



Biodiversity monitoring in Rewanui

Initial bird survey February 2009



FOR FURTHER INFORMATION

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1. Summary

Monitoring of bird species in Rewanui by Greater Wellington Regional Council (Greater Wellington) began in February 2009. This is scheduled to be repeated annually during a three year Sustainable Farming Fund project in Rewanui, administered by the Ministry of Agriculture and Forestry.

The presence or absence, numbers and diversity of native birds within an ecosystem offer a useful indicator of habitat health. Five minute bird counts were conducted across the entire property at 27 bird count stations representing three habitat types; native, exotic and mixed native/exotic habitat. Ten native bird species were detected and 15 exotic bird species. The average numbers of native birds at each station were compared across the habitat types to identify species that are most representative of native and unmodified habitats. The presence of bellbird and woodpigeon in an area signify habitat that is relatively unmodified and their counts compared across regions may prove useful in assessing health of an ecosystem.

The silvereye and tui were the most abundant native bird species across all habitats in Rewanui. Magpies were abundant in native forest as well as exotic habitat and redpoll and goldfinch frequent the exotic and mixed habitats. Rewanui has high numbers of all native bird species when compared to five minute bird counts carried out in Wellington in 2008. No particularly rare native birds were seen during this survey although a whitehead was observed by a Greater Wellington field officer in April 2009, and a New Zealand falcon was also seen in Rewanui in June 2008. This initial survey provides baseline data for ongoing long-term monitoring of birds in Rewanui.

2. Introduction

Greater Wellington is contracted by the Montfort Trimble Foundation to monitor biodiversity within the diverse Rewanui property. This project is funded for three years by a Sustainable Farming Fund (SFF) administered by the Ministry of Agriculture and Forestry. Monitoring biodiversity (biological diversity; i.e. the variety of fauna and flora present in an ecosystem) allows one to assess the relative health of an area and its resilience to environmental and human-induced change. A diverse ecosystem has more connections between species and this complexity bolsters it against disturbance as each species is less reliant on the next. In the field of ecology it is often an inherent assumption that biodiversity monitoring is the study of the native species in the ecosystem. Rewanui has protected native forest nestled in amongst sheep and cattle farming as well as both exotic and native forestry. Therefore monitoring in Rewanui includes exotic species detected during the surveys and the diversity of these within the property is discussed.

Monitoring of all biological indicators is scheduled to be phased in during the project's first year from July 2008 to June 2009. Annual bird monitoring is the fifth indicator of biodiversity to be initiated with surveys of pest animals, vegetation, invertebrates and lizards already underway. The numbers and diversity of native birds within an ecosystem offer a useful indicator of habitat health. As they are intricately linked with the abundance of other native plants

and animals, they provide an indirect means to monitor these factors also. By monitoring a variety of native plants and animals in Rewanui, Greater Wellington hopes to identify survey techniques and native species that can be most effectively employed to determine the natural “health” of an ecosystem.

Native bird monitoring in Rewanui is performed using the five minute bird count method (Dawson and Bull, 1975). Although five minute bird counts measure relative population changes over time, they are not designed to determine absolute abundance. Bird populations are temporally variable due to environmental factors and therefore long term trend data are necessary to distinguish any real management-induced population change. Native bird monitoring in Rewanui is scheduled for three years during this SFF project which will provide an initial description of native birds should longer term monitoring be instigated.

Control of pest animals and plants in this reserve is conducted by Greater Wellington under its Key Native Ecosystem programme, and by Trevor Thomson of the QE II Trust under contract to the Trimble Foundation. Control of cats, mustelids, hedgehogs, possums and rodents is performed throughout the year by Greater Wellington across the entire property, with the aim of protecting native species in general, and breeding native birds and endangered lizards in particular. Additionally Trevor Thomson performs a poison operation in the western forest blocks from October to February each year specifically to protect native birds and other breeding native species in the mature native forest during spring and summer when possums and rats are also on the increase. The Animal Health Board (AHB) performs possum and ferret control in the area for the vector management of bovine tuberculosis and so pest predator species are at low levels across Rewanui (Fea, 2008a). It has been proven in other studies that native birds have higher nesting success and lower adult mortality following effective rodent, possum and stoat control. The bird count stations are in the same locations as the invertebrate pitfalls, wetahouses and the rodent and mustelid tracking tunnels so that eventually bird numbers can be related to the levels of these other indicator species.

