2019

Call count monitoring of Northland brown kiwi 2018

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Te Papa Atawhai

New Zealand Government

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1. Introduction

1.1 Objective

The objective of this report is to provide a summary of the 2018 results for Northland brown kiwi (*Apteryx mantelli*) call count monitoring, and to provide recommendations for future monitoring.

1.2 Background

Northland populations of kiwi had declined mainly due to predation by stoats (*Mustela erminea*), ferrets (*M. furo*), dogs (*Canis familiaris*) and cats (*Felis catus*), along with increasing land development pressures throughout the region (Pierce et al. 2006). In the early 1990s, a network of kiwi call count listening stations was established nationally to determine trends (stable, increasing or decreasing) in kiwi populations over time (McLennan 1992). In 1993, 24 stations were established in four geographic areas in Northland (Northern, Eastern, Southern, Western) where kiwi were known to be present, with kiwi call count monitoring carried out annually since 1995. Call count surveys are one of the main tools used for assessing trends in kiwi populations and are used in Northland to:

- Monitor the trends in call counts (and hence population size) over time at the 24 original (1993) listening stations in the four geographic areas (Northern, Eastern, Western, Southern).
- Monitor the trends in kiwi populations at the growing number of kiwi management areas throughout Northland.

1.3 Northland listening sites

The 24 original kiwi listening stations that were established in 1993 at the four geographic areas (Pierce & Westbrooke 2003) are mapped in Figure 1 and listed in Table 1. In the Northern cluster six stations were established either in or on the edge of extensive forest in the Herekino-Raetea-Puketi Forests area. In the Eastern cluster six stations were established in forest remnants and extensive exotic forestry in the Bay of Islands area spanning Purerua Peninsula-Waitangi-Russell Peninsula. In the Western cluster five stations are in extensive forest (two in Waipoua) or forest remnants (Kaitui, Trounson and Paerata). The Southern cluster comprises seven stations within 30 km of Whangarei, all northwest to northeast of the city and involving forest remnants, including two that also include exotic forests (Glenbervie 7A & 9A). Over the years since 1993 many additional listening stations have been added, predominantly in areas where community groups are working to protect kiwi. The extensive involvement of local communities in the protection of kiwi and the associated expansion of the number of kiwi listening stations provides strong information on the current distribution and density of Northland brown kiwi throughout

its range. (Fig. 1). Populations now extend across both public and private land in Northland, from Whakaangi in the Far North to Ponui Island in the south
(Fig. 1).

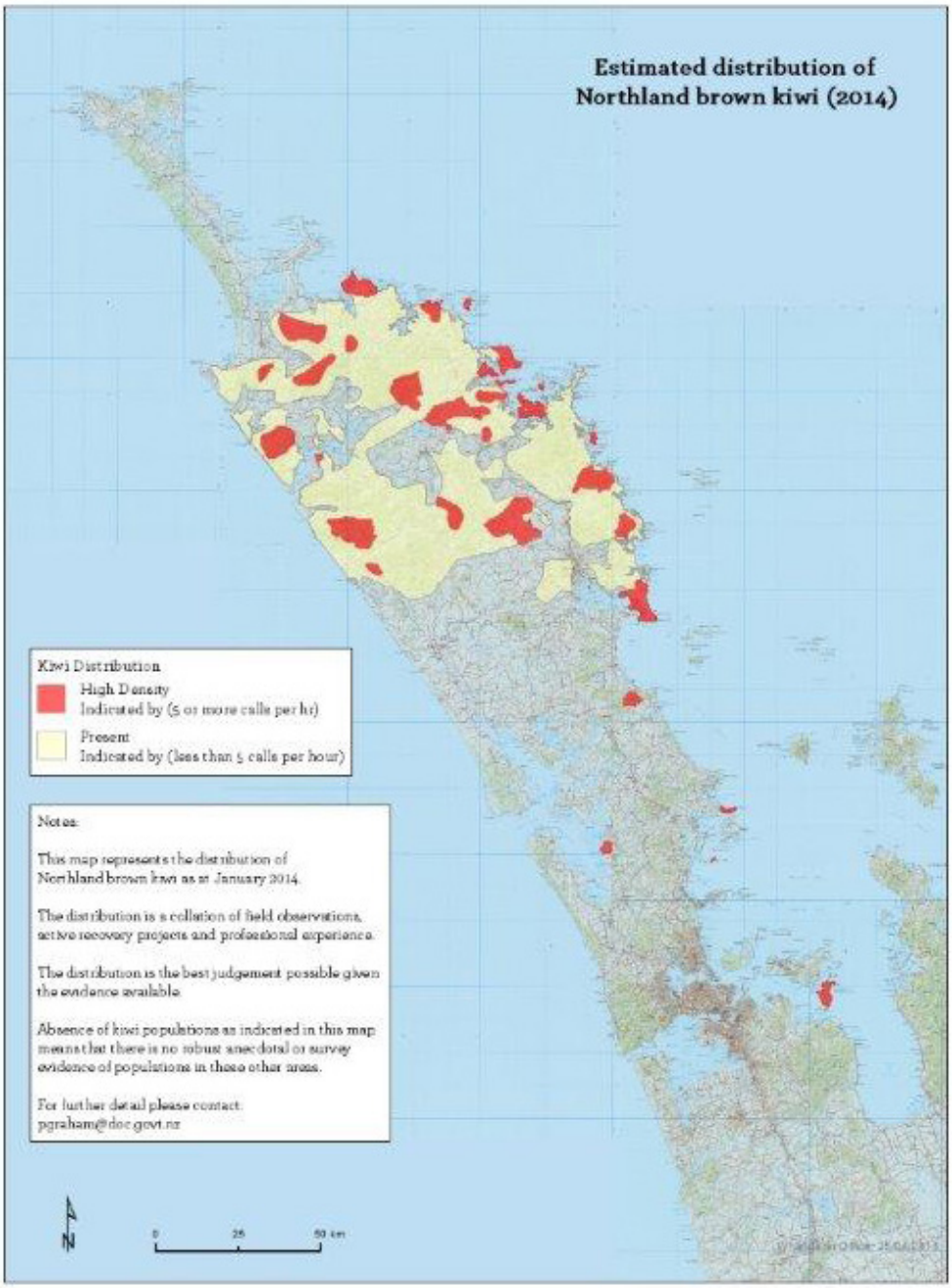

Figure 1. Northland kiwi distribution and relative abundance as known in 2018.

Table 1. The original Northland kiwi listening stations, grouped by geographic area with corresponding station numbers.

NORTHERN	EASTERN	WESTERN	SOUTHERN
1 Diggers Valley	10 Marsden Cross	16 Kaitui	21 Glenbervie 7A
2 Takahue	11 Puketotara	17 Trounson	22 Glenbervie 9A
4 Gartons	12 Rangitane	18 Cathedral	23 Marlow Road
5 Kaiaka	13 Waitangi No 12	19 Waipoua L/Out	24 Purua N
7 Puketi Forest	14 Mt Bledisloe	20 Paerata	25 Rarewarewa S
8 Puketi Scenic Reserve	15 Tikitikiore		26 Mimiwhangata
			27 Sandy Bay

2. Methods

The 2018 Northland brown kiwi call count survey followed the recommendations made by Robertson & Colbourne in the Kiwi Best Practice Manual (2003 and 2017; the relevant instructions from the latter are included in Appendix 1) and aligns with the findings of Colbourne & Digby (2016). Kiwi calls were listened for and counted during the first 2 hours of darkness, and during the dark phase of the moon, for 4 nights per station (n = 8 hours). Wherever possible quiet conditions were favoured, with little or no wind, rain, or background noise.

Kiwi listening was carried out from 2 June to 20 June 2018, with a back-up window from 1 July to 20 July 2018.

2.1 2018 kiwi listening data

kiwi listening data for 2018 were received from the following management areas:

- Mangatete
- Honeymoon Valley
- Whaakangi
- Mahinepua
- Bay of Islands
- Russell
- Puketi Forest
- Waimate North
- Hupara
- Sandy Bay
- Tutukaka
- Manaia-The Nook
- Kauri Mountain
- Bream Head/Taurikura
- Motatau-Marlow
- Purua-Rarewarewa
- Waipoua-Trounson
- Tawharanui
- Marunui
- Mataia
- Tanekaha

3. General patterns

3.1 Northland monitoring trends since 1995

Trends in call count data collected since 1995 at the 24 original listening stations (see Table 1) in the Northern, Eastern, Southern and Western survey areas are graphed for comparison in Fig. 2 and the 2018 data for all Northland listening stations are presented and summarised in Appendices 2, 3 and 4.

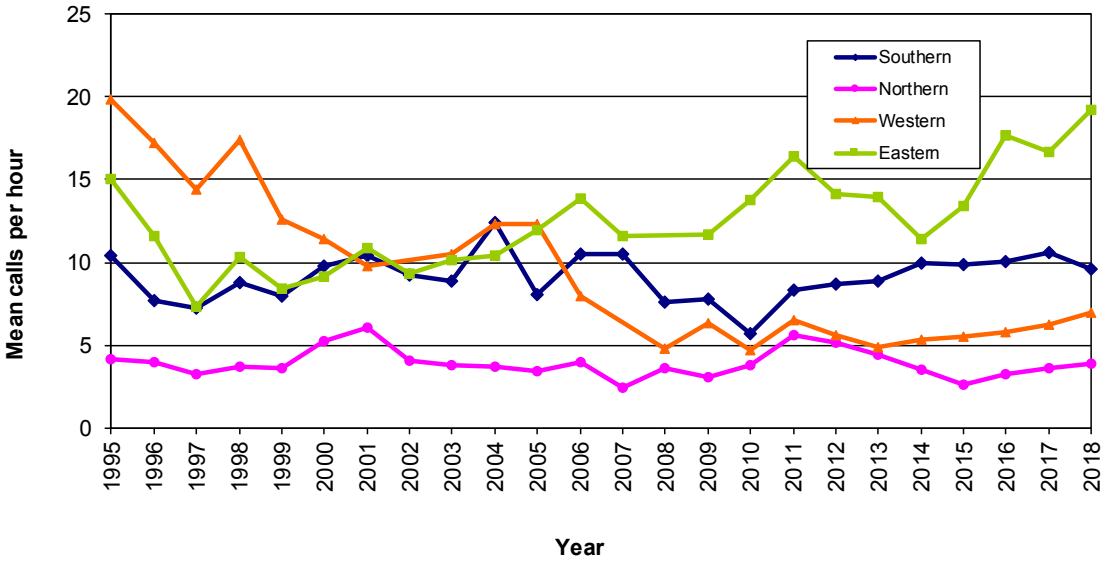

Figure 2. Mean hourly kiwi call rates for each of the original four Northland monitoring areas 1995–2018. The mean for the Northern cluster was estimated using the 2017 data for one station (Diggers), the 2016 data for two stations (Takahue and Gartons) and the 2015 data for one station (Kaiaka). The mean for the Western cluster was estimated using the 2014 data for one station (Paerata). The mean for the Southern cluster was estimated using an ALD for one station (Glenbervie 7A) and the 2017 data for two stations (Glenbervie 9A and Purua North).

