

State and trends in the diversity, abundance and distribution of birds in Pōneke / Wellington City

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Cover Image: A kākā (*Nestor meridionalis*) photographed in Zealandia Te Māra a Tāne Wildlife Sanctuary.

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Executive Summary

Five-minute bird counts have been carried out at 100 bird count stations in forest habitat throughout Pōneke / Wellington City's parks and reserves network each year between 2011 and 2023. The aim of these surveys is to monitor trends in the diversity, abundance and distribution of native forest birds throughout Pōneke / Wellington City's parks and reserves, to assess how local conservation management activities are impacting the city's native bird fauna.

Native birds outnumber introduced birds across the Pōneke / Wellington City parks and reserves network. The average number of native and introduced birds counted per bird count have both increased by 55% since 2011. Among the native bird species recorded, there have been substantial increases in the average annual counts of kererū (a 243% increase), kākā (a 170% increase), tūī (a 93% increase) and pīwakawaka / New Zealand fantails (a 37% increase) since 2011. Previously reported declines in the average annual counts of tauhou / silvereyes and pīpīwharau / shining cuckoos may be in the process of stabilising.

The predator-free Zealandia Te Māra a Tāne sanctuary is having a measurable 'halo' effect on native forest bird communities throughout Pōneke / Wellington City. The average number of native bird species recorded per five-minute bird count station declined with increasing distance from Zealandia Te Māra a Tāne's predator-proof fence. An average of 5.4 native bird species were recorded at count stations closest to Zealandia Te Māra a Tāne's boundary between 2011 and 2023, whereas an average of 4.0 native bird species were recorded at count stations situated furthest from Zealandia Te Māra a Tāne's boundary over the same period. In contrast, the average number of introduced species recorded per five-minute bird count station increases with increasing distance from Zealandia Te Māra a Tāne's predator-proof fence.

These results suggest that the presence of large 'source' populations of native forest birds in Zealandia Te Māra a Tāne, together with the increasing extent and intensity of mammalian predator control being carried out in Pōneke / Wellington City, is driving spectacular recoveries in several previously rare or locally extinct native forest bird species in the city. As a consequence, bird communities in native forest habitats in forested parks and reserves in Pōneke / Wellington City are becoming more diverse, creating improved opportunities for local residents and visitors alike to encounter a wider range of New Zealand's native forest bird species in the heart of New Zealand's capital city. One clear sign of this increasing level of engagement is the large and growing number of citizen science bird records that are being collected in Pōneke / Wellington City, with a total of 126,129 observations of native forest birds having been reported by local residents and visitors since 2011.

Set against these successes, it is becoming increasingly clear that further improvements in the health of Pōneke / Wellington City's native bird populations is being significantly limited by the presence of very large populations of free-roaming domestic, stray and feral cats in the city. To maximise the potential gains to be achieved by the significant resources being invested in controlling and eradicating rodents and mustelids from the city, Wellington City council, community-led conservation groups and residents of Pōneke / Wellington City will need to work together to find a way to exclude free-roaming cats from forested habitats within the city.

It is recommended that Wellington City Council continues to carry out these five-minute bird counts on an annual basis, to monitor future improvements in the city's native bird communities as Pōneke / Wellington City continues on its journey towards becoming the world's first predator-free capital city.

Keywords: Citizen science, eBird, encounter rate, five-minute bird count, generalised linear mixed-effect models, iNaturalist New Zealand, New Zealand Bird Atlas, Predator Free Wellington, Wellington City, Zealandia Te Māra a Tāne

Pōneke / Wellington City forest reserves native bird health check at glance

	Outside Zealandia Te Māra a Tāne	Inside Zealandia Te Māra a Tāne
<p>High concern</p> <p>Tiny or declining populations, moderate to high predator risk</p>	<p>hihi, kākārīki / red-crowned parakeet, korimako / bellbird, pōpōkotea / whitehead, tīeke / North Island saddleback, tītītipounamu / rifleman, toutouwai / North Island robin</p>	<p>hihi</p>
<p>Moderate concern</p> <p>Small, localised or sparse populations, moderate to high predator risk</p>	<p>kārearea / New Zealand falcon, pīpīwharau / shining cuckoo</p>	<p>pīpīwharau / shining cuckoo</p>
<p>Low concern</p> <p>Large, stable or increasing populations, low to moderate predator risk</p>	<p>kākā, kererū, kōtare / New Zealand kingfisher, pīwakawaka / New Zealand fantail, riroriro / grey warbler, tauhou / silvereye, tūī</p>	<p>kākā, kākārīki / red-crowned parakeet, kārearea / New Zealand falcon, kererū, korimako / bellbird, kōtare / New Zealand kingfisher, pīwakawaka / New Zealand fantail, pōpokotea / whitehead, riroriro / grey warbler, tauhou / silvereye, tīeke / North Island saddleback, tītītipounamu / rifleman, toutouwai / North Island robin, tūī</p>
<p>Data deficient</p> <p>Population size and trends poorly known</p>	<p>kiwi-nui / North Island brown kiwi, Ruru / morepork</p>	<p>ruru / morepork</p>

1. Introduction

Over the past twenty-five years there has been a dramatic improvement in the diversity, abundance and distribution of native forest birds in Pōneke / Wellington City (Miskelly *et al.* 2005; McArthur *et al.* 2021). This improvement is a result of two key developments in the management of indigenous forest habitats in and around the city. Firstly, a series of species reintroductions to local predator-free sites (e.g., Zealandia Te Māra a Tāne, Matiu/Somes Island and Mana Island) have created local source populations of previously locally extinct or near-extinct bird species which have begun dispersing into forested reserves throughout the city (Miskelly & Powlesland, 2013; McArthur *et al.* 2017). These species include: kākā (*Nestor meridionalis*), kākārīki / red-crowned parakeet (*Cyanoramphus novaezelandiae*), pōpokotea / whitehead (*Mohoua albicilla*) and korimako / bellbird (*Anthornis melanura*) (Miskelly *et al.* 2005; Froude, 2009; McLaughlin & Harvey, 2013; Miskelly, 2018). Secondly, ongoing multi-species mammalian predator control has resulted in local increases in resident native bird species such as tūī (*Prosthemadera novaeseelandiae*) and kererū (*Hemiphaga novaeseelandiae*) (Bell, 2008; Froude, 2009; Brockie & Duncan, 2012; McArthur *et al.* 2021). This mammalian predator control work has been carried out by Wellington City Council (WCC), Greater Wellington Regional Council (GWRC) and a large number of community-led conservation groups and has allowed some of these recently reintroduced native bird species to establish functional populations away from their original reintroduction sites.

Eleven endemic forest bird species have been successfully reintroduced to Zealandia Te Māra a Tāne since 2000, and a further two species have recolonised of their own accord (Miskelly, 2018¹). This has led to the re-establishment of a diverse and abundant endemic forest bird community within Zealandia Te Māra a Tāne's predator-proof fence. Competition with these recently established species has caused substantial declines in local populations of tauhou / silvereye (*Zosterops lateralis*), riroriro / grey warbler (*Gerygone igata*) and pīwakawaka / fantail (*Rhipidura fuliginosa*), all of which had been present in the sanctuary prior to the eradication of mammalian predators (Miskelly, 2018). At least six introduced bird species have also experienced similar, substantial declines within Zealandia Te Māra a Tāne over the same time period, demonstrating that endemic forest birds can effectively out-compete introduced bird species in the absence of mammalian predators (Miskelly, 2018). These changes to Zealandia Te Māra a Tāne's bird community observed over the past two decades could foreshadow the changes that may occur in forest habitats in other forested parks and reserves in Pōneke / Wellington City, as pest control and eradication efforts continue to expand and intensify across the city.

Mammalian predator control and eradication efforts in Pōneke / Wellington City continue to grow in both intensity and coverage. Dozens of community groups across the city are now participating in predator control activities, and in recent years the concept of creating 'predator free suburbs' has emerged. Following central government's announcement in July 2016 to work towards the goal of a Predator Free New Zealand by 2050, these citywide predator control efforts have further crystallised into the Predator Free Wellington initiative. Predator Free Wellington is being co-funded by WCC, GWRC and the NEXT Foundation and plans to build on the proliferation of pest-free suburb projects

¹ Miskelly (2018) lists 10 forest bird species reintroduced to Zealandia. In March 2019, an 11th species, tītītipounamu / rifleman (*Acanthisitta chloris*) was also reintroduced to the sanctuary (<https://www.facebook.com/ZEALANDIA/posts/10156377249456401>; accessed 04/04/2021).

with the aim of eradicating rats (*Rattus* spp.), mustelids (*Mustela* spp.) and possums (*Trichosurus vulpecula*) from Pōneke / Wellington City. The first stage of this project commenced in July 2019 with the successful eradication of rats and mustelids from Te Motu Kairangi / Miramar Peninsula, and preparations are now well underway to begin an eradication of rats, possums and mustelids from an additional 14 suburbs from Island Bay to the CBD (<https://www.pfw.org.nz/>; accessed 04/04/2023). In 2018, the Capital Kiwi Project also began installing a network of predator traps on the Wellington Peninsula to the west of Pōneke / Wellington City. By 2022, this trapping network had grown to over 4,500 traps across 23,500 hectares of land stretching from the Wellington south coast to Porirua. In November 2022 a major milestone was reached with the release of thirteen kiwi-nui / North Island brown kiwi (*Apteryx mantelli*) on Terawhiti Station, followed by the release of an additional 125 birds in 2023 and 2024 (<https://www.capitalkiwi.co.nz/>; accessed 25/05/2023).

These combined efforts to eradicate or control mammalian predators in Pōneke / Wellington City are predicted to lead to further dramatic changes in the distribution and abundance of native birds in the city. Monitoring the ongoing changes that are occurring to native bird populations in the city therefore provides a useful means by which the outcome of the considerable time and effort now being spent on improving Pōneke / Wellington City's biodiversity can be measured. For this reason, WCC identified a need to monitor local bird populations to provide a measure of the success or otherwise of their recently adopted Biodiversity Strategy & Action Plan (WCC, 2015). Goal 4.2.2a of this Biodiversity Strategy involves setting up a "consistent terrestrial outcome monitoring framework...incorporating existing monitoring work in a collaborative approach with other key organisations" (WCC, 2015).

Five-minute bird count monitoring was carried out between 2001 and 2009 in nine selected parks and reserves in Pōneke / Wellington City by Pacific Eco-Logic Ltd (Froude, 2009). These counts recorded substantial increases in the local abundance of tūi concurrent with a major expansion in pest control efforts in Pōneke / Wellington City that occurred over this time. These counts also provided some of the earliest evidence that bird species re-introduced to Zealandia Te Māra a Tāne were dispersing and settling in nearby reserves (Froude, 2009). This survey design focused on monitoring birds in only a selected subset of Pōneke / Wellington City parks and reserves however, so couldn't provide a comprehensive picture of changes in the native bird community across the entire network of the city's parks and reserves. In 2011 therefore, a new survey design was developed to monitor changes in the distribution and abundance of native forest birds in forest habitats across the entire network of Pōneke / Wellington City parks and reserves (McArthur *et al.* 2012).

These latter counts have been carried out each year since 2011 and have demonstrated the important influence that Zealandia Te Māra a Tāne has had on the native forest bird community in the wider Wellington City. Approximately a third of the native forest bird species detected in Pōneke / Wellington City parks and reserves during these counts have been re-introduced to Zealandia Te Māra a Tāne (McArthur *et al.* 2021). Furthermore, the declines in the abundance of several common, resident native and introduced bird species first reported in Zealandia Te Māra a Tāne by Miskelly (2018) has now been detected in forest habitats beyond Zealandia Te Māra a Tāne's predator-proof fence (McArthur *et al.* 2021). Bird species reintroduced to Zealandia Te Māra a Tāne have had varying levels of success at colonising forest habitats elsewhere in the city. Both kākā and kākārīki / red-crowned parakeets are now regularly encountered in parks, reserves and suburban gardens throughout central city suburbs. In contrast, tīeke / North Island saddleback (*Philesturnus rufusater*), toutouwai / North Island robin (*Petroica longipes*) and pōpokotea / whitehead all continue to have very sparse and localised distributions, largely restricted to forested reserves immediately adjacent to Zealandia Te Māra a Tāne. This indicates that mammalian predators are limiting the ability of these

reintroduced bird species to establish self-sustaining populations in native forest habitats beyond Zealandia Te Māra a Tāne's predator-proof fence (McArthur *et al.* 2021; Irwin & Empson, 2022).

Nevertheless, mean annual counts of native forest birds increased by 41% between 2011 and 2022. This was driven by substantial increases in the average annual counts of kākā (a 260% increase), kererū (a 200% increase), tūī (an 85% increase) and pīwakawaka / New Zealand fantails (a 49% increase). Therefore, although some native bird species have failed to thrive beyond Zealandia Te Marā a Tāne's predator-proof fence, other species have clearly benefited from the ongoing, steady expansion and intensification of mammalian predator control efforts throughout Pōneke / Wellington City since 2011 (McArthur *et al.* 2023).

We have made use of citizen science observations to supplement this monitoring, allowing us to map the distribution of native birds in Pōneke / Wellington City in unprecedented detail. These maps have helped document the range expansion of recently re-introduced species such as kākā and kākārīki / red-crowned parakeet and to detect recent, local re-colonisation events that have occurred in several of the city's parks and reserves (McArthur *et al.* 2023).

This report provides an update on the state and trends in the diversity, abundance and distribution of birds in forest habitats in parks and reserves throughout Pōneke / Wellington City, by analysing and reporting a thirteenth year of five-minute bird count data, together with additional citizen-science data collected since the publication of the previous bird monitoring report in May 2023.

2. Methods

2.1 Five-minute bird count data collection

One hundred bird count stations were established at randomly selected locations in forest habitat in parks and reserves throughout Pōneke / Wellington City in November 2011 and have been surveyed annually between 2011 and 2023 (Figure 2.1). These bird count stations were established at a minimum distance of 200 metres from one another and each station has been marked with either a blue triangle affixed to a living tree, or with pink flagging tape if situated in plantation forest.

Two five-minute bird counts have been carried out at each station each year, with the two counts at each station being carried out on different days. All counts were carried out between early November and early January each year. Counts were only conducted on fine, calm days between 1.5 hours after sunrise and 1.5 hours before sunset (approximately 7.30 am to 6.30 pm). At each station, an observer spent five minutes recording the number of individuals of all species seen or heard from the count station (i.e., an unbounded count as per Dawson & Bull, 1975 and Hartley & Greene, 2012). Care was taken not to record the same bird twice during a count. Two experienced observers conducted the counts each year, with each observer surveying approximately half of the bird count stations.

Bird conspicuousness can vary in response to external variables such as time of year, weather, time of day and change in observer (Bibby *et al.* 2000). To account for this, every effort was made to standardise or sample the range of variation in each of these factors. Precautions taken include carrying out these counts during the same months each year and in similar weather conditions. Counts were carried out throughout the day, so sampled any variation in bird conspicuousness that occurred during the day.

Variation in the methods and abilities of observers can have a substantial impact on five-minute bird count results and can sometimes either mask or be mistaken for true changes in bird abundance or conspicuousness from one survey to the next (McArthur *et al.* 2013). For this reason, we've endeavoured to minimise the number of observers used to collect this five-minute bird count data, with only two changes being made so far during the thirteen-year duration of this project. In each case, when one observer has been replaced with another, the second observer has remained the same across both years, thus providing us with some ability to differentiate observer-related variation in bird encounter rates from those caused by true changes in bird conspicuousness or abundance from one year to the next.



Figure 2.1: Locations of five-minute bird count stations surveyed annually in Pōneke / Wellington City parks and reserves between 2011 and 2023.

2.2 Five-minute bird count data analysis

The Pōneke / Wellington City five-minute bird count data were entered into a Microsoft Excel spreadsheet and then imported into the statistical package R (R Core Team, 2021) for statistical analysis. Three separate analyses were carried out, the first of which looked at overall trends in the encounter rates of native and introduced birds over time; the second investigated temporal trends in the encounter rates of any individual species that occurred in at least 50 counts carried out between 2011 and 2023); and the third investigated the influence that Zealandia Te Māra a Tāne's proximity had on the diversity of native and introduced bird species recorded at a bird count station.

For all three analyses, generalised linear mixed-effects models with a Poisson error were used to investigate temporal and spatial trends in bird encounter rates. For each analysis, we compared models from a candidate set to determine which of the plausible relationships between the number of birds encountered and time best explained the data. The model that fitted the data best was selected using Akaike's Information Criterion, corrected for small sample size (AICc; Burnham and Anderson, 2002). The model with the lowest AICc value provided the best fit to the data, using the lowest number of model parameters. We then used our preferred models to assess whether trends in bird encounter rates were increasing or decreasing over time by calculating estimates of slope, and 95% confidence intervals (CIs) around estimates. Positive estimates of slope indicated increases in bird encounter rates, while negative estimates of slope indicated decreases in bird encounter rates. We used the 'lme4' package (Bates *et al.* 2015) in the statistical package R (R Core Team, 2021) for all three analyses.

2.2.1 Trends in the encounter rates of native versus introduced species

To analyse overall trends in the encounter rates of native versus introduced birds over time, three plausible models were considered:

1. **No change:** Bird encounter rates have not changed between 2011 and 2023 but encounter rates of native and introduced species have differed. This model included the number of individuals of all species detected during a count in a given year as a response variable, and the status of each species (native or introduced) as a predictor variable.
2. **Same population trend for both native and introduced species:** Bird encounter rates have changed between 2011 and 2023, at the same rate for both native and introduced species. This model consisted of the same response variable as the "no change" model above but included both species status and year as predictor variables.
3. **Different population trends for native versus introduced species:** Bird encounter rates have changed between 2011 and 2023, but at different rates for native versus introduced species. This model consisted of the same response and predictor variables as the "same population trend" model above but included an additional interaction term between the status and year predictor variables to allow for the slope of the relationship with time to vary between native and introduced species.

For each of these three models, a random intercept term was included for each station to account for the repeated-measures design. We did not include observer in the model because observer was partly confounded with station. However, only four observers have been used over the thirteen-year series of counts, and generally at least five levels of a random effect (in this case, the observer) are required to achieve robust estimates of variance (Gelman & Hill, 2007).

2.2.2 Trends in the encounter rates of individual native forest bird species

To analyse trends in the encounter rates of individual bird species between 2011 and 2023, two plausible models were considered:

1. **No trend:** Bird encounter rates have not changed between 2011 and 2023.
2. **Trend over time:** Bird encounter rates have either increased or decreased between 2011 and 2023.

Both models included the number of individuals of each species detected during a count in a given year as a response variable, an intercept term and a random intercept term for each station to account for the repeated-measures design. The “trend over time” model also included year as a predictor variable. As with the first analysis, observer was not included as a random effect. Where it was necessary, an observation-level random effect was also included to account for overdispersion, i.e., a higher error variance than assumed by the Poisson error distribution for these models (Harrison, 2014).

2.2.3 Zealandia Te Māra a Tāne’s influence on native and introduced species richness

To analyse how the proximity to Zealandia Te Māra a Tāne influenced the number of native or introduced species recorded at a bird count station, three plausible models were considered:

1. **No spatial trend:** Differences in species richness occur between native and introduced species at any given location but show no relationship with distance from Zealandia Te Māra a Tāne.
2. **Same spatial trend for native and introduced species:** Differences in species richness occur between native and introduced species at any given location, and these differences vary in relation to the distance of the count station from Zealandia Te Māra a Tāne at the same rate for both native and introduced species.
3. **Different spatial trends for native versus introduced species:** Differences in species richness occur between native and introduced species at any given location, and these differences vary in relation to the distance of the count station from Zealandia Te Māra a Tāne but at different rates for native and introduced species.

All three models contained species richness (i.e., the mean number of species detected at each station) as a response variable, an intercept term, and a random intercept term for each station (to account for the repeated-measures design) and for year (to account for variation between years). All models also included a log-transformed offset term consisting of the number of native and introduced

species included in the analysis, to account for there being more native than introduced species in the analysis. A linear relationship between species richness and distance to Zealandia Te Māra a Tāne was also assumed. Model one (no spatial trend) included status (whether a species is native or introduced) as a predictor variable. Model two (same spatial trend for native and introduced species) included status and distance to the nearest point of Zealandia Te Māra a Tāne's boundary as predictor variables. Model three (different spatial trends for native and introduced species) included the same predictor variables as model two, but also included an interaction term between status and distance to Zealandia Te Māra a Tāne as an additional predictor variable to allow for the spatial trend in species richness to vary between native and introduced species.

Patterns in the distribution of native birds among Pōneke / Wellington City reserves were also examined by mapping the relative frequency at which each native forest bird species was detected at each bird count station using ArcMap version 10.8.2. Although this technique does not explicitly take into account relative differences in abundance (e.g., less common species present within sight or earshot of a bird count station are less likely to be detected) or variation in detection probabilities between species (e.g., less conspicuous species will also be less likely to be detected), it should be sufficient to detect relatively conspicuous patterns in species' distributions and habitat use (Mackenzie *et al.* 2006).

2.3 Citizen science data analysis

The increase in the availability of online tools to record natural history observations has led to a steady increase in the number of citizen science bird observations that are available online. These data were combined with our more systematic five-minute bird count data to help detect changes in bird distribution in Pōneke / Wellington City over time. To date, residents and visitors to Pōneke / Wellington City have contributed over 299,700 bird observations to online databases and projects such as New Zealand eBird, the New Zealand Bird Atlas, iNaturalist and the Great Kererū Count.

The New Zealand eBird database (<http://ebird.org/content/newzealand/>), which in turn hosts the New Zealand Bird Atlas dataset, is run by the Cornell Lab of Ornithology in partnership with Birds New Zealand (formerly the Ornithological Society of New Zealand). It provides a facility for recreational birders and professional ornithologists to permanently record their bird observations in a standard format in one centralised location and makes these observations available to researchers, conservation managers and environmental policy makers (Scofield *et al.* 2012). Globally, the eBird database is now the largest and fastest growing biodiversity database in the world, with over 930,000 unique users having so far contributed over 1.6 billion bird observations (Sullivan *et al.* 2014; <https://ebird.org/news/2023-year-in-review>, accessed 05/06/2024).

Within the eBird database, automated data filters and an expert review process ensure that these data are of high quality and accuracy (Sullivan *et al.* 2014). We used eBird's "download data" tool to access the March 2024 release of the eBird Basic Dataset (EBD) and to build custom datasets containing citizen science records of all native forest bird species recorded in Pōneke / Wellington City between 2011 and 2024. We formatted these datasets using Microsoft Excel, including removing any extraneous data fields and converting latitude/longitude coordinates to New Zealand Transverse Mercator (NZTM2000) coordinates. We then saved these files as .csv files so that they could be imported into ArcMap and converted into shapefiles. Once in ArcMap, we visually inspected these eBird records to locate and remove any records containing obvious location errors (e.g., records placed offshore, or for which location descriptions didn't match the coordinates provided) or absence records, before adding these records to the distribution maps created from the five-minute bird count data. A total of 107,891 records of native forest birds observed in Pōneke / Wellington City was retrieved from eBird using this process, representing 86% of all of the citizen science bird observations included in this report.

The iNaturalist New Zealand database is the second-largest online source of citizen science bird data for Pōneke / Wellington City. iNaturalist New Zealand is a database that allows citizen scientists to submit, share and store natural history observations online. Unlike eBird, it is designed to accept records for almost any taxon of plant or animal rather than just birds. iNaturalist New Zealand (<https://inaturalist.nz/>) is run by a charitable trust called the New Zealand Bio-recording Network Trust and was established using funding from the New Zealand Government's Terrestrial Freshwater Biodiversity Information System Fund.

Within the iNaturalist New Zealand database, a community peer-review process is used to validate records, with records tagged as either "research grade" or "casual grade" depending on whether or not the original species identifications have been verified by other iNaturalist New Zealand users. We used the search tool on the iNaturalist New Zealand website (<https://inaturalist.nz/>) to create and download a custom dataset of all bird observations recorded in Pōneke / Wellington City between 2011 and 2024. We formatted this dataset using Microsoft Excel, then saved the resulting file as a .csv file so that it could be imported into ArcMap and converted to a shapefile. We then displayed the

data on a map and visually inspected them, removing records with obvious location errors, before adding these records to the distribution maps created from the five-minute bird count data. A total of 17,704 records of native forest birds observed in Pōneke / Wellington City was retrieved from iNaturalist New Zealand using this process, representing 13.5% of all of the citizen science bird observations included in this report.

Kererū Discovery's Great Kererū Count dataset is the third-largest source of citizen science bird data available for Pōneke / Wellington City. The Great Kererū Count was a nationwide kererū survey that took place each year between 2014 and 2021 (Hartley 2021). Observers from around the country were encouraged to record the presence or absence of kererū at locations of their choosing over a 10-day period each September. In 2021 during the final year of the project, 12,002 reports were received nationwide, with a total of 24,562 kererū counted (<https://kererudiscovery.org.nz/the-great-kereru-count/>; accessed 21/04/2022). We made a request for access to the Great Kererū Count data from Kererū Discovery and received a .csv file containing 574 observations reported from Pōneke / Wellington City. We imported this .csv file into ArcMap and visually inspected the records to locate and remove any records containing obvious location errors before adding these records to the distribution maps created from the five-minute bird count data. The 574 kererū observations sourced from the Great Kererū Count dataset represent 0.5% of all of the citizen science bird observations included in this report.

We created distribution heat maps for native forest bird species with more than 100 citizen science observations, using the 'Kernel Density' tool in ArcMap's Spatial Analyst toolbox. For species with less than 100 citizen science observations, the individual observations were plotted directly onto the maps.

A key difference between these citizen science datasets and the five-minute bird count data is that the temporal and spatial distribution of search effort spent by citizen scientists varies unpredictably from year to year, whereas this search effort is standardised during these five-minute bird counts. Nonetheless, accurate bird observations submitted by citizen scientists have the potential to complement distribution data derived from our five-minute bird count dataset by providing information describing the presence of native forest birds at other times of the year, and at locations and in habitats not sampled by these five-minute bird counts. By collecting bird observation data all year round, local citizen scientists are also better placed to record local colonisation events prior to the colonising species being detected during these five-minute bird counts.

3. Results

3.1 Species diversity

Fifty bird species have been detected during the five-minute bird counts carried out in forested parks and reserves in Pōneke / Wellington City between 2011 and 2023. No new bird species were detected during the 2023 bird counts. A full list of the 50 bird species detected, along with their current national and regional conservation status rankings, can be found in Appendix One of this report.