Bird monitoring is useful in tracking the emergence of rare species in protected habitats and determining the stability of populations detected. Rewanui is reasonably close to large tracts of forest with rare native birds, such as the Tararuas and Pukaha/Mount Bruce reserve which are within 30 kilometres “as the (blue-wattled) crow flies”. This situation coupled with the pest control measures in place means that Rewanui is a possible candidate for the dispersal and potential settling of rare native bird species such as kakariki, kaka, tomtit and whitehead amongst others.

Miskelly et al (2005) state “*that it is important to document the rate of recolonisation by native birds into and between fragmented forest reserves as the response of these birds to animal pest control may be applicable to restoration projects in many other parts of New Zealand*”. Biodiversity monitoring in Rewanui by Greater Wellington is designed so that other landowners of native forestry blocks may be interested in implementing similar user-friendly techniques as effective ways to learn about, and improve, the native values on their properties. With greater awareness of the biodiversity in

their backyards, people may be encouraged to further protect the mosaic of native habitats across private land allowing for an overall improvement in native ecosystems throughout New Zealand.

3. Methods

A total of 81, five-minute bird counts were made between February 11th and 17th 2009 in accordance with the methods described by Dawson and Bull (1975). There are a total of 27 bird count stations located on point transects randomly placed throughout the property. Each station is located at least 200 metres from any other so that they may be treated as independent from each other.

Each bird count station was visited three times on separate days in the morning during fine weather (with no rain or strong winds) and data from sites were then grouped according to the sites degree of natural character. This “naturalness” was determined with a visual assessment of habitats as dominated either by native or exotic plant species (ie. above 70-80%) and the third group was classed as mixed. Nine sites each represent the three habitat types being native, exotic and mixed native/exotic habitat.

Birds seen or heard during a five minute period were recorded and any species detected beyond 100 metres were excluded (to minimise counting individual birds across multiple sites). Additionally, birds seen or heard between sites were also recorded to ensure any rarer or spatially patchy species were also described. Bird distribution and abundance was then compared across the different habitat types in Rewanui and discussed in relation to recent bird counts performed in the Wellington region.

4. Results

For all 81 counts combined, a total of 25 species were recorded, 10 bird native species (the uppermost 10 in Table 1) and 15 exotic or introduced bird species. Additionally, coveys of turkey and quail were observed outside of the bird count areas but still within Rewanui in February. In June 2008, a native New Zealand falcon was also seen during pest animal surveys on a number of occasions flying above the native and mixed forests in Rewanui (Fea, 2008b).

The most abundant native bird was the silvereye with the highest average number per count (4.26 birds) in the mixed native/exotic habitat and the maximum being nine silvereyes per count at a native habitat station (station 3.05). Refer to page 14. The next most common native bird was the tui with 2.74 birds on average per count in native forest habitat and a maximum of six tui at a mixed habitat station (station 7.10). Numbers of tui were markedly lower in the exotic habitat with only 0.15 birds on average at these stations. Refer to Figure 1 which depicts the frequency of each bird species in the three habitat types. This illustrates that silvereyes were the most abundant species in all three habitats. Bellbirds were most common in the native forest over mixed and exotic and numbers of fantail and warbler were higher in the mixed habitat. The numbers of bellbird, fantail and woodpigeon drop off to zero or