Northern Area

The mean kiwi call rate for the Northern cluster was calculated for 2018 using data from only two stations, as data were not received for Digger's Valley (Station 1; data not received since 2017), Takahue or Gartons (stations 2 and 4 respectively; data not received from either since 2016), or Kaiaka (Station 5; data not received since 2015). The slight increase in mean call rate recorded in 2016 and 2017 has continued, with a slight increase from 3.6 calls/hr in 2017 to 3.9 in 2018 (Fig. 2). This increase was all attributed to one station, Puketi Scenic Reserve/Station 8, where the mean increased from 9 calls/hr in 2017 to 12.1 in 2018, the highest mean on record for this station. The other station that was listened from in 2018 was Puketi Forest/Station 7, where there was a decrease in the mean from 9.8 calls/hr in 2017 to 8.3 in 2018. Although a decrease was observed, the 2018 mean of 8.3 calls/hr was the second highest recorded since 2011, and the third highest ever observed for this station. An upward trend for three consecutive years is a very good sign for the Northern cluster, but it would have more validity if it had been calculated from all six listening stations.

Eastern Area

After a slight decrease in the mean kiwi call rate from 2016 to 2017, the 2018 mean of 19.2 calls/hr is a very pleasing result. The result is the highest mean call rate ever recorded for the Eastern cluster, and is the second highest recorded for all four of the original clusters since records began in 1995 (just behind the mean of 19.8 calls/hr recorded for the Western cluster in 1995; Fig. 2). All

six stations had 4 full nights of listening in 2018, and an increase in mean call rate was observed for all but one of them (Waitangi No. 12/Station 13, where the mean call rate almost halved from 11.5 in 2017 to 6 in 2018. This station has had quite variable results over the years, so hopefully this observation reflects natural fluctuation rather than a sudden population decline). Of the stations where an increase was observed, the greatest change was at Rangitane/Station 12, where the mean call rate almost doubled from 10.1 in 2017 to 18.1 in 2018 (the highest ever recorded for this station). Mean call rates at Puketotara/Station 11, Mt Bledisloe/Station 14, and Tikitikiore/Station 15 all increased by 3–4.5 calls/hr from 2017 to 2018 and Marsden Cross/Station 10 had a smaller increase from 38.8 calls/hr in 2017 to 39.6 in 2018. The 2018 result was the highest ever recorded for this station and is very impressive. The 2018 results were also the highest on record for Puketotara (equal with 2014) and the Mt Bledisloe result was the highest for the station since 2011. It is fantastic to see all the hard work that has gone into protecting kiwi in this area paying off so well with these positive kiwi call rate results.

Southern Area

After an exceptional 7 years of stable or increasing mean call rates, there was a slight downward trend for the Southern cluster in 2018 (Fig. 2). Two of the seven stations were not listened from in 2018 (Glenbervie 9A/Station 22 due to a failed ALD and Purua North/Station 24 due to listener illness). Of the five that were listened from, four recorded a decrease in the mean call rate compared with 2017. The exception was Glenbervie 7A/Station 21, where the mean call rate more than doubled from 1.9 calls/hr in 2017 to 3.9 in 2018. It is worth considering that the 2017 and 2018 data at Glenbervie 7A/Station 21 were collected via an artificial listening device (ALD), whereas prior to 2017 calls at this site were collected by a human listener. ALDs are a useful tool and certainly result in more kiwi listening data being collected overall, but the results are not directly comparable with human listeners due to the different methodology used. However, as both the 2017 and 2018 data were collected via ALD, the increase over these 2 years is likely to be accurate. Of the four stations showing a decreased call rate from 2017, the biggest difference was observed at Mimiwhangata, with a substantial drop from 14.6 calls/hr in 2017 to 9.8 in 2018, similar to the 2016 result. Both figures are within the usual range observed for this station, so may be due to a temporary decrease in call rates rather than fewer kiwi on the ground. A reasonable decrease was also observed at Marlow Road/Station 23 (from a mean of 21.1 calls/hr in 2017 to 18.4 in 2018), but again these figures are within the usual range for this station, and very similar mean call rates were also observed in 2014 and 2016. Rarewarewa South/Station 25 and Sandy Bay/Station 27 both had decreases of ≤1 call/hr in their mean rates, so very little change given that kiwi call surveys are a crude measure of general trends over time. The four stations that were listened from each had 4 full nights of listening completed.

Western Area

It is very pleasing to see that the general upward trend in mean kiwi call rates that began in 2014 has continued for the Western cluster in 2018, with a mean of 7 kiwi calls/hr heard (Fig. 2). The alarmingly dramatic decrease in call rates from 1995 to 2008 has been steadily reversing and, significantly, the mean call rate for this cluster has been greater than the 5 calls/hr threshold for 5 years now. The 2018 data were derived from four stations, with Paerata/Station 20 not being listened from since 2014. At Katui/Station 16 the mean call rate has more than tripled from 1.5 calls/hr in 2017 to 5 in 2018. This is a fantastic result for this station, and the highest record since 2004. It is a good reminder that continuing to monitor stations with very low or nil results is vital to ascertain when populations begin to recover. There was also an increase in mean call rates at Trounson/Station 17, from 11.1 in 2017 to 13.5 in 2018. The 2018 result is the highest observed since 2009. Waipoua Lookout/Station 19 decreased from a mean of 11.6 in 2017 to 9.6 in 2018. The 2018 result is in the previous range but a little on the low side for this station. It will be important to continue monitoring here to ensure the population isn't decreasing. There was little change observed for Cathedral Grove/Station 18, with a minor decrease from 6.1 calls/hr in 2017 to

6 in 2018. Of the four stations listened from in 2018, both Katui/Station 16 and Cathedral Grove/Station 18 had only 3 full nights of listening completed, and all four stations used the second listening window for at least 2 nights of listening (although these data are still comparable as they are within the May–July window as recommended by Colbourne & Digby 2016).

4. Trends at managed populations

Each year, the same selection of listening stations are used to compare call rates over time to provide population trends for management areas. Only these core stations contribute data for the mean hourly call rate calculations depicted in the bar graphs for each management area provided below. It is important that kiwi coordinators prioritise kiwi listening from the core stations each year to ensure that the most accurate depictions of population trends that are occurring in management areas are obtained. The stations that are used in this analysis are listed and data summarised in Appendix 4 for each management site and should be referred to when organising kiwi listening each year.

4.1 Summary of areas

4.1.1 Mangatete

Following a slight decrease in mean call rates observed at this area in 2017, the mean number of kiwi calls/hr has recovered to 17.6 in 2018, almost on par with the peak of 17.9 observed in 2016 (Fig. 3). Overall, the Mangatete management area has been relatively stable for the past 4 years, which is somewhat surprising given that the mean is derived from only two stations. Adding further stations is recommended for a more robust analysis. Both stations had 4 full nights of listening completed, and both recorded independent results at or very close to the overall mean (Station 3 – 17.6; Station 256 – 17.5). The mean of 17.5 kiwi calls/hr for Station 256 was the highest on record for this station to date. The result for Station 3 was similar to that observed for the previous 3 years. It is impressive so see such high call rates being maintained over time.

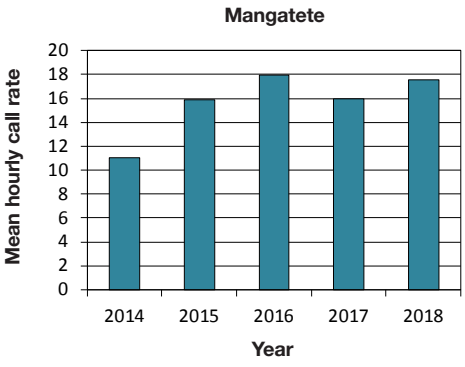

Figure 3. Trends in mean kiwi call rates (calls/hr) at Mangatete management area.

4.1.2 Honeymoon Valley

As with the previous 2 years, there were insufficient data from Honeymoon Valley to create a graph to show trends. Although data were received from three stations, one ('Toa Toa Ridge') was listened from for the first time in 2018, 3 of the 4 listening nights were outside the official kiwi listening

windows and one (Station 271) had only 1 night of listening completed. Data were received from 'NZFRT reserve, campsite' for the third year in a row, with the 2018 mean (4.4 kiwi calls/hr) being slightly lower than that observed previously (5.6 in 2016; 5.1 in 2017). It was alarming to note that the second night of listening at this station was interrupted by a hunter searching for a missing dog; if lost dogs occur regularly then they could well be one of the causes of the regular returns of very low (<1 call/hr) kiwi call rates in the wider area. Ensuring that the same stations are listened from consistently every year will enable the long-term trends at this management site to be established more readily.

4.1.3 Whakaangi

The mean call rate for the Whakaangi management area is usually calculated using the call counts from seven stations; however, only three of the core stations were listened from in 2017, each for the full 4 nights. With the exception of 2015, the mean call rate has been trending down since 2011, after being relatively stable from 2005 to 2010 (Fig. 4). The 2017 mean was 4 calls/hr, and 2018 is the second year that the mean for this area has dropped below 5 calls/hr (the first time was 2016, with a mean of 4.7 calls/hr). Three stations were listened from and the results from all three differed considerably from the previous year. The mean count from Station 135 crashed from 5.3 calls/hr in 2016 to only 0.5 in 2017, and from >20 calls/hr in the 2005–11 period. Conversely, Station 137 increased from a mean of 0.8 calls/hr in 2016 to 4.8 in 2017, with the 2017 result being near the middle of the range recorded for this station (0.8–8.4 calls/hr) since 2005. The third station (Station 136) increased from a mean of 4.5 calls/hr in 2016 to 6.8 in 2017. Although this increase should be considered desirable, it is worth noting that the 2017 mean was the second lowest ever recorded for this station. The stations that were excluded in 2017 had slightly higher mean call rates in 2016 than those used to create the mean for 2017, so the mean may be lower than if these other four stations were included. The mean kiwi call rate for individual stations in this management area has fluctuated immensely over the previous few years, so it is difficult to predict how much the exclusion of these stations will have skewed the results; but regardless, it is clear that the kiwi call rates in this area are trending down. I hope that enough is being done to protect the remaining kiwi in Whakaangi and that this alarming downward trend will cease.

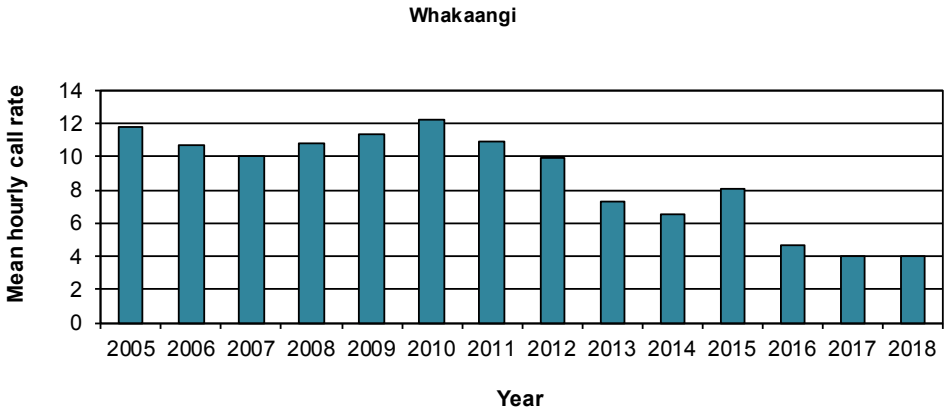

Figure 4. Trends in mean kiwi call rates (calls/hr) at Whakaangi management area.

