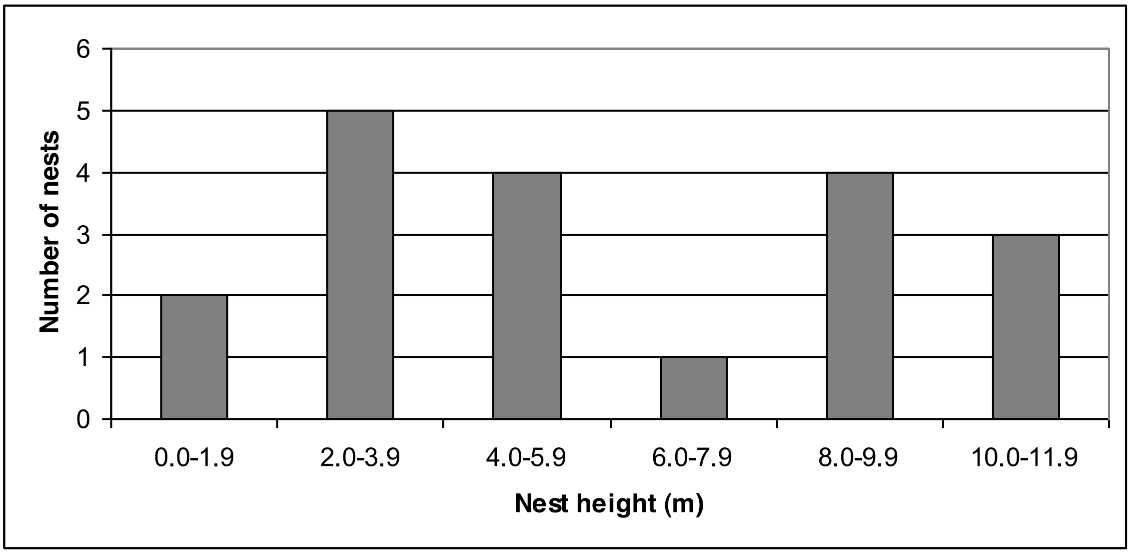


FIGURE 1: Frequency distribution of nest heights of the fantail on production land in Banks Peninsula, Oamaru, Outram, and the Catlins, South Island, New Zealand.

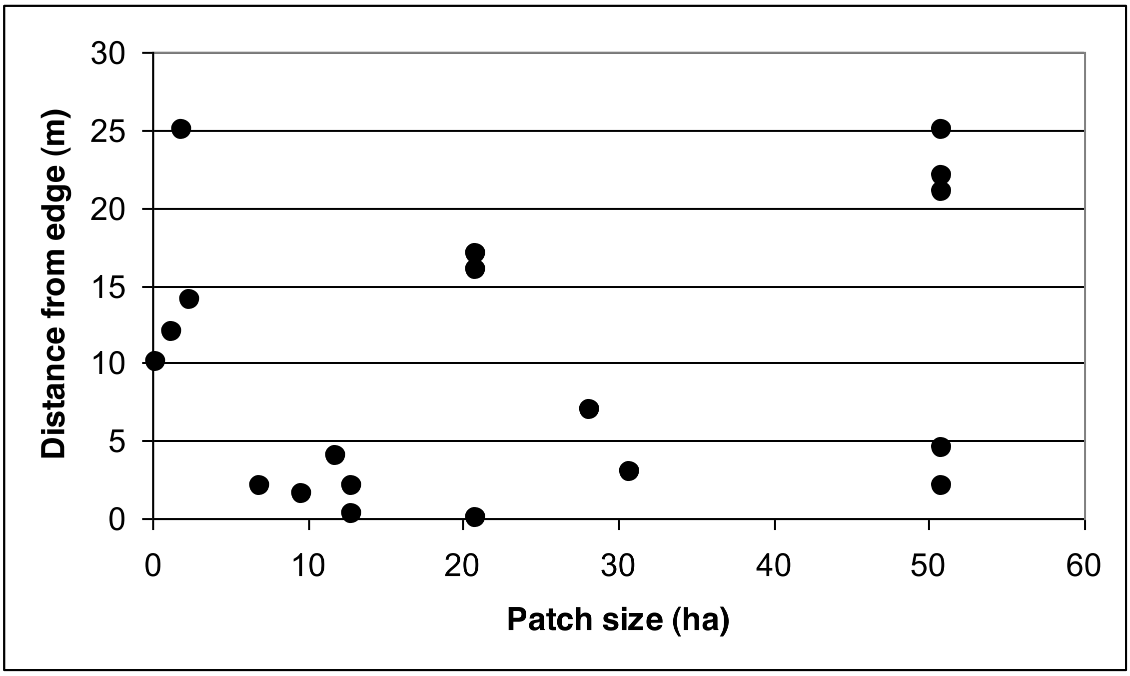


FIGURE 2: Distance from the edge of the habitat patch for each fantail nest found in relation to the total habitat patch size on production land in Banks Peninsula, Oamaru, Outram, and the Catlins, South Island, New Zealand.