Of these 50 bird species, 24 are typically found in native forest habitats, including 17 native or endemic species and seven introduced and naturalised species. The remaining 26 bird species recorded during these counts are marine, coastal or open country species such as kororā / little penguin (*Eudyptula minor*), tōrea pango / variable oystercatcher (*Haematopus unicolor*) and kāhu / swamp harrier (*Circus approximans*) and are not included in any of the individual species' analyses reported below. Among the 17 native or endemic bird species recorded during these counts, one has been assessed as 'Threatened - Nationally Vulnerable', one assessed as 'Threatened - Nationally Increasing', three assessed as 'At Risk - Nationally Declining', one assessed as 'At Risk – Nationally Relict', two assessed as 'At Risk - Nationally Recovering', and nine assessed as 'Not Threatened' under the New Zealand Threat Classification Scheme (Appendix One; Robertson *et al.* 2021).

The best model to describe the overall trends in encounter rates of native versus introduced birds in forested parks and reserves in Pōneke / Wellington City over time was the model that assumed that population trends would differ between native versus introduced species. This model had a lower AICc value compared to the next closest model considered ($\Delta\text{AICc} = 6.25$). According to this model, the mean number of native birds encountered per count increased between 2011 and 2023 (the coefficient of year on log abundance was 0.21; 95% CI 0.19 - 0.23). Fifty-five percent more native birds were encountered in 2023 than in 2011, with a mean of 7.6 (± 0.3 SE) native birds encountered per bird count in 2023 compared to 4.9 (± 0.2 SE) native birds per count in 2011. The mean number of introduced birds encountered per count also increased between 2011 and 2023 (the coefficient of year on log abundance was 0.017; 95% CI 0.012 – 0.021). Fifty-five percent more introduced birds were counted in 2023 than in 2011, with a mean of 5.9 (± 0.3 SE) introduced birds encountered per bird count in 2023 compared to 3.8 (± 0.1 SE) introduced birds per count in 2011 (Figure 3.1).

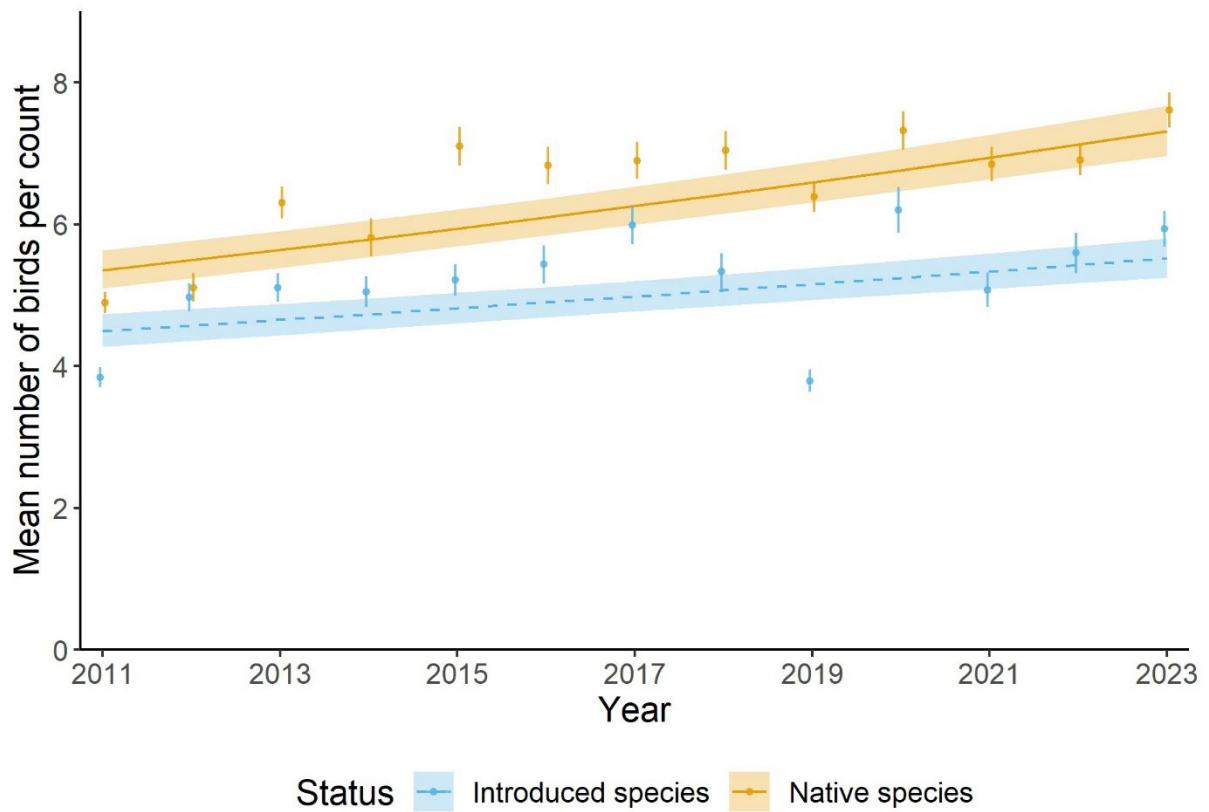


Figure 3.1: Trends in the mean number of native and introduced birds encountered per bird count in forested parks and reserves in Pōneke / Wellington City between 2011 and 2023. Individual data points (\pm standard error) represent the mean number of native and introduced bird species detected per count each year. Solid orange and dashed blue lines (\pm 95% Confidence Intervals) represent the modelled trend in the number of native and introduced bird species recorded per count each year, respectively.

3.2 Abundance and distribution of native forest bird species

Of the 17 native forest bird species recorded during these five-minute bird counts, 12 species were encountered on at least 50 occasions between 2011 and 2023. Based on the lowest AICc values of the two candidate models, nine of these 12 species showed trends over time, whereas three species showed no trend. For species where year had an effect on mean encounter rates, a coefficient estimate greater than zero indicates an increase in encounter rates over time, with greater coefficient estimates indicating faster rates of increase. Conversely, a negative coefficient estimate indicates a decrease in encounter rates over time. Based on the coefficient estimates for the eight native forest bird species that showed trends over time, seven of these species (tūī, riroriro / grey warbler, pīwakawaka / New Zealand fantail, kākā, kererū, tīeke / North Island saddleback and korimako / bellbird) showed an increase in mean encounter rates over time, and two species (tauhou / silvereye and pīpīwharau / shining cuckoo; *Chrysococcyx lucidus*) showed a decline in encounter rates (Table 3.1).

The following individual species accounts are listed in decreasing order of their current or recent abundance in forested parks and reserves in Pōneke / Wellington City. Species that are most frequently encountered during these five-minute bird counts are covered first, and the species that are only seldom encountered, or not encountered at all during these five-minute bird counts are treated last. Every species of native forest bird that has been observed in Pōneke / Wellington City outside of Zealandia since 2011 is included in this section of the report. A separate summary table of annual native forest bird encounter rates can be found in Appendix Two of this report.

Table 3.1: Summary of models of population change in 12 native forest bird species detected on at least 50 occasions in Pōneke / Wellington City parks and reserves since 2011, and trend if detected. The 'selected model' column indicates which model was selected for each species. The 'trend' column indicates whether the change in abundance was increasing, decreasing, or if no trend was detected ('-') based on estimates of slope.

Species	AICc model 1	AICc model 2	Δ AICc	Selected model	Trend	Coefficient estimate (95% CIs)
Tūi	9284.80	9095.39	189.41	Model 2 (Trend over time)	Increasing	0.054 (0.046 – 0.061)
Pīwakawaka NZ fantail	3901.36	3851.27	50.10	Model 2 (Trend over time)	Increasing	0.064 (0.046 – 0.082)
Kākā	2398.63	2318.87	79.77	Model 2 (Trend over time)	Increasing	0.121 (0.096 – 0.148)
Kererū	1975.00	1917.00	58.00	Model 2 (Trend over time)	Increasing	0.121 (0.090 – 0.156)
Tieke North Island saddleback	782.06	779.64	2.42	Model 2 (Trend over time)	Increasing	0.047 (0.003 – 0.090)
Korimako Bellbird	447.58	447.33	0.24	Model 2 (Trend over time)	Increasing?	0.133 (-0.385 – 0.555)
Riroriro Grey warbler	6955.87	6955.68	0.19	Model 2 (Trend over time)	Increasing?	0.007 (-0.002 – 0.170)
Pōpokotea Whitehead	762.20	764.03	1.83	Model 1 (No change over time)	-	-
Kōtare New Zealand kingfisher	693.34	694.96	1.62	Model 1 (No change over time)	-	-
Kākāriki Red-crowned parakeet	739.47	740.37	0.90	Model 1 (No change over time)	-	-
Tauhō Silvereye	9486.55	9482.53	9.77	Model 2 (Trend over time)	Declining	-0.011 (-0.020 – -0.002)
Pīpīwharau Shining cuckoo	2468.25	2459.51	8.74	Model 2 (Trend over time)	Declining	-0.046 (-0.073 – -0.017)

3.2.1 Tūī (*Prosthemadera novaeseelandiae*)

National conservation status: Not Threatened (Robertson *et al.* 2021).

Regional conservation status: Not Threatened (Crisp, 2020).

The tūī is the native forest bird species that is most frequently encountered during these five-minute bird counts. Tūī encounter rates have increased by 93% since 2011, from a mean of 1.35 (± 0.09 SE) tūī recorded per five-minute bird count in 2011 to a mean of 2.61 (± 0.12 SE) tūī per count in 2023 (the coefficient of year on log abundance was 0.054; 95% CI 0.046 – 0.061). Much of this increase appears to have occurred between 2011 and 2015, whereas tūī encounter rates from 2015 onwards have been much more stable (Figure 3.2).



Image courtesy of Tony Whitehead/NZ Birds

The tūī is the native forest bird species most commonly reported by citizen scientists in Pōneke / Wellington City. Between 2011 and 2024, citizen scientists reported a total of 28,230 encounters with tūī, demonstrating that this species is now commonly encountered in native forest, suburban and urban habitats throughout the city (Figure 3.3).

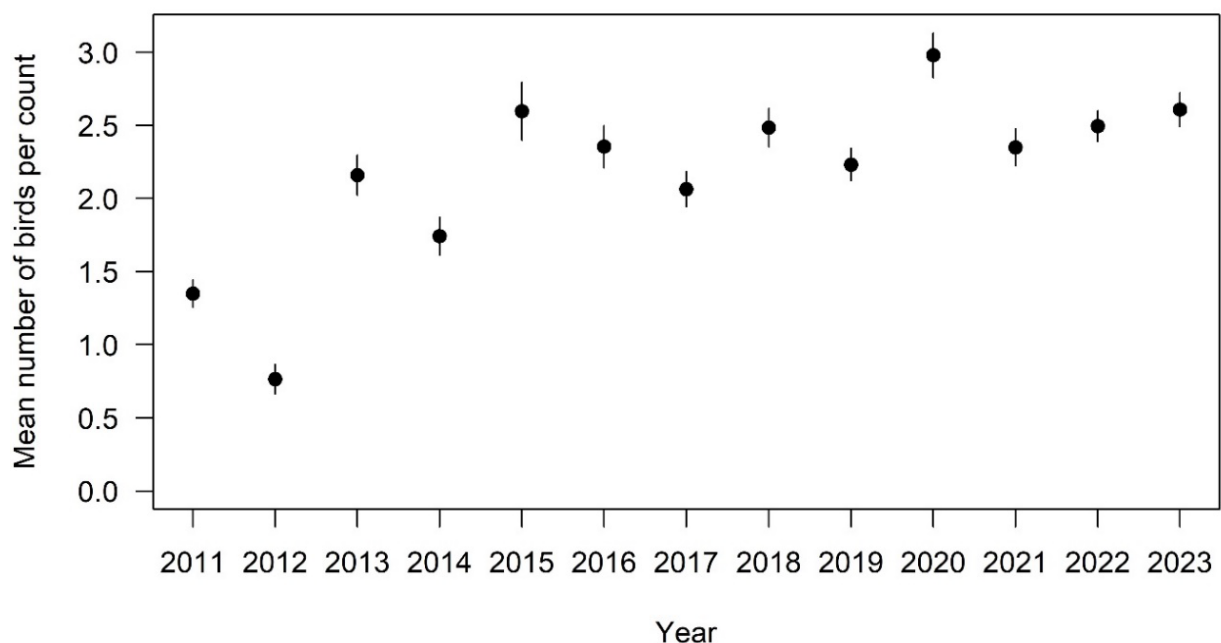


Figure 3.2: Mean (\pm SE) number of tūī recorded per five-minute bird count station in Pōneke / Wellington City between 2011 and 2023.

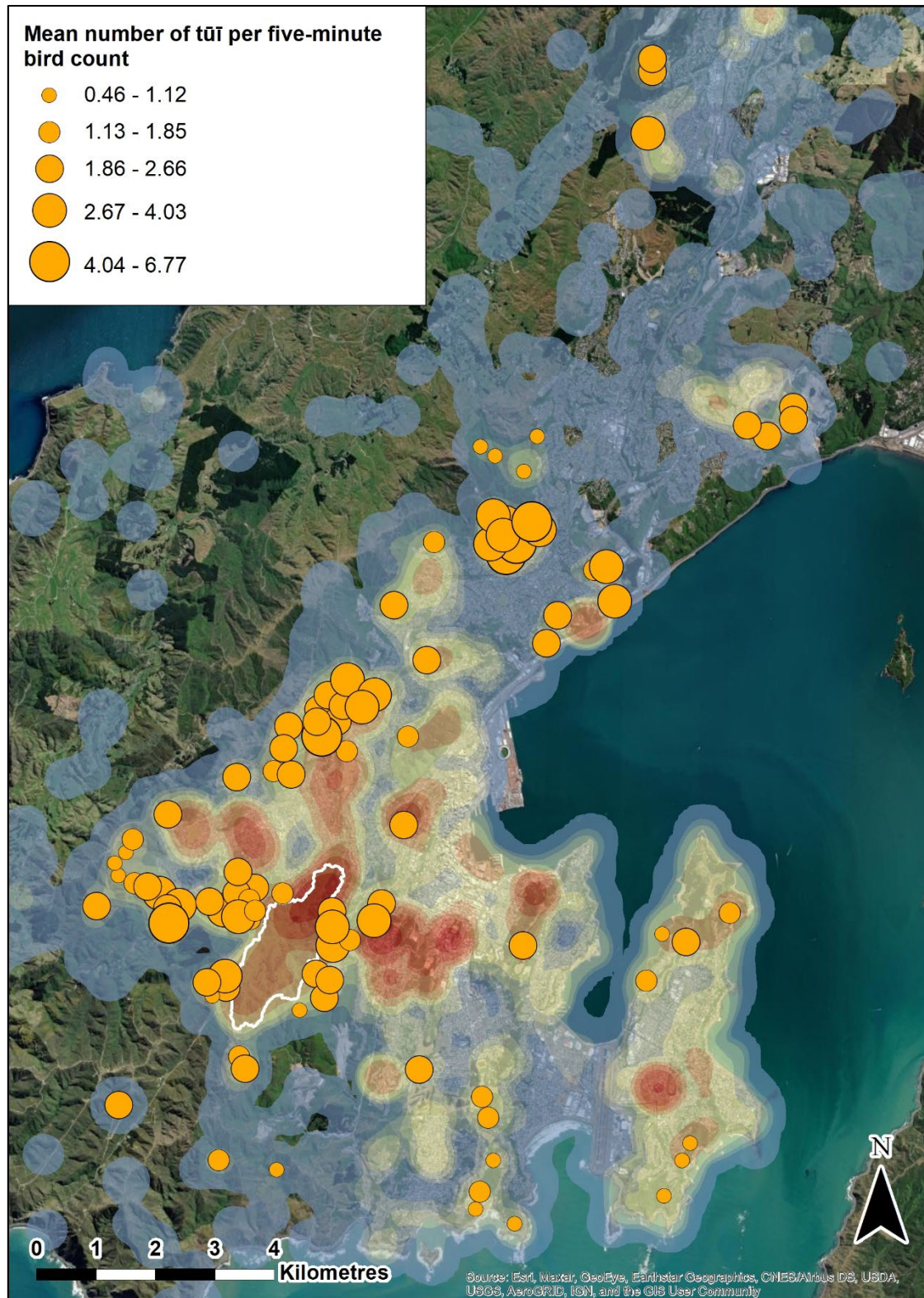


Figure 3.3: Distribution of tūi in Pōneke / Wellington City between 2011 and 2024. The orange circles represent tūi detections at five-minute bird count stations, with the size of the circle corresponding to the mean number of tūi detected per station each year between 2011 and 2023 (see map legend). The shading on the map represents the local density of tūi observations reported by citizen scientists via the New Zealand eBird database (n=25,864) and the iNaturalist database (n=2,366) between 2011 and 2024, with areas of warmer shading representing higher local densities of tūi observations.

3.2.2 Tauhou / Silvereve (Zosterops lateralis)

National conservation status: Not Threatened (Robertson *et al.* 2021).

Regional conservation status: Not Threatened (Crisp, 2020).

The tauhou / silvereve is the second most frequently encountered native forest bird species in these five-minute bird counts. Tauhou / silvereves have experienced a shallow decline in encounter rates since 2011 (the coefficient of year on log abundance was -0.011; 95% CI -0.020 – -0.002; Figure 3.4) Despite this, the mean encounter rate of 2.26 (\pm 0.11 SE) tauhou / silvereves recorded per count in 2023 was 22% higher than the mean of 1.86 (\pm 0.16 SE) tauhou / silvereves recorded per count in 2011. This apparent discrepancy highlights the weakness of this long-term trend, and may indicate that annual tauhou/silvereve encounter rates are in the process of stabilising.



Image courtesy of Ormond Torr/NZ Birds Online

The tauhou / silvereve is the fourth most frequently reported native forest bird species by citizen scientists in Pōneke / Wellington City. Between 2011 and 2024, citizen scientists reported a total of 13,633 encounters with tauhou / silvereves, demonstrating that this species is commonly encountered in native forest, suburban and urban habitats throughout the city (Figure 3.5).

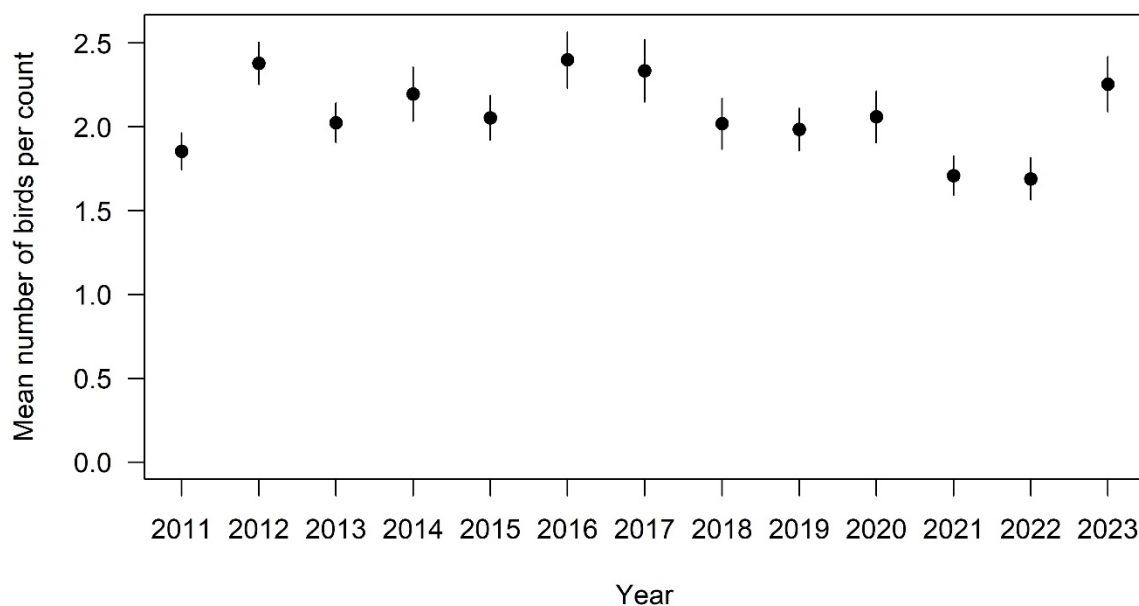


Figure 3.4: Mean (\pm SE) number of tauhou / silvereves recorded per five-minute bird count station in Pōneke / Wellington City between 2011 and 2023.

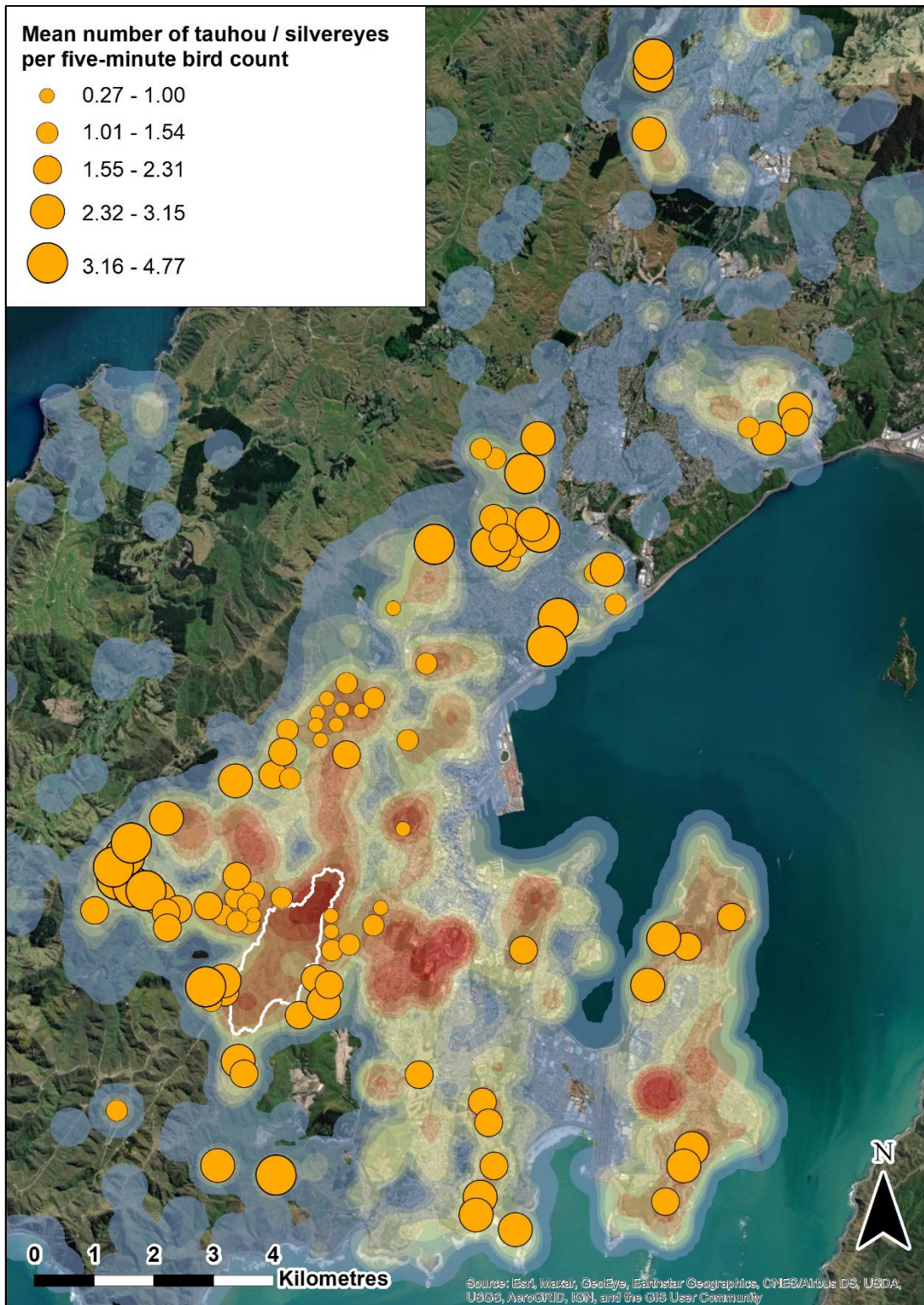


Figure 3.5: Distribution of tauhou / silvereeyes in Pōneke / Wellington City between 2011 and 2024. The orange circles represent tauhou / silvereeye detections at five-minute bird count stations, with the size of the circle corresponding to the mean number of tauhou / silvereeyes detected per station each year between 2011 and 2023 (see map legend). The shading on the map represents the local density of tauhou / silvereeye observations reported by citizen scientists via the New Zealand eBird database (n=13,130) and the iNaturalist database (n=503) between 2011 and 2024, with areas of warmer shading representing higher local densities of tauhou / silvereeye observations.

3.2.3 Riroriro / Grey warbler (*Gerygone igata*)



Image courtesy of Bartek Wypych/NZ Birds Online

National conservation status: Not Threatened (Robertson *et al.* 2021).

Regional conservation status: Not Threatened (Crisp, 2020).

The riroriro / grey warbler is the third most frequently encountered native forest bird species in these five-minute bird counts. Riroriro / grey warbler encounter rates have increased by 51% since 2011, from a mean of 0.84 (± 0.06 SE) riroriro / grey warblers recorded per five-minute bird count in 2011 to a mean of 1.27 (± 0.07 SE) riroriro / grey warblers per count in 2023 (the coefficient of year on log abundance was 0.007; 95% CI -0.002 – 0.017; Figure 3.6). Riroriro / grey warbler encounter rates have fluctuated moderately from year-to-year however, and the confidence limits

around the coefficient estimate include a lower CI less than zero, so the certainty around this increasing trend in encounter rates is currently low.

The riroriro / grey warbler is the fifth most frequently reported native forest bird species by citizen scientists in Pōneke / Wellington City. Between 2011 and 2024, citizen scientists reported a total of 12,444 encounters with riroriro / grey warblers, demonstrating that this species is commonly encountered in native forest and suburban habitats, but is less frequently reported from more heavily urbanised habitats throughout the city (Figure 3.7).

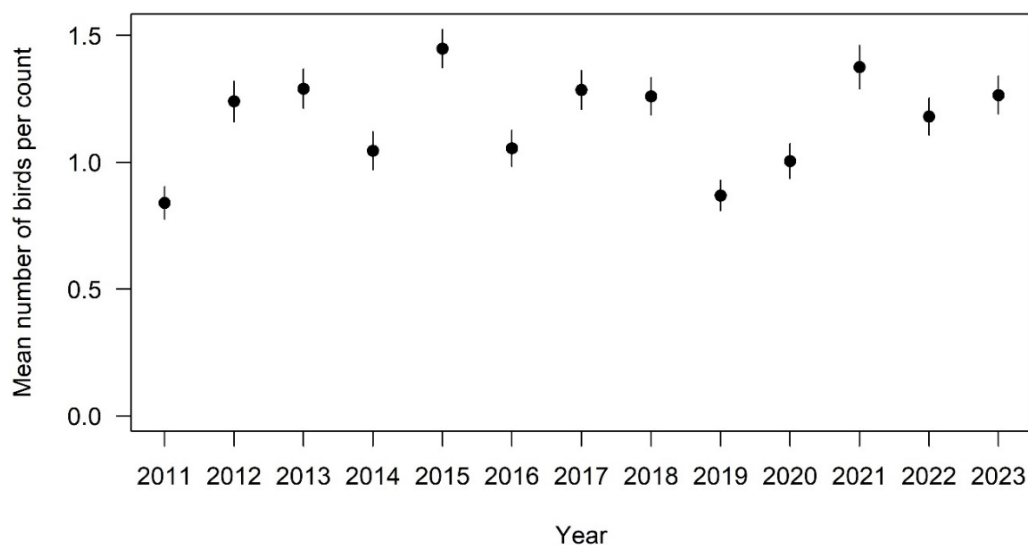


Figure 3.6: Mean (\pm SE) number of riroriro / grey warblers recorded per five-minute bird count station in Pōneke / Wellington City between 2011 and 2023.

