



Region-wide Kiwi Call Survey of Coromandel Brown Kiwi 2022

Kiwi at Home - Kiwi i te Kāinga

Survey Date:
24 June - 2 July 2022



PREDATOR FREE
HAURAKI COROMANDEL
COMMUNITY TRUST

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1. Introduction

1.1 Predator Free Hauraki Coromandel Community Trust

This Region-wide Kiwi Call Survey is part of the Kiwi i te Kāinga Project, governed by Predator Free Hauraki Coromandel Community Trust (PFHCCT). PFHCCT was established as a charitable trust in 2017 to advance local community conservation and biodiversity enhancement efforts towards the goal of the Hauraki-Coromandel region becoming predator free.

The Kiwi i te Kāinga Project is a Save the Kiwi, Jobs for Nature funded project aiming to increase the number of Coromandel Brown Kiwi (CBK) throughout the region. The project brings together local agencies, iwi, and six well-established community-led kiwi care groups: Kapowai Kiwi Group, Mahakirau Forest Estate, Moehau Environment Group, Project Kiwi Trust, Thames Coast Kiwi Care, and the Whenuakite Kiwi Care. A fundamental part of Kiwi i te Kāinga is monitoring the CBK population over the duration of the project through a Region-wide Kiwi Call Survey. There are several approaches to collecting kiwi population data that have been carried out by various community groups across the Coromandel Peninsula. However, this Region-wide Kiwi Call Survey is the first of a three consecutive year survey that will create a baseline for monitoring the kiwi population across the peninsula.



1.2 North Island Brown Kiwi

The North Island Brown Kiwi (*Apteryx mantelli*) is one of five kiwi species endemic to Aotearoa. Four geographically and genetically distinct taxa of North Island Brown Kiwi (NIBK) are recognised: Coromandel, Eastern, Northland, and Western taxa. CBK are considered a distinct taxa endemic to the Coromandel (Burbridge et al., 2023).

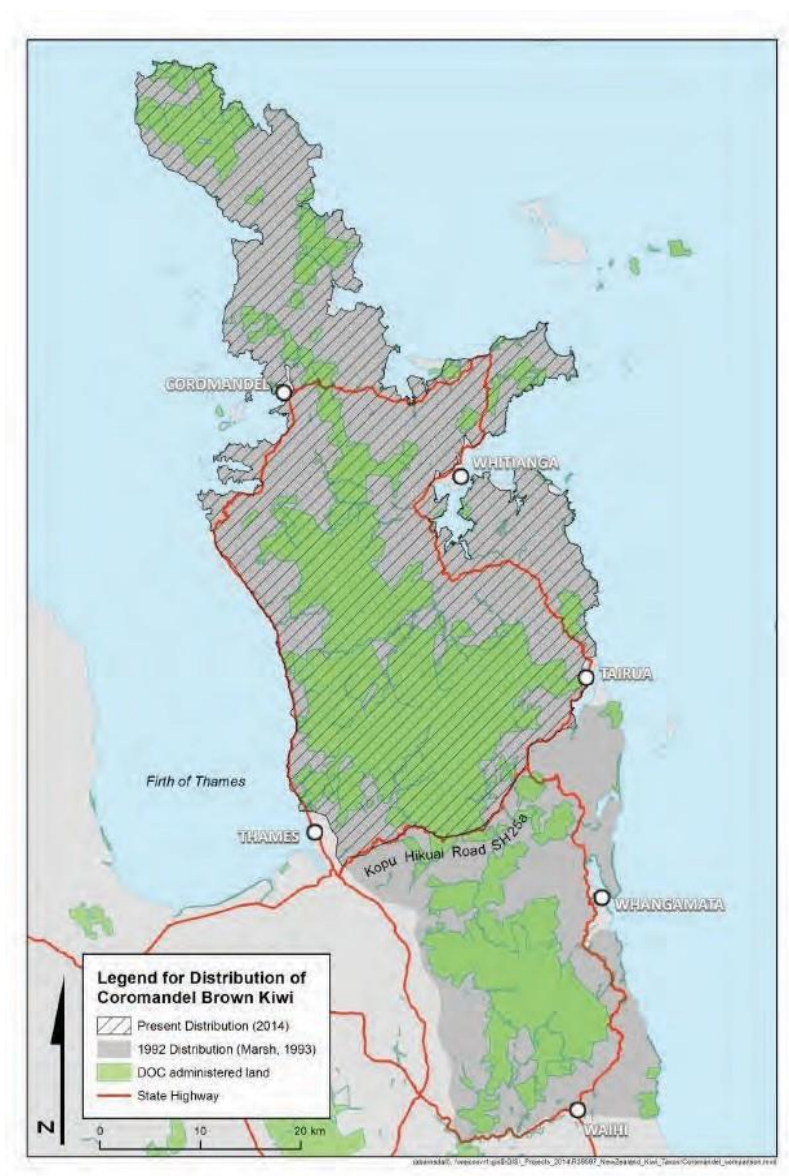
1.3 Known Distribution and Historical Data Collection of Coromandel Brown Kiwi

The earliest literature referring to NIBK populations is from 1985, where the NIBK population in the Coromandel region was described as sparse, extending southwards along the Kaimai Ranges to the Mamaku Plateau (Bull et al., 1985). The Department of Conservation's (DOC) 1987 Ecological Regions and New Zealand Districts Report found that the core historical distribution range of CBK was considered the Coromandel Ecological Region (McEwen, 1987) which extends from the Colville to Waihi Ecological Districts (Waikato Regional Council, 2018).

From October 1992 to July 1993, Sid Marsh (contracting to DOC) carried out the first systematic kiwi-orientated survey in the Coromandel region. This survey followed local concerns of kiwi vanishing or appearing in small numbers due to predation and habitat loss. Marsh concluded a widespread kiwi distribution throughout the peninsula, with the more dense concentrations along the east coast from Whangamatā northwards. From Kennedy Bay, high kiwi calls were heard from the east to west coast, including the Moehau Area (Appendix A) (Marsh, 1993).

In 2015, the Coromandel Brown Kiwi Taxon Plan identified three main areas as strongholds of CBK: North of Coromandel Town, Kūaotunu Peninsula and the Kapowai/Whenuakite area (Friis et al., 2015). Noticeably absent from this 2015 study was the presence of any CBK south of the Kopu-Hikuai Road (Figure 1), where they had been previously identified in Marsh's (1993) survey.