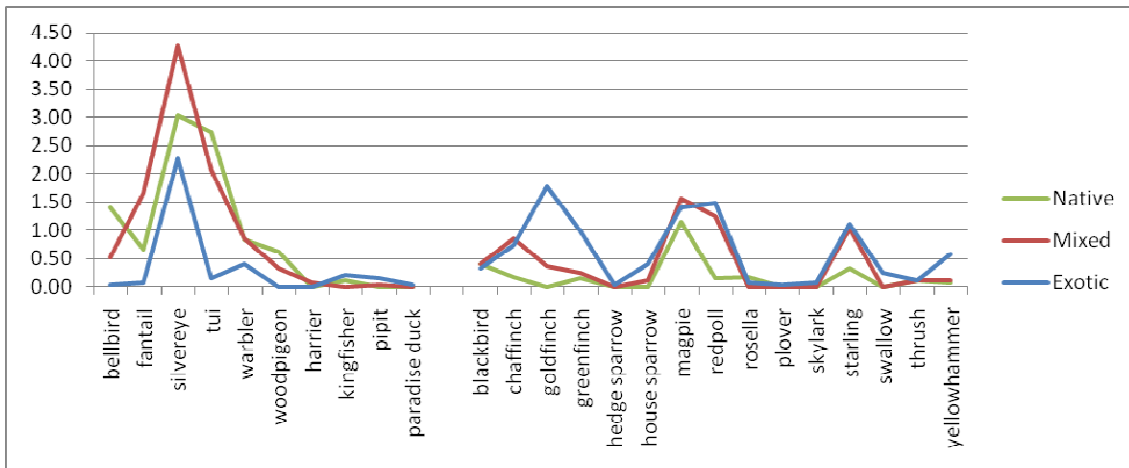
thereabouts in the exotic habitat. However, the number of kingfisher, pipit and paradise duck increase in the exotic landscapes.

Table 1 shows the average number of birds per count in Rewanui across different habitat types and compared with numbers in Wellington native forest reserves, 2008 (from Fea, 2008b)

<i>Habitat Type:</i>	<i>Native</i>	<i>Mixed</i>	<i>Exotic</i>	<i>Wellington 2008</i>
bellbird	1.41	0.52	0.04	0.19
fantail	0.67	1.67	0.07	0.66
silvereve	3.04	4.26	2.26	1.39
tui	2.74	2.07	0.15	0.80
warbler	0.85	0.85	0.41	0.62
woodpigeon	0.63	0.33	0.00	0.39
harrier	0.00	0.07	0.00	0.00
kingfisher	0.11	0.00	0.22	0.05
pipit	0.00	0.04	0.15	no data
paradise duck	0.00	0.00	0.04	0.10
blackbird	0.41	0.41	0.33	0.54
chaffinch	0.19	0.85	0.74	0.29
goldfinch	0.00	0.37	1.78	no data
greenfinch	0.15	0.26	1.00	0.23
hedge sparrow	0.00	0.00	0.04	0.03
house sparrow	0.00	0.11	0.41	0.32
magpie	1.15	1.56	1.41	0.36
redpoll	0.15	1.26	1.48	no data
rosella	0.19	0.00	0.07	0.26
plover	0.00	0.00	0.04	0.11
skylark	0.00	0.00	0.07	no data
starling	0.33	1.04	1.11	1.20
swallow	0.00	0.00	0.26	0.04
thrush	0.11	0.11	0.11	0.07
yellowhammer	0.07	0.11	0.59	no data

The numbers of introduced bird species are noticeably higher in the habitat dominated by exotic plant species compared to the native forest habitat. The most common exotic bird on average was the goldfinch with the magpie and redpoll close behind in the exotic habitat. Magpie were consistently seen or heard in all three habitat types. The difference within exotic bird species numbers is less noticeable when comparing the mixed native/exotic to the exotic habitat as magpie, blackbird, chaffinch, goldfinch, redpoll and starling were also frequently seen in the mixed habitats. Refer to Figure 1. The numbers of exotic birds in native habitat however, is generally low compared to the exotic and mixed habitats except for blackbirds and rosella which were marginally more abundant in the native forest.

Figure 1 shows the average number of native and exotic birds per count for the different habitat types across Rewanui



Figures 2, 3 and 4 each show a typical representation of the numbers of bird species per count across each particular habitat. Figure 2 shows the tally for count station “4.05” which is situated in the middle of the mature native bush on the western side of the property. Refer to the full map of the Rewanui bird count stations on page 15. Figure 2 illustrates the fact that native birds generally dominate the native habitat although exotic birds are also consistently seen, particularly the blackbird, magpie and starling.

Figure 3 shows this to be a predictably reverse situation in typical exotic habitat with only a few native species showing up and finch species, magpie and yellowhammer increasing in presence.