4.1.4 Mahinepua-Radar Hill

There was a sizeable increase in the mean call rate at Mahinepua-Radar Hill, up from 7.5 calls/hr in 2017 to 11 in 2018 (Fig. 5). These data were derived from three stations (83, 84 and 85; each had 4 full nights of listening). A significant change was that Stations 88 and 99, which have been listened from consistently since 2003 and 2004 respectively, were not listened from in 2018. If there was a large change in the mean call rate combined with a change in the stations data were received from, it could generally be assumed that the observed change was likely due to the

difference in methodology (i.e. fewer stations), but in this case Stations 88 and 99 tended to have higher call rates than other stations at this management site (Station 88 had mean kiwi calls/hr >7 for 5 of the past 6 years and Station 99 had >10 calls/hr for 3 of the past 4 years, and a peak of 16 calls/hr in 2005). These previous high rates combined with the fact that the three monitored stations recorded increases in their mean call rates (Station 83 increased from 7.9 calls/hr to 8.1, the highest mean on record after the 7.9 calls/hr recorded in 2017; Station 84 increased from 6.3 calls/hr to 12.3, which is almost double the previous high of 6.8 calls/hr recorded in 2012; and Station 85 increased from 6.4 calls/hr to 12.5, which is the highest mean on record for this station, and >2 calls/hr higher than the previous peak call rate) indicates that the observed increase in mean was due to an actual increase, rather than differing methodology. Hopefully this observed peak will indicate a long-term upward trend, unlike that in 2012 which was followed by a dramatic decrease in call rates the following year.

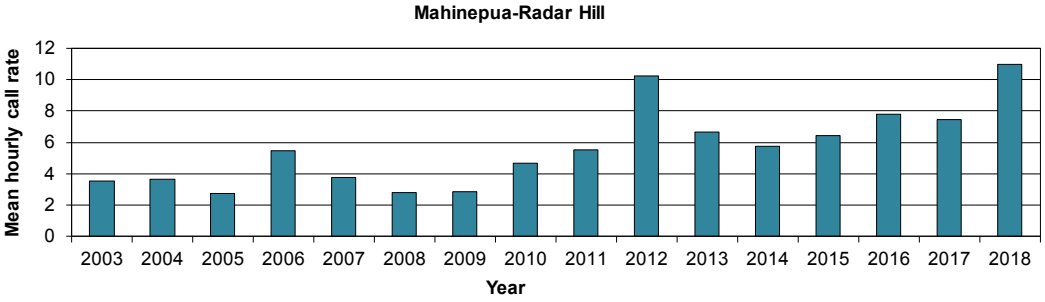

Figure 5. Trends in mean kiwi call rates (calls/hr) at Mahinepua-Radar Hill management area.

4.1.5 Russell Peninsula

Once again, kiwi listening results for the Russell Peninsula area showed a large change in mean kiwi call rates compared with the previous year. After the noticeable drop from 2016 to 2017, the mean call rate increased from 11.3 calls/hr in 2017 to 16.5 in 2018 (Fig. 6). The last peak for this management site was in 2016 when a mean of 19.7 calls/hr was recorded. However, two key stations were missing from the analysis so this observed difference may not have been accurate. In 2018 there were no data missing, with five key stations listened from, each for 4 full nights. There was no change for one station (Station 59), where the mean call rate stayed stable at 13.5 calls/hr. The four other stations all had increases in the mean call rate. The most dramatic of these was station 173, which increased nearly 10-fold from a mean of 1.3 calls/hr in 2017 to 11.1 in 2018. The highest mean previously recorded for this station was 2.5 calls/hr in 2007. Stations 62 and 170 showed a similar pattern, with the mean increasing from 11.1 and 10.4 calls/hr respectively in 2017 to 17.1 and 16.1 calls/hr respectively in 2018. The mean call rate at Station 15 also increased, from 20.4 calls/hr in 2017 to 24.6 in 2018. The 2018 result is the second highest recorded since listening began at this station in 1995. The highest was 25.5 calls/hr, recorded in 2016. It was excellent to see another peak at this management site, and even better that this time the data had more rigor.

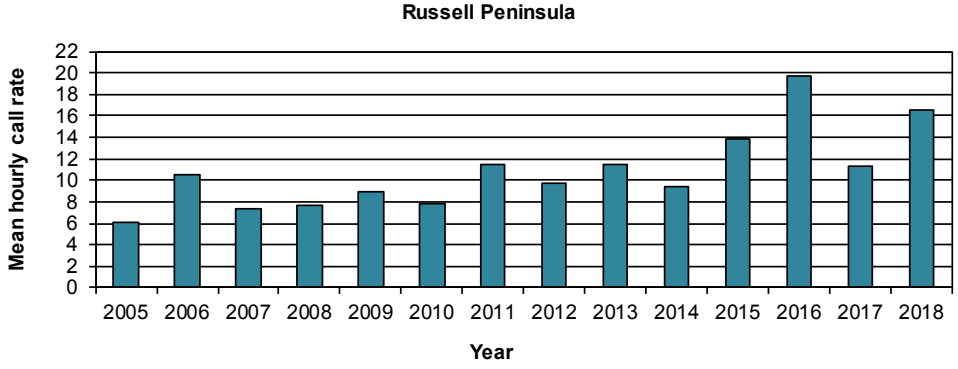

Figure 6. Trends in mean kiwi call rates (calls/hr) at Russell Peninsula management area.

4.1.6 Puketi Forest

The mean kiwi call rate at the Puketi Forest management area almost doubled from 2017 to 2018, increasing from 3.5 calls/hr in 2017 to 6 in 2018 (Fig. 7). This was the highest recorded mean for this site in over a decade of kiwi call count surveys. Four full nights of listening were completed at each of the five stations used to calculate the area mean, and for four of these the mean number of kiwi calls recorded increased from the previous year. Two of the stations (Stations 102 and 104) recorded their highest mean call rates in 2018 (Station 102 increased from 2.3 calls/hr in 2017 to 3.9 in 2018, while Station 104 more than tripled from 2.8 calls/hr in 2017 to 9.5 in 2018. The next highest mean recorded for this management site was 8 calls/hr, which was recorded in 2011). The mean call rate at Station 108 more than doubled from 2.4 calls/hr in 2017 to 6.8 in 2018, the second highest mean call rate on record after 7.1 calls/hr in 2009. Station 111 had little change, increasing slightly from 5.3 calls/hr in 2017 to 5.4 in 2018; and Station 106 decreased slightly from 4.9 calls/hr in 2017 to 4.5 in 2018. The 2018 result is still the second highest mean call rate for this station. The relatively high mean call rate in 2018 is a positive sign for this management site, especially as it is higher than the 5 calls/hr threshold. The only other year that the mean call rate for Puketi Forest was >5 calls/hr was in 2014. Hopefully the 2019 data will show a continuation of this upward trend.

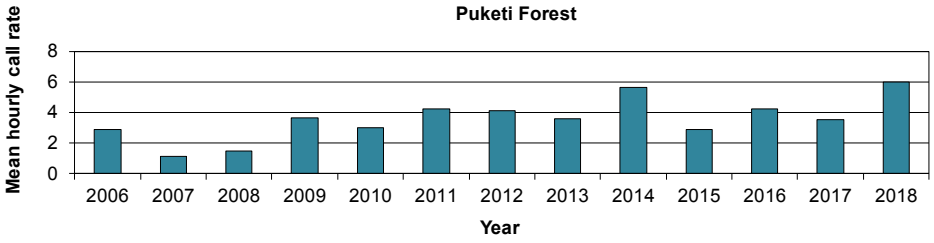

Figure 7. Trends in mean kiwi call rates (calls/hr) at Puketi Forest management area.

4.1.7 Waimate North

There was a strong request from the Waimate North kiwi listeners to include Station 113 when deriving the mean for this management area. This station has been listened from for all but 2 years since 2004 and is seen as a key station in the local area so this request was granted. It is striking how much the inclusion of this one extra station affects the overall mean kiwi call rates (Fig. 8). The mean call rate for the Waimate North management site in 2018 was 10.9 calls/hr, which is down from the 12.5 calls/hr recorded in 2017. Of the six stations listened from in 2018, the mean call rate increased for two, decreased for three, and for one (Station 122) there was no 2017 data. The 2018 mean at Station 122 was 4.4 calls/hr, which is in the normal range for this station. Station 120 had a very slight increase from a mean of 5.3 calls/hr in 2017 to 5.6 in 2018, both of which were relatively low call rates for this station. Station 118 had a larger increase in mean call rate from 10.9 calls/hr in 2017 to 15.9 in 2018. The 2018 mean at this station is the second highest recorded for the Waimate North management site, after the outlier of 22.3 calls/hr recorded in 2004. Minor decreases were observed at Station 114 (from a mean of 8.8 calls/hr in 2017 to 7.6 in 2018, which is still within the usual observed range for this station) and Station 124 (from a mean of 6.1 calls/hr in 2017 to 5.5 in 2018. The 2018 result is the lowest in 5 years, but still within the normal range for this station). A larger decrease was observed at Station 113, from 31.4 calls/hr in 2017, to 26.6 in 2018. As with Station 114, the 2018 mean is the lowest in 5 years, but within the previously observed range for this station. All six stations had 4 full nights of listening completed.

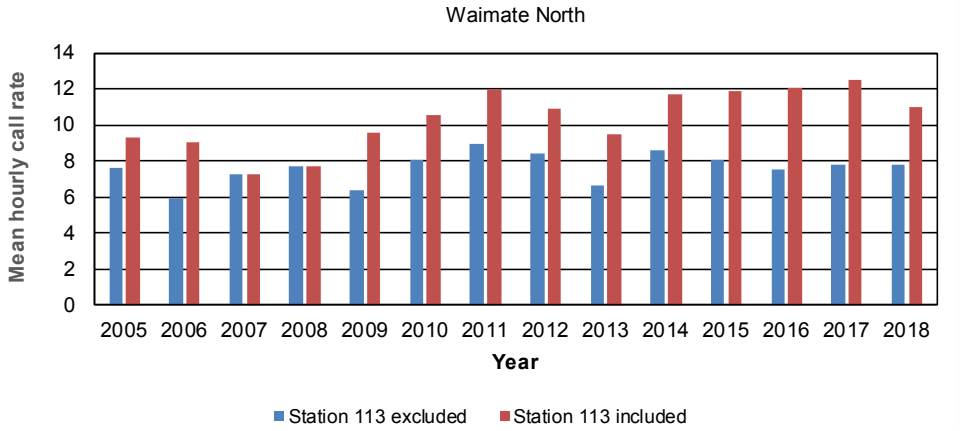

Figure 8. Trends in mean kiwi call rates (calls/hr) at Waimate North management area.

4.1.8 Hupara

The mean kiwi call rate at Hupara management area increased substantially from 16.8 calls/hr in 2017 to 22.3 in 2018 (Fig. 9). This increase also marks the highest recorded mean call rate for this site, and a bounce back to just above the previous high of 21.8 calls/hr recorded in 2016. The 2018 mean was calculated using data from two stations (Stations 257 and 258). Mean call rates at both stations increased, with Station 257 increasing from 12.1 calls/hr in 2017 to 19.9 in 2018. This was the highest mean on record for this station, and almost 3 calls/hr higher than the previously highest mean of 17.1 calls/hr recorded in 2016. Mean kiwi call rates at Station 258 also increased, from 21.4 calls/hr in 2017 to 24.8 in 2018, which was within the previously known range of mean call rates for this station. Four complete nights of kiwi listening were completed for each station; however, as both stations were monitored by the same listener the second kiwi listening window was also utilised for station 258 (for all but the first night of the kiwi listening survey). Hupara management area has consistently returned very high individual station and overall mean kiwi call rates, and it was good to see that the 2018 data were no exception. Further data were received for Hupara; however, these were recorded using ALDs, which differ in method, location, timing, length and duration of kiwi listening than the existing approach. For these reasons the extra data were not included in the 2018 analysis.