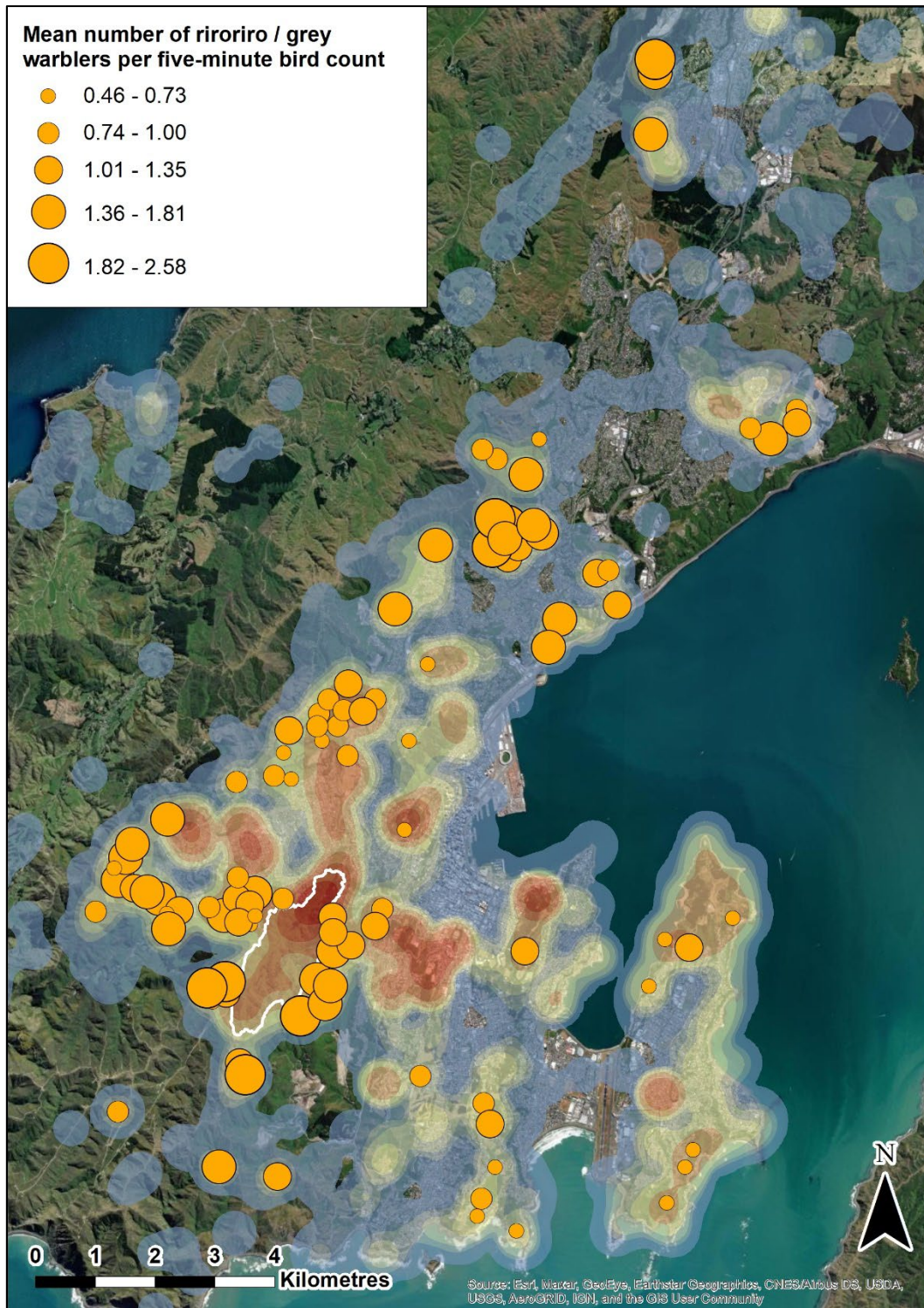


Figure 3.7: Distribution of riroriro / grey warblers in Pōneke / Wellington City between 2011 and 2024. The orange circles represent riroriro / grey warbler detections at five-minute bird count stations, with the size of the circle corresponding to the mean number of riroriro / grey warblers detected per station each year between 2011 and 2023 (see map legend). The shading on the map represents the local density of riroriro / grey warbler observations reported by citizen scientists via the New Zealand eBird database (n=12,158) and the iNaturalist database (n=286) between 2011 and 2024, with areas of warmer shading representing higher local densities of riroriro / grey warbler observations.

3.2.4 Pīwakawaka / New Zealand fantail (*Rhipidura fuliginosa*)



Image courtesy of Cheryl Marriner/NZ Birds Online

National conservation status: Not Threatened (Robertson *et al.* 2021).

Regional conservation status: Not Threatened (Crisp, 2020).

The pīwakawaka / New Zealand fantail is the fourth most frequently encountered native forest bird species in these five-minute bird counts. Pīwakawaka / New Zealand fantail encounter rates have increased by 37% since 2011, from a mean of 0.35 (\pm 0.04 SE) pīwakawaka / New Zealand fantails recorded per five-minute bird count in 2011 to a mean of 0.48 (\pm 0.05 SE) pīwakawaka / New Zealand fantails per count in 2023 (the coefficient of year on log abundance was 0.064; 95% CI 0.046 – 0.082; Figure 3.2.7). Moreover, pīwakawaka /

New Zealand fantails have increased by 129% over the past nine years, from a low of 0.21 birds per count in 2015, to 0.48 birds per count in 2023 (Figure 3.8).

The pīwakawaka / New Zealand fantail is the sixth most frequently reported native forest bird species by citizen scientists in Pōneke / Wellington City. Between 2011 and 2024, citizen scientists reported a total of 11,168 encounters with pīwakawaka / New Zealand fantails, demonstrating that this species is commonly encountered in native forest, suburban and urban habitats throughout the city (Figure 3.9).

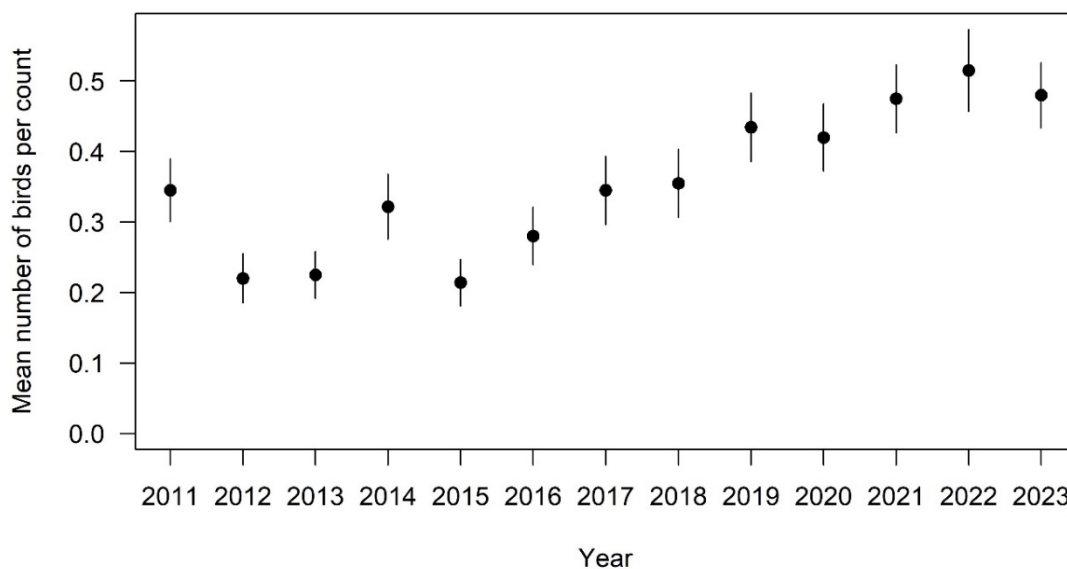


Figure 3.8: Mean (\pm SE) number of pīwakawaka / New Zealand fantails recorded per five-minute bird count station in Pōneke / Wellington City between 2011 and 2023.

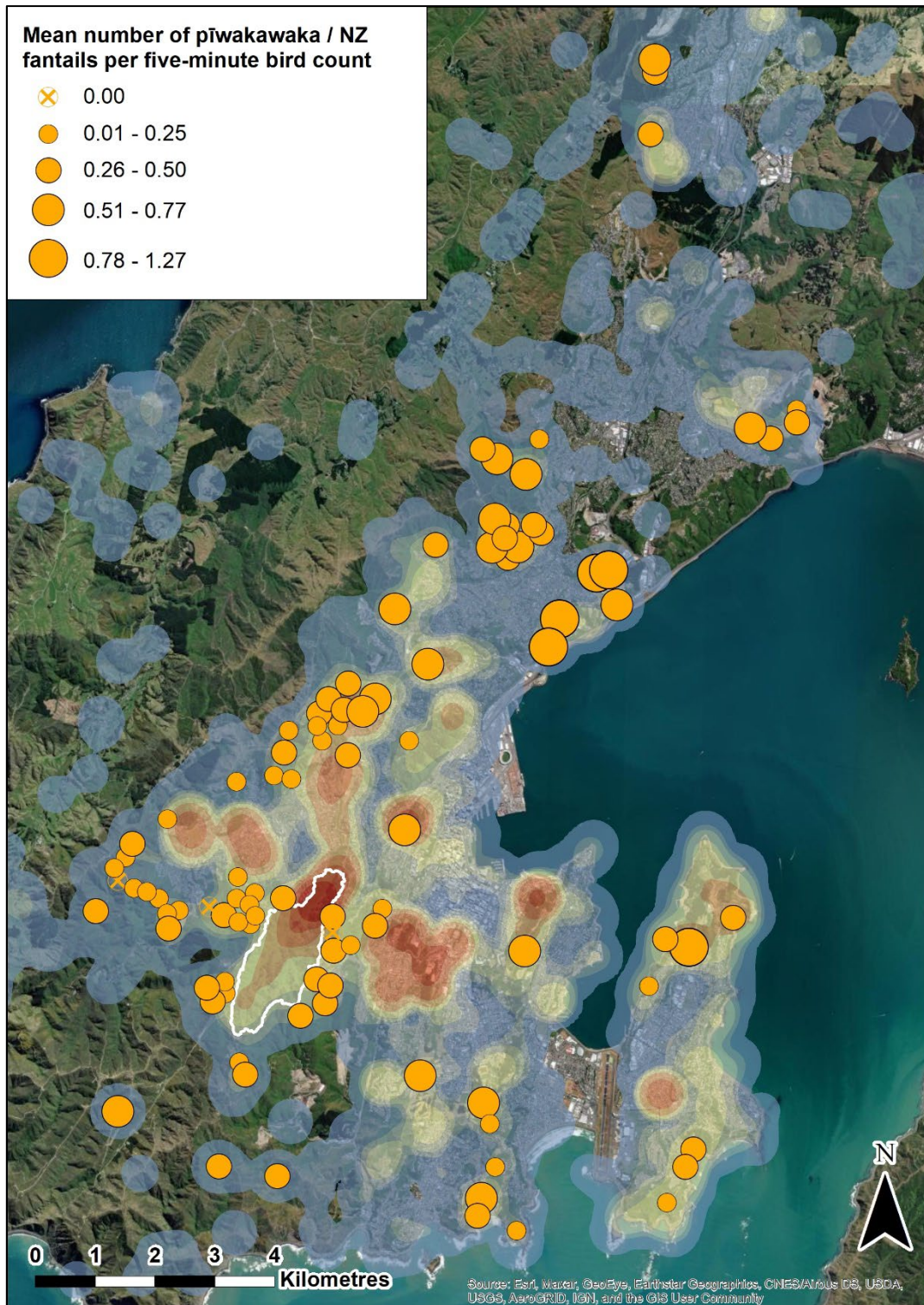


Figure 3.9: Distribution of pīwakawaka / New Zealand fantails in Pōneke / Wellington City between 2011 and 2024. The orange circles represent pīwakawaka / New Zealand fantail detections at five-minute bird count stations, with the size of the circle corresponding to the mean number of pīwakawaka / New Zealand fantails detected per station each year between 2011 and 2023 (see map legend). The shading on the map represents the local density of pīwakawaka / New Zealand fantail observations reported by citizen scientists via the New Zealand eBird database (n=10,371) and the iNaturalist database (n=797) between 2011 and 2024, with areas of warmer shading representing higher local densities of pīwakawaka / New Zealand fantail observations.

3.2.5 Pīpīwharau / Shining cuckoo (*Chrysococcyx lucidus*)



Image courtesy of Rob Lynch/NZ Birds Online

National conservation status: Not Threatened (Robertson *et al.* 2021).

Regional conservation status: Not Threatened (Crisp, 2020).

The pīpīwharau / shining cuckoo is the fifth most frequently encountered native forest bird species in these five-minute bird counts. Pīpīwharau / shining cuckoo encounter rates have declined in Pōneke / Wellington City between 2011 and 2023, with an annual mean of 0.21 (\pm 0.03 SE) pīpīwharau / shining cuckoos recorded per five-minute bird count between 2011 and 2018 compared to an annual mean of 0.12 (\pm 0.03 SE) pīpīwharau / shining cuckoos recorded per count between 2019 and 2023 (the coefficient of

year on log abundance was -0.055; 95% CI -0.090 - -0.024; Figure 3.10). A sudden and abrupt decline in pīpīwharau / shining cuckoo counts was observed between 2018 and 2019, followed by a slow recovery since 2019 (Figure 3.10).

Pīpīwharau / shining cuckoos are sparsely distributed throughout Pōneke / Wellington City, though 'hotspots' in encounter rates appear to occur in forested reserves adjacent to Zealandia Te Māra a Tāne, and in Khandallah Park (Figure 3.11). The pīpīwharau / shining cuckoo is the fifteenth-most frequently reported native forest bird species by citizen scientists in Pōneke / Wellington City. Between 2011 and 2024, citizen scientists reported a total of 1,476 encounters with pīpīwharau / shining cuckoos, demonstrating that these birds are regularly encountered in native forest and less frequently encountered in suburban habitats throughout the city during the spring and summer months each year (Figure 3.11).

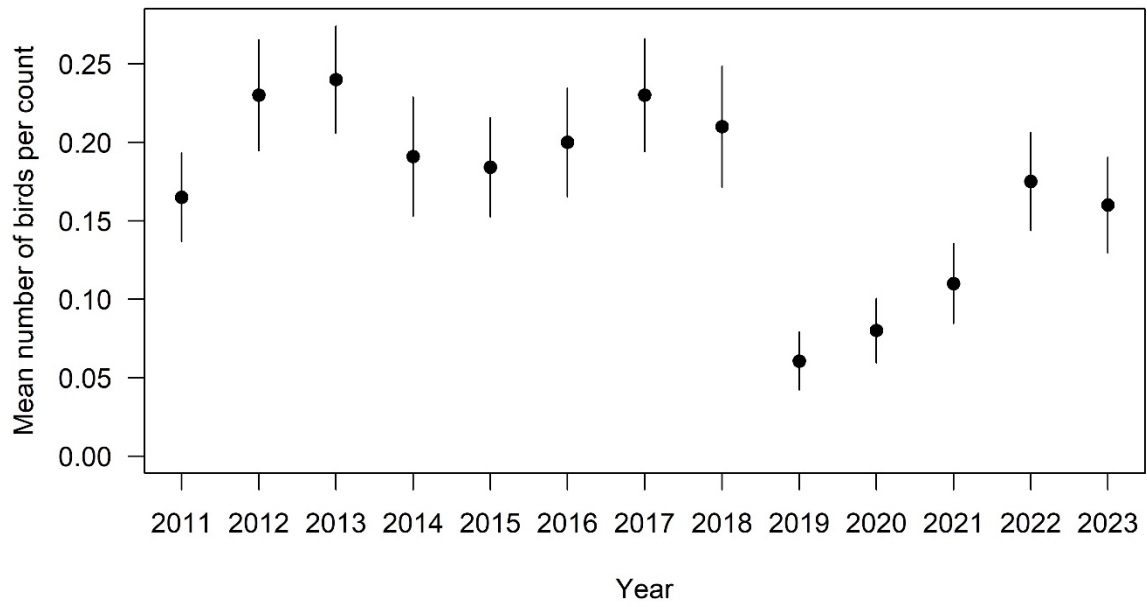


Figure 3.10: Mean (\pm SE) number of pīpīwhararua / shining cuckoos recorded per five-minute bird count station in Pōneke / Wellington City between 2011 and 2023.

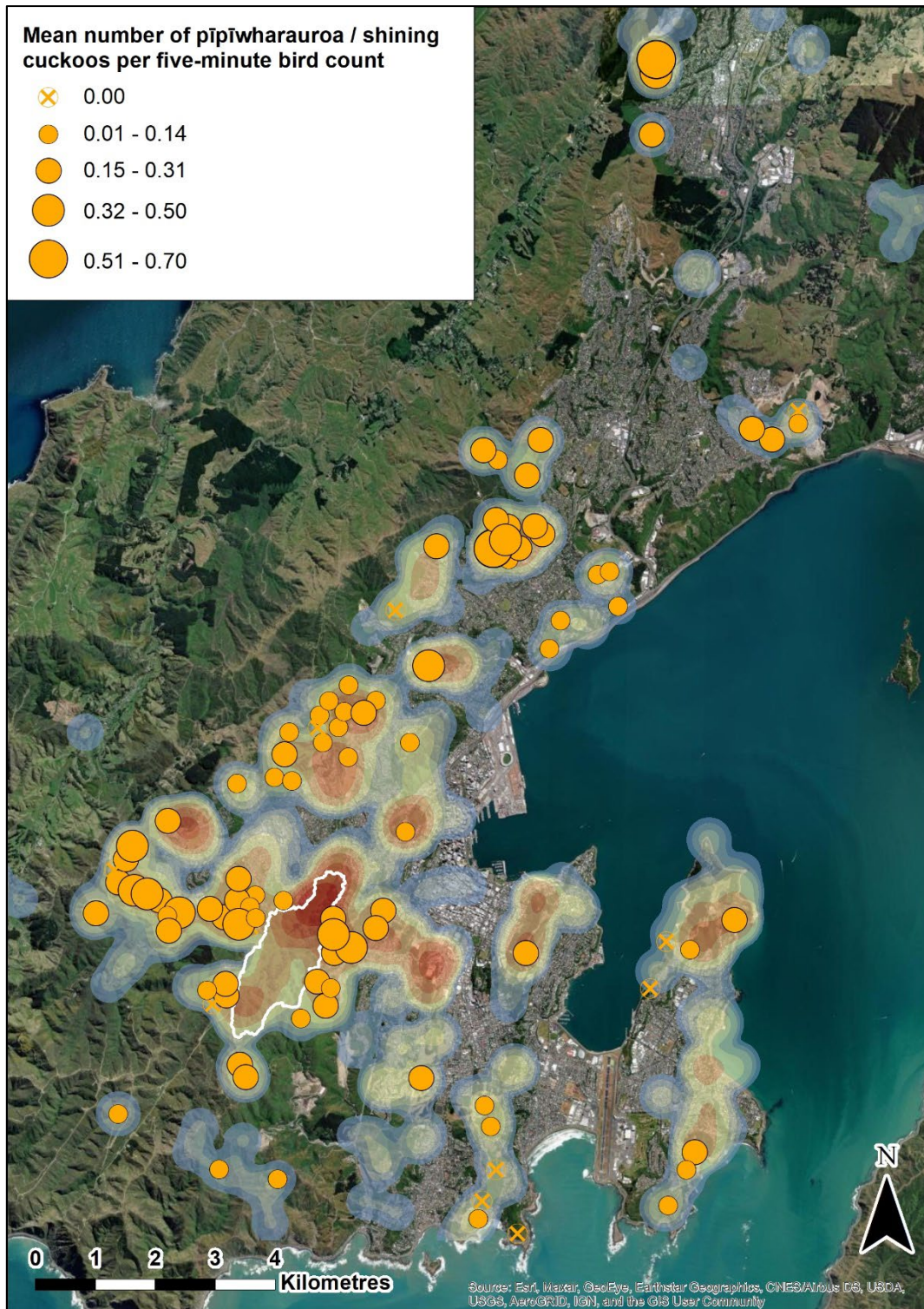


Figure 3.11: Distribution of pīpīwharau / shining cuckoos in Pōneke / Wellington City between 2011 and 2024. The orange circles represent pīpīwharau / shining cuckoo detections at five-minute bird count stations, with the size of the circle corresponding to the mean number of pīpīwharau / shining cuckoos detected per station each year between 2011 and 2023 (see map legend). The shading on the map represents the local density of pīpīwharau / shining cuckoo observations reported by citizen scientists via the New Zealand eBird database (n=1,386) and the iNaturalist database (n=90) between 2011 and 2024, with areas of warmer shading representing higher local densities of pīpīwharau / shining cuckoo observations.

3.2.6 Kākā (*Nestor meridionalis*)

National conservation status:

At Risk, Recovering (Robertson *et al.* 2021).

Regional conservation status:

At Risk, Recovering (Crisp, 2020).

The kākā was reintroduced to Zealandia Te Māra a Tāne between 2002 and 2007 (Miskelly, 2018) and is now the sixth most frequently encountered native forest bird species in these five-minute bird counts. Kākā encounter rates have increased by 170% since 2011, from a mean of 0.10 (\pm 0.02 SE) kākā recorded per five-minute bird count in 2011 to a mean of 0.27 (\pm 0.05 SE) kākā per count in 2023 (the coefficient of year on log abundance was 0.121; 95% CI 0.096 – 0.148; Figure 3.12).



Image courtesy of Jean-Claude Stahl/NZ Birds Online

The kākā is now the second most frequently reported native forest bird species by citizen scientists in Pōneke / Wellington City. Between 2011 and 2024, citizen scientists reported a total of 15,794 encounters with kākā, demonstrating that this species is now commonly encountered in native forest and suburban habitats in the central and southern suburbs of Khandallah, Ngaio, Wadestown, Karori, Kelburn, Te Aro, Mt Cook, Brooklyn, Newtown and Island Bay. Kākā are also being infrequently reported from more northern and eastern suburbs, including Johnsonville, Tawa, and on Te Motu Kairangi / Miramar Peninsula (Figure 3.13).

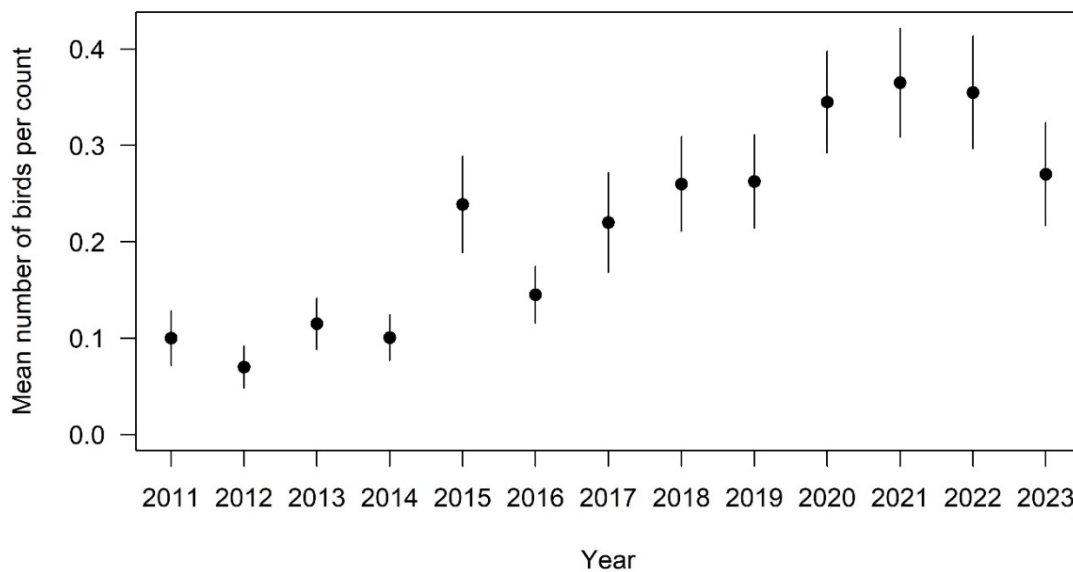


Figure 3.12: Mean (\pm SE) number of kākā recorded per five-minute bird count station in Pōneke / Wellington City between 2011 and 2023.