Figure 1: Coromandel Brown Kiwi in 1993 and 2014 (Friis, 2015)



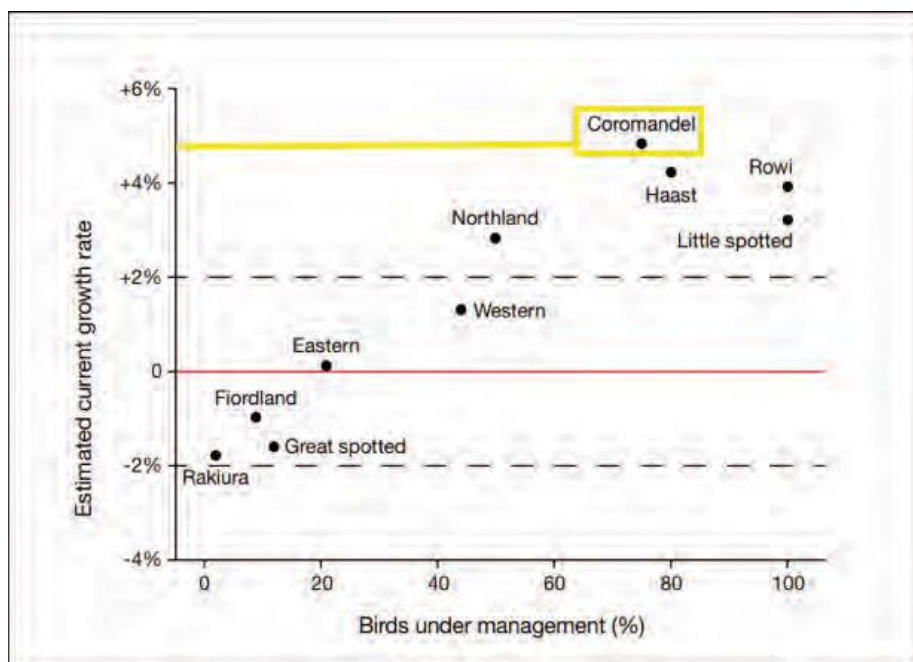
1.4 Kiwi Conservation in the Hauraki-Coromandel Region

Over the last decade there has been a significant increase in predator control in the Hauraki-Coromandel Region. This includes the expansion of the groups involved in the Kiwi i te Kāinga Project, all of which were established in the late 1990s and early 2000s, as well as the addition of numerous new conservation groups.

Throughout the Coromandel Peninsula a number of local kiwi call surveys have also been conducted by DOC, Moehau Kiwi Sanctuary, and various established conservation groups to explore the relationship between predator control and kiwi populations. Kiwi care community groups strongly back kiwi conservation in the Hauraki-Coromandel region. Their efforts have most certainly been critical to kiwi survival as it is estimated that 75% of the CBK population resides within managed sites (Friis et al., 2015).

Land left without ground-based predator control contributed to a decline in the distribution of CBK by 40% between the early 1990s and 2013 (Friis et al., 2015). The DOC Kiwi Recovery Plan, 2018-2028 (Germano et al., 2018) reported that Hauraki-Coromandel kiwi management has resulted in CBK population increases on average of 4.8% annually (Figure 2). Thanks to intensive NIBK management operations, in 2021, the conservation status of the NIBK moved up the New Zealand Threatened Species List from At Risk-Declining to Not Threatened – Conservation Dependendant. The 'conservation dependant' part of this classification acknowledges that while NIBK are not under a current threat of extinction, they still require ongoing conservation and management to maintain populations. Populations are predicted to increase by >10% across the next three generations, however, no clear differentiation has been made for the status of the four taxa of NIBK in the Threatened Species List (Robertson et al., 2021). It is also worth noting that the status of NIBK is Vulnerable on the International Union for Conservation of Nature (IUCN) red list, this status was last reviewed in October 2017.

Figure 2: Relationship between the proportion of managed kiwi population and estimated rate of annual population increase by taxon (Germano et al., 2018)



1.5 Kiwi i te Kāinga Region-wide Kiwi Call Survey

Kiwi call surveys are one tool used to determine the presence of adult kiwi in different areas with a positive bias towards male kiwi due to females calling less frequently (Colbourne & Digby, 2016). They can also be used to estimate and compare the relative abundance of kiwi populations, and are useful for understanding long-term, broad trends. The data gained in this first survey will establish a baseline level of understanding for the two additional annual surveys. It also provides volunteers in the region with an opportunity to socialise and get involved in conservation in an authentic project that engages directly with a taonga species rather than introduced predators.

Kiwi call surveys enable regions to:

- determine population changes over time by monitoring changes in mean kiwi call count rates,
- measure the impact of conservation management efforts by observing how kiwi distribution (monitored by call counts) changes in response to these efforts,
- develop a regional map with overlays detailing where kiwi are and are not and where kiwi populations are growing and declining,
- map pest and predator control efforts and kiwi hotspots,
- support future land management decision-making, and
- raise awareness at a regional and national level.

The survey aims to establish geographically spread listening sites, with the purpose of providing valuable insights into kiwi distribution across the peninsula, while simultaneously assisting various groups in monitoring kiwi populations. Subsequently, PFHCCT intends to develop detailed maps utilising the data collected during the course of this survey. To accurately identify trends and enable comparability between years, the kiwi call method will remain consistent in both methodology and timing, throughout the initial three years, as well as any future surveys.

1.6 Objectives

The objectives of this survey are:

- To establish a baseline of CBK distribution throughout the region to assist in the measurements of call count changes over time and to explore whether distribution has occurred.
- This survey will also provide recommendations for future surveys, and over time help to inform future management decisions.



2. Methodology

This Region-wide Kiwi Call Survey follows best practise guidelines and input from the National Kiwi Recovery Group and Save the Kiwi. The methodology from the kiwi call monitoring of Northland brown kiwi was also explored (Colbourne et al., 2022).

The timing for this survey was set for June. Colbourne & Digby's (2016) study confirmed that the highest call rate of CBK for both sexes lies between May and June and within the first two hours of darkness.

2.1 Listening Site Selection

Listening sites were selected based on a 10x10 km quadrant overlay imposed on the survey area covering most of the Coromandel Peninsula from Moehau in the north to Maratoto in the south (Figure 3). Consecutive quadrant numbers were allocated North to South, East to West with the aim of having at least one listening site per quadrant. Due to the peninsula's topography – a mountain range forming a North-South spine – the majority of sites were located either west or east of the Coromandel Ranges with the exception of where a road crossed over which allowed volunteer access to more central parts of the ranges.

Community groups and individuals proposed listening sites in their local areas following a list of site criteria. Key criterion was avoiding sites with high known kiwi populations and making an effort to include areas with suspected kiwi absence to establish a baseline for monitoring kiwi population growth. Criteria for listening sites also included good accessibility, site tenure and availability of volunteers.

Figure 3: Map with grid overlay showing the 33 quadrants.