FIGURE 3: An example of the resulting ArcGIS map with patch size for nest locations. Example shows Dalglish farm on Banks Peninsula showing a highlighted habitat patch. Dots represent the fantail nests found in this study.

# Discussion

## Fantail nesting behaviour

The fantails in this study used a wide variety of tree species for nesting, in a range of habitat types, proving to be adaptable breeders. As a number of previous studies (Powlesland 1982; Blackburn 1965; McLean 1980; McLean 1984; McLean & Jenkins 1980) have discussed, fantails adapt well to the changing habitat which has resulted from the clearing of land for human use. This study has further shown that fantails are capable of surviving and breeding in highly modified production land, despite the loss of native bush habitat. While most nests were found in native trees, there were also nests found in pine plantations and in a eucalypt hedge. Throughout this study it was clear that farmland in New Zealand is highly variable in terms of its vegetation cover. While some farms have retained large tracts of native vegetation, others boast only pine plantations. If the fantail is to prove to be a successful breeder on production land it is important that they not only are able to breed in a variety of habitats, but also choose to. The nests found in pine plantations in this study were all in relative close proximity to native vegetation, showing that those pairs had chosen to nest in pine despite the availability of native species.

Compared to a previous study by Powlesland (1982) on South Island fantails in Kaikoura, the fantails in this study used quite different vegetation for nesting. Powlesland (1982) found that Mahoe (*Melicytus ramiflorus*), kanuka (*Leptospernum ericoides*) and karamu (*Coprosma robusta*) were the most utilised. This difference is most likely a reflection of the different habitat types within the study, with the population in Kaikoura living in a reserve of native bush. However, this also demonstrates how previous studies have focussed on reserve land, which typically consists of native habitat (Moller *et al.* 2005), resulting in only an understanding of breeding behaviour on such land.

Nest height and location within the tree were comparable to previous studies. McLean (1984) found all nests were built in the lower 3m of the forest, with a mean of 1.9m. In comparison, a study by Powlesland (1982) found nest heights ranged from 0.8m to 6.9m with a mean height of 2.9m, and Blackburn (1965) found nests between 5 and 23 feet (1.5 to 7m). This study found an average of 5.69m, decreasing to 4.76m when the nests found in pine trees are excluded. The vegetation seen in this study was typically grazed; resulting in a lack of an understorey and fewer small trees than seen in ungrazed patches. Therefore, the opportunity for fantails to breed lower to the ground, as seen in previous studies, may be compromised.

However, the sample size is too small to conclude whether this is a definitive trend on production land.

Habitat patch size was determined using existing ArcGIS data. These habitat patches were determined from aerial photos, and so small-scale patch variation is not easily picked up. As a result, while from the ground patch sizes appear small, variable and broken up by areas of pasture, the ArcGIS analysis shows patches to be large and contiguous. Fig. 3 shows an example of a patch on the Dalglish farm in Banks Peninsula. The ArcGIS map shows a large patch of 20.92 ha, when in reality the nests found were in a smaller patch with cleared land along the fence lines. Consequently, while from the ground the nests were within 20m of the visible edge of the habitat patch, this 'edge' is not recognised on the ArcGIS map.

### Use of the fantail as a focal species

As the fantail does not require a specific vegetation type for survival or breeding, it shows potential as an ideal candidate for use as a focal species. Warburton *et al.* (1992) found that insectivorous species, including fantails, favoured the lower and middle tiers of a forest, and preferred younger trees, reflecting the relative abundance of insects on trees in the forest. If prey is more abundant on younger trees, then this would suggest that farms could allow regeneration of native forests resulting in an increase of fantails.

However, further study is required to investigate why they are not as abundant in highly vegetated farms as seen in the Catlins cluster. As the bellbird was common in these areas (personal obs.) it is possible that habitat not suited for fantails is suitable for bellbirds. If only the fantail is used as an indicator, there is a large risk that farms with dense bush will be regarded as poor habitat, when the opposite is true. If the reason fantails are not as common in highly vegetated areas is the increased presence of bellbirds in the area, perhaps it is necessary to consider using the bellbird as a co-indicator.