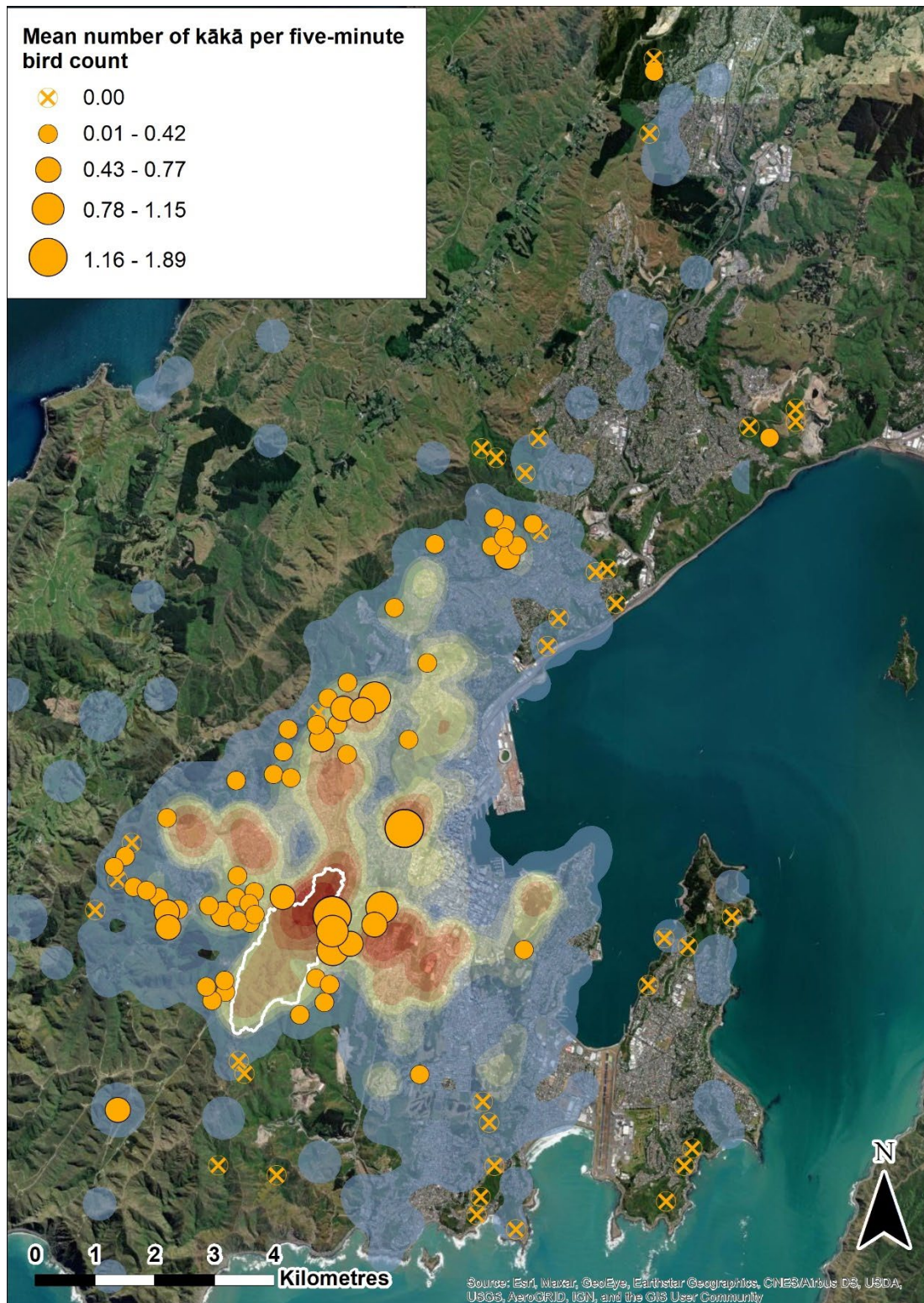


Figure 3.13: Distribution of kākā in Pōneke / Wellington City between 2011 and 2024. The orange circles represent kākā detections at five-minute bird count stations, with the size of the circle corresponding to the mean number of kākā detected per station each year between 2011 and 2023 (see map legend). The shading on the map represents the local density of kākā observations reported by citizen scientists via the New Zealand eBird database (n=13,605) and the iNaturalist database (n=2,189) between 2011 and 2024, with areas of warmer shading representing higher local densities of kākā observations.

3.2.7 Kererū (*Hemiphaga novaeseelandiae*)

National conservation status: Not Threatened
(Robertson *et al.* 2021).

Regional conservation status: At Risk, Recovering
(Crisp, 2020).

The kererū is the seventh most frequently encountered native forest bird species in these five-minute bird counts. Kererū encounter rates have increased by 243% since 2011, from a mean of 0.07 (\pm 0.02 SE) kererū recorded per five-minute bird count in 2011 to a mean of 0.24 (\pm 0.04 SE) kererū per count in 2023 (the coefficient of year on log abundance was 0.121; 95% CI 0.096 – 0.148; Figure 3.14). Significant ‘hotspots’ in kererū encounter rates occur in Ōtari-Wilton’s Bush and in Khandallah Park, two reserves that contain some of the largest remaining areas of old-growth native forest in Pōneke / Wellington City (Figure 3.15).

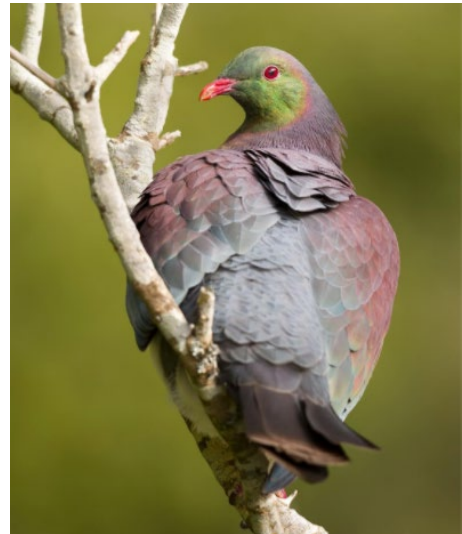


Image courtesy of Arindam Bhattacharya/
NZ Birds Online

The kererū is the third most frequently reported native forest bird species by citizen scientists in Pōneke / Wellington City. Between 2011 and 2024, citizen scientists reported a total of 14,227 encounters with kererū, demonstrating that kererū are commonly-encountered in native forest and suburban habitats throughout the western and central suburbs of the city and on northern Miramar Peninsula, but are less frequently reported from northern, southern and eastern suburbs (Figure 3.15).

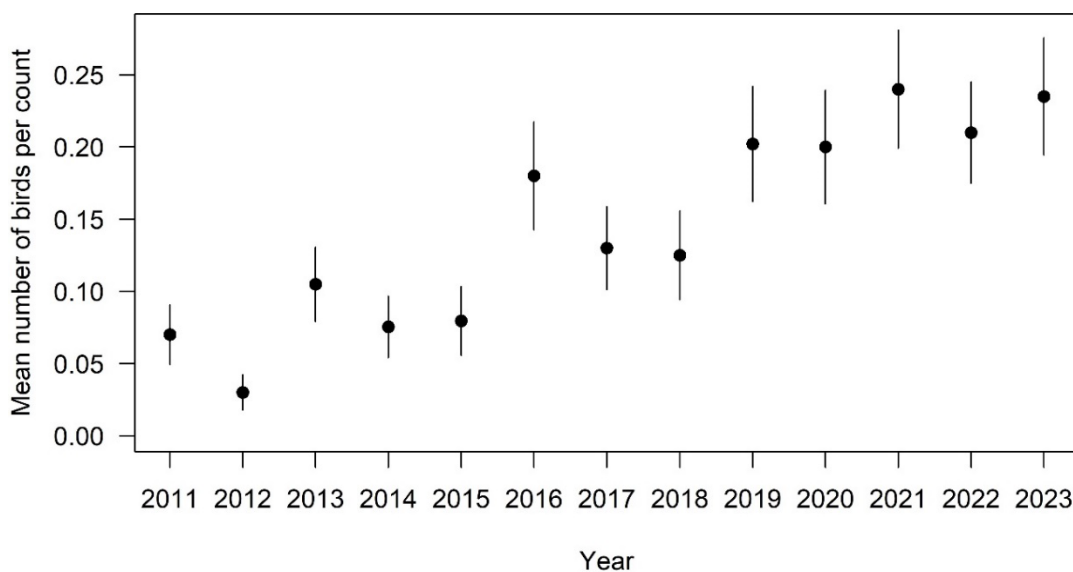


Figure 3.14: Mean (\pm SE) number of kererū recorded per five-minute bird count station in Pōneke / Wellington City between 2011 and 2023.

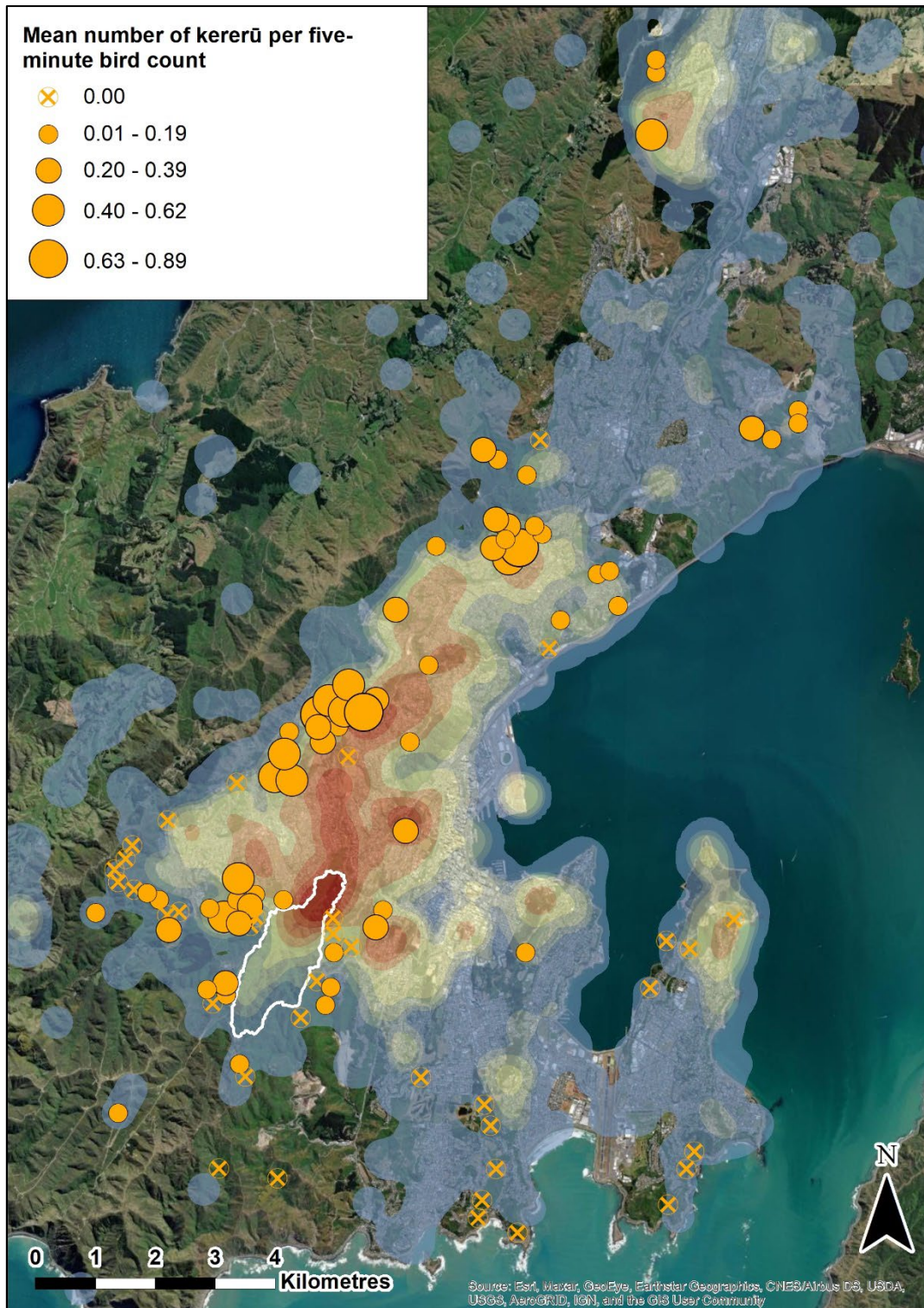


Figure 3.15: Distribution of kererū in Pōneke / Wellington City between 2011 and 2024. The orange circles represent kererū detections at five-minute bird count stations, with the size of the circle corresponding to the mean number of kererū detected per station each year between 2011 and 2023 (see map legend). The shading on the map represents the local density of kererū observations reported by citizen scientists via the New Zealand eBird database (n=5,569) and the iNaturalist database (n=8,084) and the Great Kereru Count (n=574) between 2011 and 2024, with areas of warmer shading representing higher local densities of kererū observations.

3.2.8 Tīeke / North Island saddleback (*Philesturnus rufusater*)

National conservation status:

At Risk, Recovering (Robertson *et al.* 2021).

Regional conservation status:

Regionally Vulnerable (Crisp, 2020).

The tīeke / North Island saddleback was reintroduced to Zealandia Te Māra a Tāne between 2002 and 2003 (Miskelly, 2018) and is now the eighth most frequently encountered native forest bird species in these five-minute bird counts. Tīeke / North Island saddleback encounter rates have increased since 2011, from a low of 0.015 (\pm 0.009 SE) tīeke / North Island saddlebacks recorded per five-minute bird count in 2012 to a mean of 0.075 (\pm 0.022



Image courtesy of Rob Lynch/NZ Birds Online

SE) tīeke / North Island saddlebacks per count in 2023 (the coefficient of year on log abundance was 0.047; 95% CI 0.003 - 0.090; Figure 3.16). Tīeke / North Island saddlebacks are largely restricted to Zealandia Te Māra a Tāne and to forested reserves less than 1-2 km from Zealandia Te Māra a Tāne's pest-proof boundary fence (Figure 3.17), so this increase in encounter rates may be an indication that the intensification of mammalian predator control efforts in Waimapihi Reserve in recent years is benefitting this species.

The tīeke / North Island saddleback is the eighth most frequently reported native forest bird species by citizen scientists in Pōneke / Wellington City. Between 2011 and 2024, citizen scientists reported a total of 4,671 encounters with tīeke / North Island saddlebacks, and the majority of these sightings were reported either from inside Zealandia Te Māra a Tāne or in native forest habitats within 1 km of Zealandia Te Māra a Tāne's boundary fence (Figure 3.17). This localised distribution of tīeke / North Island saddleback observations strongly suggests that one or more environmental factors are severely limiting the ability of this species to colonise forest habitats beyond Zealandia Te Māra a Tāne's predator-proof fence.

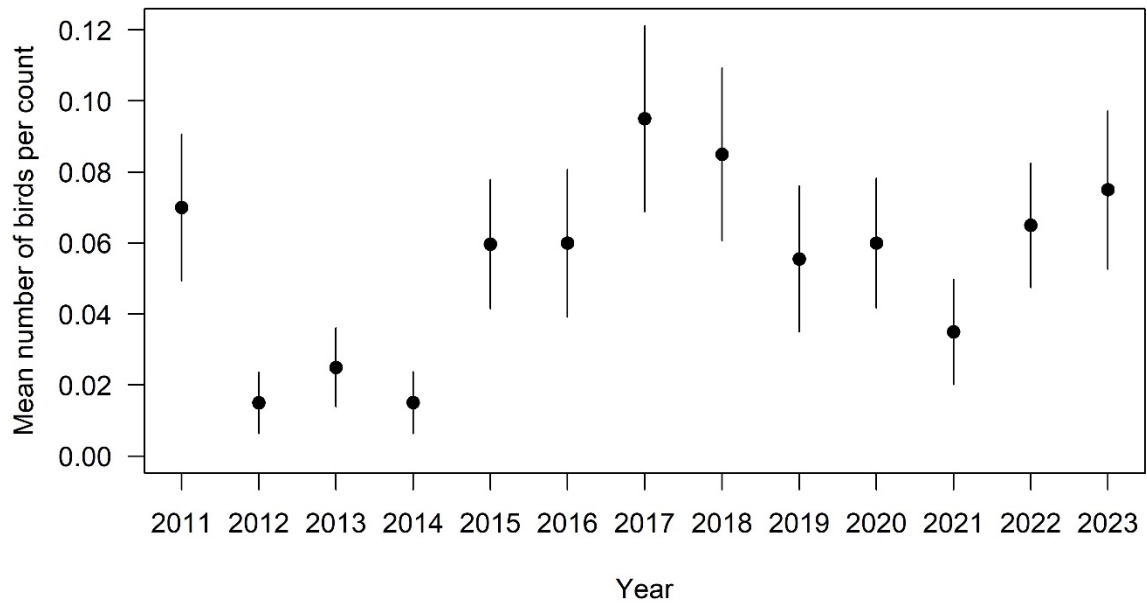


Figure 3.16: Mean (\pm SE) number of tīeke / North Island saddlebacks recorded per five-minute bird count station in Pōneke / Wellington City between 2011 and 2023.

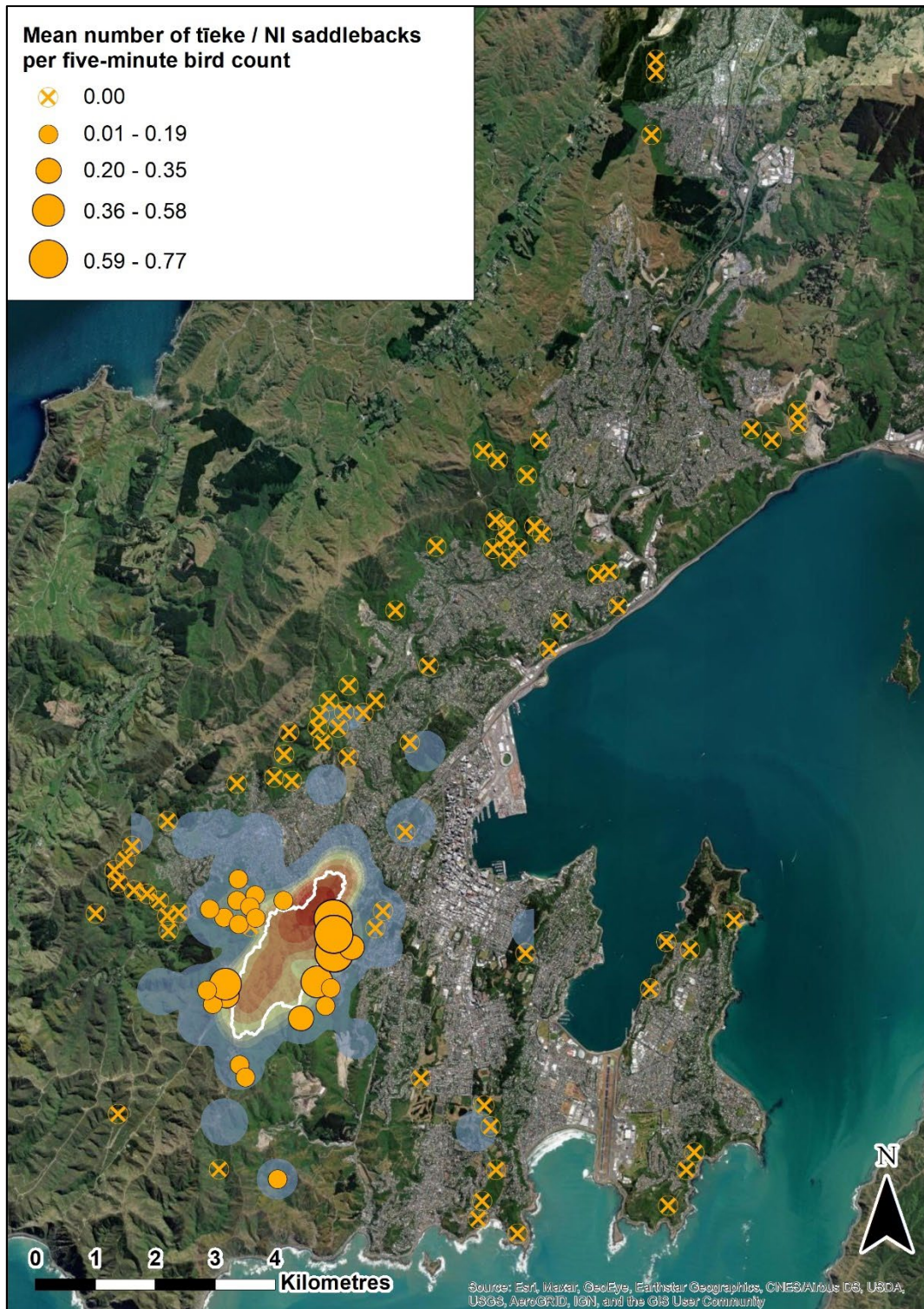


Figure 3.17: Distribution of tīeke / North Island saddlebacks in Pōneke / Wellington City between 2011 and 2024. The orange circles represent tīeke / North Island saddleback detections at five-minute bird count stations, with the size of the circle corresponding to the mean number of tīeke / North Island saddlebacks detected per station each year between 2011 and 2023 (see map legend). The shading on the map represents the local density of tīeke / North Island saddleback observations reported by citizen scientists via the New Zealand eBird database (n=4,671) between 2011 and 2024, with areas of warmer shading representing higher local densities of tīeke / North Island saddleback observations.

3.2.9 Pōpokotea / Whitehead (*Mohoua albicilla*)



Image courtesy of Tony Whitehead/NZ Birds Online

National conservation status: Not Threatened (Robertson *et al.* 2021).

Regional conservation status: Not Threatened (Crisp, 2020).

The pōpokotea / whitehead was reintroduced to Zealandia Te Māra a Tāne between 2001 and 2002 (Miskelly, 2018) and is now the ninth most frequently encountered native forest bird species in these five-minute bird counts. Despite some minor year-to-year fluctuations, pōpokotea / whitehead encounter rates have not changed significantly between 2011 and 2023.

Pōpokotea / whitehead encounter rates have varied between a high of 0.11 (± 0.03 SE) pōpokotea / whiteheads per count in 2019 and a low of 0.04 (± 0.02 SE) per count in 2013 (Figure 3.18).

The pōpokotea / whitehead is the ninth most frequently reported native forest bird species by citizen scientists in Pōneke / Wellington City. Between 2011 and 2024, citizen scientists reported a total of 3,915 encounters with pōpokotea / whiteheads. These records show that pōpokotea / whiteheads are largely restricted to Zealandia Te Māra a Tāne and to forest reserves within 1-2 km of Zealandia Te Māra a Tāne's boundary fence, however they are occasionally recorded further afield, including in Trelissick Park, Ōtari-Wilton's Bush, Tinakori Hill, Wellington Botanical Gardens, Mākara Peak and Prince of Wales Park (Figure 3.19). This localised distribution of pōpokotea / whitehead observations strongly suggests that one or more environmental factors are severely limiting the ability of this species to colonise forest habitats beyond Zealandia Te Māra a Tāne's predator-proof fence.

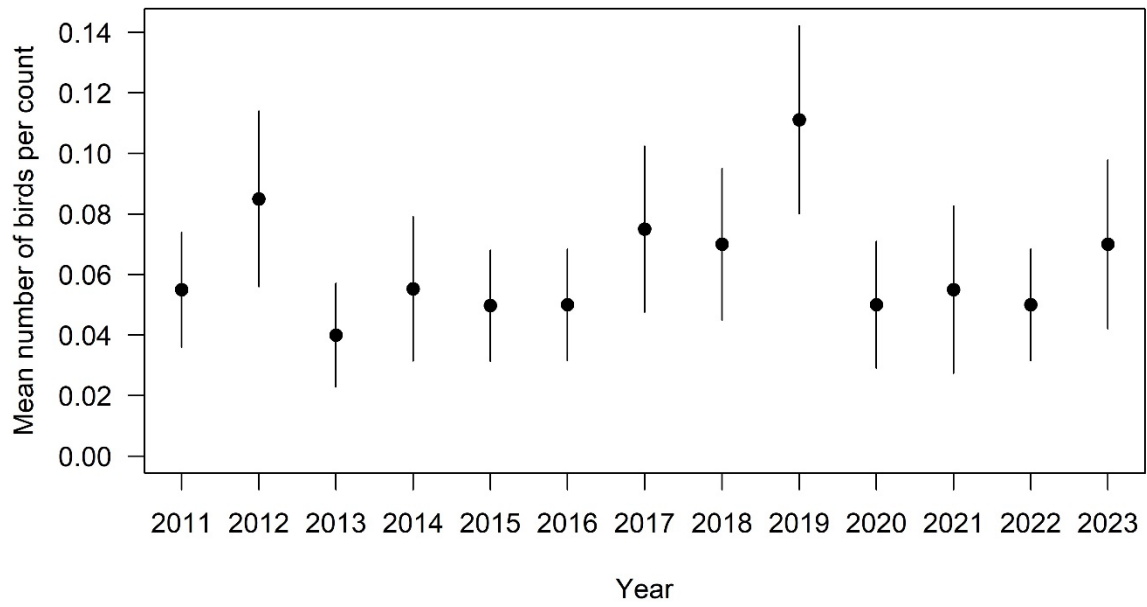


Figure 3.18: Mean (\pm SE) number of pōpokotea / whiteheads recorded per five-minute bird count station in Pōneke / Wellington City between 2011 and 2023.

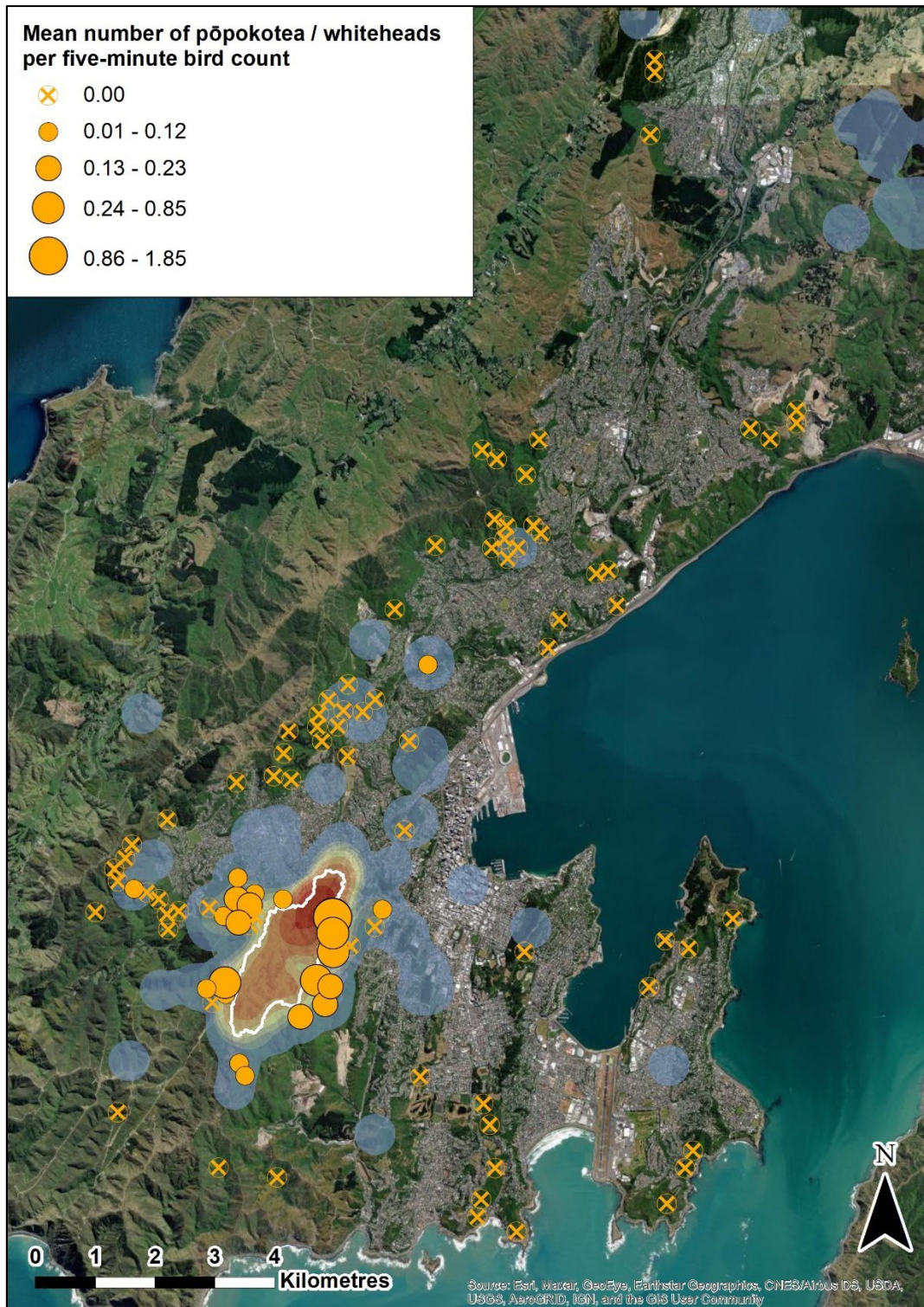


Figure 3.19: Distribution of pōpokotea / whiteheads in Pōneke / Wellington City between 2011 and 2024. The orange circles represent pōpokotea / whitehead detections at five-minute bird count stations, with the size of the circle corresponding to the mean number of pōpokotea / whiteheads detected per station each year between 2011 and 2023 (see map legend). The shading on the map represents the local density of pōpokotea / whitehead observations reported by citizen scientists via the New Zealand eBird database (n=3,693) and the iNaturalist database (n=222) between 2011 and 2024, with areas of warmer shading representing higher local densities of pōpokotea / whitehead observations.