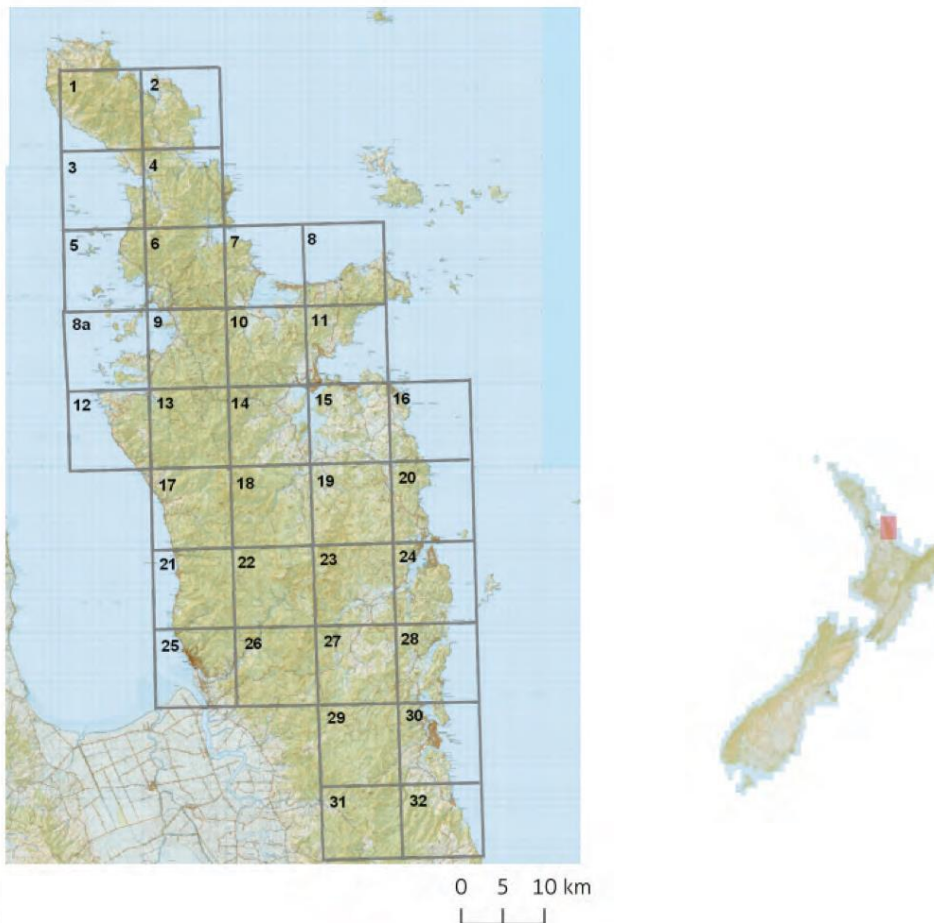


Figure 4: Map of Kiwi Call Count Survey area illustrating listening sites and identification codes



Legend

- Acoustic Recorder Listening Sites
- Crewed Listening Sites

0 5 10 km

A total of 44 listening sites were established; 36 were monitored by volunteers (crewed sites), 7 with automated acoustic recorders, and one with both (Figure 4, Appendix A). Automated acoustic recorders were set up in the field to ensure coverage in more central areas with difficult access and where volunteer availability was limited. Four sites were chosen specifically because they are not actively ground-managed for predator control. These were sites HAU291, HAU311, HAU312, and HAU313.

2.2 Site Clusters

The 44 listening sites have been categorised into geographical clusters denoted as Northern, Eastern, Southern, and Western, as illustrated in table 1 below.

Table 1: Listening sites categorised by cluster.

Northern	Eastern
HAU011 Stony Bay Road	HAU152 Grange Road North
HAU021 Port Charles	HAU153 Red Hill
HAU031 Tukituki	HAU161 Te Puia
HAU041 Adam's Place	HAU162 Hinds Farm
HAU051 McMillan	HAU163 Tirohanga
HAU052 Waitete	HAU191 Kapowai
HAU061 Driving Creek	HAU202 Mangaiti Farm
HAU062 Kennedy Bay	HAU204 Red Bridge Pines
HAU063 Flays Road	HAU205 Tairua North
HAU071 Matarangi Bluff	HAU206 Silverstream
HAU072 Mana Manu	HAU203 Te Karo
HAU081 Rimu Tree	HAU241 Pauanui Lakes
HAU101 Whangapoua Forest	HAU242 Red Bridge Lookout
HAU111 Ngāti Hei Hukarahi	HAU281 Ōpoutere
Southern	Western
HAU291 Wires Track	HAU081A Te Kouma Farm
HAU301 Waikaukau	HAU091 Kahurangi Block
HAU311 Maratoto Northwest	HAU121 Mana Retreat
HAU312 Komata	HAU131 Mahakirau
HAU313 Golden Cross	HAU141 Wairua Lodge
HAU321 Mataora Bay	HAU171 Square Kauri
	HAU181 East T-C Road
	HAU211 Waiomu/Te Puru
	HAU212 Ngarimu Bay
	HAU251 Tararu
	HAU261 Kauaeranga Valley

2.3 Volunteer Training

Each crewed site had a Site Host who was required to attend a two-hour kiwi call training workshop in either Coromandel or Tairua. All other volunteers were encouraged to also attend. Training consisted of becoming familiar with and identifying kiwi calls, identifying similar calls of other species, correctly recording data, and reading compass bearings. Volunteers were encouraged to use NZ Bird Online, following the training, to become more familiar with avian calls. They were provided with sheets for recording their data and a booklet detailing instructions for the survey evenings (Appendix D, Appendix E).

2.4 Data Recording

During the survey period, which coincided with the new moon on June 29, volunteers were given a week from June 24 to conduct their surveys, with the aim of collecting data during the darkest nights. Volunteers were encouraged to listen for kiwi calls for four consecutive nights, weather permitting (Appendix C), with each survey conducted between 18:00 – 20:00. At each site, a total of 480 minutes of data was collected from the four nights of the survey. Consecutive nights were proposed for all sites to complete data collection by July 2nd.

To maximise the ability to detect kiwi calls, volunteers were instructed to listen under quiet conditions, as wind, rain and other background noises can reduce the audibility of the calls. In cases where weather interruptions hindered data collection, volunteers were permitted to complete the remaining survey on non-consecutive days within the week.

The same participants were stationed at the same sites each night and were instructed to record any significant variations in weather and noise throughout the two-hour survey period. Kiwi calls were recorded by volunteers for the entire survey duration on standardised data sheets provided during training. The data sheets included the time of the call, the sex of the kiwi, the direction of the call, and the perceived distance (Appendix D).

2.5 Automated Acoustic Recorders

Automated acoustic recorders were deployed to seven sites that were too remote to access or where there were no volunteers available to crew them. HAU313 site was both crewed and deployed with an acoustic recorder as this site is difficult to access. The use of a recorder alongside volunteers is viewed as a way to future proof the data collection at this site. Department of Conservation AR4 acoustic recorders were used on automated recorder sites. Recorders were installed on trees at shoulder height directed away from potential background sound disruptions such as roads and vehicles. Recorders were programmed following DOC Kiwi Best Practise Guidelines, recording on the low setting for the duration of the survey. The low setting was used to capture the low sound frequency of kiwi calls (DOC, n.d.).

2.6 Data Processing

Automated acoustic recorder data was analysed using Raven Lite software. It is important to define the differences between the two data collection methods, AAR and human ear auditory perception. Unlike the human ear, AAR data is non-directional and cannot provide distance or direction. A study by Castro et al. (2019) indicated that AAR data will detect about 80% of a good human ear. Call rates were calculated by mean total calls per hour, and the ratio of female to male calls.

3. Results

3.1 Kiwi Calls Across Sites

Of the 44 survey sites, 27 recorded kiwi calls, 15 recorded zero calls and at two sites no survey was completed (see table 2 below). Four survey sites (HAU062, HAU071, HAU206 and HAU281) did not complete the full 480 minutes of listening time. Sites HAU163 and HAU081 had considerably higher mean calls per hour than every other site, with 14.38 and 10.00 respectively. Four sites (HAU291, HAU311, HAU312, HAU313) were chosen because they are in areas not actively ground managed for predator control. These four sites reported zero kiwi calls. The mean calls per hour across all 42 sites with data was 1.62.

Table 2: Call rate results are displayed by geographical cluster.

Northern

Site	Total Calls	Mean calls per hour
HAU011 Stony Bay Road	9	1.32
HAU021 Port Charles	19	2.38
HAU031 Tukituki	9	1.16
HAU041 Adam's Place	14	1.75
HAU051 McMillan	10	1.25
HAU052 Waitete	1	0.13
HAU061 Driving Creek	11	1.38
HAU062 Kennedy Bay*	3	1.33
HAU063 Flays Road	6	0.63
HAU071 Matarangi Bluff*	26	3.47
HAU072 Mana Manu	Automated Recorder Failure	
HAU081 Rimu Tree	80	10.00
HAU101 Whangapoua Forest	8	1.00
HAU111 Ngāti Hei Hukarahi	No Survey Conducted	

Southern

Site	Total Calls	Mean calls per hour
HAU291 Wires Track	0	0.00
HAU301 Waikaukau	0	0.00
HAU311 Maratoto Northwest	0	0.00
HAU312 Komata	0	0.00
HAU313 Golden Cross	0	0.00
HAU321 Mataora Bay	0	0.00

Table 2 (cont.)