While this study has given a good first look at fantail nesting habits on production land, the sample size is too small for any conclusive results to be drawn. Given the limited time spent on each farm, fantails could only be encountered randomly, rather than searching the entire farm. A larger sample size would also allow for comparisons between the organic, integrated management, and conventional farm systems which are present in each farm cluster. Fantails have an average of four nests in a season, sometimes five (Blackburn 1965). In this study only one or two nests were found for each pair. In order to determine the nesting patterns of each pair, they would need to be followed more closely throughout the season. If the fantail is to be a reliable focal species well into the future, it would also be necessary to understand the breeding success of these nesting pairs, and to also gather survival statistics. Although the fantail is a common species now, it is important that it is known whether they really are that successful on production land so that we can be certain of there continuing success.

## Conclusion

In conclusion, the fantail has proven to be a versatile breeder on production land. The results from this study have added weight to findings from previous studies that fantails are adaptable and can, and do, breed on a variety of native and non-native tree species. This versatility makes the fantail a good possible choice for use as a focal species for future assessment of farms in the ARGOS programme. However, given that there were few fantails on farmland with dense native bush, particularly in the Catlins, it would be important to include at least a second avian species as a focal species, such as the bellbird, in order to account for habitat quality that is not preferred by fantails. Future studies into the breeding success of the fantail, as well as more intensive survival statistics would be needed to be able to conclude whether the fantail would be a reliable focal species well into the future.

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## References


Berry L 2001. Edge effects on the distribution and abundance of birds in a southern Victorian forest. *Wildlife Research 28*: 239–245.

Blackburn A 1965. Breeding of the North Island Fantail. *Notornis 12*: 127-137.

Citta JJ, Lindberg MS 2007. Nest-site selection of passerines: effects of geographic scale and public and personal information. *Ecology 88*: 2034-2046.

Clark RG, Hobson KA, Nichols JD, Bearhop S 2004. Avian dispersal and demography: scaling up to the landscape and beyond. *Condor 106*: 717–719.

Fella RA, Sibson RB, Turbott EG 1993. *Collins field guide to the birds of New Zealand.* Harper Collins, Auckland. Pp 185-186.

Furness RW, Greenwood, JJD, Jarvis PJ 1993. Can birds be used to monitor the environment? *in* Furness RW, Greenwood JJ (eds). *Birds as Monitors of Environmental Change*. Chapman and Hall, London.

Howe RW 1984. Local dynamics of bird assemblages in small forest habitat islands in Australia and North America. *Ecology 65*: 1585–1601.

Kreuss A, Tscharntke T 2002. Contrasting responses of plant and insect diversity to variation in grazing intensity. *Biological Conservation 106*: 293-302.

Lambeck RJ 1997. Focal Species: A Multi-Species Umbrella for Nature Conservation. *Conservation Biology 11*: 849-856.

McLean IG 1980. The influence of song behaviour and breeding success on spacing between nests of the fantail *Rhipidura fuliginosa. Ibis 122*: 98-102.

McLean IG 1984. Breeding by Fantails (*Rhipidura fuliginosa*) on Tiritiri Island. *Notornis 31*: 279-283.

McLean IG, Jenkins PF 1980. Breeding and development of the New Zealand Fantail *Rhipidura fuliginosa. Notornis 27*: 105-113.

Moller H, Wearing A, Pearson A, Perley C, Steven D, Blackwell G, Reid J, Johnson M 2005. Environmental monitoring and research for improved resilience on ARGOS farms. *Argos Working Paper No. 6.* University of Otago, Dunedin. 136 p.

Munro K 2007. Breeding behaviour and ecology of the grey fantail (*Rhipidura albiscapa*). *Australian Journal of Zoology 55*: 257–265.

Newton I 2004. The recent declines of farmland bird populations in Britain: an appraisal of causal factors and conservation actions. *Ibis 146*: 579- 600.

Powlesland MH 1982. A breeding study of the South Island Fantail (*Rhipidura fuliginosa fuliginosa). Notornis 29*: 181-195.

Salmon JT 1996. *Native trees of New Zealand*. Reed ltd, Auckland. 384 p.

Salmon JT 1999. *Exotic trees*. Reed ltd, Auckland. 372 p.

Warburton B, Kingsford SJ, Lewitt DW, Spurr EB 1992. Plant species preferences of birds in lowland rimu *(dacrydium cupressinum)* forest—implications for selective-logging. *New Zealand Journal of Ecology 16*: 119-126.

Williams PA, Karl BJ 2002. Birds and small mammals in kanuka (*Kunzea ericoides*) and gorse (*Ulex europaeus*) scrub and the resulting seed rain and seedling dynamics. *New Zealand Journal of Ecology 26:* 31-41.