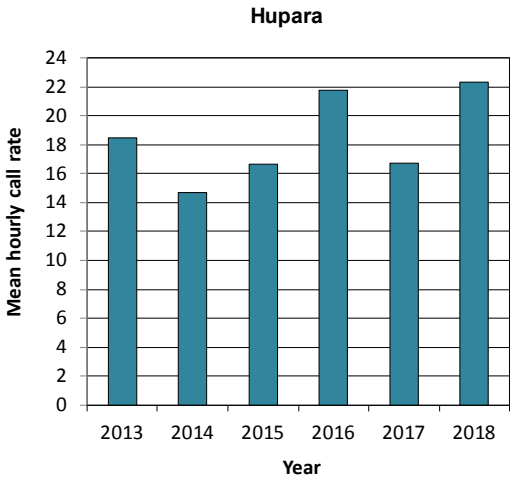

Figure 9. Trends in mean kiwi call rates (calls/hr) at Hupara management area.

4.1.9 Sandy Bay

After 2 years in a row of mean kiwi call rates greater than 5 calls/hr being recorded for the Sandy Bay management area, the rate dropped to 4.9 calls/hr in 2018. This was a reasonable decrease from the mean call rate of 7 calls/hr recorded in 2017 (Fig. 10). Most of this decrease was attributable to Station 260, where the mean call rate was 9.3 calls/hr in 2017, followed by a decrease to 3.6 in 2018. Data at Station 260 were collected using an ALD, and for 3 nights only during the kiwi listening window. Using an ALD, and for fewer listening nights than is standard, could be considered factors that would affect the outcome for this station. However, ALDs have been used at Station 260 since 2015 and the 2017 mean (3.3 calls/hr higher than the next highest mean call rate recorded for this Station) was somewhat of an anomaly and the 3.6 calls/hr observed in 2018 was on the low side but within the normal range previously observed for this station. Additionally, completing kiwi listening for only 3 nights rather than the requisite 4 is not uncommon, and although not ideal it has been accepted as comparable data numerous times previously. These factors suggest that methodology alone probably can't explain the variation observed at this station. The two other stations also both had a decrease in the mean call rate from 2017 to 2018, although minor by comparison. Station 27 had a decrease from 6.25 to 6 calls/hr, which is still quite high for this station and Station 261 had a decrease from 5.5 to 4.8 calls/hr, which is within the normal range of results for this station, which tends to have variable results. Stations 27 and 261 both had 4 full nights of kiwi listening completed. Hopefully the mean call rate at the Sandy Bay management area will increase to above the 5 calls/hr threshold in 2019.

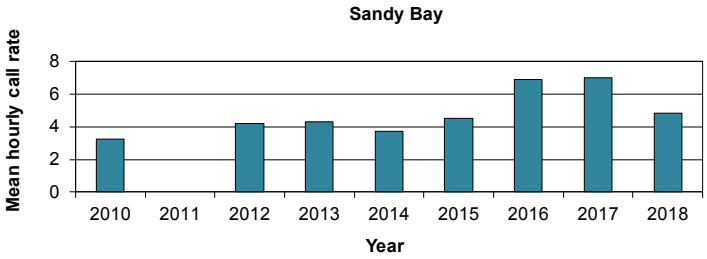

Figure 10. Trends in mean kiwi call rates (calls/hr) at Sandy Bay management area.

4.1.10 Tutukaka

Data from Station 142 were again included in the analysis for the Tutukaka management area in 2018 (as were data from Station 28) and as predicted there was a decrease in the overall mean kiwi call rate, down from 15.3 calls/hr in 2017 to 12.5 in 2018 (Fig. 11). A mean of 12.5 calls/hr is still an excellent result, and it is good to know this result likely better reflects what is happening to the kiwi population as it is derived from more stations than previously. Four stations were used to calculate the mean call rate. Station 125 increased from a mean of 13.8 calls/hr in 2017 to 17.6 in 2018. This is the highest recorded mean for this station since listening began in 2003. The mean call rate at Station 126 decreased from 16.9 calls/hr in 2017 to 14.9 in 2018. Although a decrease was observed, it was good to confirm that the very high 2017 mean wasn't just a one-off peak, and that the 2018 data also suggest high kiwi call rates in the area. Neither Station 142 or 28 were listened from in 2017, but at 5.6 calls/hr in 2018, the mean rate observed at Station 142 is within the normal expected range for this station. Station 28 recorded a mean of 12 kiwi calls/hr.
It was the first time that listening had been completed there since 2014, so it was excellent to be able to include these data. A mean of 12 calls/hr is the highest recorded result for this station, which was originally listened from in 1996 (with an original mean call rate of 7.3 calls/hr). All four stations had 4 full nights of listening completed. Additionally, there were four new stations in the area listened from in 2018 via ALDs. Two of these stations had mean kiwi call rates of 14 and 15 calls/hr respectively. It was excellent to see that the high overall mean call rate for the Tutukaka management area was also reflected in these new stations.

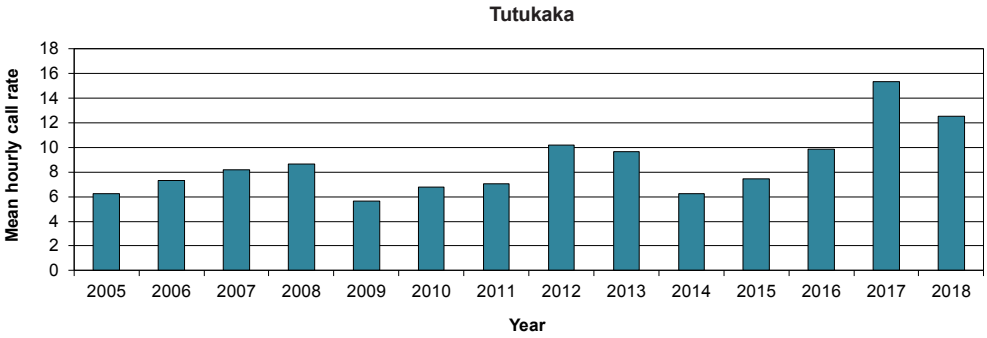

Figure 11. Trends in mean kiwi call rates (calls/hr) at Tutukaka management area.

4.1.11 Manaia-The Nook

There was a very slight increase in the mean call rate at the Manaia-The Nook management area from 8.8 calls/hr in 2017 to 9 in 2018 (Fig. 12). Five stations were listened from, each with 4 full nights of listening completed. An increase in call rates was observed at both Stations 47 and 48. Station 47 had the largest increase, from a mean of 8.8 calls/hr heard in 2017 to 13.5 in 2018. The 2018 result was the highest on record for this station. Station 48 increased from a mean of 13.5 calls/hr in 2017 to 15.3 in 2018. This is a similar rate to that which was observed from 2014 to 2016, so it is positive to see this high rate continue. The mean kiwi call rates for stations 49 and 56 both decreased from 2017 to 2018, to 6.8 and 6.1 calls/hr respectively, both of which were in the previously observed range. Station 71 decreased from a mean of 3.9 kiwi calls/hr in 2017 to 3.1 in 2018. Again, this was similar to the previously known range for this station. Station 71 had generally very low calls from 2002 to 2011, then a cluster of higher call rates from 2013 to 2018. Although there is some variation in the results for the Manaia-Nook management area, it is very positive to see the overall pattern of increasing kiwi call rates over time, thanks to the impressive effort put into protecting kiwi in this and the wider Whangarei Heads area.

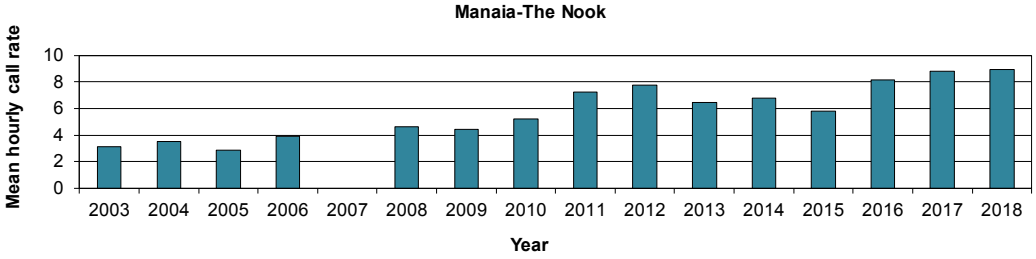

Figure 12. Trends in mean kiwi call rates (calls/hr) at Manaia-Nook management area.

4.1.12 Kauri Mountain

For the second year in a row, the mean kiwi call rate for the Kauri Mountain management area declined, from 7.1 calls/hr in 2017 to 5.5 in 2018 (Fig. 13). An individual decrease was noted at each of the five stations that were listened from in 2018. Station 54 decreased from a mean of 6.5 calls/hr in 2017 to 5.1 in 2018. There has been some variation observed in mean call rates over the years at this station, but 5.1 calls/hr is still comparatively high. The mean call rates were highest in 2016 and 2017 respectively. Station 72 decreased by a similar margin, from 7.1 calls/hr in 2017 to 5.6 in 2018. Again, this is within the previously known range for this station, but it is the lowest mean call rate recorded there since 2013. As with Station 54, the highest mean for this station was recorded in 2016 and the second highest in 2017. Station 73 decreased to a mean of 4.8 calls/hr in 2018. As with Station 72, this was the lowest recorded mean since 2013 (but within the 'normal' range); and 2016 also recorded the highest mean since listening began in 2002. Station 74 decreased only slightly, from a mean of 6.1 kiwi calls/hr in 2017 to 5.8 in 2018. The 2018 result was still high for this station (the third highest to date). Mean kiwi call rates at Station

141 decreased by the largest margin, from 8.9 calls/hr in 2017 to 6.3 in 2018. The 2018 result is at the higher end of the previously recorded range for this station. Again, the highest recorded rates were in 2016 and 2017, both with 8.9 calls/hr. It was interesting that there is a repeating pattern across many stations of the highest mean call count rates being recorded in 2016 and 2017. Perhaps there was an unknown factor that induced extra calling or made calls more likely to be heard and recorded during these years, and the 2018 result is simply a return to a more 'normal' value for this management site. It is good to see that the 2018 result is still above 5 calls/hr despite 2 years of decreasing counts. Hopefully the call rates will now stabilise or, better still, increase. Four stations had 4 full nights of listening completed, and Station 141 had 3 nights only.

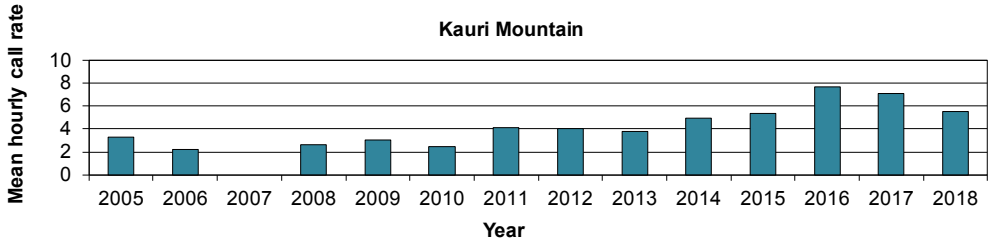

Figure 13. Trends in mean kiwi call rates (calls/hr) at Kauri Mountain management area.

4.1.13 Bream Head/Taurikura

After a dip in mean call rate at Bream Head/Taurikura management area in 2017, there was an increase in 2018, up from 5.8 calls/hr in 2017 to 6.9 in 2018 (Fig. 14). The largest increase was seen at Station 39, which recovered to a mean of 11.3 kiwi calls/hr in 2018 from 7.4 in 2017. The 2018 result is more consistent with what has been recorded in recent years at that station. The mean call rate at station 42 also increased, up from 6.8 calls/hr in 2017 to 8.5 in 2018. This was the highest recorded mean for this station, after the previous peak of 7.6 calls/hr in 2013. No change was recorded for Station 69, which stayed consistent with a mean of 3.3 kiwi calls/hr. At Station 42 there was a decrease in the mean call rate, from 6 in 2017 to 4.5 in 2018. This was the lowest result for this station since 2008 (although there was a gap in kiwi listening from 2009 to 2011). All four stations had 4 full nights of listening completed. It was good to see that the downward trend from 2016 and 2017 hasn't continued; hopefully mean call rates at the Bream Head/Taurikura management area will increase more consistently in the future.