Eastern

Site	Total Calls	Mean calls per hour
HAU152 Grange Road North	7	0.88
HAU153 Red Hill	8	1.00
HAU161 Te Puia	41	5.13
HAU162 Hinds Farm	44	5.87
HAU163 Tirohanga	115	14.38
HAU191 Kapowai	30	3.75
HAU202 Mangaiti Farm	0	0.00
HAU204 Red Bridge Pines	0	0.00
HAU205 Tairua North	11	1.38
HAU206 Silverstream*	10	2.50
HAU203 Te Karo	0	0.00
HAU241 Pauanui Lakes	6	0.75
HAU242 Red Bridge Lookout	0	0.00
HAU281 Ōpoutere*	11	2.75

Western

Site	Total Calls	Mean calls per hour
HAU081A Te Kouma Farm	0	0.00
HAU091 Kahurangi Block	1	0.13
HAU121 Mana Retreat	0	0.00
HAU131 Mahakirau	7	0.88
HAU141 Wairua Lodge	0	0.00
HAU171 Square Kauri	24	3.00
HAU181 East T-C Road	6	0.63
HAU211 Waiomu/Te Puru	0	0.00
HAU212 Ngarimu Bay	0	0.00
HAU251 Tararu	0	0.00
HAU261 Kauaeranga Valley	0	0.00

*Sites with less than 480 minutes listening time.

Figure 5: Mean calls per hour grouped by cluster.

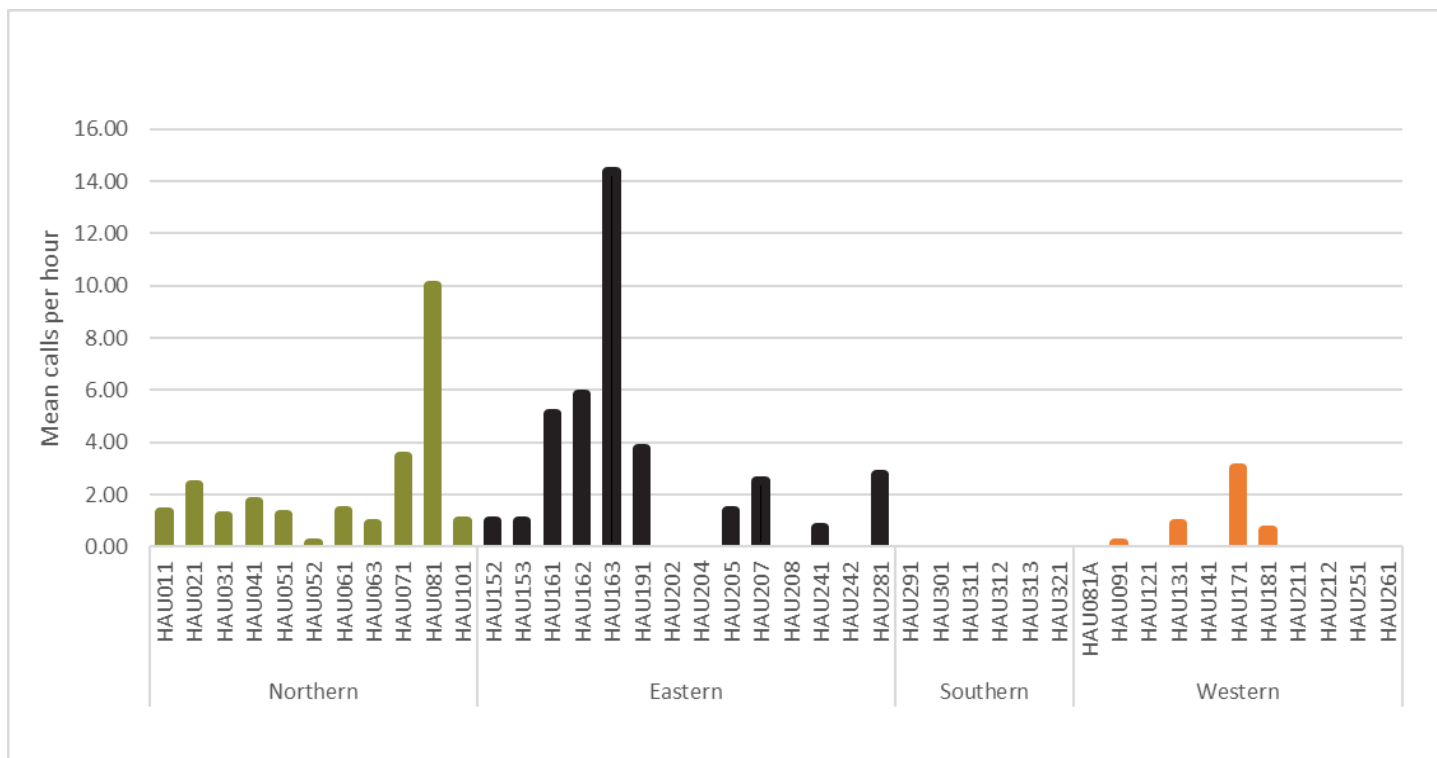
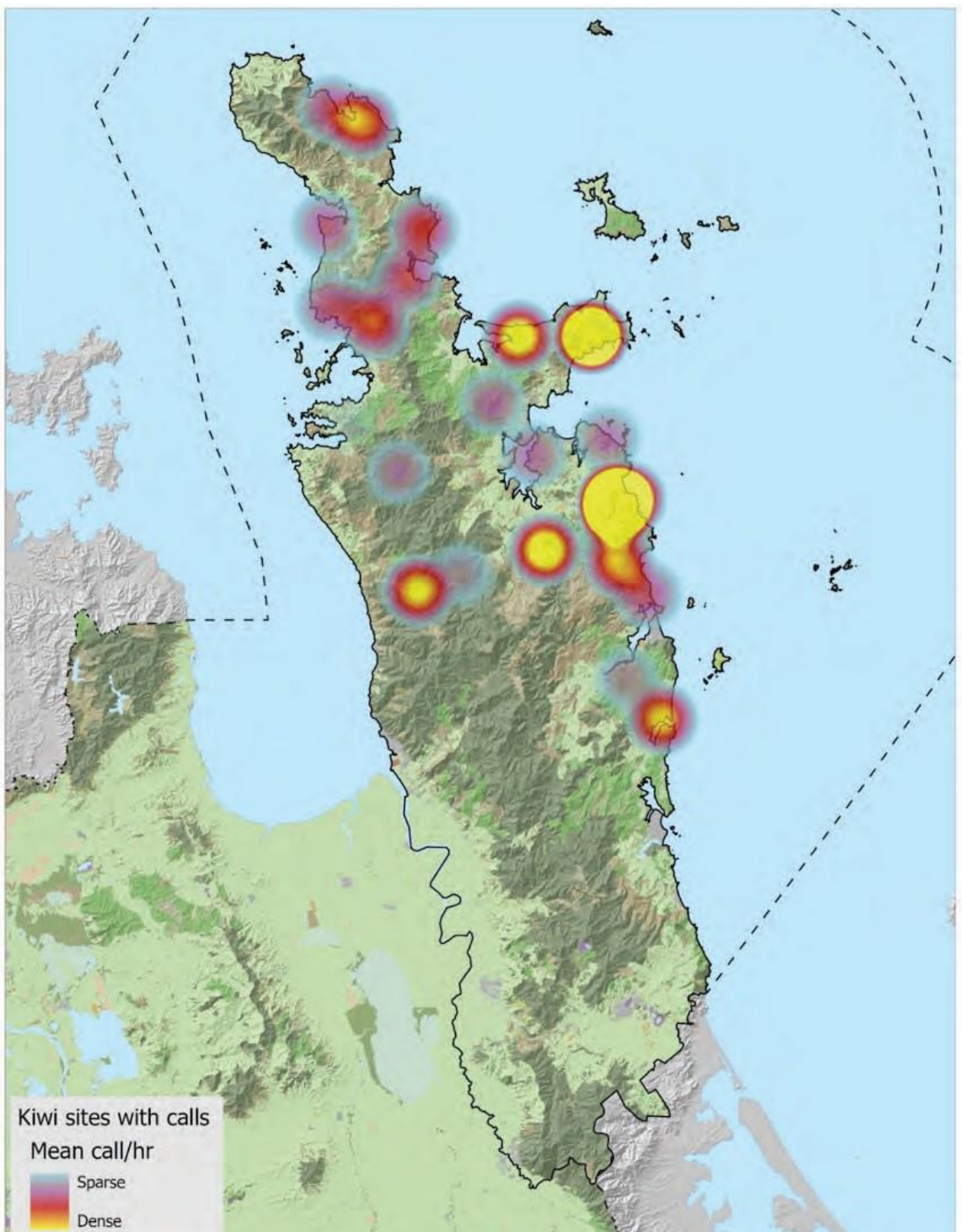