3.2.10 Kākāriki / Red-crowned parakeet (*Cyanoramphus novaezelandiae*)



Image courtesy of Laurie Ross/NZ Birds Online

National conservation status: At Risk, Relict (Robertson *et al.* 2021).

Regional conservation status: At Risk, Recovering (Crisp, 2020).

The kākāriki / red-crowned parakeet was reintroduced to Zealandia Te Māra a Tāne between 2010 and 2011, although it is likely that this species had begun re-colonising Wellington City as early as 1999, following the eradication of rats from Kāpiti Island in 1996 and the introduction of kākāriki / red-crowned parakeets to Matiu/Somes Island in 2003 (Miskelly *et al.* 2005). Kākāriki / red-crowned parakeets are now the tenth most frequently encountered native forest bird species in these five-minute bird counts. Kākāriki / red-crowned parakeet encounter rates have not changed significantly between

2011 and 2023, but have varied between a low of 0.01 birds counted per five-minute bird count in 2011, 2012 and 2013 and a high of 0.09 birds per count in 2015 and 2018 (Figure 3.20). Beyond Zealandia Te Māra a Tāne, kākāriki / red-crowned parakeets now appear to be either established or regular visitors to several forested reserves in the city, including in Wright’s Hill Reserve, Waimapihi Reserve, Ōtari-Wilton’s Bush, Khandallah Park, Huntleigh Park and the Wellington Botanic Gardens (Figure 3.21).

Kākāriki / red-crowned parakeets are the thirteenth most frequently reported native forest bird species by citizen scientists in Pōneke / Wellington City. Between 2011 and 2024, citizen scientists reported a total of 2,333 encounters with kākāriki / red-crowned parakeets demonstrating that this species is infrequently encountered in both native forest and suburban habitats in central and western suburbs and is now occasionally encountered in forest habitats on Te Motu Kairangi / Miramar Peninsula (Figure 3.21).

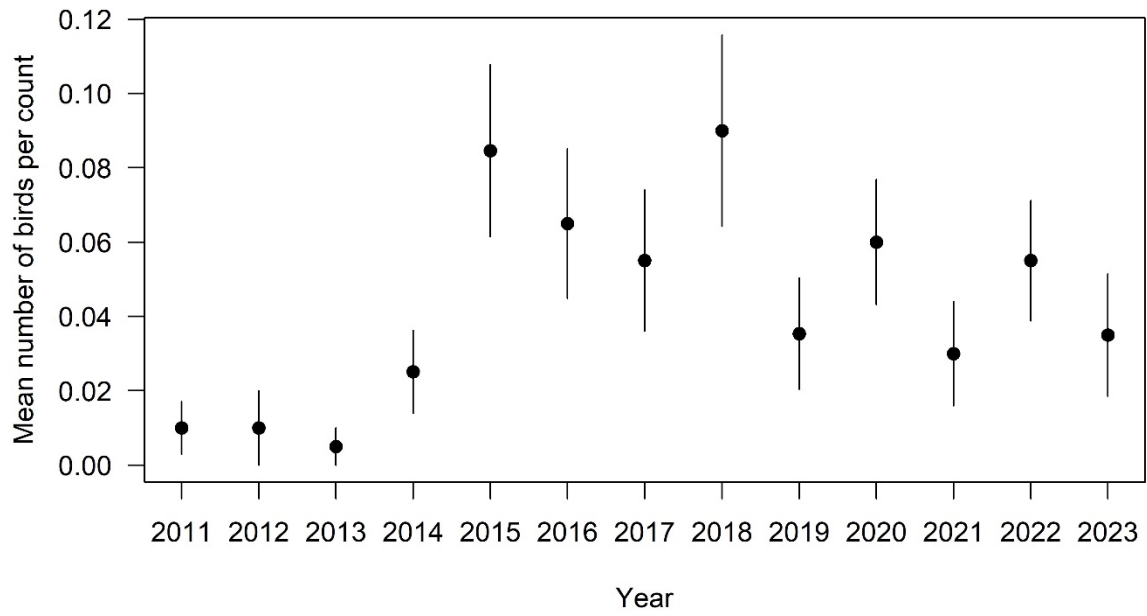


Figure 3.20: Mean (\pm SE) number of kākārīki / red-crowned parakeets recorded per five-minute bird count station in Pōneke / Wellington City between 2011 and 2023.

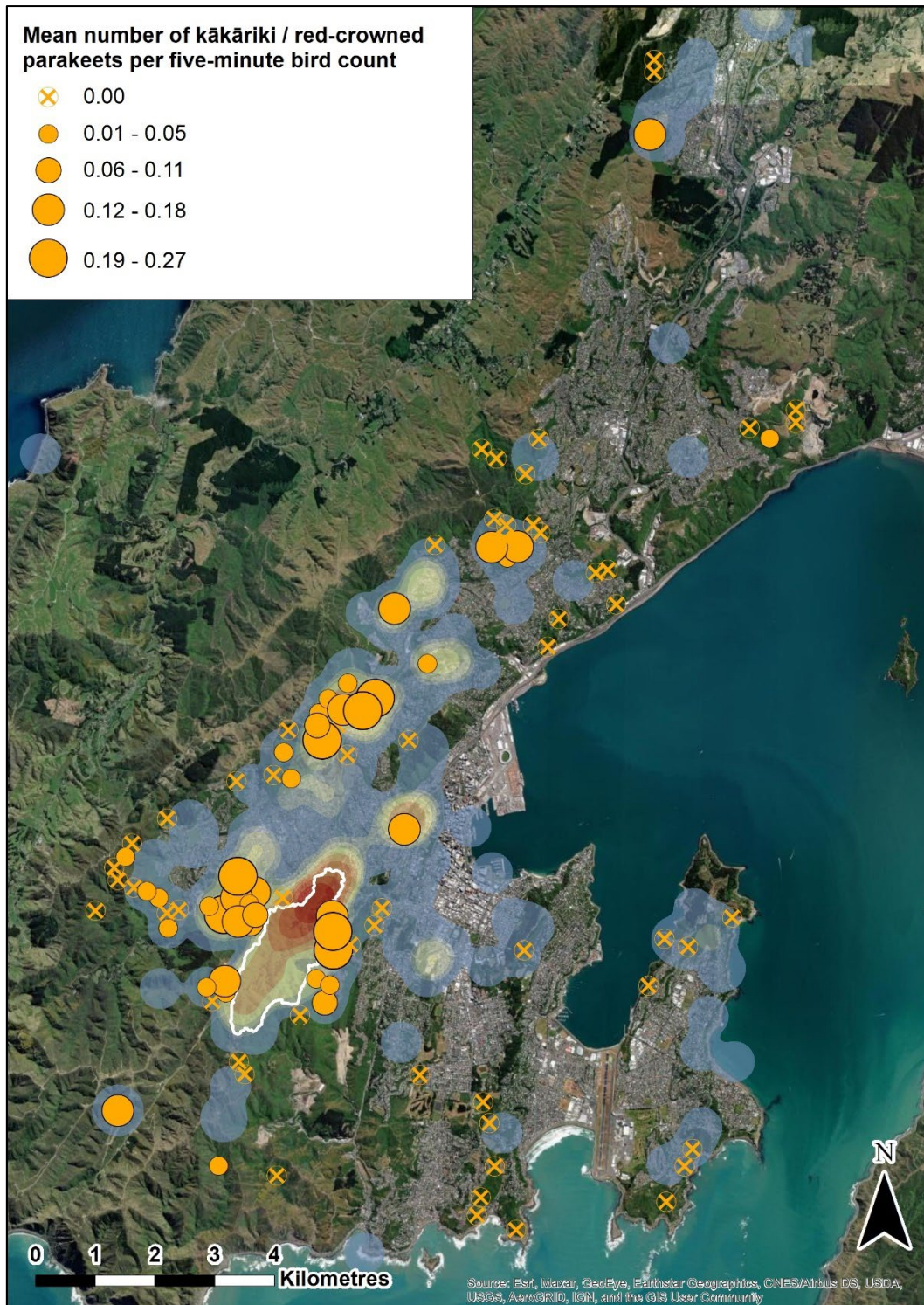


Figure 3.21: Distribution of kākāriki / red-crowned parakeets in Pōneke / Wellington City between 2011 and 2024. The orange circles represent kākāriki / red-crowned parakeet detections at five-minute bird count stations, with the size of the circle corresponding to the mean number of kākāriki / red-crowned parakeets detected per station each year between 2011 and 2023 (see map legend). The shading on the map represents the local density of kākāriki / red-crowned parakeet observations reported by citizen scientists via the New Zealand eBird database (n=2,333) between 2011 and 2024, with areas of warmer shading representing higher local densities of kākāriki / red-crowned parakeet observations.



Image courtesy of Bartek Wypych/NZ Birds Online

National conservation status: Not Threatened (Robertson *et al.* 2021).

Regional conservation status: Not Threatened (Crisp, 2020).

The kōtare / New Zealand kingfisher is the eleventh most frequently encountered native forest bird species in these five-minute bird counts. Despite minor year-to-year fluctuations, kōtare / New Zealand kingfisher encounter rates have not changed significantly between 2011 and 2023. Kōtare / New Zealand kingfisher encounter rates have varied between a low of 0.02 (\pm 0.01 SE) kōtare / New Zealand kingfishers per count in 2016 and 2022, and a high 0.07 (\pm 0.02 SE) per count in 2023 (Figure 3.22).

The kōtare / New Zealand kingfisher is the twelfth most frequently reported native forest bird species by citizen scientists in Pōneke / Wellington City. Between 2011 and 2024, citizen scientists reported a total of 2,438 encounters with kōtare / New Zealand kingfishers, demonstrating that kingfishers are regularly encountered in native forest, suburban and coastal habitats throughout the city, but with particular concentrations of records in the suburbs of Karori, Wilton, Mt Victoria and in northern and eastern parts of Te Motu Kairangi / Miramar Peninsula (Figure 3.23).

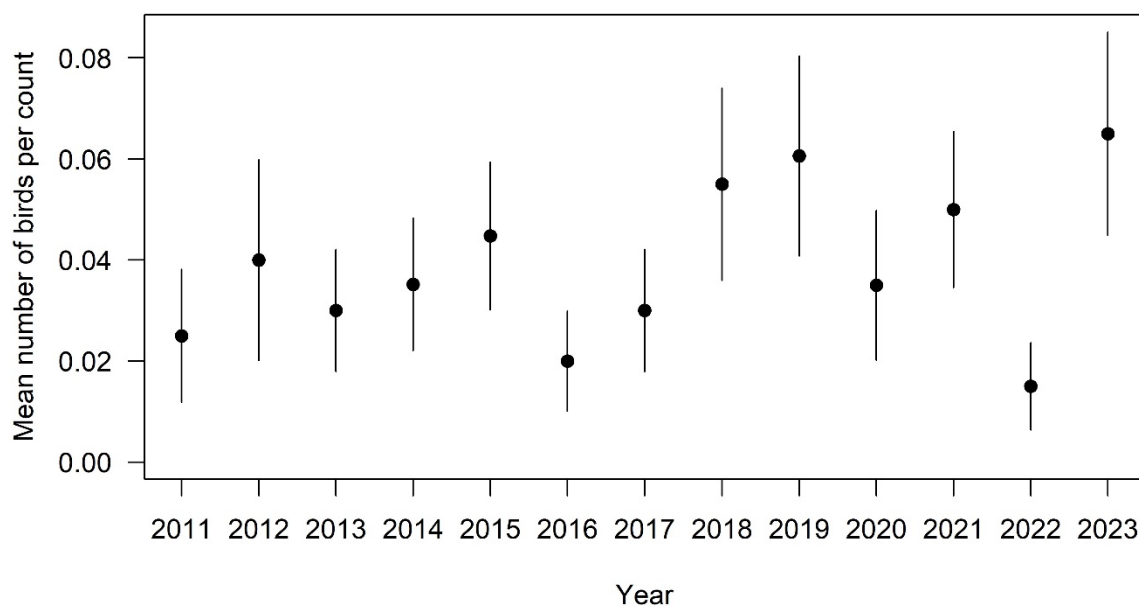


Figure 3.22: Mean (\pm SE) number of kōtare / New Zealand kingfishers recorded per five-minute bird count station in Pōneke / Wellington City between 2011 and 2023.

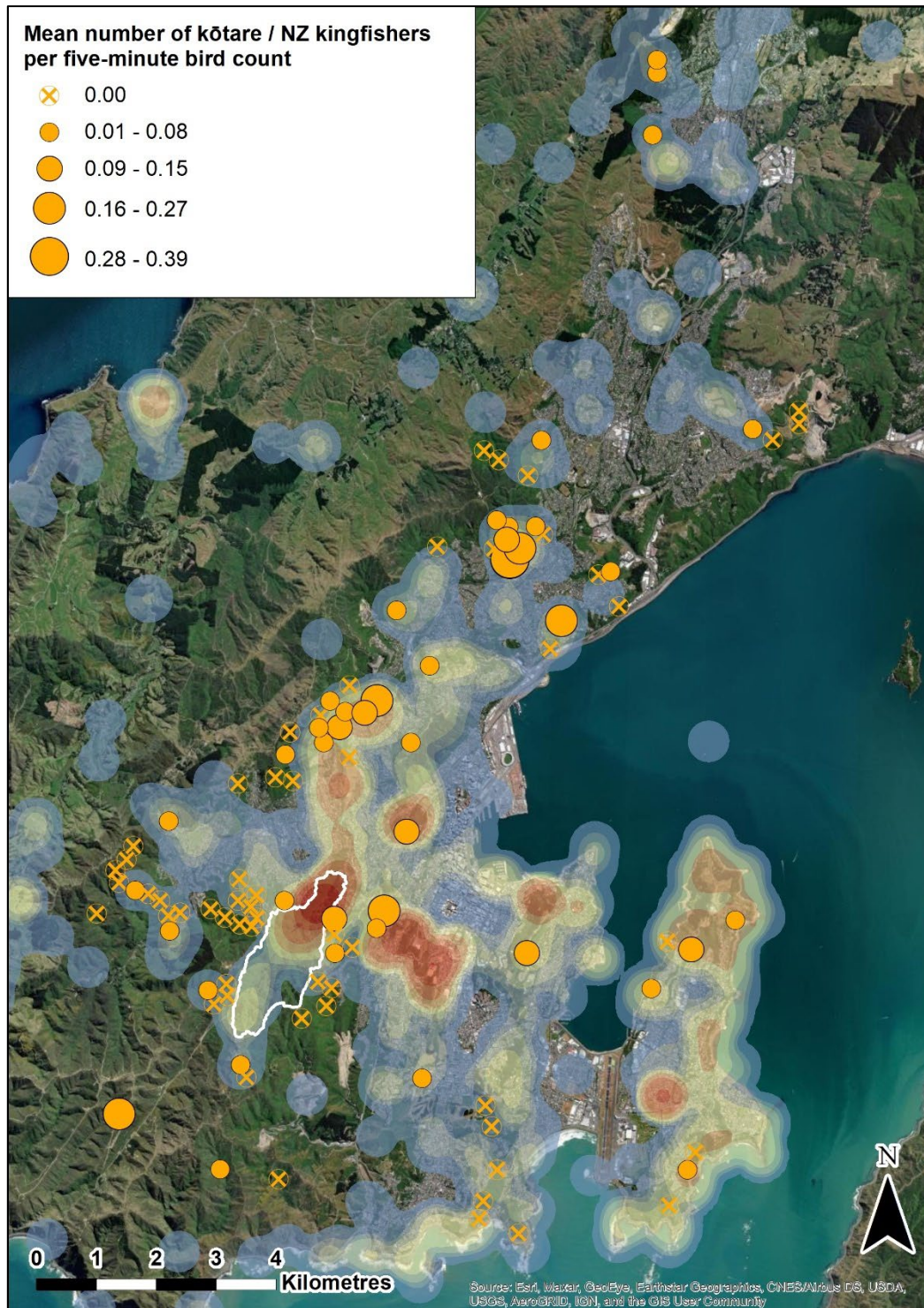


Figure 3.23: Distribution of kōtare / New Zealand kingfishers in Pōneke / Wellington City between 2011 and 2024. The orange circles represent kōtare / New Zealand kingfisher detections at five-minute bird count stations, with the size of the circle corresponding to the mean number of kōtare / New Zealand kingfishers detected per station each year between 2011 and 2023 (see map legend). The shading on the map represents the local density of kōtare / New Zealand kingfisher observations reported by citizen scientists via the New Zealand eBird database (n=2,187) and the iNaturalist database (n=251) between 2011 and 2024, with areas of warmer shading representing higher local densities of kōtare / New Zealand kingfisher observations.

3.2.12 Korimako / Bellbird (*Anthornis melanura*)



Image courtesy of Craig McKenzie/NZ Birds Online

National conservation status: Not Threatened (Robertson *et al.* 2021).

Regional conservation status: Not Threatened (Crisp, 2020).

The korimako / bellbird was reintroduced to Zealandia Te Māra a Tāne between 2001 and 2011 (Miskelly 2018), although at least two individuals were present in the suburb of Karori during 1999 and 2000 (Miskelly *et al.* 2005). The korimako / bellbird is now the twelfth most frequently encountered native forest bird species in these five-minute bird counts. Korimako / bellbird encounter rates have increased from zero birds detected during five-minute bird counts carried out in 2011 to a mean of 0.060 (\pm 0.021 SE) birds detected per count in 2023 (the coefficient

of year on log abundance was 0.133; 95% CI -0.385 – 0.555; Figure 3.24). Korimako / bellbird encounter rates have fluctuated moderately from year-to-year however, and the confidence limits around the coefficient estimate include a lower CI less than zero, so the certainty around this increasing trend in encounter rates is currently low.

The korimako / bellbird is the tenth most frequently reported native forest bird species by citizen scientists in Pōneke / Wellington City. Between 2011 and 2024, citizen scientists reported a total of 3,026 encounters with korimako / bellbirds, demonstrating that this species is infrequently encountered in native forest and suburban habitats across the city. A resident population is now established in Zealandia Te Māra a Tāne (Miskelly, 2018) and local hotspots of citizen science observations indicate that korimako / bellbirds are also either resident or regular visitors to the Wellington Botanic Gardens, Ōtari-Wilton's Bush and Karori Cemetery, and Khandallah Park (Figure 3.25).

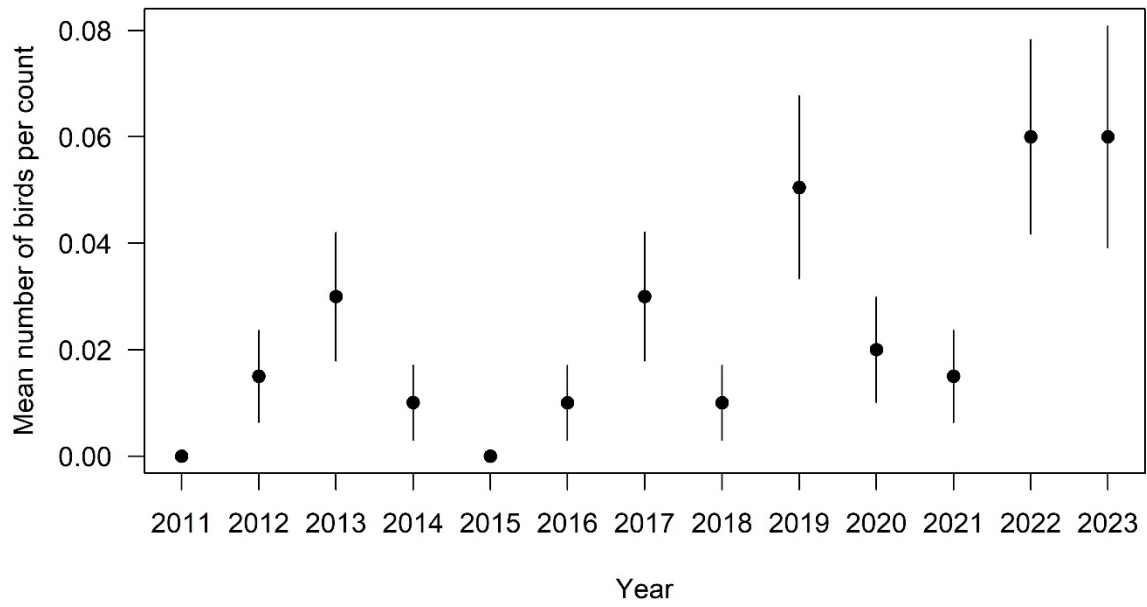


Figure 3.24: Mean (\pm SE) number of korimako / bellbirds recorded per five-minute bird count station in Pōneke / Wellington City between 2011 and 2023.

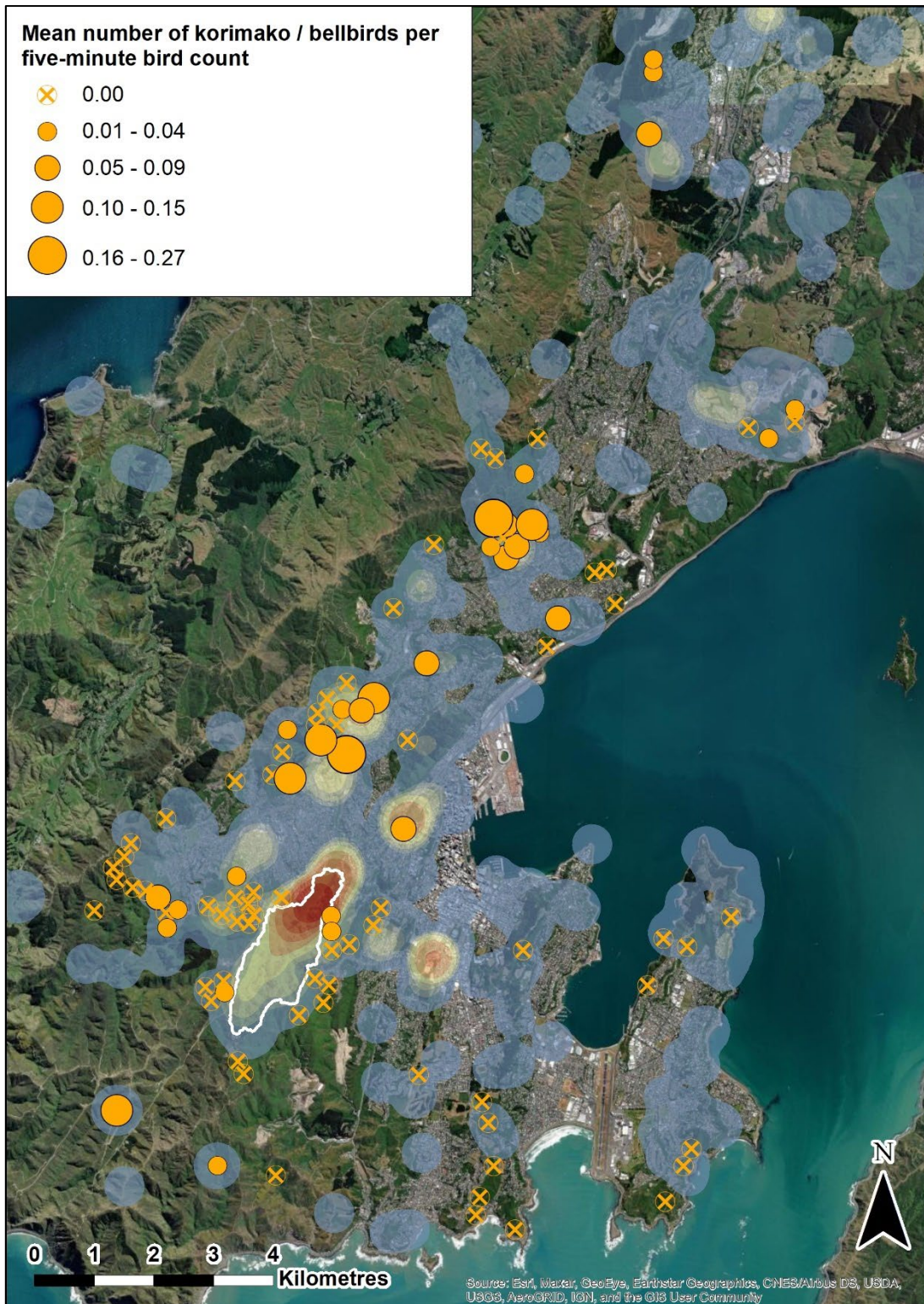


Figure 3.25: Distribution of korimako / bellbirds in Pōneke / Wellington City between 2011 and 2024. The orange circles represent korimako / bellbird detections at five-minute bird count stations, with the size of the circle corresponding to the mean number of korimako / bellbirds detected per station each year between 2011 and 2023 (see map legend). The shading on the map represents the local density of korimako / bellbird observations reported by citizen scientists via the New Zealand eBird database (n=2,591) and the iNaturalist database (n=435) between 2011 and 2024, with areas of warmer shading representing higher local densities of korimako / bellbird observations.

3.2.13 Kārearea / New Zealand falcon

(*Falco novaeseelandiae*)



Image courtesy of Steve Attwood/NZ Birds Online

National conservation status:

Nationally Increasing (Robertson *et al.* 2021).

Regional conservation status: Regionally Critical (Crisp, 2020).