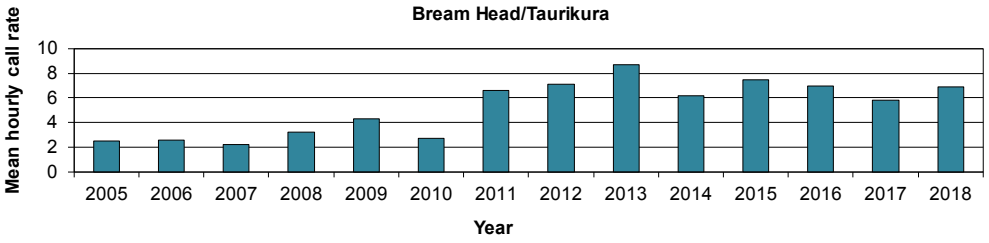

Figure 14. Trends in mean kiwi call rates (calls/hr) at Bream Head/Taurikura management area.

4.1.14 Motatau-Marlow

After 3 years of increasing mean kiwi call rates at the Motatau-Marlow management area, a decrease was observed in 2018, from 12.9 calls/hr in 2017 to 11 in 2018 (Fig. 15). Three stations were used to derive the mean for this area and all of them had lower mean call rates than in 2017. The biggest change was observed at Station 23, where the mean dropped from 21.1 calls/hr in 2017 to 18.4 in 2018. However, these figures are both quite typical for what had been observed at this station over the past few years (especially over the period 2014–2018), so this likely reflects normal fluctuation in the number of calls heard rather than being an indication of a change in the

number of calling kiwi in the area. Station 68 decreased a similar amount, from a mean of 11.8 calls/hr in 2017 to 9.5 in 2018. This station has had quite variable results over the years, and the 2018 mean is within the usual range. Only 3 listening nights were completed for station 68, so the result may have been affected by this change in methodology. Station 129 had a slight decrease from a mean of 5.9 calls/hr in 2017 to 5.2 in 2018. Again, this station has had variable results and the 2018 mean is within the range that is typically observed. As with Station 68, Station 129 had only 3 nights of listening completed, potentially affecting the observed results. Overall, this management site has had a general pattern of increasing mean kiwi call rates since 2010, and the relatively minor decrease observed in 2018 is no cause for concern.

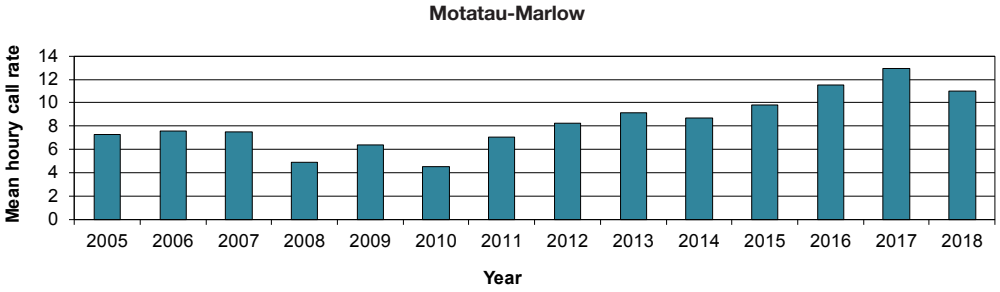

Figure 15. Trends in mean kiwi call rates (calls/hr) at Motatau-Marlow management area.

4.1.15 Purua-Rarewarewa

There was an increase in the mean call rate at Purua-Rarewarewa management area from 12.1 calls/hr in 2017 to 15.4 in 2018 (Fig. 16). This increase came solely from Station 81 where there was a marked increase from a mean of 11.8 calls/hr in 2017 to 29.8 in 2018. This is a particularly high call rate for this station; the highest on record and more than 10 calls/hr higher than the previous peak (18.6 calls/hr, recorded in 2014). The other three stations that were listened from all had decreases in the mean number of kiwi calls/hr heard. The mean call rate at Station 25 decreased from 12.1 calls/hr in 2017 to 10.3 in 2018. This was a relatively small decrease and the 2018 rate is the second highest mean on record for this station so it should still be viewed as a positive result. Station 139 also saw a minor decrease, from a mean of 16 calls/hr in 2017 to 15.5 in 2018. This station is typically variable in its results, and the 2018 mean is within the expected range. Station 82 had the greatest decline, from a mean of 8.1 calls/hr in 2017 to 6.3 in 2018. The 2018 result is lower than what is typically observed at this station, so monitoring needs to continue here to ensure the mean call rate returns to the usual range. Although most of the stations at this management site recorded decreases in the mean number of kiwi calls/hr in 2018 (compared with 2017), this pattern was masked by the pronounced increase at Station 81. There were new listeners in 2018, which can sometimes lead to a change in the number of kiwi calls detected. This may explain the huge increase in calls recorded in 2018, but the difference may also be completely genuine, as mean call rates of 30+ calls/hr are well demonstrated in areas of particularly high kiwi density. One notable absence from the analysis for this management site was Station 24, which is one of the original listening stations and one of only nine stations that had been listened from annually since 1995, so it was a shame to not be able to capture and include data from it in 2018. Additionally, the mean from Station 24 was typically lower than the area mean of 15.4 calls/hr, so the 2018 mean is likely higher than it would have been if Station 24 was included. It is important that Station 24 is included in the 2019 kiwi listening survey. Station 139 was listened from for 3 nights only; the other three stations were listened from for 4 full nights.

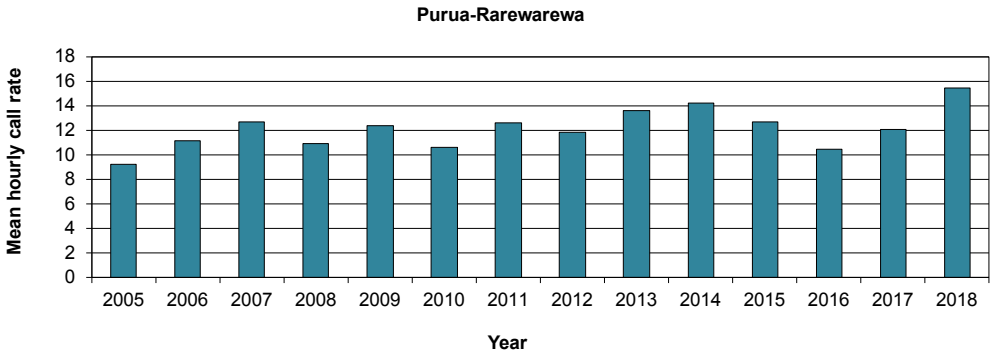

Figure 16. Trends in mean kiwi call rates (calls/hr) at Purua-Rarewarewa management area.

4.1.16 Waipoua-Trounson

Following an observed decrease in 2017, it was positive to see an increase in the mean kiwi call rate for the Waipoua-Trounson management area in 2018 (from 7.3 calls/hr in 2017 to 8.4 in 2018; Fig. 17). The usual five stations were listened from and three of these showed increases in mean call rates compared with 2017, while the remaining two had decreases. The most notable increase was that observed at Station 16, up from a mean of 1.5 calls/hr in 2017 to 5 in 2018. This result is particularly significant given that this station has had such low call rates in recent years, and 2018 was the first year that the mean had been over the 5 calls/hr threshold since 2004. It is excellent to see that individual kiwi can hold on with very low detection rates for so many years, allowing the population to recover when conditions improve. The other two increases in mean kiwi call rates were observed at Stations 17 and 33. Both increased to means of 13.5 and 7.9 calls/hr respectively. The mean call rate recorded at Station 17 was the highest since 2011, although still within the previously observed range. The mean call rate at Station 33 was low in 2017, while the 2018 mean was more typical of rates previously recorded for this station. Decreases in mean call rates were observed at Stations 18 and 19. Station 18 changed only slightly from 6.1 calls/hr in 2017 to 6 in 2018. Station 19 decreased from 11.6 calls/hr in 2017 to 9.6 in 2019, which is also within the typical range for this station. Stations 16 and 19 each had only 3 nights of listening completed, and all five stations had some listening carried out during the second kiwi listening window.

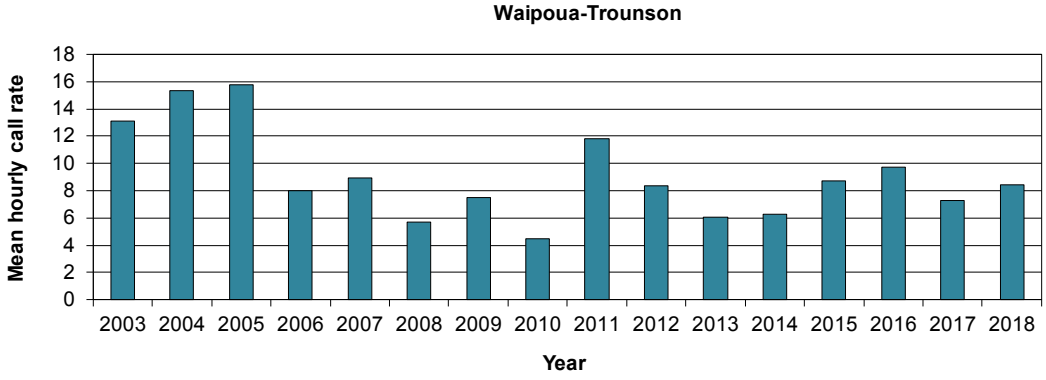

Figure 17. Trends in mean kiwi call rates (calls/hr) at Waipoua-Trounson management area.

4.1.17 Tawharanui

After falling below the 5 calls/hr threshold in 2017, it was excellent to see the mean kiwi call rate at Tawharanui management area being comfortably above that threshold once more with a mean of 7.3 calls/hr recorded in 2018 (Fig. 18). Once again, all six stations were listened from, and for 4 full nights. It is fantastic to see such good quality and consistent data being collected at this site. Three of the stations recorded a decrease in mean call rates compared with 2017; Stations 161 and 163 had only minor declines from 4.4 to 4.1 calls/hr, and 4.5 to 4.4 calls/hr respectively. Station 165

had a more substantial decrease from a mean of 7.3 calls/hr in 2017 to to 4.8 in 2018. The 2018 mean was still within the typical range recorded at this station but was the lowest recorded since 2015. The remaining three stations all recorded an increase in their mean call rates compared with 2017. The mean call rate at Station 162 almost doubled from 5.9 calls/hr in 2017 to 10.8 in 2018, which was the highest mean rate recorded for this station by >4 calls/hr (the next highest was 6.6 calls/hr in 2016). Station 164 almost tripled from a mean of 2.4 calls/hr in 2017 to 7 in 2018. This was the second highest mean rate recorded at this station, behind the 8 calls/hr recorded in 2014. The mean call rate quadrupled for Station 166, up from 3 calls/hr in 2017 to 12.6 in 2018. The 2018 result was the highest by >3 calls/hr (the next highest was 9.5 calls/hr, recorded in 2015). This was a huge jump and it is great to see the Tawharanui management area start to have some more regular high call rates. In 2018 two stations had ≥20 calls/hr in a single individual hour: Stations 162 and 66. These results are a sign of a growing and thriving kiwi population.