Figure 5 illustrates call rates per hour by geographical cluster. The highest number of calls were recorded at sites located in the Northern and Eastern regions. Several sites in the Western region also reported calls, while no calls were recorded at any of the Southern sites.

3.2 Kiwi Density Across Sites

The heat map shows the distribution of kiwi calls across the peninsula (Figure 6). The east coast has the most hot-spots and there are few in the south of the peninsula with the exception of an unexpected hot spot in Ōpoutere, south of the Kopu-Hikuai Road.

Figure 6: Map of Kiwi Call Density across sites with calls.



Map credit: Craig Biggs, Waikato Regional Council

Note: Due to the nature of this survey targeting unknown 'kiwi hotspots,' while deliberately excluding well-established kiwi areas within organised kiwi care groups, it should be noted that the map presented does not provide a comprehensive depiction of the entire kiwi population within Hauraki-Coromandel. Appendix F contains a table presenting the annual average call counts recorded by kiwi care groups Kapowai Kiwi Group, Mahakirau Forest Estate, Moehau Environment Group, Project Kiwi Trust, Thames Coast Kiwi Care, and Whenuakite Kiwi Care. The provided call count rates originate from the respective kiwi care groups, and as such, they are not affiliated with the PPHCCT Region-wide survey dataset.

3.3 Male and Female Call Ratios

At all but two sites that recorded kiwi calls there were more male calls than female calls (Figure 7). The other two sites, HAU051 and HAU205, had more female calls and equal female to male calls respectively. The sites that had the highest number of female calls also had the highest number of male calls. Of all the calls heard from all the sites, approximately one quarter were female, and three quarters were male (Figure 8).

Figure 7: The total number of female and male calls over the survey period for each of the sites where a call was recorded.

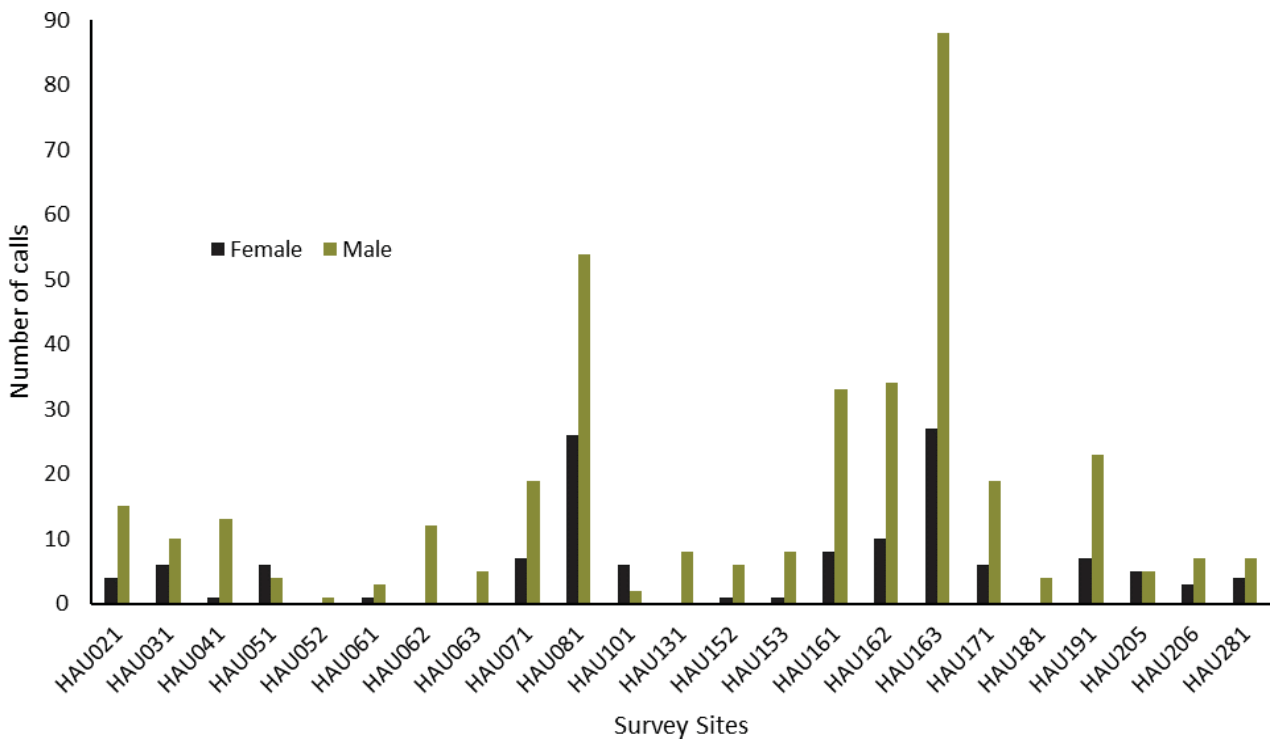
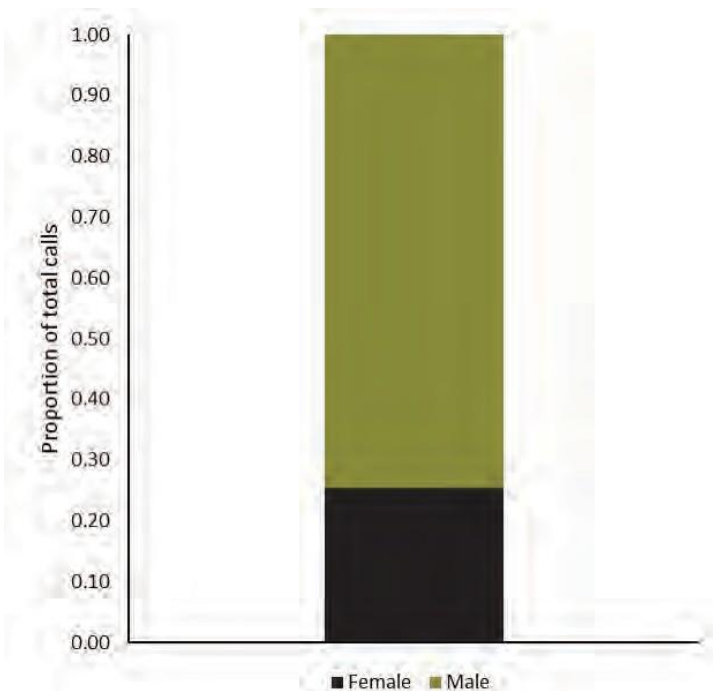


Figure 8: The combined ratio of female to male calls from all sites over the survey period.