The kārearea / New Zealand falcon is the thirteenth most frequently encountered native forest bird species in these five-minute bird counts. Kārearea / New Zealand falcons have only been detected on 25 occasions during these five-minute bird counts, providing too few detections to allow trends in encounter rates to be modelled. Kārearea / New Zealand falcon encounter rates have fluctuated from year to year between 2011 and 2023, from zero birds recorded in 2011, 2014 and 2019 to a mean of 0.03 birds encountered per bird count station in 2023. Between 2011 and 2020,

one or two Kārearea / New Zealand falcons were typically detected each year, whereas between 2021 and 2023 this has increased to between four and six birds per year, indicating that kārearea / New Zealand falcon encounter rates may be increasing over time (Figure 3.26).

The kārearea / New Zealand falcon is the eleventh most frequently reported native forest bird species by citizen scientists in Pōneke / Wellington City, with 2,868 encounters recorded between 2011 and 2024. Kārearea / New Zealand falcons are regularly encountered throughout central Wellington suburbs and on Te Motu Kairangi / Miramar Peninsula but are less frequently reported from more northern suburbs (Figure 3.27). These reports likely represent a relatively small number of highly mobile individuals ranging freely in native forest, suburban and urban habitats throughout the city. Several pairs of kārearea / New Zealand falcons are known to breed in Pōneke / Wellington City, at locations including Zealandia Te Māra a Tāne, Ōtari-Wilton's Bush, Tinakori Hill and on Te Motu Kairangi / Miramar Peninsula (eBird, 2023; McArthur, 2024). Kārearea / New Zealand falcons typically occur at fairly low densities and are known to be highly mobile (Heather & Robertson, 2015), so are not expected to undergo any dramatic increases in Pōneke / Wellington City in response to local conservation management efforts.

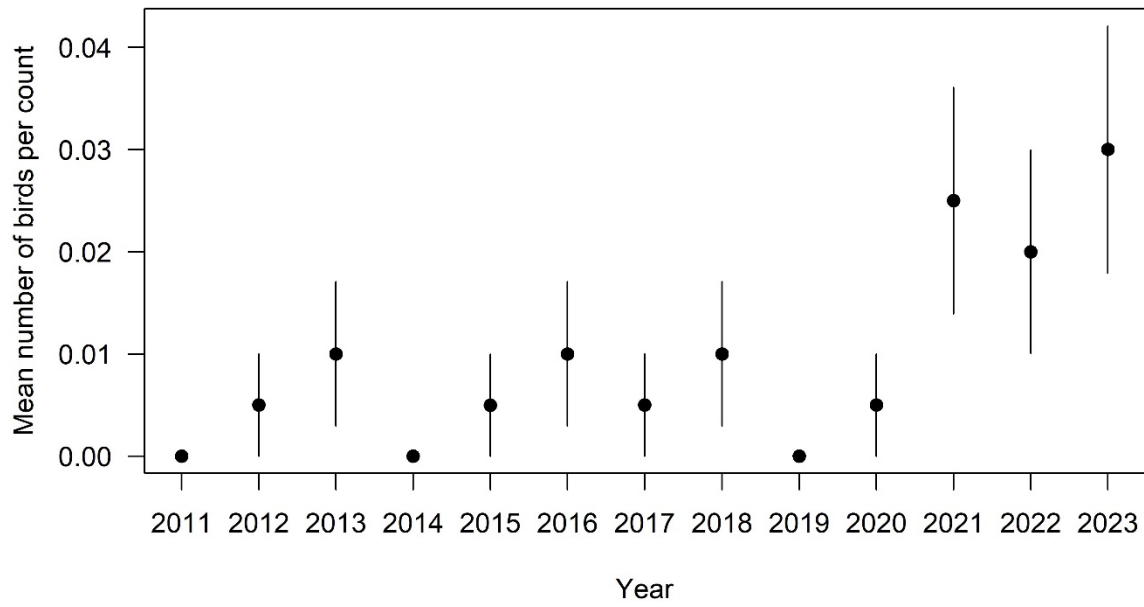


Figure 3.26: Mean (\pm SE) number of kārearea / New Zealand falcons recorded per five-minute bird count station in Pōneke / Wellington City between 2011 and 2023.

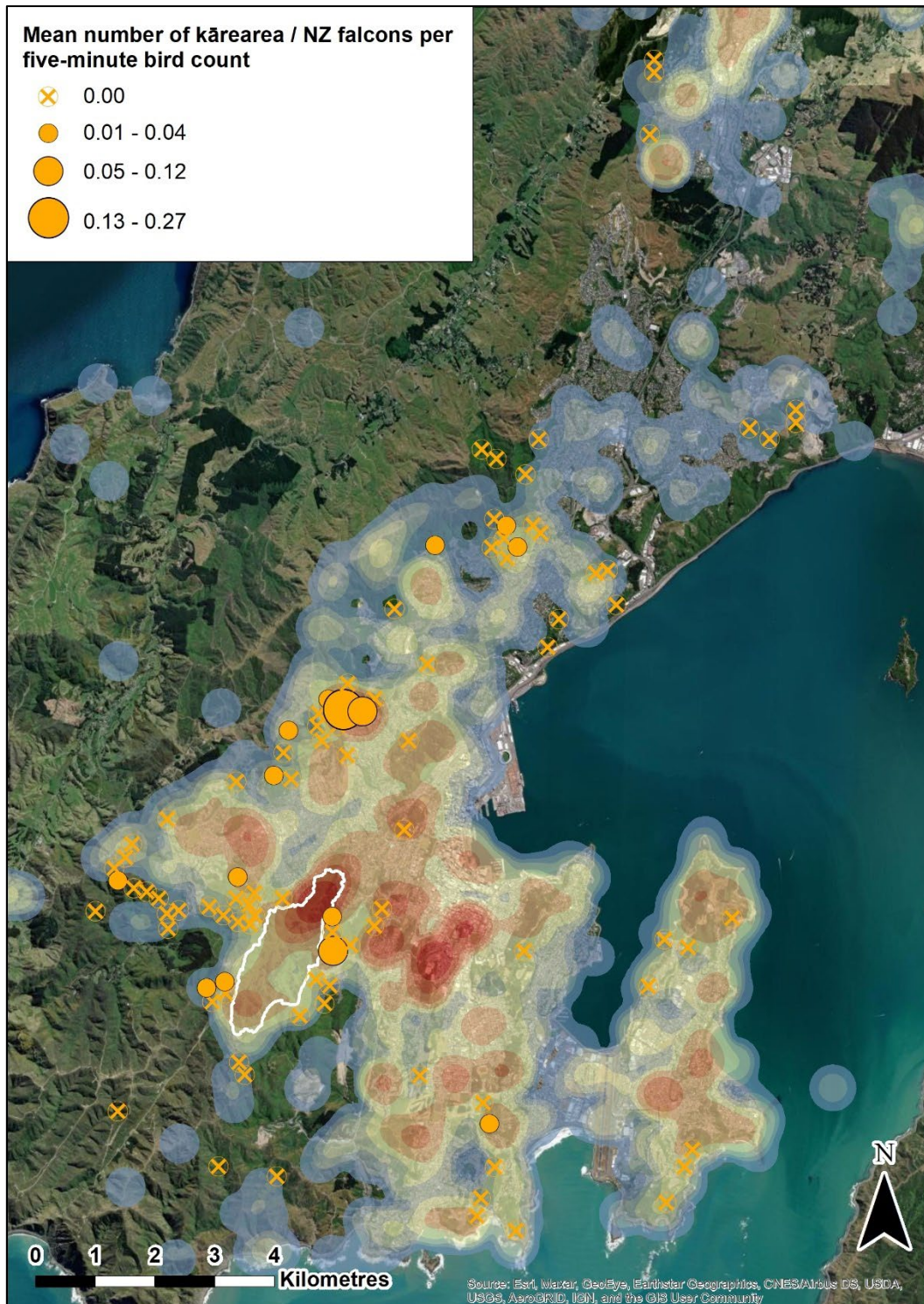


Figure 3.27: Distribution of karearea / New Zealand falcons in Pōneke / Wellington City between 2011 and 2024. The orange circles represent karearea / New Zealand falcon detections at five-minute bird count stations, with the size of the circle corresponding to the mean number of karearea / New Zealand falcons detected per station each year between 2011 and 2023 (see map legend). The shading on the map represents the local density of karearea / New Zealand falcon observations reported by citizen scientists via the New Zealand eBird database (n=2,480) and the iNaturalist database (n=388) between 2011 and 2024, with areas of warmer shading representing higher local densities of karearea / New Zealand falcon observations.

3.2.14 Toutouwai / North Island robin (*Petroica longipes*)

National conservation status: At Risk, Declining
(Robertson *et al.* 2021).

Regional conservation status: Not Threatened
(Crisp, 2020).

The toutouwai / North Island robin was reintroduced to Zealandia Te Māra a Tāne between 2001 and 2002 (Miskelly, 2018) and is now the fourteenth most frequently encountered native forest bird species in these five-minute bird counts. Toutouwai / North Island robins have only been detected on 14 occasions during these five-minute bird counts, providing too few detections to allow trends in encounter rates to be modelled. Toutouwai / North Island robin encounter rates have fluctuated from zero to a mean of 0.015 birds recorded per bird count each year, with no overall trend in encounter rates between 2011 and 2023 (Figure 3.28).



Image courtesy of Neil Fitzgerald/
NZ Birds Online

The toutouwai / North Island robin is the seventh most frequently reported native forest bird species by citizen scientists in Pōneke / Wellington City with 4,848 encounters recorded between 2011 and 2024, the majority of which are from within Zealandia Te Māra a Tāne. Of those reports from outside of Zealandia Te Māra a Tāne's predator-proof fence, the majority have occurred at locations within 500 m of the fence, with only occasional records from forested reserves further afield, including in Ōtari-Wilton's Bush, Tinakori Hill, the Wellington Botanical Gardens, Prince of Wales Park and Makara Peak (Figure 3.29). This localised distribution of toutouwai / North Island robin observations in and around Zealandia Te Māra a Tāne suggests that one or more environmental factors are severely limiting the ability of this species to colonise forest habitats beyond Zealandia Te Māra a Tāne's predator-proof fence.

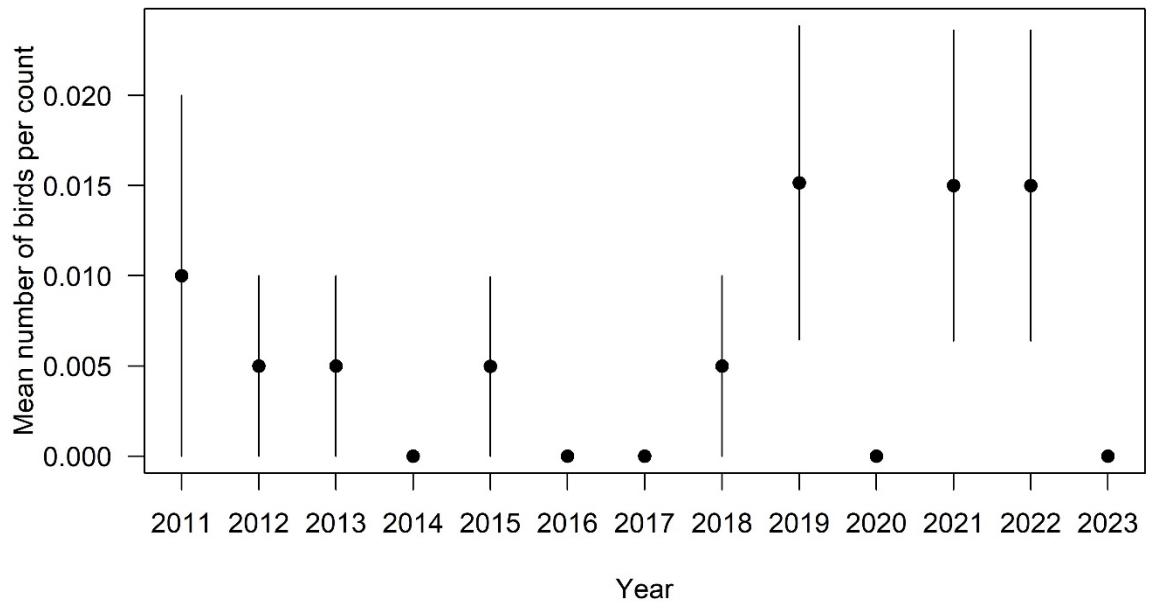


Figure 3.28: Mean (\pm SE) number of toutouwai / North Island robins recorded per five-minute bird count station in Pōneke / Wellington City between 2011 and 2023.

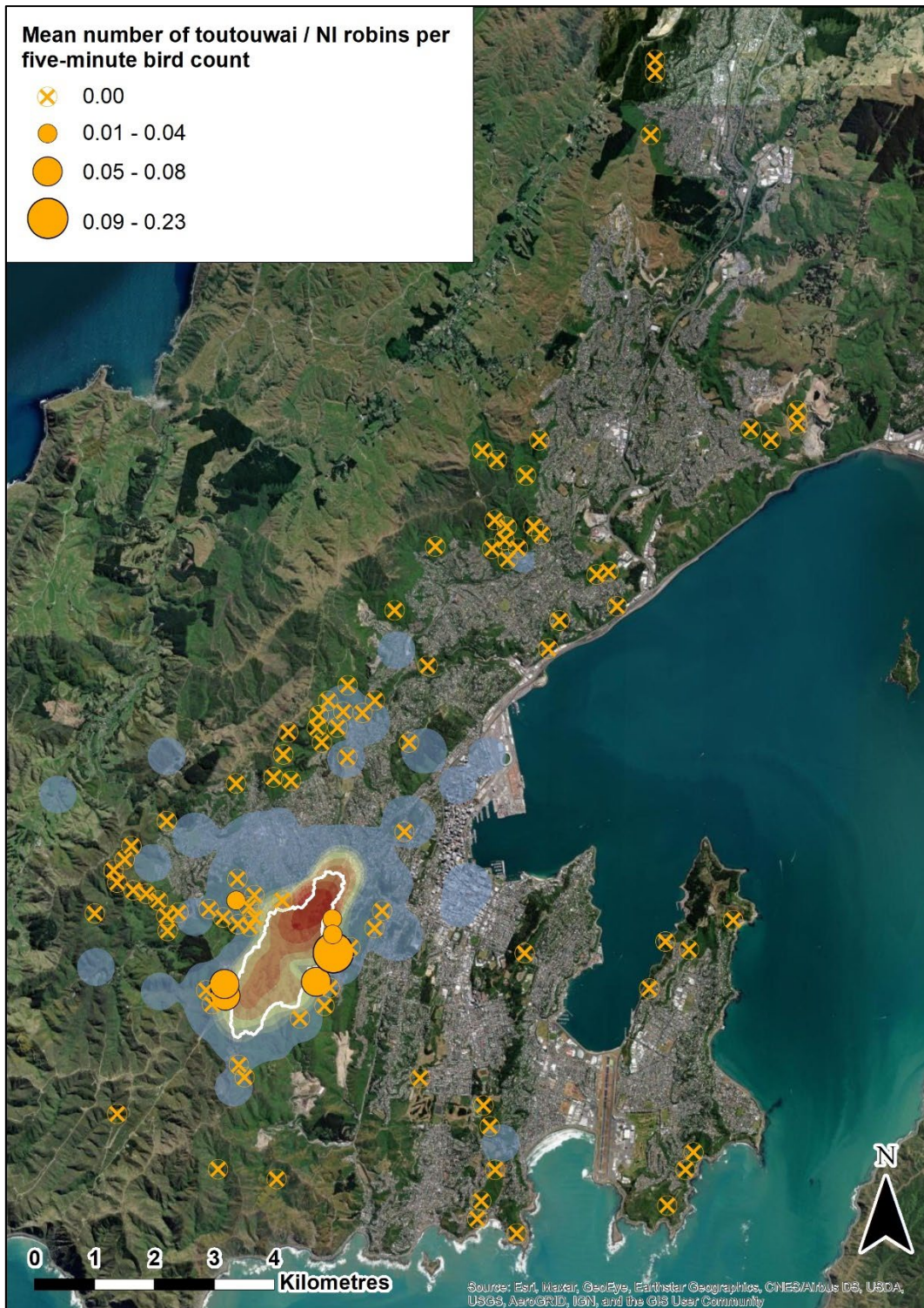


Figure 3.29: Distribution of toutouwai / North Island robins in Pōneke / Wellington City between 2011 and 2024. The orange circles represent toutouwai / North Island robin detections at five-minute bird count stations, with the size of the circle corresponding to the mean number of toutouwai / North Island robins detected per station each year between 2011 and 2023 (see map legend). The shading on the map represents the local density of toutouwai / North Island robin observations reported by citizen scientists via the New Zealand eBird database (n=4,128) and the iNaturalist database (n=720) between 2011 and 2024, with areas of warmer shading representing higher local densities of toutouwai / North Island robin observations.

3.2.15 Hihi (*Notiomystis cincta*)

National conservation status:

Nationally Vulnerable (Robertson *et al.* 2021).

Regional conservation status:

Regionally Critical (Crisp, 2020).

Hihi were reintroduced to Zealandia Te Māra a Tāne between 2005 and 2010, and a population is now being maintained in the sanctuary with an ongoing programme of supplementary feeding (Heather & Robertson, 2015; Miskelly, 2018). Hihi were detected during these five-minute bird counts for the first and only time in 2019, with a single bird being seen and heard at each of two count stations in Wrights Hill Reserve, 390 and 605 metres from the nearest point of Zealandia Te Māra a Tāne’s boundary fence respectively.



Image courtesy of Paul Le Roy/NZ Birds Online

Hihi is the fourteenth most frequently reported native forest bird species by citizen scientists in Pōneke / Wellington City, with 1,950 records submitted since 2011. The majority of these records have been from within Zealandia Te Māra a Tāne, however there have been several dozen reports of birds seen or heard in native forest habitats up to 600 m from Zealandia Te Māra a Tāne’s boundary fence (Figure 3.30). In May 2016, a single hihi was reported from Orleans Recreational Reserve in Ngaio, 4.5 km NNE of Zealandia Te Māra a Tāne (Birds New Zealand, 2016), and additional sightings have been recorded from Tinakori Hill and the Wellington Botanical Gardens. With these few exceptions, it appears that hihi are largely confined to Zealandia Te Māra a Tāne, and either experience very low emigration rates from the sanctuary, or very low survival rates once they leave the sanctuary.

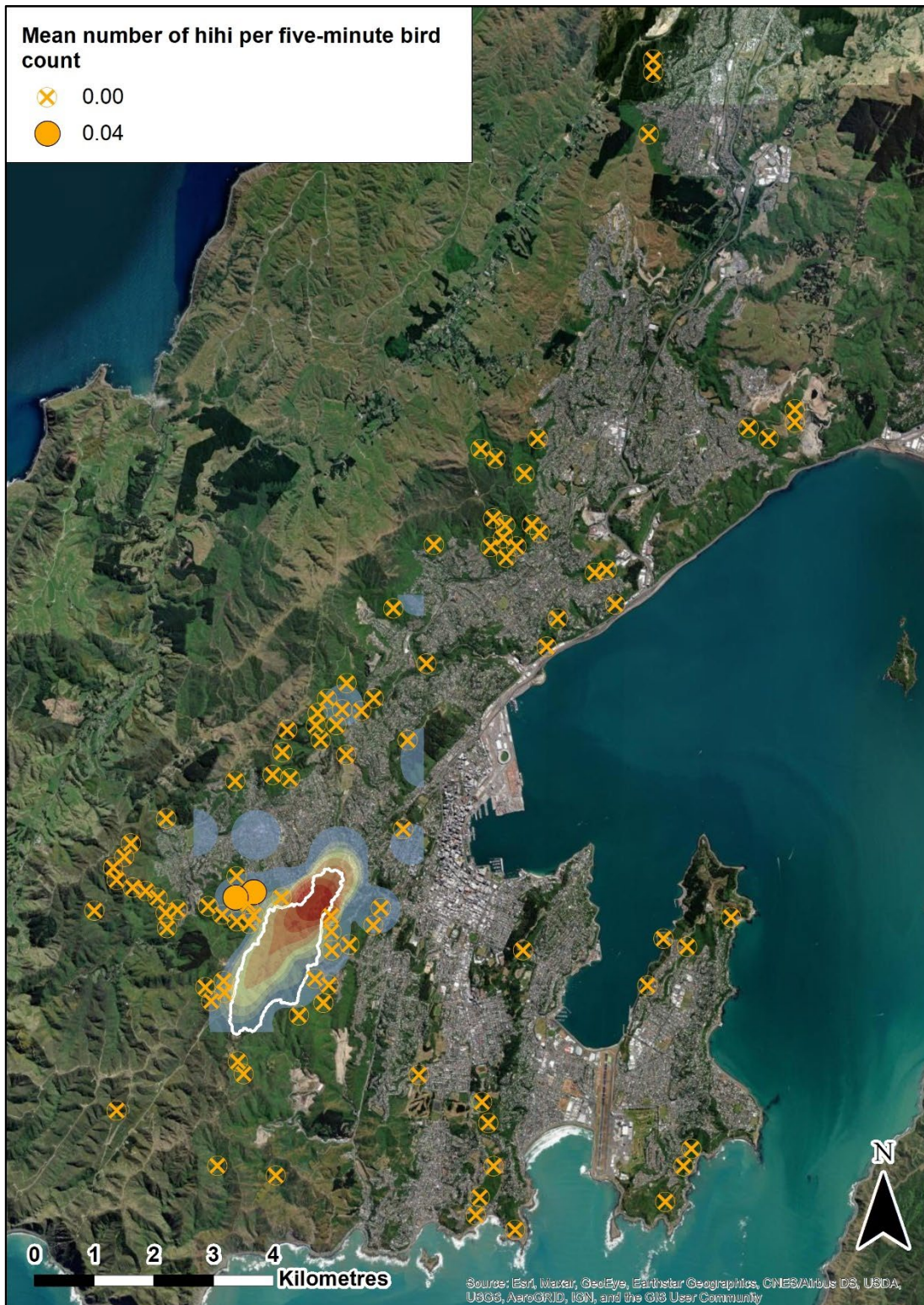


Figure 3.30: Distribution of hihi in Pōneke / Wellington City between 2011 and 2024. The orange circles represent hihi detections at five-minute bird count stations, with the size of the circle corresponding to the mean number of hihi detected per station each year between 2011 and 2023 (see map legend). The shading on the map represents the local density of hihi observations reported by citizen scientists via the New Zealand eBird database (n=1,950) between 2011 and 2024, with areas of warmer shading representing higher local densities of hihi observations.

3.2.16 Tītipounamu / Rifleman (*Acanthisitta chloris*)



Image courtesy of Glenda Rees
NZ Birds Online

National Conservation status: At risk, Declining
(Robertson *et al.* 2021)

Regional conservation status: At risk, Declining
(Crisp, 2020).

Tītipounamu / rifleman apparently occurred in Pōneke / Wellington City until at least the mid-19th Century, as Oliver (1955) reports that the species was collected by P. Earle at Port Nicholson ‘about 1840’. Tītipounamu / rifleman were either extremely rare or extinct in the area by 1938 however, as Secker (1958) did not encounter them during extensive explorations made in the area between 1938 and 1956. Tītipounamu / rifleman were reintroduced to Zealandia Te Māra a Tāne in March 2019 when 59 birds were transferred from the Wainuiomata/Orongorongo Water Collection Area. These birds have bred successfully within Zealandia Te Māra a Tāne with 58 fledglings recorded during the 2020/2021 breeding season

alone².

Tītipounamu / rifleman were detected for the first time during these five-minute bird counts in 2022, with a single bird being detected at a count station in Wright’s Hill Reserve 453 metres from the Zealandia Te Māra a Tāne fenceline. Tītipounamu / rifleman have also been reported on 592 occasions by citizen scientists since 2019, although the majority of these sightings have been made within Zealandia Te Māra a Tāne. A number of significant sightings have been made beyond Zealandia Te Māra a Tāne’s predator-proof fence however; for example, during the 2021/2022 breeding season tītipounamu / rifleman bred successfully on Te Ahumairangi Hill and a family group was also encountered in Makara Peak Park, indicating that tītipounamu / rifleman have bred successfully at this latter location as well (Melissa Boardman *personal observation*; Thomas, 2022). The species has also been recorded recently in Central Park, Waimapihi Reserve, Otari-Wilton Bush and the Wellington Botanical Gardens (eBird, 2023), providing an early indication that tītipounamu / rifleman are proving to be remarkably successful at colonising native forest habitats beyond Zealandia Te Māra a Tāne’s predator-proof fence (Figure 3.31).

² <https://www.facebook.com/ZEALANDIA/posts/10157605617536401>; accessed 04/04/2021.



Figure 3.31: Distribution of tītīpounamu / rifleman in Pōneke / Wellington City between 2011 and 2024. The orange circles represent tītīpounamu / rifleman detections at five-minute bird count stations, with the size of the circle corresponding to the mean number of tītīpounamu / rifleman detected per station each year between 2011 and 2023 (see map legend). The shading on the map represents the local density of tītīpounamu / rifleman observations reported by citizen scientists via the New Zealand eBird database (n=487) and the iNaturalist database (n=105) between 2011 and 2024, with areas of warmer shading representing higher local densities of tītīpounamu / rifleman observations.

3.2.17 Miromiro / Tomtit (*Petroica macrocephala*)

National conservation status: Not Threatened
(Robertson *et al.* 2021).

Regional conservation status: Not Threatened
(Crisp, 2020).

The miromiro / tomtit is a vagrant (i.e., irregular visitor) to Pōneke / Wellington City at the present time, with no local self-sustaining population known to currently exist within Pōneke / Wellington City boundaries. A single miromiro / tomtit was recorded for the first time during this five-minute bird count project in 2016, at a count station in Khandallah Park (Figure 3.32; McArthur *et al.* 2017). In January 2021, at least one tomtit was recorded in Ōtari-Wilton's Bush by New Zealand Bird Atlas surveyors (Milius, 2021). The nearest miromiro / tomtit breeding populations to Pōneke / Wellington City currently occur in Belmont and East Harbour Regional Parks, approximately 13 and 14 km from Pōneke / Wellington City respectively (Figure 3.32; eBird, 2023). Miromiro / tomtits are known to have strong dispersal abilities, including over open water (Parker *et al.* 2004), so it is likely that these recent Pōneke / Wellington City observations represent birds that have dispersed into the city from one of these nearby source populations. Several more recent citizen science observations recorded in Zealandia may be misidentifications of similar species, although two recent observations submitted to the iNaturalist database are supported by photographic evidence (Figure 3.32).



Image courtesy of Paul Shaw/NZ Birds Online

Miromiro / tomtits were present in native forest habitats within Pōneke / Wellington City limits historically and persisted in both Ōtari-Wilton's Bush and Khandallah Park until at least as late as the mid-1920s (Stidolph, 1924; 1925). An attempt was made to reintroduce miromiro / tomtits to Zealandia Te Māra a Tāne between 2001 and 2004 and some successful local breeding subsequently occurred both inside and outside of the sanctuary's predator proof-fence between 2003 and 2006. However, this population suffered from high rates of emigration, possibly caused by interspecific competition with an already well-established toutouwai / North Island robin population. As a result, miromiro / tomtits failed to establish in Zealandia Te Māra a Tāne and had become locally extinct again by 2007 (Empson and Fastier, 2013).