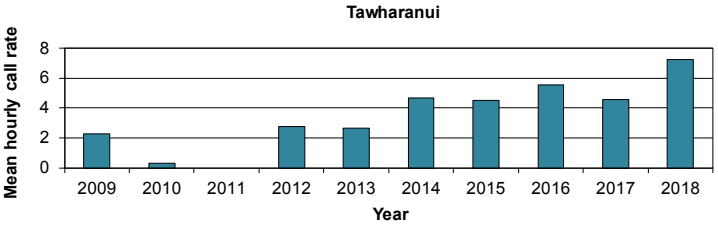

Figure 18. Trends in mean kiwi call rates (calls/hr) at Tawharanui Open Sanctuary management area.

4.1.18 Marunui

After just crossing the >5 calls/hr threshold in 2017, the mean kiwi call rate at Marunui management area dropped slightly to 4.6 calls/hr in 2018 (Fig. 19). The two stations that were listened from almost reversed call rates between 2017 and 2018; Station 253 increased from a mean of 3.3 to 5.6 calls/hr (the highest recorded for this station), and Station 275 halved from a mean of 6.9 to 3.5 calls/hr (this was similar to the 2016 result, and is still the second highest mean recorded for this station). It is difficult to read too much into these results given that only two stations were used to derive the mean, and because there is not yet the longevity of kiwi listening at this management area to enable long-term trends to be observed. The most important considerations are that kiwi are now established in the area, they are calling and territorial (so are breeding) and (with the exception of 2018) showing a general trend of increasing call rates. Both stations were listened from for 4 full nights.

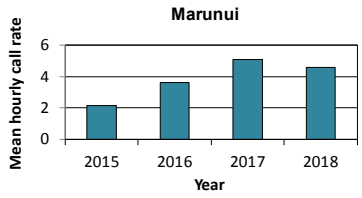

Figure 19. Trends in mean kiwi call rates (calls/hr) at Marunui management area.

4.1.19 Mataia

The 2018 data recorded at Mataia management area were insufficient to create a graph. Data were received from Station 254, but this was from prior to the official kiwi listening period. A mean of 3.3 calls/hr was recorded, a slight decrease from the 4 calls/hr heard in 2017. No data were received from Station 255, which is the other station regularly listened from in this management area. A new station was added ('Quarry'), but the data collected here (mean = 2 calls/hr) was from between the two kiwi listening windows, and as the standard method was not used these data

are not directly comparable with the other stations. Data were also collected from a third station ('Hoopers Bush'), but on an ad hoc basis, not within the official recording period. Three kiwi calls were heard on three separate nights, so it is good that kiwi are present in this new listening area. All data were collected via ALDs. It would be very helpful to continue to listen from Station 255, and to ensure that data collected are consistent with the kiwi listening windows and are for the first 2 hours of darkness on each listening night.

4.1.20 Kawau Island

It was very helpful to receive 2018 kiwi listening data for Kawau Island. Data had not been received from this management area for several years, but had been collected and so was able to be included in this report retrospectively. The three stations that were listened from in 2018 all had means of 2.5 calls/hr, which is consistent with the generally low kiwi call rates heard on the island. The data were all collected via ALD, and for longer than 2 hours per night, but only 8 hours of these data were considered for this report, as per the standard kiwi listening method (Robertson & Colbourne 2003 and 2017). It is excellent that kiwi are persisting on the island despite some habitat and predation pressure. It was very fortunate that when kiwi were initially taken to the island (by Governor Grey in the 1800s), it was from one area in the Hokianga (Craig et al. 2011), so their provenance is clearly known. Hopefully a renewed interest in predator control on the island will result in an increasing kiwi population (S. Stoddart pers. comm.).

5. Discussion and general recommendations

The 2018 Northland brown kiwi call count survey had an overall result of most management areas recording increases in mean call rates compared with 2017. Of the original four clusters of listening sites (northern, eastern, southern, western – which include the stations that have been listened from for the longest, so have the best chance of showing changing trends over time), three (75%) increased in mean call rates from 2017, with only the Southern cluster having a reduced mean call rate. Of the other 17 management areas where a mean call rate could be calculated from the 2018 data, it increased from 2017 in ten of them, decreased in six (five of which were from the Southern area), and no change was recorded in one. It is excellent to see that the trend is for more kiwi calls detected, so likely more kiwi on the ground. The knowledge around what is required to increase kiwi numbers has grown rapidly and continues to be added to, and this knowledge can be applied region-wide to make real differences to protecting the kiwi population. It is interesting that most of the observed decreases were from southern Northland, especially given the impressive kiwi protection measures that are deployed there. As has been previously discussed, reductions in the mean number of kiwi calls recorded can happen for several reasons and don't necessarily indicate population decline. Other factors that the changes can potentially be attributed to include listening error/bias (e.g. a listener with diminishing hearing), animal behaviour (e.g. a male kiwi looking for a mate one year, vs. having found one the next) and varying environmental conditions (e.g. more wind or background noise). However, a downward trend over several years could well be indicative of a decreasing population, so this will be monitored carefully over the coming years.

There are eight stations which have now been listened from annually for 24 years, since 1995 (stations 7, 8, 12, 14, 15, 18, 19, 25). The commitment by the coordinators and listeners in these areas to ensure this long-term study continues is appreciated, and the value in continuing to collect data from these stations will only increase over time. There are many more stations which have one or only a few years of missing data, and it is vital that these also continue to be monitored long-term. Newer stations are important for monitoring the effects of increasing kiwi protection measures, especially as kiwi move back to areas that they have long been absent from.

As has been discussed in previous reports (e.g. Craig 2018), call count monitoring is a crude method designed to allow listeners to ascertain if there are kiwi present, and to look at general trends over time. Therefore, continuing to listen from the same stations is important as it allows us to understand population trends. Although kiwi listening does not allow us to determine the actual number of kiwi present (Colbourne & Digby 2016; Robertson & Colbourne 2017), there is some correlation between call rates and the number of kiwi present (Colbourne & Digby 2016). If the aim is to ascertain true population size, Colbourne & Digby (2016) recommend using kiwi call count surveys alongside other methods that will also detect chicks and juveniles, namely banding and recapture using kiwi detection dogs and handlers, as this will remove the inherent kiwi listening bias of only detecting adults.

Four stations had a mean call rates of more than 30 calls/hr in 2018 (Twin Tanks – 42.6, Station 10 – 39.6, Top Vineyard Villa – 36.9, Station 171 – 32.2). These are phenomenally high call rates, and while it must be fantastic for the listeners at these stations to hear so many calls, it is no doubt very difficult for them to keep up and record all the data. The rate of increase of kiwi calls heard in some of the management areas suggests that these very high call rates will become increasingly common, which is positive news.

A new kiwi listening spreadsheet template was created in time for the 2018 kiwi listening period, but it was not used by all listeners/co-ordinators. It collects the same data as the previous template, but with the added feature of the data being validated (e.g. it is no longer possible to enter data in the wrong place, or using an incorrect format, so the data is more accurate and reliable, and can be analysed more readily). It is very important that this is the only template that is used to store and collate the data from the 2019 kiwi listening period and beyond. This does not replace the paper field sheets but, rather, the database that the field sheets are used to populate. If listeners have any trouble with accessing or using the new template, they can contact the local kiwi listening co-ordinator or the Whangarei DOC Office.

The publication of this report was delayed well past the ideal window for returning it to listeners. It proved particularly difficult for those groups who rely on the data presented in this report during the funding application process (e.g. K4K). In the past there has been flexibility regarding accepting late data as it is desirable to include as many stations as possible to give a clearer overall picture of what is happening with Northland brown kiwi. However, it has been made very clear by many of the listeners who did get their data in on time that they would like the report published earlier, even if it is incomplete. The 2018 process was further complicated by changes in personnel at DOC meaning that some of the data didn't make it to the correct place, adding to the delay in this report.

It is important that coordinators ensure that all core stations are listened from, and that listeners include all the relevant data. Please note that kiwi listening data should include the following:

- The station is identifiable to those who enter and analyse the data for this report, and to future listeners who will repeat listening at the same station. This means that every kiwi listening card must include the individual station number (see Appendix 1), and this number must not be changed. If it is a new station that will be listened from consistently please add the comment 'station number required' or similar in the comments field, and a number will be assigned in the subsequent report. Each card must also include an up-to-date GPS reference for the site. Both the stations number and GPS reference need to be written on every card, every night;
- There is consistency in kiwi listeners. Ideally this will mean the same person will listen from the same station for each of the 4 nights, and in subsequent years. If this is not practical, aim for at least having the same person covering the same stations for all 4 nights. The exception to this would be if the listener is no longer able to adequately detect kiwi calls, in which case a permanent replacement should be sought;

- Each station needs to be covered for 4 nights if possible. If this can't be finished in the first kiwi listening window it is possible to use the second window. It is more important that fewer stations are listened from for 4 nights than more stations for only 1–2 nights. This will produce more robust data and will give a more accurate measure of kiwi in your area;
- Kiwi call cards need to be filled out in full, including all the fields, each night.
- Reduced capacity in the Whangarei Kiwi Sanctuary team means that groups are now required to enter their kiwi listening data into the spreadsheet themselves. This needs to be sent to Ayla Wiles at DOC's Whangarei Area Office, no later than the 31st of August in the year in which it was collected. If it is not submitted by the 31st of August it will not be included in the report.
- Please ensure the data are accurate. If you notice any errors or inconsistencies in the data used for this report, please advise Ayla Wiles immediately.

5.1 Other recommendations

- Provide new listeners with adequate training. This not only includes how to identify the difference between male/female kiwi calls; other species' calls that may be mistaken as kiwi; compass use and judging distances but also how to fill out the forms fully, correctly, and legibly. The updated Kiwi Best Practice Manual (Robertson & Colbourne 2017) is a useful tool.
- Try to map the location of calling birds during the four nights of listening. This will help to identify the minimum number of individuals and pairs heard from each station. As discussed above, these data are not used in this report at present, but it may be in the future. In the meantime, those groups who are analysing these data themselves are finding some interesting results.
- If you add a new listening station in your area, please identify it very clearly as a new station so that it can be allocated a consistent station number. Please make sure you also provide GPS co-ordinates for the station, a name that will make sense to everyone, and any other identifying or necessary information about the station.
- Please check the station numbers listed in Appendix 1. If any of these numbers are not accurate, please let Ayla Wiles (awiles@doc.govt.nz) know as soon as possible.

5.1.1 Kiwi listening 2019

Kiwi listening for 2019 should preferably be carried out over the period 22 May – 10 June, with a back-up window of 20 June – 9 July.

Information about kiwi listening can be found on the Kiwis for kiwi website http://www.kiwisforkiwi.org/resources/call-count-monitoring/.

6. Acknowledgements

Thank you to all the people who carried out kiwi listening in 2018. Your time and effort in obtaining information about kiwi in your area on those cold winter nights is very much appreciated, as is your patience in waiting for the delayed report. Thanks also to local kiwi listening co-ordinators and to those who took the time to enter the data into the spreadsheets again this year.