4. Discussion

The PFHCCT Region-wide Kiwi Call Survey provides insights into kiwi distribution on the Coromandel Peninsula. The survey spans the accepted historical distribution of CBK and encompasses a diverse geographical landscape comprising a mix of sites with varying habitat types and environments. These sites include both those under active kiwi management and those without. By capturing data across this broad range of locations, the survey aims to provide an understanding of kiwi distribution on the peninsula. A total of 44 listening sites were established unevenly across the peninsula spanning from Moehau in the north to Maratoto in south, with a bias towards coastal locations. This is due to the higher number of conservation groups along the central Coromandel east coast. Lack of easy access and volunteer availability hindered listening site establishment in inland areas, especially south of the Tapu-Coroglen Road.

4.1 Kiwi Call Rates

Of the 42 sites, 16 did not record any kiwi calls and many recorded very low call rates. This was an expected result as the survey was designed to target areas that had few or no kiwi present to provide useful data for establishing a baseline and providing areas to measure future population expansion. This was especially important in areas that were on the fringes of the Kiwi i te Kāinga groups that are primarily focused on kiwi protection, such as Kapowai Kiwi Group, Mahakirau Forest Estate, Moehau Environment Group, Project Kiwi Trust, Thames Coast Kiwi Care, and the Whenuakite Kiwi Care. Although many of these sites had low calls rates, this does not necessarily indicate low kiwi numbers under the protection of these groups due to the site selection requirements of this survey. It does, however, provide us with a baseline to measure whether some kiwi populations inside the areas managed by these groups start to reach carrying capacity and spill over into areas such as those where these survey sites are located. An increase in kiwi call rates in future years would inform if this is occurring. The majority of calls were heard within the Northern and Eastern clusters, along with several calls in the Western cluster. As it happens these three clusters are where the intensive community-led kiwi care groups are situated.

An interesting find in this survey was the kiwi calls heard in Ōpoutere (HAU281, 2.75 calls/hr) — none of the Kiwi i te Kāinga projects are in range of this area, and it is the most southern listening site where kiwi were recorded. This is significant as the 2015 study by Friis recorded no kiwi calls south of the Kopu-Hikuai Road. The south-east region was historically inhabited by a substantial population of CBK, with their range extending as far as Waihi (Marsh, 1993). The findings of this survey suggest kiwi are once again returning to this region following their recorded disappearance in 2015. Future surveys will be interesting to see if further kiwi calls are recorded at the Ōpoutere site.

The growth of kiwi populations outside of established conservation areas is dependent on the survival and immigration of chicks and subadults. As managed areas reach carrying capacity, this is likely to occur more frequently (Robertson, 2024). This survey suggests evidence of this at two sites (HAU161: 1.38 calls/hr, HAU163:

14.38 calls/hr) adjacent to Whenuakite Kiwi Care, and one site (HAU71: 3.47 calls/hr) adjacent to the Project Kiwi Trust. Robertson (2004) suggests long term population growth will depend on increasing areas under management so that travel paths for kiwi chicks and sub-adults become safer and new habitat options become available.

The southern clustered sites recorded no kiwi calls. These sites are on land with limited to no predator control. It will be interesting to monitor over the next few years to see if this changes with any expansion of the predator control in surrounding areas.

4.2 Kiwi Sex Ratios

There were considerably more male calls counted during the survey than female calls; for every female call there were approximately three male calls. This was expected as males call more frequently than females (Colbourne & Digby 2016). Estimating the number of individual females in an area by their calls is not as reliable as it is for males (Colbourne & Digby 2016), therefore these results do not signify that for every female kiwi on the peninsula there are three males. Rather, despite the bias toward male calls, we can expect the ratio of female kiwi to male kiwi to be more even as it generally is in most wild kiwi populations (Robertson 2004).

4.3 Limitations

Over 100 volunteers participated in this survey, and every effort was made to ensure that the data recorded were accurate through kiwi call training and crewing each listening site with at least two people. However, it is possible that some calls recorded as kiwi may have been a different species, such as a ruru (*Ninox novaeseelandiae*), and some kiwi calls may have been missed. Overall, the survey would not have been possible without these volunteers and the data that they gathered for the purpose of this Region-wide survey is extremely valuable.

As a result of weather and volunteer availability constraints, four survey sites were unable to complete the full 480-minute survey period. Consequently, the call rates for these sites were calculated differently from those of the other sites, with their mean calls not being based on the standard 480-minute survey duration. Therefore, it is advised to exercise caution when interpreting the mean call rates of these sites.

As with any survey relying on multiple people in an outdoor environment, there were a range of factors that limited optimal listening at sites. While volunteers were asked to conduct surveys on nights that were fine to avoid the sound of rain or wind, in some cases this was unavoidable and additionally, some volunteers reported that their sites were close to roads or townships which made it difficult to hear. In planning for future surveys, extending the listening window and allowing for more flexibility could increase optimal listening conditions, enhancing the accuracy of data collection. Survey sites HAU071 and HAU11 did not obtain data during this survey due to technical issues with the acoustic recorders or volunteers not being available.



5. Recommendations

This Region-wide Kiwi Call Survey was the first of a three-year survey. The data collected is to establish a baseline for future surveys. It is critical that kiwi call data is as accurate as possible to ensure trends reflect the CBK population as accurately as possible. We have the below recommendations for the next survey:

- The survey will be repeated with a minimum of all listening sites from year one, and we will strive for consistency in volunteers stationed at each site, meaning the same listener/listeners will be stationed at each site, each night, over consecutive survey years.
- The year two survey will aim to have listening sites in quadrants that were not monitored in the baseline survey, meaning all 33 quadrants are actively monitored.
- Prior to the year two survey, the participants from the year one survey are to be contacted for feedback and suggestions on the survey operations.
- Wherever possible, each survey site needs to be crewed over four nights.
- An in-field simulation survey training evening to be incorporated into a training and refresher course for volunteers. Field training will include not only simulations of kiwi calls but also calls commonly mistaken as kiwi, navigation and compass training, and data recording processes.



6. Conclusion

The purpose of this survey, the first year of a three-year study, was to establish a baseline of Coromandel Brown Kiwi populations throughout the region. The foundational data will serve as a basis for comparing and interpreting information gathered in the subsequent two years of the study and any monitoring thereafter. The survey was designed to cover a widespread range of listening sites over the Coromandel Peninsula including managed and unmanaged landscapes to examine CBK populations at a region-wide level.