Figure 2 shows the average number of each bird species represented at station “4.05”, a typical native forest bird count station in Rewanui

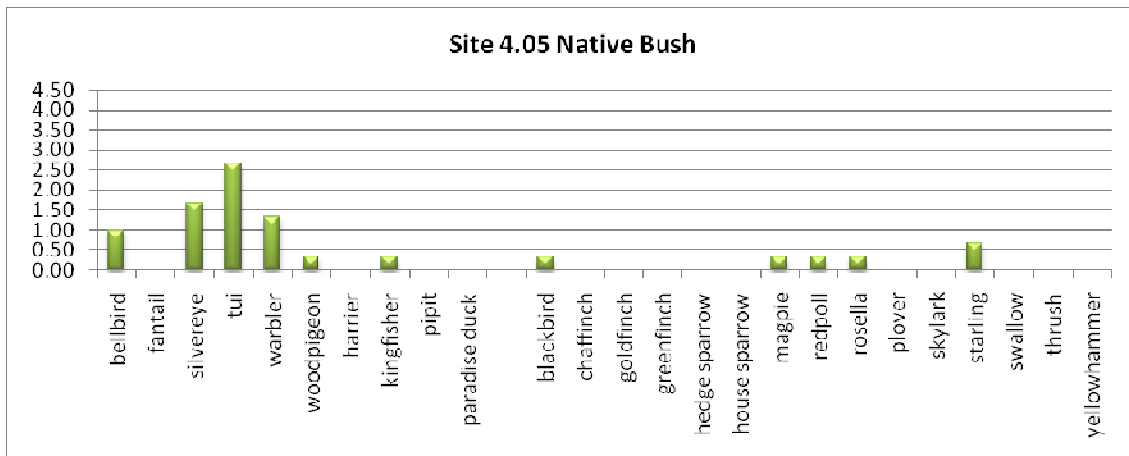


Figure 3 shows the average number of each bird species represented at station "8.01", a typical exotic habitat bird count station in Rewanui

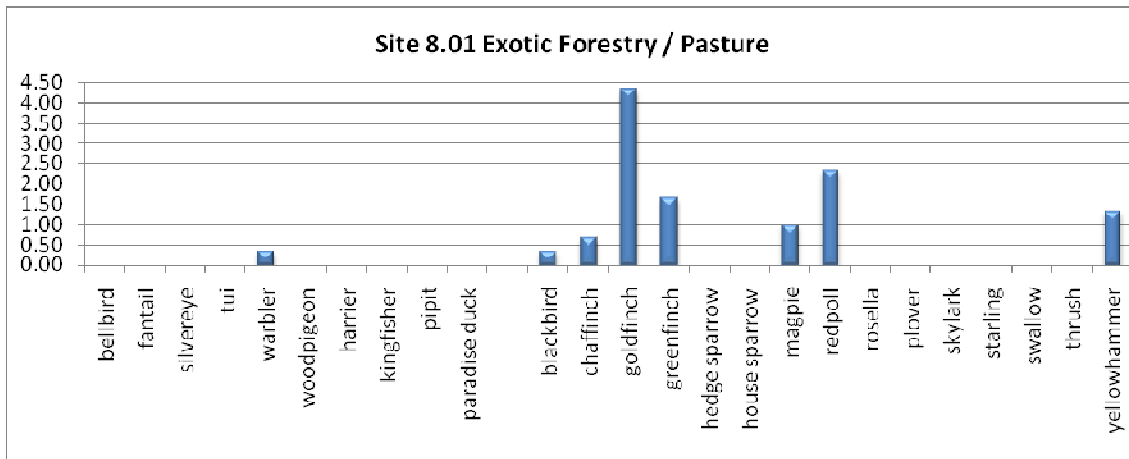
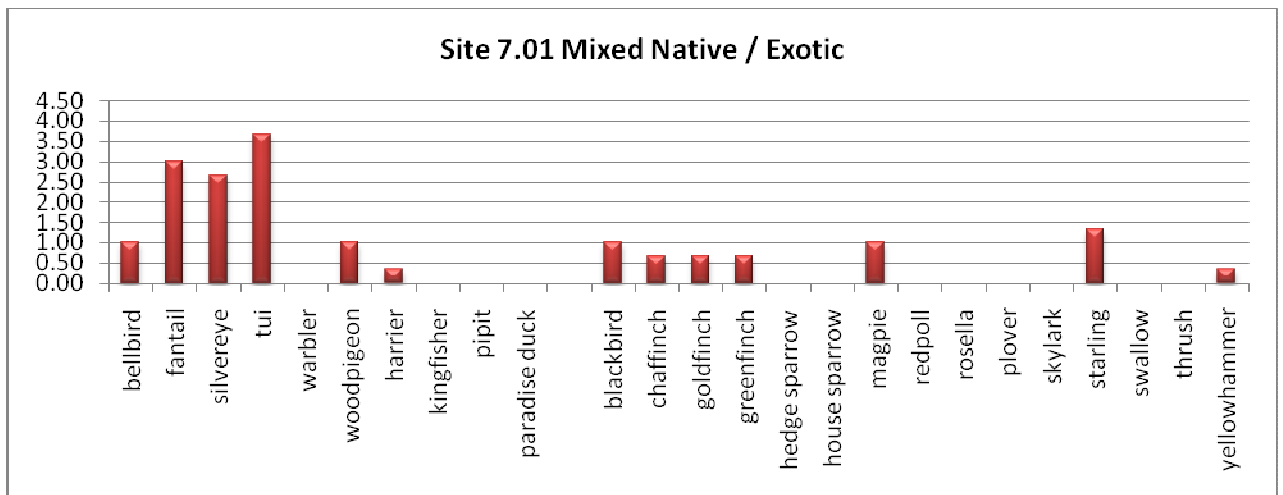