7. References

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Appendix 1

Kiwi call survey methods (from the Kiwi Best Practice Manual, Robertson & Colbourne 2017)

1. Go through the Kiwi Call Scheme card methods and fields before you go out. You may also wish to practice or refresh your skills by listening to the calls of kiwi at: http://nzbirdsonline.org.nz/
2. Choose listening sites that cover a wide listening area, preferably on a prominent knob, spur, hilltop, ridgeline or riverflat, away from loud river, stream, sea, traffic or hut noise. However, do not be put off listening from a campsite in thick bush if that is the most practical way of conducting a count.
3. Neighbouring listening sites should preferably be at least 1 km apart to increase the overall coverage.
4. On a topographical map, or GIS map system, estimate the listening range from each listening site – at many places, a ridge or spur will cut out distant calls from certain directions or the habitat in some directions may be unsuitable for kiwi, and so the listening range may be far from circular.
5. Before departing to the listening sites, remember to synchronise your watch with others who are listening in the same general area, so that you can better determine if a bird was heard at multiple sites.
6. Arrive at the listening site with enough time to get ready for recording. Remember that if your listening site is on a hill, you will require some time to cool off and to then pile some clothing on and prepare your forms before you will be ready to listen. Have all of your clothing and gear handy, so that you do not make unnecessary noise during the survey.
7. Start your listening period no earlier than 30 minutes after local sunset. Sunset times are available from http://www.linz.govt.nz/hydro/nautical-info/astronomical-info and on many GPS units.
8. Preferably do your listening in the first 2 hours of darkness (from 30 minutes after local sunset). Listening conditions are often best on a dark night, with little or no wind, rain or other noise, but counts in any conditions will still be valuable. Try to listen for a 2-hour period, because call rates will tend to average out, but listening periods of different durations are acceptable. Avoid doing a short listen simply to include a call that you heard when you were not otherwise intending to do a survey – in this situation, you are better off filling out a Kiwi Reporting Scheme card. Record any birds that called outside your planned listening period in the 'Notes' section, rather than, for example, adding onto the count the pair that called when you were packing up your gear!
9. At the end of each hour of listening, total up the number of calls heard and estimate the number of individual males and females you heard calling (allowing for movement of birds during your listening period) in the 'Notes' section.
10. Do not solicit calls from kiwi by using tapes or shepherd's whistles in the first hour of listening, and only do so later in the night if it is important to determine if kiwi are present at the site. In this case, make sure that this is clear in your notes, along with the times that the calls were broadcast.
11. If you hear other teams broadcasting calls from another site, record this information on your card, along with the time, estimated distance and direction – it may be that you have heard a bird responding to their broadcast rather than the broadcast itself.

12. At the end of the second hour, summarise your data in the field (while information is fresh in your mind):
    - Total up the number of calls heard in the second hour and estimate the number of individual kiwi you heard calling.
    - Add the two counts together and estimate the total number of birds heard during the 2-hour period, again allowing for movement of birds over the whole 2-hour period. Note that one male calling four times is a quite different biological result from four males which each called once.
13. Describe the listening site well (e.g. at cairn on terrace 5 m south of where the track drops down the true right (eastern) bank of the large stony creek, 1200 m west of Cameron's Hut, North Hurunui Valley) so that the exact same listening spot can be used.in future surveys.
14. Photocopy or scan the card for you own records, and then send the original card or the scanned copy to the Kiwi Call Scheme Coordinator.

How to complete the Kiwi Call Scheme card:

CARD NUMBER Leave the top right-hand space blank. If you wish to link the card to the number of a listening station in the area surveyed, use the 'Notes' section on the card.

OBSERVER If more than one person listened from a listening station, give the name of the most experienced observer first. For each new observer, provide the address and affiliation on the first card only. This information is not required on subsequent cards unless addresses or affiliations change.

LOCALITY NAME Provide, in order, the province, the offshore island name (if applicable), the forest or reserve name and the nearest named locality or feature (such as river, stream, trig, etc.), followed by a brief description of the exact location of the listening station (use the 'Notes' section if you run out of space). For example, Southland, Stewart Island/Rakiura, Rakiura National Park, Mason Bay, sand hill 100 m east of Island Hill Homestead. This location will be further verified by the grid reference. This enables all records from Southland or Stewart Island/Rakiura to be sorted. If possible, include a photocopy of a map of the area with the listening stations marked on it, and the estimated listening extent over suitable habitat, even if you did not hear any birds calling throughout the marked area.

GRID REFERENCE Wherever possible, use the Topo50 map series, which is the official topographical map series used by the New Zealand emergency services. These maps cover the entire country. If you are using a GPS system, you should change the settings on your GPS receiver to 'NZGD2000', the datum used by Topo50, or to the 'New Zealand TM' (Transverse Mercator) position format and 'WGS 84' map datum, which is coincident with NZGD2000. If you do not have access to these maps or have a lot of data in the older grid reference, you can still use the metric NZMS 260 series maps and keep your GPS unit set to the 'New Zealand' position and the map datum set as 'NZGD49' or 'NZGD1949'. However, the grid references will need to be converted later from the NZ Map Grid to the NZ Transverse Mercator projection (NZGD2000) using a conversion programme such as that available at http://apps.linz.govt.nz/coordinate-conversion. For the section labelled 'Series', either put T50 to indicate Topo50, or 260 to indicate that you have used the NZMS260 map series. Ignore the N S X on old versions of the card and enter the Sheet Name for NZMS 260 maps. You should use grid references rather than the alternative decimal latitude/longitude system. Grid references are easy to interpret on maps and it is straightforward to work out how far each point is from adjacent points – something that cannot be done with latitudes/longitudes. The grid reference should be given to 7 places for the easting (horizontal) and 7 places for the northing (vertical), i.e. to the nearest metre, even though old versions of the Kiwi Call Scheme card have only 5 spaces available. You can download maps as image files (TIFF and GeoTIFF formats) and data files (Shape and IFF formats), or you can purchase paper maps from local retailers.

NOTES If kiwi are heard in the area but do not call during the listening period, please note this fact. This information is important for distribution analyses. If more space is required for notes, continue writing under the entry of the last call heard on the back of the card (upon completion of the listening period).

WIND This is a subjective score of the average influence of wind on your count. In general, calm and light winds will not reduce the ability to hear birds calling, moderate winds may result in the loss of distant calls, and strong winds will make distant calls very difficult to detect, especially if there is a lot of noise from the wind in trees nearby. If the weather or noise conditions change markedly during a count, fill in separate cards for the different parts of the count.

RAIN This is a subjective score of the average influence of rain during your count. Noise from rainfall can reduce the listening range, and so moderate rain should be scored when you feel that the results have been affected by the noise of rainfall.

TEMPERATURE This is a subjective score of the average temperature during your count. Note accurate readings if you have them available.

CLOUD COVER This is a subjective score of the average cloud cover during your count.

GROUND CONDITIONS This is a subjective score of the average ground conditions during your count.

NOISE This is a subjective score of interference to listening caused by other types of noise, such as river, waterfall, traffic or sea noise, talking by non-listening members of the party, or noise from other animals, e.g. petrels calling, cows mooing or frogs croaking. Avoid noisy conditions wherever possible. MOONLIGHT This is a subjective score of how bright the moonlight was, averaged over the listening period. Some early studies on brown kiwi, in particular, showed that they called noticeably less often on bright, moonlit nights. Interim results of more recent work indicate that this may not always be the case; however, until these data are fully analysed, it is best to continue to plan surveys on dark nights wherever possible.

LISTENING COVERAGE When listening from a ridge on a calm night, choose 'wide' as the descriptive term. When listening from a campsite in a gully, underline 'narrow'. When listening in a gully with a noisy creek and pouring rain … head back to your tent!

MAJOR HABITAT TYPES Mark a maximum of three categories of vegetation types found within the listening zone. If the types of vegetation present are not listed, circle 17 and explain in the notes. Developed farmland is typical New Zealand pasture, and is well fenced, intensively grazed and has few trees. Undeveloped farmland has rank grasses interspersed with mānuka, gorse and other scrub throughout, and may include extensively grazed river flats or frost flats.

MINUTES LISTENED Give the total time that calls were listened for, in minutes. The number of calls will eventually be expressed as a number of calls per hour. As a general rule of thumb, 1 hour per station is a good continuous period for listening for kiwi calls. Do not listen for more than 3 consecutive hours in a single night, as your concentration will rapidly diminish beyond this. Do not be tempted to 'start' listening as soon as you hear a kiwi calling or to 'finish' a count as soon as a bird has called.

CALLS Record calls according to the species calling, sex (M/F), time, compass bearing that the kiwi called from and the estimated distance (metres). If you are not confident of estimating distance, then write 'near', 'moderate' or 'distant'. A call is made up of a series of notes, ranging from just 1–2 to about 25. Because it is the call rate that is important, if two calls from the same individual are more than a minute apart, record these calls on separate lines. If a pair duet (male or female responds during or shortly after the call of its partner), indicate that these calls are linked. In some species, a duet will comprise alternating calls, with a number of notes from one bird followed by a number of notes from its partner, and then a number from the original bird, and so on; regard this series of calls as being just one call from each member of the pair, unless

one of the calls is obviously from a third bird. At the completion of listening, estimate the number of individuals you heard during the listening period, taking into account the possibility that birds may have moved around during this time.

OTHER ANIMALS HEARD Record other animal species that you heard calling during the listening period, and make an estimate of their abundance using the following criteria:
Few = 1–2 individuals, Moderate = 3–6 individuals, Many = 6+ individuals.

Appendix 2

Mean call count data (calls/hr) for all Northland stations 1995–2018

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
1	Diggers Valley	1.10	2.40	4.10	2.50	2.10	3.30	4.10	3.75	3.00	3.90	3.90	2.70	1.30	2.00	1.67	–	2.50	–	–	–	–	2.75	0.88	–
2	Takahue	4.30	3.50	5.50	5.40	6.30	8.40	7.90	4.50	3.30	4.75	5.30	5.00	3.60	4.90	3.13	4.75	11.38	6.88	5.25	2.38	0.13	0.00	–	–
4	Gartons	5.60	5.00	1.20	–	0.80	2.00	8.60	–	1.50	4.10	4.90	7.10	1.50	1.25	0	0.13	0.25	0.75	0.25	0.25	0.00	0.13	–	–
5	Kaiaka	1.70	1.30	2.40	3.40	1.60	3.50	3.00	2.10	1.90	3.75	2.80	1.50	0.00	0.75	–	1.63	1.13	0.25	1.60	1.63	2.00	–	–	–
7	Puketi	6.60	5.40	2.10	3.00	6.00	7.60	6.40	3.50	5.00	3.40	1.50	2.30	0.80	3.90	4.00	6.88	9.38	6.25	6.25	5.88	5.63	5.63	9.75	8.25
8	Puketi SR	5.40	6.50	4.40	4.00	5.10	6.50	6.10	6.40	8.25	9.40	2.30	5.10	7.40	8.90	9.00	7.88	9.00	11.75	9.75	7.63	5.38	9.25	9.00	12.10
Mangatete																									
3	Lightning Hill	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	15.50	13.50	10.00	17.63	20.5	17.13	17.60
256	Baigents home drive	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	12.00	14.13	15.38	14.75	17.50
Honeymoon Valley																									
271	H-moon Valley Green Bach	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.38	0.50	–	0.00
272	H-moon Valley Lost Valley track	–	–	–	–	–	–	–	–	–	–	–	–	-	-	–	–	–	–	–	–	0.63	–	–	–
273	H-moon Valley Central Ridge of Beth's	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4.63	–	–	–
274	H-moon Valley Greg's driveway	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.25	–	–	
	NZFRT reserve, campsite	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5.63	5.13	4.38
	Toa Toa Ridge	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.50
Whakaangi																									
130	Whakaangi 1	–	–	–	–	–	–	–	–	–	–	9.00	10.40	4.60	7.60	6.33	–	–	–	–	–	–	–	–	–
131	Whakaangi 2	–	–	–	–	–	–	–	–	–	–	14.90	25.00	15.30	20.75	17.13	16.13	9.38	8.00	4.75	3.13	14.13	4.88	–	2.83
132	Whakaangi 3	–	–	–	–	–	–	–	–	–	–	13.50	14.60	9.00	10.75	12.17	12.17	5.50	3.13	6.75	3.88	4.38	5.88	–	4.17
29	Whakaangi 4	–	–	4.50	–	2.90	1.90	6.25	3.75	4.90	6.60	2.30	6.80	6.30	4.90	5.75	9.83	5.00	–	–	–	–	–	–	–
133	Whakaangi 5	–	–	–	–	–	–	–	–	–	–	9.80	13.80	10.10	–	8.25	–	7.88	4.13	–	3.50	7.13	6.75	–	5.17
134	Whakaangi 6	–	–	–	–	–	–	–	–	–	–	6.00	7.30	3.90	–	9.50	7.00	–	–	4.50	–	–	–	–	–
135	Whakaangi 7	–	–	–	–	–	–	–	–	–	–	21.90	28.00	24.50	27.00	25.88	21.88	23.38	19.13	11.88	13.63	9.00	5.25	0.50	2.63
136	Whakaangi 8	–	–	–	–	–	–	–	–	–	–	14.10	29.00	11.80	18.80	15.25	10.50	20.00	15.25	12.75	13.00	10.88	4.50	6.75	7.25
137	Whakaangi 9	–	–	–	–	–	–	–	–	–	–	4.80	8.40	5.60	6.50	4.88	8.13	5	–	–	2.63	3.00	0.75	4.75	1.75