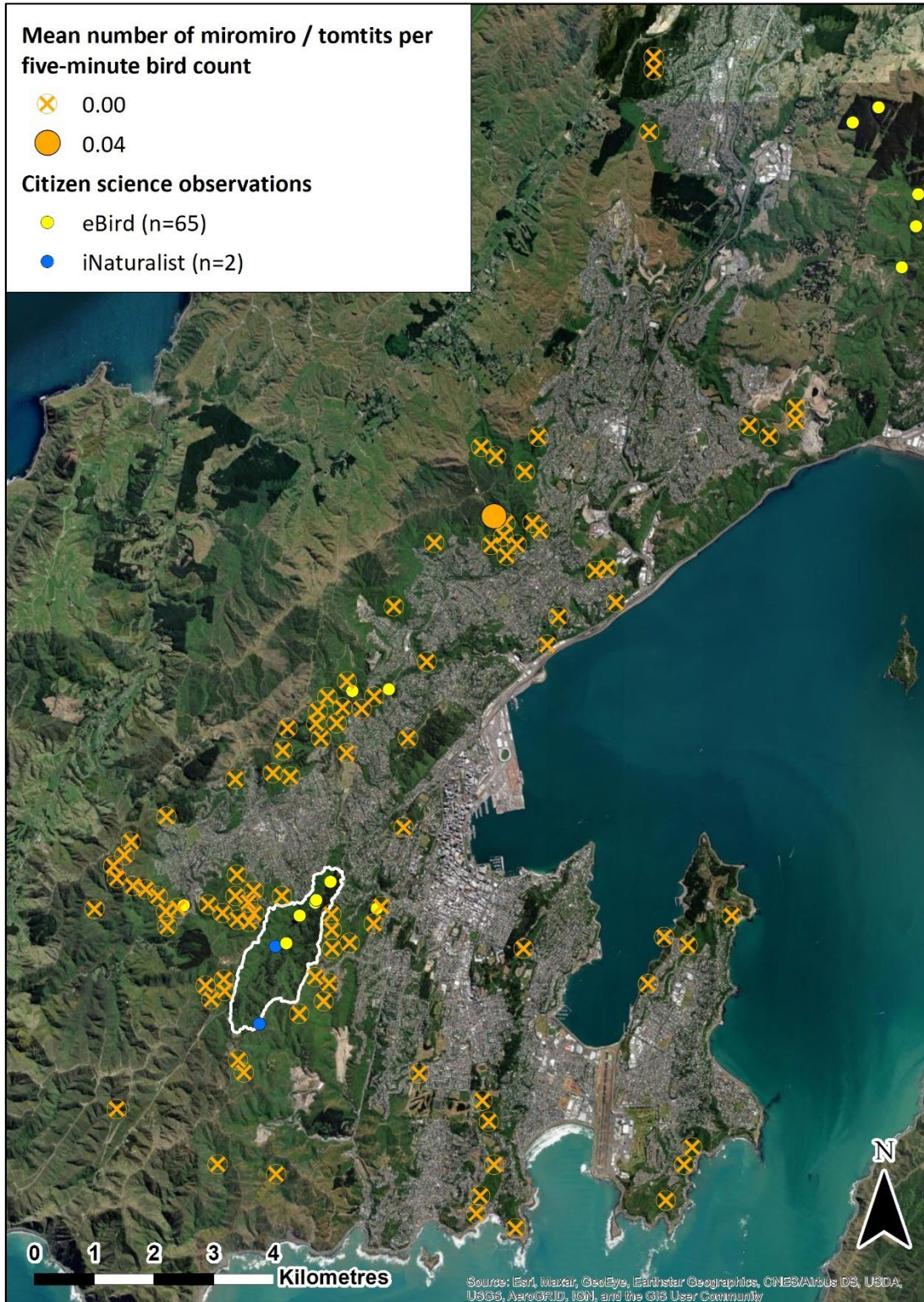


Figure 3.32: Distribution of miromiro / tomtits in Pōneke / Wellington City between 2011 and 2024. Orange circles represent miromiro / tomtit detections at five-minute bird count stations, with the size of the circle corresponding to the mean annual number of miromiro / tomtits detected per station between 2011 and 2023. Yellow and blue circles represent miromiro / tomtit observations reported by local citizen scientists via the New Zealand eBird and iNaturalist databases between 2011 and 2024.

3.2.18 Koekoeā / Long-tailed cuckoo (*Eudynamys taitensis*)



Image courtesy of Adam Clarke/NZ Birds Online

National conservation status: Nationally Vulnerable (Robertson *et al.* 2021).

Regional conservation status: At Risk, Naturally Uncommon (Crisp, 2020).

Koekoeā / long-tailed cuckoos appear to be a rare passage migrant in Pōneke / Wellington City at the present time. Koekoeā / long-tailed cuckoos have not yet been recorded during these five-minute bird counts and have only been recorded by citizen scientists in Pōneke / Wellington City on nineteen occasions since 2011 (Figure 3.33). Given the current scarcity of koekoeā / long-tailed cuckoos in Pōneke / Wellington City, the

local population of pōpokotea / whiteheads present in forest habitats in and adjacent to Zealandia Te Māra a Tāne is likely to be one of only a few local pōpokotea / whitehead populations in the Pōneke / Wellington region that does not experience brood parasitism by koekoeā / long-tailed cuckoos.

3.2.19 Ruru / Morepork (*Ninox novaeseelandiae*)

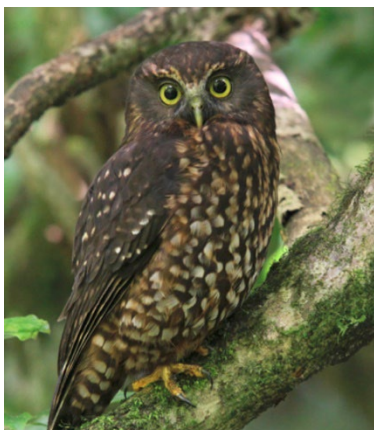


Image courtesy of Adam Clarke/
NZ Birds Online

National conservation status: Not Threatened (Robertson *et al.* 2021).

Regional conservation status: Not Threatened (Crisp, 2020).

The ruru / morepork is the most common and conspicuous native forest bird species present in Pōneke / Wellington City that has not yet been detected during these five-minute bird counts, owing to its nocturnal habits and the fact that these counts are carried out during daylight hours. They have been reported on 1,476 occasions in Pōneke / Wellington City by citizen scientists since 2011. These records suggest that ruru / moreporks are relatively widespread in Pōneke / Wellington City but are most frequently encountered in the native forest habitats that form Wellington's 'green belt' including Zealandia Te Māra a Tāne. Ruru / moreporks are also regularly reported from

suburbs with greater mature tree cover, including the suburbs of Brooklyn, Karori, Wadestown, Ngaio and the eastern parts of Te Motu Kairangi / Miramar Peninsula (Figure 3.34).

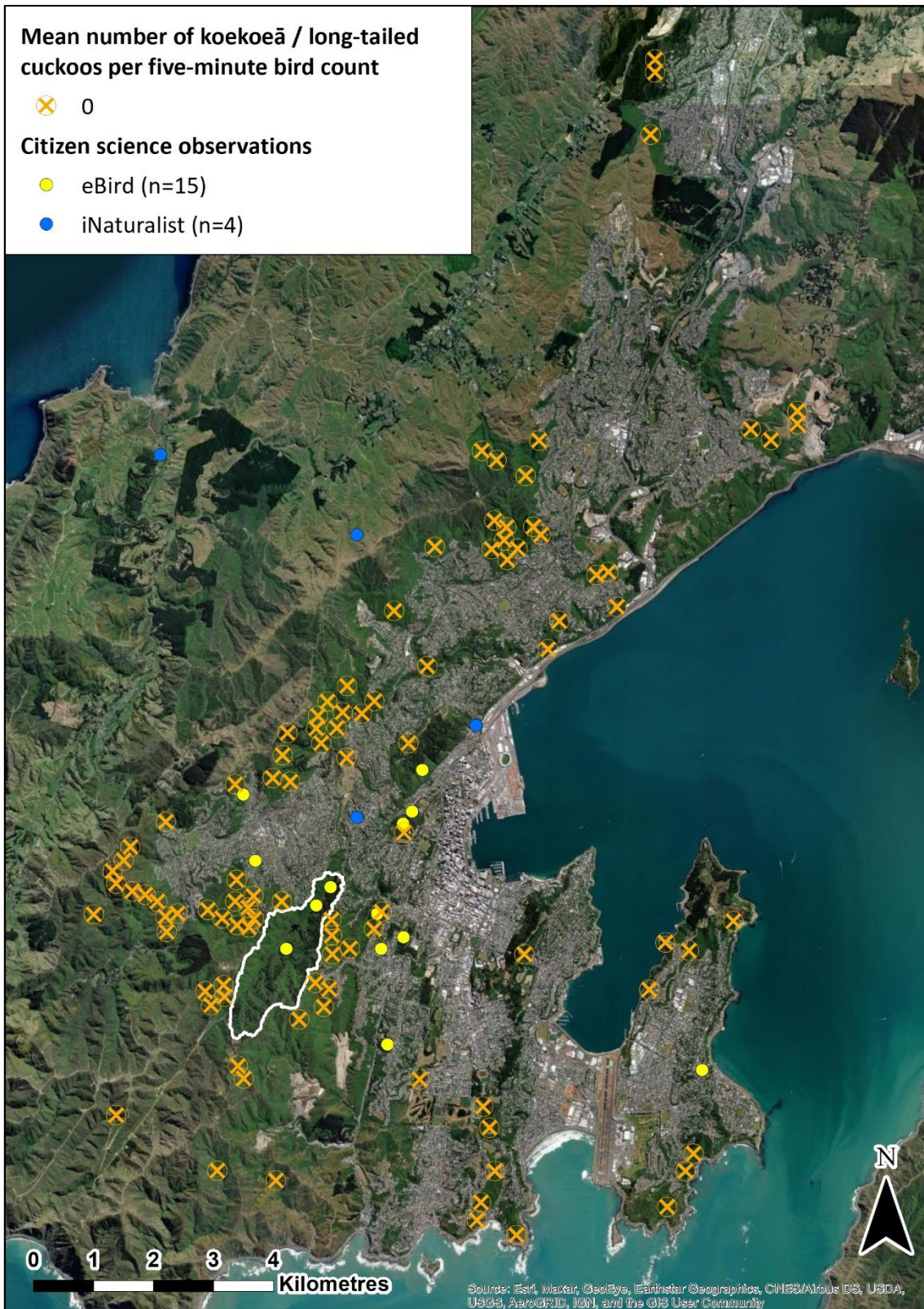


Figure 3.33: Distribution of koekoeā / long-tailed cuckoos in Pōneke / Wellington City between 2011 and 2024. Orange circles represent koekoeā / long-tailed cuckoo non-detections at five-minute bird count stations between 2011 and 2023. Yellow and blue circles represent koekoeā / long-tailed cuckoo observations reported by local citizen scientists via the New Zealand eBird and iNaturalist databases between 2011 and 2024.

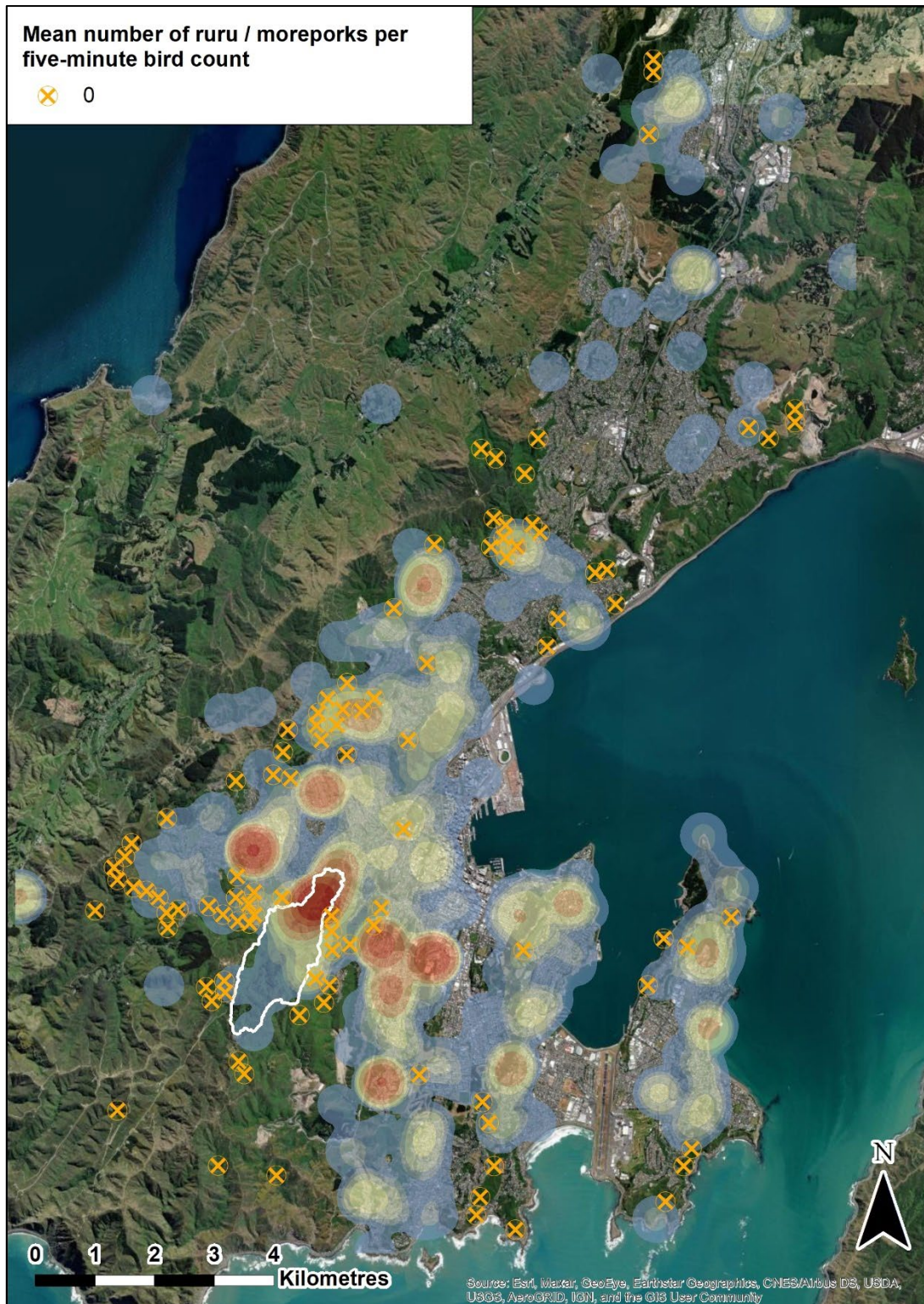


Figure 3.34: Distribution of ruru / moreporks in Pōneke / Wellington City between 2011 and 2024. The orange circles represent ruru / morepork non-detections at five-minute bird count stations surveyed each year between 2011 and 2023 (see map legend). The shading on the map represents the local density of ruru / morepork observations reported by citizen scientists via the New Zealand eBird (n=1,195) and iNaturalist (n=281) databases between 2011 and 2024, with areas of warmer shading representing higher local densities of ruru / morepork observations.

3.2.20 Kiwi-nui / North Island brown kiwi (*Apteryx mantelli*)



Image courtesy of Department of Conservation/
NZ Birds Online

National conservation status: Not Threatened (Robertson *et al.* 2021).

Regional conservation status: Regionally Endangered (Crisp, 2020).

Kiwi-nui / North Island brown kiwi were introduced to Pōneke / Wellington City in November 2022, with the release of 13 birds on Terawhiti Station. A further 125 birds were released in 2023 and 2024 and the discovery of two chicks in late 2023 confirmed that kiwi had bred successfully on the Wellington Peninsula for the first time in over 150 years³. In pre-human New Zealand, kiwi-nui / North Island brown kiwi did not naturally occur on the North

Island anywhere south of the Manawatū Gorge, instead being confined to the upper North Island from Whanganui and Hawke's Bay northwards. The southern North Island was instead occupied by both rowi / Okarito brown kiwi (*A. rowi*) and kiwi pukupuku / little spotted kiwi (*A. owenii*), both of which are now extinct in the Wellington region outside of predator-free sanctuaries (Heather & Robertson, 2015). This being the case, the introduction of kiwi-nui / North Island brown kiwi to Pōneke / Wellington City is best characterised as an 'ecological replacement', defined as the conservation introduction of a suitable extant taxon to fill the ecological niche left vacant by the extinction of another species (Seddon & Soorae, 1999).

Kiwi-nui / North Island brown kiwi have not yet been detected during these five-minute bird counts and are unlikely to be in the future due to their nocturnal habits. However, kiwi-nui / North Island brown kiwi have been reported on at least three occasions by citizen scientists in Pōneke / Wellington City, on the edge of Makara Peak Park and from the adjacent Makara Valley (Figure 3.36). A fourth bird was recorded on a backyard security camera visiting a suburban property in Broadmeadows in May 2024, but despite this sighting receiving widespread media coverage (Figure 3.35), it has not been entered into either the New Zealand eBird or iNaturalist databases.

³ <https://www.rnz.co.nz/national/programmes/countrylife/audio/2018944556/bringing-kiwi-back-to-the-capital-a-national-taonga-returns-to-wellington>; accessed 29/06/2024.

NEW ZEALAND

Kiwi turns up in suburban back yard - I didn't expect it to be that large'

11:53 am on 2 May 2024

Share this     



Figure 3.35: A security camera image of a kiwi-nui / North Island brown kiwi visiting a suburban backyard in Broadmeadows in May 2024. This image was published in a Radio New Zealand news article published online on the 2nd May, 2024 (<https://www.rnz.co.nz/news/national/515768/kiwi-turns-up-in-suburban-back-yard-i-didn-t-expect-it-to-be-that-large>; accessed 29/06/2024).

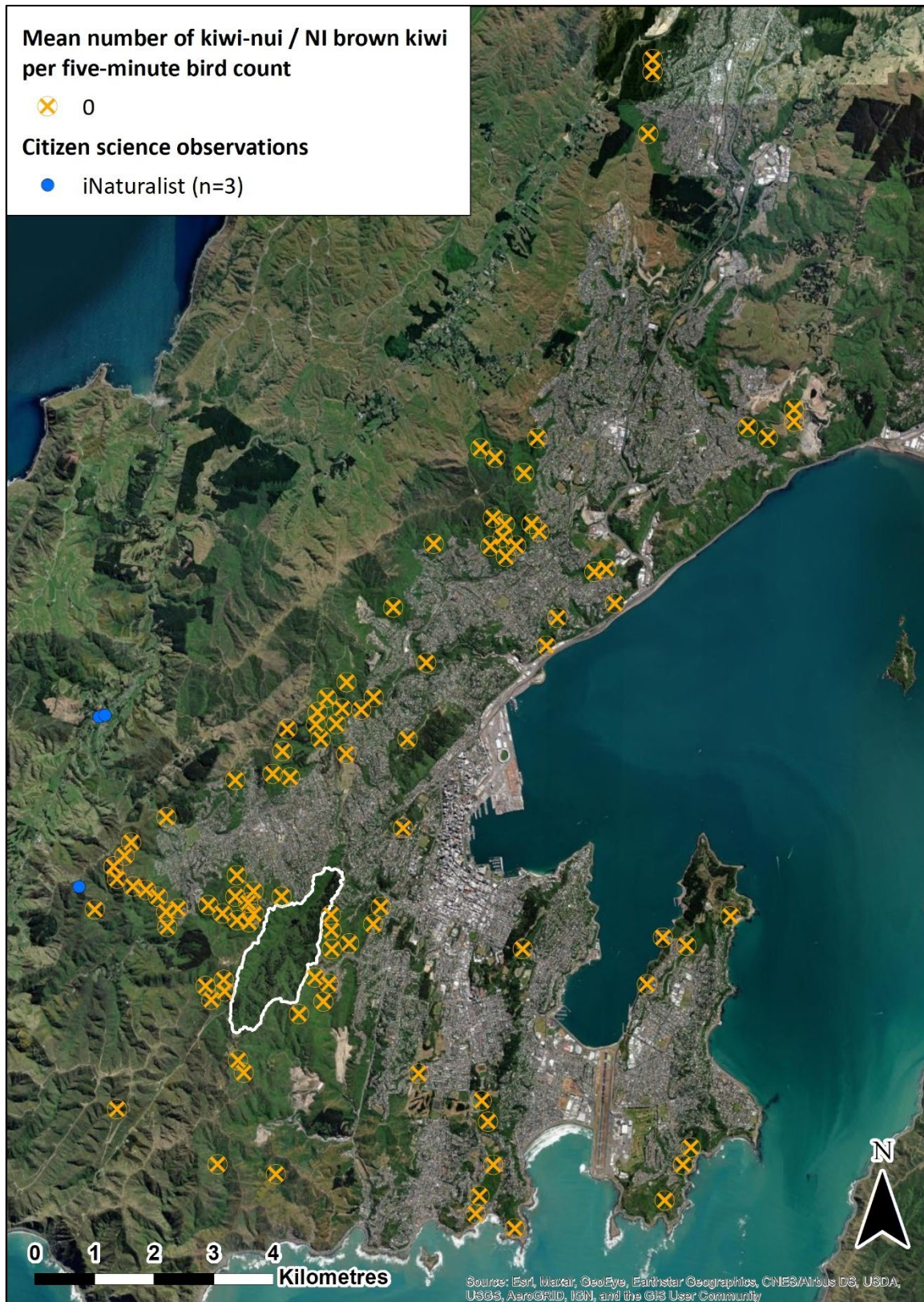


Figure 3.35: Distribution of kiwi-nui / North Island brown kiwi in Pōneke / Wellington City between 2011 and 2024. Orange circles represent kiwi-nui / North Island brown kiwi non-detections at five-minute bird count stations between 2011 and 2023. Blue circles represent kiwi-nui / North Island brown kiwi observations reported by local citizen scientists via the iNaturalist database between 2011 and 2024.

3.3 The Zealandia Te Māra a Tāne ‘halo effect’

The best model to describe how the proximity of a bird count station to Zealandia Te Māra a Tāne influences the diversity of native and introduced species at that station was the model that assumed different spatial trends for native versus introduced species. This model had a lower AICc value ($\Delta\text{AICc} = 10.44$) than the next best model, which was the model that assumed that native and introduced species would show the same spatial trend.

According to this model, the species richness of native birds was higher at count stations closer to Zealandia Te Māra a Tāne, suggesting that the predator-free sanctuary is exerting a measurable ‘halo’ effect on forest bird communities beyond the predator-proof fence (the coefficient of distance on log number of native forest bird species was -0.574 ; 95% CI $-0.613 - -0.532$). On average, a mean of $5.4 (\pm 0.3 \text{ SE})$ native forest bird species were detected at count stations situated within 200 m of Zealandia Te Māra a Tāne’s boundary, whereas a mean of $4.0 (\pm 0.3 \text{ SE})$ native forest bird species were detected at stations situated more than 10 km from Zealandia Te Māra a Tāne.

In contrast, the species richness of introduced bird species increased slightly with increasing distance from Zealandia Te Māra a Tāne (the coefficient of distance on log number of introduced bird species was 0.022 ; 95% CI $-0.021 - 0.024$). On average, a mean of $3.1 (\pm 0.2 \text{ SE})$ introduced bird species were detected at count stations situated within 200 m of Zealandia Te Māra a Tāne’s boundary, whereas a mean of $3.2 (\pm 0.4 \text{ SE})$ introduced species were detected at the stations situated more than 10 km from Zealandia Te Māra a Tāne (Figure 3.35).

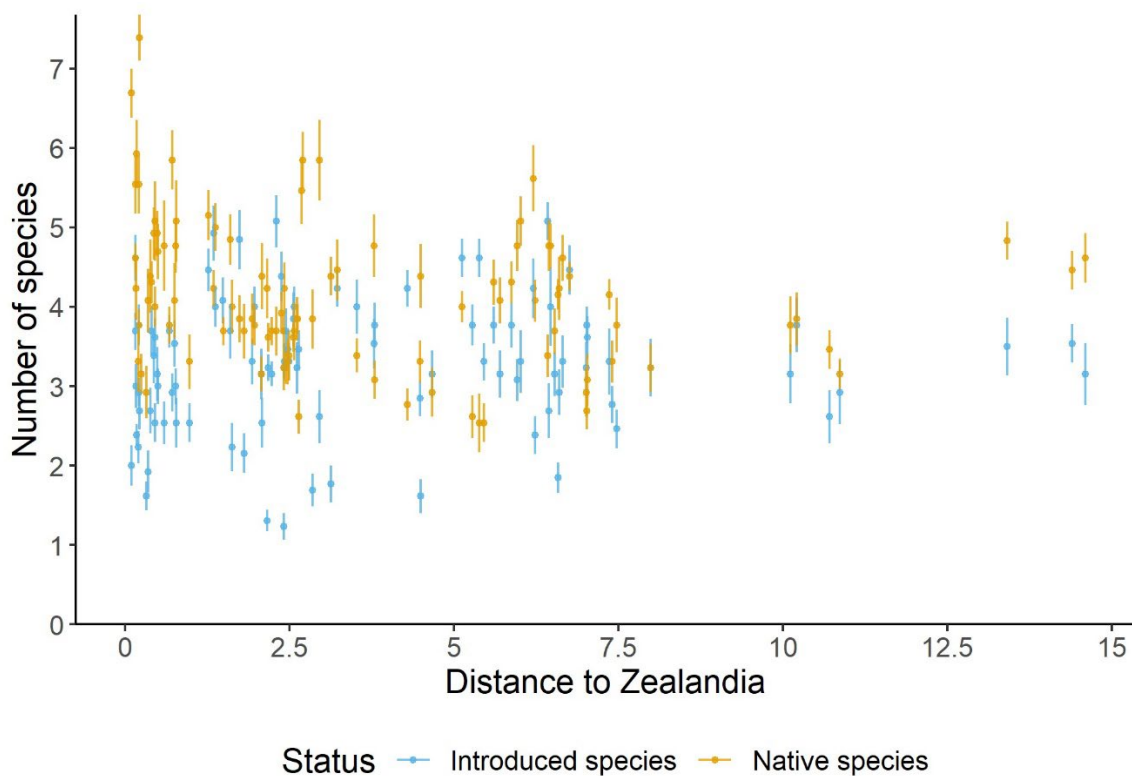


Figure 3.35: Mean number of native and introduced bird species detected per station between 2011 and 2023, in relation to each station’s distance from Zealandia Te Māra a Tāne.