Figure 4 shows the average number of each bird species represented at station "7.01", a typical native / exotic mixed habitat bird count station in Rewanui



The final representation of a typical habitat in Figure 4 is for the mixed native/exotic vegetation. Here it shows that a mixture of both native and exotic birds are found with reasonable numbers of native birds seen such as the fantail, silvereye and tui at count station "7.01".

The native New Zealand pipit were detected at three different count stations in the mixed and exotic habitats in low numbers. Refer to page 14. These were also frequently seen across the grassy habitats of the entire property between counts. Other native bird species such as the kingfisher, harrier and paradise duck were more commonly observed in the more open habitats. Refer to Table 1.

5. Discussion

This survey is useful in presenting a description of the species present and providing baseline data for monitoring any long-term change. Intuitively, native and exotic bird species are primarily distributed across the native and exotic habitats respectively. This survey has also shown that there are certain

bird species that can be effectively used to represent a healthier, more natural ecosystem and indicate the degree of human modification.

There are a variety of habitats in Rewanui with mature native and exotic forest, open grassland, native shrubland, small creeks and ponds as well as stocked paddocks. The exotic habitat class includes a range of both grazed and non-grazed pasture species, poplars, willows and exotic forestry tree species. The exotic bird species within Rewanui are diverse with 17 species detected (15 in the counts, 2 outside) which illustrates the land's capacity to supply the variety of foods needed by so many exotic and native bird species.

Magpies were common across the entire property and they were the most common introduced bird species in the native habitat. In 2003, the environmental research company Landcare Research stated that although magpies are a threat to native birds when guarding territories during the breeding season, thereby limiting the feeding range of the native birds, they may not cause actual native bird numbers to decline. Refer to <http://www.landcareresearch.co.nz/news> for the full report. Conspicuousness of native birds may decrease with harassment by magpies but actual abundance is unlikely to be severely affected. Therefore Landcare Research recommend pest control work to remain focussed on the pest mammals such as possums, rats and stoats; *“It is better to concentrate on controlling mammal pests. They are the ones that attack nests, and limit numbers of native birds. Magpies are clearly unlikely to eradicate another bird species from the wider landscape.”*

For the exotic habitat the magpie, redpoll, goldfinch and starling were the most abundant introduced bird species. Magpie, redpoll and starling also appeared consistently in the mixed habitat showing that these species are exploiting native species for food as well as exotic. Redpoll and goldfinch feed mainly on small weed and grass seeds and some invertebrates. Starling take invertebrates and fruit and magpies are also known to eat invertebrates and seeds but may also scavenge carrion or prey upon sick animals (Heather and Robertson, 2005).

Silvereye, the most common native bird species, were present in good numbers in all three habitat types and at their largest flock sizes in the mixed habitat. Refer to Table 1. They were also the most common native bird species in the native forests surveyed in Wellington (Fea, 2008b). The average number of silvereyes in the Rewanui native habitat is twice that of the 2008 Wellington counts. Refer to Table 1. This shows that they are a native bird species surviving well in disturbed habitats that preserve some native character.