A strong relationship between conservation areas and kiwi calls has been observed. This survey has found that generally, kiwi-focused conservation groups had the highest kiwi call counts including Kapowai Kiwi Group, Moehau Environment Group, Project Kiwi Trust, Thames Coast Kiwi Care and the Whenuakite Kiwi Care. Future surveys will hopefully be able to show us population growth as kiwi conservation efforts increase throughout the region.

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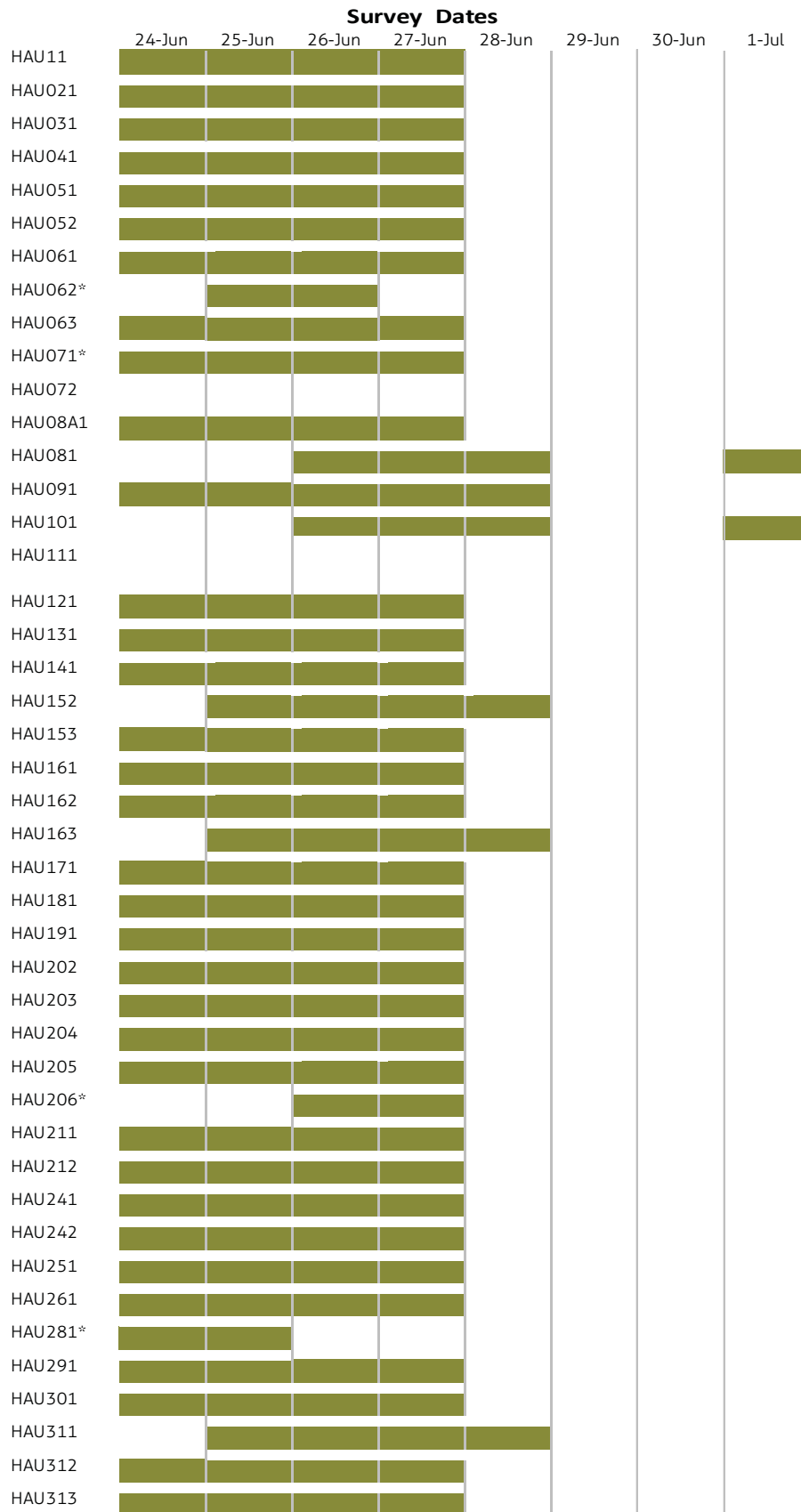
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Appendix B: Table of listening site identifications and descriptions

SITE ID	Site Description	Area	Contact	Acoustic Recorder
HAU11	Taylors Creek	Stony Bay Road	Moehau Environment Group	✓
HAU021	Ash'n'Asley's (Port Charles East)	Port Charles	Moehau Environment Group	
HAU031	Tukituki	Colville	Moehau Environment Group	
HAU041	Adam's Place	Tuateawa	Habitat Tuateawa	
HAU051	McMillan's	Koputauaki North	Moehau Environment Group	
HAU052	MJ's	Waitete	Moehau Environment Group	
HAU061	Driving Creek	Coromandel	Driving Creek Conservation Park	
HAU062	Kennedy Bay	Kennedy Bay	Ngāti Porou	
HAU063	Flays Road	Coromandel	Moehau Environment Group	
HAU071	Matarangi Bluff	Matarangi	Rings Beach Wetland Group	
HAU072	Whangapoua	Whangapoua	Manu Manu	✓
HAU08A1	Te Kouma Farm	Te Kouma	Driving Creek Conservation Park	
HAU081	Rimu Tree	Waitaia	Project Kiwi	
HAU091	Kahurangi Block (Manaia Hill-Gary')	Te Kouma East	Moehau Environment Group	
HAU101	SFNZ - Site One	Whangapoua Forest	Project Kiwi	
HAU121	Mana Retreat	Kereta Hill	Mana Retreat	
HAU131	Mahakirau Forest Estate	Mahakirau Forest Estate	Mahakirau Forest Estate	
HAU141	Wairua Lodge	Mahakirau Forest Estate	Mahakirau Forest Estate	✓
HAU152	Grange Road North	Hahei	Purangi Conservation Trust	
HAU153	Red Hill	Cooks Beach	Purangi Conservation Trust	
HAU161	Te Pauia Hot Water Beach	Hot Water Beach	Hot Water Beach Reserve Management Group	
HAU162	Hinds Farm	Whenuakite North	Whenuakite Kiwi Care	
HAU163	Tirohanga (Jacob's Rock)	Hot Water Beach		
HAU171	Square Kauri	Tapu- Coroglen Road	Thames Coast Kiwi Care	
HAU181	Tapu- Coroglen Road (Central)	Tapu- Coroglen Road	Thames Coast Kiwi Care	
HAU191	Kapowai	Kapowai	Kapowai Kiwi Group	✓
HAU202	Mangaiti Farm	Whenuakite SW	Whenuakite Kiwi Care	
HAU203	Te Karo Beach Sailors Grave	Te Karo	Whenuakite Kiwi Care	
HAU204	Pine Tree - Red Bridge Walk	Tairua	Pest Free Tairua	
HAU205	Patricks Drive- Tairua North	Tairua	Pest Free Tairua	
HAU206	Silverstream	Whenuakite West	Whenuakite Kiwi Care	
HAU211	Waiomu Te Puru (Sanford)	Waiomu Te Puru	Otohi Stream Predator Control	
HAU212	Ngarimu Bay	Ngarimu Bay	Otohi Stream Predator Control	
HAU241	Duck Creek, Pauanui Lakes Resort	Pauanui	Pauanui Lakes Resort	
HAU242	Lookout- Redbridge Walk	Tairua	Pest Free Tairua	
HAU251	Tararu	Tararu	Tararu Backyard Trappers	
HAU261	Kauaeranga Valley	Kauaeranga	DOC Thames, Mailee Stanbury	✓
HAU281	Maungaruawahine Track	Ōpoutere	Ōpoutere Resident & Rate Payer Association	
HAU291	Wires Track (PCL)	Maratoto	Maratoto Group	
HAU301	Waikaukau	Whangamatā	Whangamatā Harbour Care	
HAU311	Maratoto NW- Crissy	Maratoto	Maratoto Group	
HAU312	Maratoto S - Craig	Maratoto	Maratoto Group	✓
HAU313	Maratoto East- Tim - Whakamoehau Creek	Maratoto	Maratoto Group	✓
HAU321	Maratoto	Maratoto	Ngāti Porou	✓

Appendix C: Timeline of Listening Sites



* Sites that did not complete the full 480 minutes.