4. Discussion

4.1 Changes in bird community composition, abundance and distribution

The mean number of native forest birds being counted per five-minute bird count has increased by 55% since 2011. This has been driven by increases in the mean number of tūī, pīwakawaka / New Zealand fantail, kākā, kererū, tīeke / North Island saddleback, korimako / bellbirds and riroriro / grey warblers being counted each year. Three of these species were entirely or largely absent from Pōneke / Wellington City prior to being reintroduced to the predator-free Zealandia Te Māra a Tāne sanctuary during the early 2000s. All of these species are vulnerable to depredation by mammalian predators to varying degrees (Innes *et al.* 2010; Fea & Hartley, 2018). Given that these five-minute bird counts are carried out at the same time each year, in the same weather conditions and usually by the same observers, these results provide strong evidence that the abundance of these seven species has increased in Pōneke / Wellington City since 2011. This being the case, it is clear that these increases in native forest bird abundance are being driven by both the establishment of large source populations of these species within Zealandia Te Māra a Tāne, and the ongoing expansion and intensification of mammalian predator control efforts across the city.

Although mean annual counts for native forest birds have increased in forested habitats in parks and reserves in Pōneke / Wellington City between 2011 and 2023, mean annual counts for introduced species have also increased at a similar rate. This suggests that the native forest bird communities in forested parks and reserves outside of Zealandia Te Māra a Tāne have not yet recovered to the point where interspecific competitive exclusion is reducing the abundance and conspicuousness of introduced bird species, as has now occurred within Zealandia Te Māra a Tāne itself (Miskelly, 2018). One local exception to this pattern currently exists. Mean annual counts of introduced birds at five-minute bird count stations within a few hundred metres of Zealandia Te Māra a Tāne's predator-proof fence are lower than those stations situated furthest away from this predator-free sanctuary. This indicates that the interspecific competitive exclusion of introduced bird species that is occurring within Zealandia Te Māra a Tāne is extending some distance beyond Zealandia Te Māra a Tāne's predator-proof fence, into surrounding forest habitats in adjacent parks and reserves, part of what is colloquially known as Zealandia Te Māra a Tāne's 'halo' effect.

Zealandia Te Māra a Tāne's 'halo' effect is not confined to introduced species. On average, 26% more native bird species have been recorded annually at those five-minute bird count stations closest to Zealandia Te Māra a Tāne's boundary than at those furthest away. These higher levels of native bird species richness at stations in proximity to Zealandia Te Māra a Tāne are being driven by the emigration of birds from the large source populations now established within Zealandia Te Māra a Tāne. This measurable 'halo' effect demonstrates the key role that Zealandia Te Māra a Tāne is playing in driving increases in the diversity, abundance and distribution of native forest birds in Pōneke / Wellington City's parks and reserves.

This in turn raises the question of the relative contributions that Zealandia Te Māra a Tāne's 'halo' effect and city-wide mammalian predator control initiatives are making towards the improvements in native forest bird populations observed in Pōneke / Wellington City since 2011. For instance, Brudvig *et al.* (2009) report that biodiversity 'spillover' in a landscape is largely a function of processes occurring within the source population rather than in the surrounding landscape, suggesting that

some of the increases in native forest bird diversity, abundance and distribution observed in Pōneke / Wellington City may have occurred irrespective of the extent or intensity of mammalian predator control occurring beyond Zealandia Te Māra a Tāne's predator-proof fence. Indeed, it has long been recognised that species occupancy and density is a poor predictor of habitat quality, and that even relatively poor-quality habitats can support high population densities due to immigration alone (e.g., McArthur *et al.* 2019).

In the case of Pōneke / Wellington City, the species distribution maps contained in this report suggest that the relative importance of conservation management initiatives both within and beyond Zealandia Te Māra a Tāne's predator-proof fence is likely to be species specific. Based on these distribution maps, Pōneke / Wellington City's resident native forest bird species can be divided into two broad categories: those species with relatively widespread distributions, and those with very localised distributions. Several widespread species, including tūi, pīwakawaka / New Zealand fantail and kererū, are now frequently observed breeding successfully in native forest and suburban habitats beyond Zealandia Te Māra a Tāne's predator-proof fence, so are more likely to be benefitting from city-wide reductions in mammalian predator densities in addition to being supplemented by immigration from Zealandia Te Māra a Tāne.

A number of other species continue to have very localised distributions centred on Zealandia Te Māra a Tāne, including toutouwai / North Island robin, and tīeke / North Island saddleback. The presence of these species in native forest habitats adjacent to Zealandia Te Māra a Tāne appears to be largely a result of the emigration of birds from Zealandia Te Māra a Tāne, rather than of improvements in local predator control efforts in the reserves in which these birds are being observed. For example, toutouwai / North Island robins have been well established in Zealandia Te Māra a Tāne for at least 15 years (McGavin, 2009; Empson & Fastier, 2013), yet have only been detected on 14 occasions during these five-minute bird counts between 2011 and 2023 and are seldom reported by citizen scientists at distances greater than around 1 km from Zealandia Te Māra a Tāne (Figure 3.29). New Zealand robins (*Petroica* spp.) are known to have relatively strong dispersal capabilities through habitats dominated by woody vegetation, with juvenile birds capable of dispersing up to 11 km from their natal territories in forested habitat (Oppel & Beaven, 2004; Richard, 2007). A lack of habitat connectivity is therefore unlikely to be the factor limiting the expansion of this species in Pōneke / Wellington City. Mark-resighting and nest monitoring of toutouwai / North Island robins in reserves adjacent to Zealandia Te Māra a Tāne in recent years has confirmed that although these reserves provide suitable breeding habitat for robins, poor adult and juvenile survival rates are limiting the ability of this species to colonise forest habitats outside of Zealandia Te Māra a Tāne. For example, of 37 adult toutouwai / North Island robins banded in forested reserves adjacent to Zealandia Te Māra a Tāne in the winter of 2017, only 11 birds were still present on their territories by the beginning of the following breeding season, and only four were still present in the winter of 2018. During the 2017-2018 breeding season, a total of ten nesting attempts were monitored. Eight of these successfully fledged young, with 11 young subsequently reaching independence. However, only three of these 11 offspring were detected subsequently, and only one appeared to survive long enough to attempt to breed (unsuccessfully) the following season. Of the two nests that failed, one was depredated by a cat, and the other by a stoat (Shaw and Harvey, 2018). Adult survival rates were similarly low during the 2018-2019 breeding season. Of 16 adult birds known to be present on breeding territories in September 2018, only one was still present by March 2019. Breeding success during this second season was substantially worse than the previous year. Of seven nests monitored during the 2018-2019 season, only one successfully fledged young (MacKinlay, unpublished data).

Given this evidence, the most likely factor limiting the establishment of toutouwai / North Island robins (as well as other species with localised distributions in Pōneke / Wellington City, including tīeke / North Island saddleback and kākārīki / red-crowned parakeet) beyond the boundaries of Zealandia Te Māra a Tāne is depredation of both adult and juvenile birds by mammalian predators, particularly by both domestic and wild cats (*Felis catus*) and mustelids. Evidence is growing that cats are now the most significant predator of native birds in Pōneke / Wellington City. For example, of 23 kākārīki / red-crowned parakeets that were recovered dead outside of Zealandia Te Māra a Tāne's predator-proof fence between 2010 and 2016, nine of these birds (39%) had been depredated by cats (Irwin & Empson, 2022). Although considerable effort is being invested in reducing populations of rats, possums and mustelids throughout Pōneke / Wellington City, cats are currently not being targeted. Camera trapping work carried out by researchers at Victoria University of Wellington has shown that cats accounted for a relatively large proportion of the approximately 22,000 animal 'detections' collected from several Pōneke / Wellington City reserves over a five-month period in 2014 (Anton *et al.* 2018), suggesting that cats occur in relatively high densities in the parks and reserves that were sampled. Further camera trapping work carried out in 2016 confirmed that cats were likely to be present across most of the total area of Waimapihi Reserve (one of the forested reserves adjoining predator-free Zealandia Te Māra a Tāne), and that the majority of these cats appeared to be domestic pets (Woolley & Hartley, 2019).

Given this growing body of evidence, we agree with the conclusion of Shaw & Harvey (2018), that if Wellington City Council and Predator Free Wellington wish to create "a natural city that flourishes with native wildlife and a dawn chorus that will be the envy of other cities" (<https://www.pfw.org.nz/>; accessed 25/06/2019), significant work is needed to manage the risk to wildlife posed by feral, stray and free-roaming domestic cats in the city. Until this occurs, further increases in the diversity, abundance and distribution of native forest birds in the city will be constrained by the city's large cat population. Specifically, creating healthy, self-sustaining populations of native forest birds such as toutouwai / North Island robin, tīeke / North Island saddleback, pōpokotea / whitehead and kākārīki / red-crowned parakeets in forest habitats outside of Zealandia Te Māra a Tāne's predator-proof fence is unlikely to be attainable given the presence of a large cat population, irrespective of the degree to which other mammalian predators such as rats, possums, mustelids and hedgehogs are controlled or eradicated.

4.2 The role of citizen scientists in monitoring Wellington City's bird fauna

Citizen scientists are playing an increasingly important role in providing bird observation data that complement this Pōneke / Wellington City five-minute bird count dataset, enabling us to map the distribution of birds in the city in unprecedented detail. A total of 126,169 observations of native forest birds have been contributed by citizen scientists in Pōneke / Wellington City between 2011 and 2024 and are incorporated in the distribution maps in this report. Eighty-six percent or 107,891 of these observations have been contributed via the New Zealand eBird database, making eBird by far the most popular database used by local citizen scientists that have an interest in birds. A further 13.5% (17,704 observations) were submitted via the iNaturalist New Zealand database, making this the second most preferred database used by local citizen scientists. An additional 0.5% of records (574 observations) were sourced from the Great Kererū Count.

The contribution that citizen scientists have made to this bird monitoring programme has provided at least two benefits. Firstly, because citizen scientists are collecting observations from a large number

of locations not being sampled as part of this project, the resulting bird distribution maps are considerably more detailed than if they had been derived from the five-minute bird count data alone. These distribution maps have provided insights into the habitat use of native bird species in Pōneke / Wellington City, greatly improving our ability to map the steadily expanding ranges of species such as kākā and kākārīki / red-crowned parakeets as they colonise native forest habitats beyond Zealandia Te Māra a Tāne's predator-proof fence. The second benefit is the role that citizen scientists play in detecting rare, cryptic or re-colonising bird species in Pōneke / Wellington City. Citizen scientists are much better placed to detect colonising species or those species which are naturally rare, cryptic or nocturnal because they are collecting bird observations year-round. Indeed, our knowledge of the presence and distribution of three native forest bird species that occur in Wellington City (ruru / morepork, koekoeā / long-tailed cuckoo and kiwi-nui / North Island brown kiwi), is entirely derived from citizen science data at present, as none of these species have yet been detected during a five-minute bird count.

The use of 'heat maps' for the first time in this report represents an improvement in the way that we display local variation in the density of citizen science bird observations, particularly for those bird species with large numbers of citizen science observations. One limitation with these 'heat' maps however is that the shaded areas on these maps represent the local density of citizen science observations for each species. Variation in these local densities of observations will be driven by a combination of two factors, namely the local abundance and/or conspicuousness of each bird species and local variation in survey effort. In some cases, therefore, some local hotspots in bird observation density may reflect a local concentration of survey effort, rather than areas with high bird abundance or conspicuousness. To overcome this, it is recommended that Wellington City Council models bird occupancy using these citizen science data. By modelling correlations between relevant habitat and environmental variables and the detection (or non-detection) of birds at particular locations, local variation in survey effort can be standardised (MacKenzie *et al.* 2006). This approach to occupancy modelling is reliant on citizen science bird observations being structured into complete species checklists (MacKenzie *et al.* 2006), which is one reason why the New Zealand eBird database should be the recommended online tool for local citizen scientists to report and store their Pōneke / Wellington City bird observations.

Our knowledge of the abundance and distribution of diurnal (i.e., day-active) bird species in Pōneke / Wellington City has improved substantially over the thirteen years that these five-minute bird counts have been underway. The abundance and distribution of the one relatively widespread nocturnal forest bird species present in Pōneke / Wellington City is however very poorly understood. Ruru / morepork may well be relatively common in the city, and trends in ruru / morepork encounter rates or distribution over time could provide an additional measure of the outcomes of local pest control efforts. An opportunity exists therefore to fill this knowledge gap by running a citizen science project specifically aimed at mapping the distribution of ruru / morepork in Pōneke / Wellington City and quantifying encounter rates as an indirect measure of abundance. Such a project could be modelled on the 2011 Hamilton City ruru / morepork survey, whereby volunteers were assigned to a pre-defined set of survey locations over a period of five consecutive nights (Morgan & Styche, 2012). This project would also serve a secondary purpose of providing Pōneke / Wellington City residents with an additional opportunity to engage with their surrounding natural environment, learn more about the birds around them and improve their skills as citizen scientists.

5. Recommendations

Based on the results described in this report, we suggest that Wellington City Council considers adopting the following recommendations:

- That this five-minute bird count monitoring programme be continued on an annual basis, to provide a consistent, repeatable measure of the state and trends in the diversity, distribution and abundance of birds in Pōneke / Wellington City parks and reserves, in order to contribute towards objective 4.2.2a of WCC's Biodiversity Strategy and Action Plan (WCC, 2015).
- That Pōneke / Wellington City residents continue to be educated about the risk that domestic cats pose to the city's wildlife, and that Wellington City Council continues to explore options to manage the risk that domestic, stray and feral cats pose to native and endemic birds in Pōneke / Wellington City.
- That local citizen scientists continue to be encouraged to contribute their bird observations by submitting them in the form of complete bird checklists to the New Zealand eBird database (objective 4.3.3a of WCC's Biodiversity Strategy and Action Plan; WCC, 2015). By doing so, local citizen scientists will be submitting their Pōneke / Wellington City bird observation data to a single, centralised database, providing researchers and conservation managers with easy access to a large and fast-growing dataset of high quality Pōneke / Wellington City bird observations.
- That WCC develops the capability to use citizen science bird observations to model bird occupancy within Pōneke / Wellington City, both to improve the accuracy of the distribution maps included in this report, and to enable the creation of quantitative environmental management targets aimed at maximising the local diversity and abundance of native forest birds throughout the city (objective 4.3.3a of WCC's Biodiversity Strategy and Action Plan; WCC, 2015).
- That a citizen science project be carried out with the aim of mapping the distribution of ruru / morepork in Pōneke / Wellington City (objective 3.3.4b of WCC's Biodiversity Strategy and Action Plan; WCC, 2015). Such a project could involve public requests for ruru / morepork sightings during a pre-defined time period (e.g., the month of November), coupled with recruiting a pool of local volunteers to carry out night-time surveys of a pre-determined network of locations throughout the city to determine ruru / morepork distribution in local parks and reserves.

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Appendix One

This appendix contains a list of all bird species encountered in Pōneke / Wellington City parks and reserves during five-minute bird counts carried out between 2011 and 2023 (P = species detected). Scientific names, common names (both Māori and English) and the taxonomic order in which the species appear in this list all follow those used in the fifth edition of the *Checklist of the Birds of New Zealand* (Checklist Committee (OSNZ), 2022). The national conservation status rankings used are those New Zealand Threat Classification System rankings listed in Robertson *et al.* (2021) and the regional conservation status rankings are those listed in Crisp *et al.* (2024).

Māori Name	Common Name	Scientific Name	National Conservation Status	Regional Conservation Status	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
pūtangitangi	paradise shelduck	<i>Tadorna variegata</i>	Not Threatened	Not Threatened		P	P				P	P					
rakiraki	mallard	<i>Anas platyrhynchos</i>	Introduced and Naturalised	Introduced and Naturalised					P	P							
koera	California quail	<i>Callipepla californica</i>	Introduced and Naturalised	Introduced and Naturalised	P	P	P	P	P	P	P	P	P	P	P	P	P
heihei	feral chicken	<i>Gallus gallus</i>	Not Applicable ⁴	Not Applicable ⁴	P	P	P	P	P	P	P			P	P		
peihana	common pheasant	<i>Phasianus colchicus</i>	Introduced and Naturalised	Introduced and Naturalised											P		P

⁴ Although feral chickens are known to breed in the wild in New Zealand, no viable populations have been established and existing populations are being maintained by ongoing releases and/or supplementary feeding (Heather & Robertson, 2015). Because of this, the feral chicken is not recognised as a naturalised species in New Zealand (Checklist Committee (OSNZ) 2022) and therefore does not have a New Zealand Threat Classification System ranking (Robertson *et al.* 2021; Crisp *et al.* 2024).

Māori Name	Common Name	Scientific Name	National Conservation Status	Regional Conservation Status	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
kererū aropari	rock pigeon	<i>Columba livia</i>	Introduced and Naturalised	Introduced and Naturalised						P	P				P		P
kererū	kererū	<i>Hemiphaga novaeseelandiae</i>	Not Threatened	Not Threatened	P	P	P	P	P	P	P	P	P	P	P	P	P
pīpīwharau	shining cuckoo	<i>Chrysococcyx lucidus</i>	Not Threatened	Not Threatened	P	P	P	P	P	P	P	P	P	P	P	P	P
tōrea pango	variable oystercatcher	<i>Haematopus unicolor</i>	At Risk, Recovering	Regionally Endangered		P		P	P	P		P	P		P	P	P
	spur-winged plover	<i>Vanellus miles</i>	Not Threatened	Not Threatened				P				P					
tarāpunga	red-billed gull	<i>Larus novaehollandiae</i>	At Risk, Declining	Regionally Vulnerable		P	P					P		P	P	P	P
karoro	southern black-backed gull	<i>Larus dominicanus</i>	Not Threatened	Not Threatened	P	P	P	P	P	P	P	P	P	P	P	P	P
tara	white-fronted tern	<i>Sterna striata</i>	At Risk, Declining	Regionally Endangered								P		P		P	
tākupu	Australasian gannet	<i>Morus serrator</i>	Not Threatened	Migrant													P
kororā	little penguin	<i>Eudyptula minor</i>	At Risk, Declining	Regionally Vulnerable							P						
kawaupaka	little shag	<i>Phalacrocorax melanoleucos</i>	At Risk, Relict	Regionally Endangered										P			
kawau	black shag	<i>Phalacrocorax carbo</i>	At Risk, Relict	Regionally Critical								P					
kāruhiruhi	pied shag	<i>Phalacrocorax varius</i>	At Risk, Recovering	Regionally Vulnerable					P								
kawau tikitiki	spotted shag	<i>Stictocarbo punctatus</i>	Nationally Vulnerable	Regionally Critical							P						

Māori Name	Common Name	Scientific Name	National Conservation Status	Regional Conservation Status	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
matuku moana	white-faced heron	<i>Egretta novaehollandiae</i>	Not Threatened	Not Threatened			P										
kāhu	swamp harrier	<i>Circus approximans</i>	Not Threatened	Not Threatened	P	P		P								P	P
kōtare	New Zealand kingfisher	<i>Todiramphus sanctus</i>	Not Threatened	Not Threatened	P	P	P	P	P	P	P	P	P	P	P	P	P
kārearea	New Zealand falcon	<i>Falco novaeseelandiae</i>	Nationally Increasing	Regionally Critical		P	P		P	P	P	P		P	P	P	P
kākā	kākā	<i>Nestor meridionalis</i>	At Risk, Recovering	At Risk, Recovering	P	P	P	P	P	P	P	P	P	P	P	P	P
kākā uhi whero	eastern rosella	<i>Platycercus eximius</i>	Introduced and Naturalised	Introduced and Naturalised	P	P	P	P	P	P	P	P	P	P	P	P	P
kākāriki	red-crowned parakeet	<i>Cyanoramphus novaeseelandiae</i>	At Risk, Relict	At Risk, Recovering	P	P		P	P	P	P	P	P	P	P	P	P
tītīpounamu	rifleman	<i>Acanthisitta chloris</i>	At Risk, Declining	At Risk, Declining													P
korimako	bellbird	<i>Anthornis melanura</i>	Not Threatened	Not Threatened		P	P	P		P	P	P	P	P	P	P	P
tūī	tūī	<i>Prosthemadera novaeseelandiae</i>	Not Threatened	Not Threatened	P	P	P	P	P	P	P	P	P	P	P	P	P
rīrorīro	grey warbler	<i>Gerygone igata</i>	Not Threatened	Not Threatened	P	P	P	P	P	P	P	P	P	P	P	P	P
tīeke	North Island saddleback	<i>Philesturnus rufusater</i>	At Risk, Recovering	Regionally Vulnerable	P	P	P	P	P	P	P	P	P	P	P	P	P
hihi	stitchbird	<i>Notiomystis cincta</i>	Nationally Vulnerable	Regionally Critical									P				
pōpokotea	whitehead	<i>Mohoua albicilla</i>	Not Threatened	Not Threatened	P	P	P	P	P	P	P	P	P	P	P	P	P

Māori Name	Common Name	Scientific Name	National Conservation Status	Regional Conservation Status	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
makipai	Australian magpie	<i>Gymnorhina tibicen</i>	Introduced and Naturalised	Introduced and Naturalised	P		P	P	P	P	P	P		P	P	P	P
pīwakawaka	New Zealand fantail	<i>Rhipidura fuliginosa</i>	Not Threatened	Not Threatened	P	P	P	P	P	P	P	P	P	P	P	P	P
miromiro	tomtit	<i>Petroica macrocephala</i>	Not Threatened	Not Threatened						P							
toutouwai	North Island robin	<i>Petroica longipes</i>	At Risk, Declining	Regionally Vulnerable	P	P	P		P			P	P		P	P	
kairaka	skylark	<i>Alauda arvensis</i>	Introduced and Naturalised	Introduced and Naturalised	P	P	P	P	P		P	P	P	P	P	P	P
warou	welcome swallow	<i>Hirundo neoxena</i>	Not Threatened	Not Threatened	P					P	P						P
tauhou	silvereeye	<i>Zosterops lateralis</i>	Not Threatened	Not Threatened	P	P	P	P	P	P	P	P	P	P	P	P	P
tāringi	common starling	<i>Sturnus vulgaris</i>	Introduced and Naturalised	Introduced and Naturalised	P	P	P	P	P	P	P	P	P	P	P	P	P
manu pango	Eurasian blackbird	<i>Turdus merula</i>	Introduced and Naturalised	Introduced and Naturalised	P	P	P	P	P	P	P	P	P	P	P	P	P
manu-kai-hua-rakau	song thrush	<i>Turdus philomelos</i>	Introduced and Naturalised	Introduced and Naturalised	P	P	P	P	P	P	P	P	P	P	P	P	P
	dunnock	<i>Prunella modularis</i>	Introduced and Naturalised	Introduced and Naturalised	P	P	P	P	P	P	P	P	P	P	P	P	P

Māori Name	Common Name	Scientific Name	National Conservation Status	Regional Conservation Status	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
tiu	house sparrow	<i>Passer domesticus</i>	Introduced and Naturalised	Introduced and Naturalised	P	P	P	P	P	P	P	P	P	P	P	P	P
pahirini	chaffinch	<i>Fringilla coelebs</i>	Introduced and Naturalised	Introduced and Naturalised	P	P	P	P	P	P	P	P	P	P	P	P	P
	greenfinch	<i>Carduelis chloris</i>	Introduced and Naturalised	Introduced and Naturalised	P	P	P	P	P	P	P	P	P	P	P	P	P
	common redpoll	<i>Carduelis flammea</i>	Introduced and Naturalised	Introduced and Naturalised		P	P	P	P	P	P	P	P	P	P		
kōurarini	goldfinch	<i>Carduelis carduelis</i>	Introduced and Naturalised	Introduced and Naturalised	P	P	P	P	P	P	P	P	P	P	P	P	P
hurukōwhai	yellowhammer	<i>Emberiza citrinella</i>	Introduced and Naturalised	Introduced and Naturalised	P	P	P	P	P	P	P	P	P	P	P	P	P

Appendix Two

This table provides a summary of the annual mean number of birds detected per bird count for each native forest bird species that has been recorded in Pōneke / Wellington City since 2011. Species are ordered from the most to least frequently encountered in 2023. Green rows denote species for which mean encounter rates have increased significantly since 2011; yellow rows denote species with stable encounter rates between 2011 and 2023 and red rows represent those species for which encounter rates have declined since 2011. Section 3.2 of this report provides a more detailed picture of the temporal trends in encounter rates for each individual species on this list.

Species	Average number of birds observed at each station												
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Tūī	1.35	0.77	2.16	1.74	2.60	2.36	2.07	2.49	2.23	2.98	2.35	2.50	2.61
Tauhou / silvereye	1.86	2.38	2.03	2.20	2.05	2.40	2.34	2.02	1.98	2.06	1.71	1.69	2.30
Riroriro / grey warbler	0.84	1.24	1.29	1.05	1.45	1.06	1.29	1.26	0.87	1.01	1.38	1.18	1.27
Pīwakawaka / New Zealand fantail	0.35	0.22	0.23	0.32	0.21	0.28	0.35	0.36	0.43	0.42	0.48	0.52	0.48
Kākā	0.10	0.07	0.12	0.10	0.24	0.15	0.22	0.26	0.26	0.35	0.37	0.36	0.27
Kererū	0.07	0.03	0.11	0.08	0.08	0.18	0.13	0.13	0.20	0.20	0.24	0.21	0.24
Pīpīwharau / shining cuckoo	0.17	0.23	0.24	0.19	0.18	0.20	0.23	0.21	0.06	0.08	0.11	0.18	0.16
Tieke / North Island saddleback	0.07	0.02	0.03	0.02	0.06	0.06	0.10	0.09	0.06	0.06	0.04	0.07	0.08
Pōpokotea / whitehead	0.06	0.09	0.04	0.06	0.05	0.05	0.08	0.07	0.11	0.05	0.06	0.05	0.07
Kōtare / New Zealand kingfisher	0.03	0.04	0.03	0.04	0.04	0.02	0.03	0.06	0.06	0.04	0.05	0.02	0.07
Korimako / bellbird	0.00	0.02	0.03	0.01	0.00	0.01	0.03	0.01	0.05	0.02	0.02	0.06	0.06

Species	Average number of birds observed at each station												
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Kākāriki / red-crowned parakeet	0.01	0.01	0.01	0.03	0.08	0.07	0.06	0.09	0.04	0.06	0.03	0.06	0.04
Kārearea / New Zealand falcon	0.00	0.01	0.01	0.00	0.00	0.01	0.01	0.01	0.00	0.01	0.03	0.02	0.03
Toutouwai / North Island robin	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.02	0.00	0.02	0.02	0.00
Tītipounamu / rifleman	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
Hihi	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Miromiro / tomtit	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Koekoeā / long-tailed cuckoo	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
Ruru / morepork	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
Kiwi-nui / North Island brown kiwi	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