Tui numbers were much greater than the average number recorded across Wellington (2.75 cf. 0.80 in Wellington forest reserves). Refer to Table 1. Numbers of tui were not considerably lower in the mixed habitat (2.07) but markedly so in the exotic habitat (0.15). Therefore as the mixed and native habitats were similar, tui may not be useful in indicating habitat health on their own.

Fantail were present in all habitats with more than twice the numbers in the mixed habitat compared to the native forest with a group of up to 20 fantails recorded at one count station “6.01”. Refer to page 14. This indicates a successful breeding season in this area of mixed habitat. The frequent cheeps and cheeky behaviours of the fantail and the flocking behaviour of the silvereve make them easily observed and conspicuous native bird species. This is especially so on the edges of native forests and more open vegetation which contributes to their increased presence in the mixed habitat. These possible factors make the silvereve and fantail less reliable indicators of native ecosystem health as they are apparently doing well in modified habitats.

Bellbirds were detected almost entirely in the native and mixed habitats and this indicates that they require an undisturbed habitat to thrive. In the Greater Wellington bird counts for 2008, numbers were lower than the average for Rewanui native habitat (0.19 cf. 1.41, Table 1). This follows that the Rewanui populations are relatively healthy. Numbers of bellbirds in the native bush were almost three times the levels found in the mixed habitat, and they were barely detected in the exotic, so their presence offers a fair indication of naturalness of a habitat. Bellbirds are more common throughout the South Island than in the North and in the South they frequently inhabit orchards and farms but this is less common in the North (Heather and Robertson, 2005). It is therefore a triumph that they exist within this predominantly farmed North Island district. The beautiful bellbird song in Rewanui resonates across the entire property and therefore injects great natural value into the landscape.

Grey warblers were consistently seen in all habitat types and were equally common in the native and mixed habitats. Their numbers in Rewanui were also higher than last year’s counts in the Wellington region (0.85 cf. 0.62, Table 1). The endemic grey warbler is common throughout New Zealand and is one of the few passerines to have benefited from human modification of landscape (Heather and Robertson, 2005).

Woodpigeon, the largest native forest bird recorded in this study, are an impressive endemic species with loud wing beats as they fly heavily through the bush and spectacular breeding displays. They may also be useful as a key indicator species for measuring the state of native ecosystems because in Rewanui they were most common in the native bush, half the abundance in the mixed and not detected at all in the exotic habitat. Long-term monitoring of woodpigeon is important as they play a particularly vital role in our native ecosystems dispersing the seeds of large-fruited trees and shrubs (eg. titoki, matai, miro, hinau, tawa and karaka). Hutching (2004) states “*with the extinction of the moa and other giant ground-dwelling birds, the native pigeon, kereru, remains the only bird capable of swallowing the large seeds throughout native forests*”.

There were four native species that were seen more commonly in the less forested habitats (harrier, kingfisher, pipit and paradise duck). These species are not as useful as indicators of native forest health; however, they are a valuable part of the avifauna of Rewanui in these riverside and grassland ecosystems. Pipits in particular are generally scarce in intensive agricultural districts (Heather and Robertson, 2005) yet it is good news that they seem to be

in reasonable numbers in Rewanui, especially in the rough pasture fenced from stock. The native New Zealand falcon has also been observed in Rewanui (Fea, 2008a) which is hopeful news as they are an endangered species with a very restricted range.

Although whitehead were not detected in these surveys in February, there was an exciting report of one seen in late April 2009 by Steve Playle, Biosecurity Officer for Greater Wellington, who performs the pest animal control in Rewanui. Whiteheads have been observed nearby in the eastern Wairarapa recently (Ray Clarey, Senior Biosecurity Officer, Greater Wellington, pers. comm), and it will be interesting to see if whiteheads become a more common fixture of the area. Certain other rare native birds were unfortunately not detected (kakariki, tomtit, robin, kaka) however, it is hoped that with continued pest suppression and ongoing bird monitoring these rarer species may eventually find refuge in Rewanui, either by natural dispersal or via active translocation work. It is the potential re-introduction of native species previously eliminated from an area that heralds the ultimate recovery of an ecosystem.