Appendix E: Survey Manual for Participants

Kiwi i te Kāinga
Regionwide Kiwi Call Count Survey 2022

The survey starts tonight, **FRIDAY 24 JUNE 2022**
@ 6pm Takes place over 4 nights 120 minutes each night

Dates: 24 – 25 – 26 – 27 June 2022 (rolling over to the following night if weather conditions don't allow you to hear calls). Listening for 8 hours in total over 4 nights, commencing at 6pm each night, is required.

Guidelines
What you will need
Torch (fully charged/ spare batteries; spare torch) - with red light function is preferable
Watch /Phone (fully charged, especially if it is your timekeeper)
Compass / GPS (set to True North) *
Data Sheets
Pencil/ Pen
Warm Clothes
Rain Jacket

Communication
How: WhatsApp, text. Who: Site Host to Project Co-Ordinator

Each night
Site Hosts: Please send a message on WhatsApp when you are going **IN/** are back **OUT**
EXAMPLE for HAU021 "HAU021 IN" | Back home "HAU021 OUT"
If the weather conditions (strong wind/ heavy rain) won't allow you to HEAR calls, message **CANCEL**. (Example for Site HAU021) "HAU021 CANCEL"
After your listen: Please send through a **picture of both sides of your data sheet after each survey night** by WhatsApp or email (not as picture on a text message, my mobile phone does not cope with this). Note the survey date on front **AND** back of the data sheet.
Site Host: Please ensure **all** of your listening party arrive back home safely.

Before you are heading to your site

- Synchronize your phones & watches (www.timeanddate.com) using your closest location
- Review the survey methods
- Familiarize the data record sheets
- Know how to read and record compass bearings
- Listen to kiwi call recordings (male/female North Island Brown Kiwi) and calls of animals which could be confused with kiwi calls (ruru, possum, pukeko, etc)
- Know your unique site code for communication (HAU-)

• On your first night please be at your site before dark so you can familiarise yourself with your surroundings. This is important for gauging distances. A spur or ridge close by might make a call sound further away than it is. Calls might come from lower (valley below) or higher (hillside) than your listening site.

• You could take a panoramic picture starting North if you have a clear view or refer to Google maps or Google Earth (3D!) to find your bearings and identify distances to topographic features (ridges, streams, etc) around you.

Health & Safety

- Inform somebody outside your kiwi listen party, where you are going and when you are expected to be back. Make sure they know the area and how you will walk in/out. Let them know when you are safely back home. Have systems in place, that if you are not reporting to them by an arranged time, a "search" for you can be initiated.

Getting to your site
Identify hazards on your way in, so you are better prepared for your way out in the dark. communicate them with other survey participants.
Arrive early enough, unpack and be ready for a 6pm sharp start.

On site

- Please make sure your blue site tag is securely installed and the HAU- site code is showing (NOT the generic tag side with 125 on it). Please take a picture of the site tag with some of its surroundings. This will be filed with your count data for each individual site.
- Mark True North with a stick on the ground.
- Familiarise yourself with the landscape around you.
- Turn your phone to silent. Don't take any calls during the survey.

Data record sheet
Work your way through the data sheet – some explanations below

Front

- Card No (1 = 1st night, 2 = 2nd night etc), Date, Site Code, Location (something other people can relate to).
- Circle up to three major habitat types you are listening into.
- Wind direction: arrow from à to.
- The "Number of Kiwi Calls" is the total of calls as per records on the back of the sheet.
- The number of individuals heard is your best guestimate by direction and distance of the calls you have heard. If you heard 3 individuals during the first hour (3), you might have heard either the same three in the second hour (3) or more (5). Note individual females and males
- Minutes listened should be 120 minutes total

Although the Start and Finish Time recorded on the back could indicate that you were longer on site, meaning weather conditions might have interrupted your ability to HEAR calls. E.g., start 18:00h / Finish 20:15h. I then would expect a note like strong wind – survey paused.

If heavy rain or strong winds are coming up towards the very end of your two hours listening, please note if you are finishing early. Then record the actual minutes listened: e.g., finish 19:50h – Minutes Listened: 110.

- A minimum of 7.5 hours listened (with a chance to hear calls due to good conditions) over 4 nights is requested by the Kiwi Recovery Group aligning with the Kiwi Best Practice Manual.

Back
Sex (M – Male / F – Female)
Direction: Bearing in degrees – N = 360 E = 90 S = 180 W = 270 and all in between.
Use True North (record with notes on the front if not True North/ what device used for Northing)

- Have everything you need unpacked before you start at 6pm to avoid noise interference later (clothing, food, equipment).
- Fill the data sheet before you are starting with site code, location name, site host (the person who communicates with me), other site volunteers' names, habitat type, conditions
- Make a note of the weather conditions after an hour into the survey – make a note about any significant changes that may occur during the listening period

Kiwi Listen

- Listen from the same spot for every call across every night.
- Stand during the survey time, this gives you the best chance to adjust your head quickly to an incoming kiwi call. This is especially crucial at sites with a wide coverage.
- Avoid making unnecessary noises. Please listen in silence. Don't mimic or play kiwi calls. Communicate in a whisper tone. After a call, wait for a few seconds, if another bird is responding.
- Please listen in the dark if you are comfortable doing so. With a torch on you might deter a kiwi coming close. Turn the torch on once a call has finished and write down the details.
- Start to listen at 6pm. Do not start packing up before 8pm.

Recording calls

- When you hear a call, check the time.
- Use your arm to point into the direction of the call. Adjust if necessary.
- Gauge the distance of the bird as near | medium | far.
- Wait some seconds to make sure you don't miss a responding call.
- Record the time, sex, direction, and distance.
- One call per line. If a male and female in one area call alternating without an obvious break count one male / one female call. With a distinct break in calling (couple of minutes) they are two calls etc...
- If birds are duetting (male and female calling close together or overlapping calls) mark them with a bracket at the end of the lines.

Kiwi Calls or Kiwi close encounters before 6pm or after 120 minutes:

Please note any kiwi calls or kiwi close encounters on your data sheet just outside of your 120 minutes listened (on your way in or out) clearly on the data sheet. Yes, we would like to know about them.

Appendix F: Independent Kiwi Monitoring-Based Call Count Rates of Kiwi Care Groups

Kiwi Care Group	Monitoring Year	Mean Calls per Hour
Kapowai Kiwi Group	2022	1.73
Mahakirau Forest Estate	2022	0.50
Moehau Environment Group	2022	3.87
Project Kiwi Trust	2022	3.98
Thames Coast Kiwi Care	2022	0.64
Whenuakite Kiwi Care	2021	3.80