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Appendix A - average numbers of birds at each count station in Rewanui

	N	N	N	N	N	N	N	N	N	M	M	M	M	M	M	M	M	M	E	E	E	E	E	E	E	E	E	E
Species	1.01	1.05	1.10	2.05	2.10	3.05	4.01	4.05	4.10	2.01	3.10	6.01	6.05	7.01	7.05	7.10	9.01	9.05	3.01	5.01	5.05	5.10	6.10	8.01	8.05	8.10	9.10	
bellbird	2.33	2.33	2.00	0.00	0.00	0.33	4.33	1.00	0.33	0.33	1.33	0.00	0.00	1.00	0.67	1.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	
fantail	0.33	0.00	0.33	1.33	1.67	0.67	1.33	0.00	0.33	1.00	0.00	9.00	0.67	3.00	0.00	0.67	0.33	0.33	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
silvereve	2.67	2.00	2.67	1.00	2.00	9.00	4.33	1.67	2.00	2.67	8.67	5.33	2.33	2.67	4.33	5.33	3.33	3.67	7.00	1.00	1.00	3.00	1.33	0.00	3.33	1.00	2.67	
tui	2.67	3.00	2.33	4.67	2.00	1.33	3.33	2.67	2.67	2.67	1.33	2.00	0.67	3.67	0.67	6.00	0.33	1.33	0.33	0.33	0.00	0.00	0.00	0.00	0.33	0.00	0.33	
warbler	1.00	0.00	0.33	0.67	0.67	1.00	1.33	1.33	1.33	1.00	1.00	1.00	1.33	0.00	1.33	1.33	0.33	0.33	0.00	0.00	0.33	1.00	0.67	0.33	0.00	1.00	0.33	
woodpigeon	0.67	1.33	0.67	0.67	1.00	0.33	0.67	0.33	0.00	0.00	0.00	1.00	0.00	1.00	0.00	0.67	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
harrier	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
kingfisher	0.00	0.00	0.00	0.33	0.00	0.33	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.33	1.33	0.00	0.00	0.00	0.00	
pipit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	
paradise duck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
blackbird	0.00	0.00	1.00	0.67	1.00	0.33	0.33	0.33	0.00	0.00	0.67	0.67	1.00	1.00	0.00	0.00	0.00	0.33	0.67	0.00	0.33	0.00	1.00	0.33	0.33	0.00	0.33	
chaffinch	0.33	0.00	0.00	1.00	0.00	0.00	0.33	0.00	0.00	3.33	0.67	0.00	0.33	0.67	0.33	0.33	0.67	1.33	0.00	0.33	1.00	1.33	2.33	0.67	0.00	1.00	0.00	
goldfinch	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.33	0.33	0.00	0.67	1.00	0.00	0.00	0.00	0.67	0.33	2.33	3.67	0.00	4.33	2.67	1.00	1.00	
greenfinch	0.00	0.33	0.00	0.00	0.67	0.33	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.67	0.00	0.00	0.67	0.00	0.67	0.00	2.67	1.33	0.67	1.67	1.67	0.33	0.00	
hedge sparrow	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	
house sparrow	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
magpie	2.00	1.33	0.67	2.00	2.67	0.00	0.67	0.33	0.67	3.33	0.00	3.67	2.33	1.00	1.67	0.67	0.33	1.00	0.00	3.00	1.67	1.00	2.67	1.00	0.67	1.00	1.67	
redpoll	0.67	0.00	0.00	0.00	0.00	0.33	0.00	0.33	0.00	1.33	2.67	0.00	0.00	0.00	3.00	0.33	3.33	0.67	1.00	0.67	0.67	3.00	0.67	2.33	1.67	2.33	1.00	
rosella	0.33	0.00	0.33	0.67	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.67	0.00	0.00	0.00	0.00	
plover	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	
skylark	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.33	0.00	
starling	0.33	0.67	0.00	0.33	0.00	1.00	0.00	0.67	0.00	1.33	3.00	2.33	0.00	1.33	0.67	0.67	0.00	0.00	1.00	0.33	6.33	1.33	1.00	0.00	0.00	0.00	0.00	
swallow	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.67	1.67	0.00	0.00	0.00	0.00	0.00	0.00	
thrush	0.33	0.00	0.00	0.00	0.00	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.67	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
yellowhammer	0.33	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.33	0.33	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.33	1.00	0.33	1.67	