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Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
138	Whakaangi 10	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8.75	4.00	5.83	4.33	3.75	2.88	0.50	–	–	–
140	Whakaangi 11	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	16.63	7.63	3.88	7.13	7.25	7.63	7.63	8.88
	Whakaangi 12	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–								12.00
Mahinepua-Radar Hill																									
90	Mahinepua 0	–	–	–	–	–	–	–	–	–	–	–	–	2.90	2.90	3.38	3.63	4.00	7.13	4.38	3.25	4.88	5.63	5.38	6.13
83	Mahinepua 1	–	–	–	–	–	–	–	–	3.50		2.60	4.10	3.50	2.60	2.38	2.25	3.13	7.50	6.75	4.25	4.75	4.25	7.88	8.13
84	Mahinepua 2	–	–	–	–	–	–	–	–	4.20	0.80	2.30	4.80	4.30	2.75	3.25	3.25	4.25	6.75	4.75	3.63	4.25	7.29	6.25	12.25
85	Mahinepua 3	–	–	–	–	–	–	–	–	5.60	4.75	4.00	5.50	5.40	3.25	5.88	5.25	5.25	10.25	5.00	5.88	5.38	7.29	6.38	12.50
88	Mahinepua 4	–	–	–	–	–	–	–	–	6.10	4.10	3.00	7.80	4.70	4.10	9.50	4.75	5.38	10.63	7.13	8.00	6.88	9.25	7.50	–
87	Mahinepua 5	–	–	–	–	–	–	–	–	–	–	–	–	2.40	0.90	2.00	–	–	–	–	–	–	–	–	–
86	Mahinepua 6	–	–	–	–	–	–	–	–	1.00	2.50	2.30	–	0.40	0.75	1.25	–	–	–	–	–	–	–	–	–
89	Mahinepua 7	–	–	–	–	–	–	–	–	0.90	5.90	1.80	4.80	1.90	0.40	–	–	–	–	–	–	–	–	–	–
181	Mahinepua 8	–	–	–	–	–	–	–	–	–	–	–	–	0.80	0.40	–	–	–	–	–	–	–	–	–	–
182	Mahinepua 9	–	–	–	–	–	–	–	–	–	–	–	–	0.10	0.10	–	–	–	–	–	–	–	–	–	–
183	Mahinepua 10	–	–	–	–	–	–	–	–	–	–	–	–	1.60	1.25	–	–	–	–	–	–	–	–	–	–
184	Mahinepua 11	–	–	–	–	–	–	–	–	–	–	–	–	2.90	1.25	1.25	–	–	–	–	–	–	–	–	–
98	Mahinepua 12	–	–	–	–	–	–	–	–	–	3.50	2.30	3.80	2.50	3.40	2.88	–	–	–	–	–	–	–	–	–
99	Mahinepua 13	–	–	–	–	–	–	–	–	–	3.90	3.80	7.40	7.30	5.00	9.38	7.75	9.50	160	9.63	6.88	11.00	10.88	9.29	–
92	Mahinepua 14	–	–	–	–	–	–	–	–	–	–	–	–	0.6	1.25	1.13	1.38	0.75	–	–	–	–	–	–	–
91	Mahinepua 15	–	–	–	–	–	–	–	–	–	–	–	–	1.00	1.10	1.63	1.75	3.13	–	–	–	–	–	–	–
93	Mahinepua 16	–	–	–	–	–	–	–	–	–	–	–	–	1.30	6.00	2.00	2.63	5.25	–	–	–	–	–	–	–
94	Mahinepua 17	–	–	–	–	–	–	–	–	–	–	–	–	2.50	4.90	5.00	3.38	6.88	–	–	–	–	–	–	–
95	Mahinepua 18	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.75	–	–	–	–	–	–	–	–	–
Eastern																									
10	Marsden Cross	20.90	18.30	9.60	16.70	14.50	19.90	21.90	17.90	18.50	22.00	19.30	30.60	23.00	-	20.25	24.50	34.88	30.86	30.25	19.25	30.38	38.63	38.75	39.63
11	Puketotara	10.00	13.80	8.10	11.60	9.70	8.00	–	2.50	7.50	3.60	–	7.10	13.70	10.60	6.17	9.50	9.25	9.13	9.75	14.00	12.75	–	11.00	14.00
12	Rangitane	14.00	5.60	8.40	10.50	7.50	8.40	11.50	10.50	8.60	8.00	8.00	11.50	9.10	15.90	15.25	11.38	10.75	12.75	11.25	12.83	9.50	10.88	10.13	18.13
13	Waitangi No 12	7.60	7.60	6.30	8.90	5.30	7.10	11.50	15.10	18.40	13.75	11.50	15.50	6.30	–	–	–	–	6.75	7.38	3.00	4.75	7.50	11.50	6.00
14	Mt Bledisloe	27.10	10.90	5.50	7.90	8.80	5.10	6.40	6.75	4.90	8.90	9.10	5.50	9.60	11.25	8.25	11.38	13.71	7.38	10.75	6.75	7.88	10.88	8.25	12.75
15	Tikitikiore	10.80	13.50	6.10	6.10	4.50	6.50	2.90	3.30	3.10 (12.3)	6.10 (7.1)	3.38	13.00	7.90	11.00	12.25 (5.25)	12.25	13.50	17.75	14.50	12.38	15.13	25.50	20.38	24.63
Russell Peninsula																									
59	Opito Farms	–	–	–	–	–	5.70	–	9.90	–	–	4.63	13.10	6.10	9.13	6.75	4.25	5.25	8.13	6.88	11.50	10.13	–	13.50	13.50

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Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
60	Flagstaff/Te Maiki	–	–	–	–	–	3.70	1.30	1.30	–	–	–	4.30	–	6.38	–	2.50	4.25	3.88	3.25	3.25	3.88	3.38	5.75	5.00
61	Milne Ct	–	–	–	–	–	–	–	–	–	–	–	6.30	5.80	–	–	–	–	–	–	–	–	–	–	–
62	Uruti Rd	–	–	–	–	–	10.80	7.60	10.50	–	–	7.63	14.40	7.90	5.00	12.75	12.25	12.75	11.5	13.88	6.88	15.00	21.63	11.13	17.13
156	Russell Heights	–	–	–	–	–	–	–	–	–	–	–	9.80	4.80	5.00	2.50	5.00	–	–	–	–	–	–	–	–
170	Nikau Block	–	–	–	–	–	–	–	–	–	–	12.88	10.00	12.00	12.00	12.00	8.88	14.25	9.13	20.75	14.63	14.88	12.00	10.38	16.13
171	Mace/Farmer	–	–	–	–	–	–	–	–	–	–	–	–	–	6.63	4.75	17.63	10.38	6.25	4.00	4.00	14.25	12.75	21.63	32.17
172	Pipiroa Bay	–	–	–	–	–	–	–	–	–	–	–	–	–	0.00	3.00	2.00	2.75	6.00	5.38	5.63	3.00	3.25	3.57	4.75
173	Shortlands	–	–	–	–	–	–	–	–	–	–	–	2.00	2.50	1.38	1.13	1.25	–	2.33	1.13	2.00	–	–	1.25	11.13
174	Johnsons	–	–	–	–	–	–	–	–	–	–	–	10.00	9.75	12.75	10.00	10.00	11.38	8.5	10.13	10.25	11.25	12.75	12.25	11.88
176	Jarvis	–	–	–	–	–	–	–	–	–	–	5.38	4.30	–	–	–	–	–	–	–	–	–	–	–	–
177	Soloman's Gate	–	–	–	–	–	–	–	–	–	–	11.50	6.38	–	–	–	–	5.38	6.25	4.88	14.00	9.50	–	9.25	–
210	Paroa Bay, Russell	–	–	–	–	–	–	–	–	–	–	–	–	4.30	–	–	–	–	–	–	–	–	–	–	–
211	Eagles Nest	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4.50	–	–	–	–	–	–	–	–
Bay of Islands																									
146	Kauri Cliffs 1 (Pink Beach)	–	–	–	–	–	–	–	–	9.00	–	–	4.00	4.25	1.75	5.00	6.50	–	–	–	–	–	3.25	–	–
147	Kauri Cliffs 2 (Puriri)	–	–	–	–	–	–	–	–	–	–	–	1.50	3.00	2.75	1.00	–	–	–	–	–	–	–	–	–
148	Wiwiki Beach	–	–	–	–	–	–	–	–	–	–	–	32.10	–	–	–	–	–	–	–	–	–	–	–	–
149	Mataka Stn Gate, Purerua	–	–	–	–	–	–	–	–	–	–	–	4.00	4.10	8.25	6.75	18.5	3.25	10	6.88	–	–	–	–	–
150	McKenzie Rd, Purerua	–	–	–	–	–	–	–	–	–	–	–	9.50	12.10	10.25	5.00	7.50	–	2.50	–	–	–	–	–	–
151	Mtn Landing (Lot 30) Purerua	–	–	–	–	–	–	–	–	–	–	–	12.30	10.20	18.75	12.60	25.00	22.75	20.25	–	–	–	–	–	–
152	Waitoto Block	–	–	–	–	–	–	–	–	–	–	–	4.00	–	–	–	–	–	–	–	–	–	–	–	–
153	Aroha Island	–	–	–	–	–	–	–	–	6.88	–	–	12.60	–	–	–	–	–	–	–	–	–	–	–	–
154	Napia Bay	–	–	–	–	–	–	–	–	–	8.70	5.50	4.60	4.00	4.50	3.25	5.60	7.50	3.60	4.00	–	–	–	–	–
155	Stirlings Quarry	–	–	–	–	–	–	–	–	7.30	9.80	13.00	12.40	10.20	8.30	4.00	8.50	–	–	–	–	–	–	–	–
97	Kurapari Rd	–	–	–	–	7.10	–	–	–	12.70	8.80	9.25	10.40	5.50	6.00	6.75	4.75	2.33	5.50	7.00	–	–	–	–	–
138	Hupara	–	–	–	–	–	–	–	–	–	25.60	19.30	27.80	–	–	–	–	–	–	–	–	–	–	–	–
185	Akeake Reserve, Kerikeri	–	–	–	–	–	–	–	–	–	–	–	–	–	2.75	0.50	–	6.00	–	–	–	–	–	–	–
186	Cunningham Gardens, Aroha Island	–	–	–	–	–	–	–	10.75	8.63	–	–	–	–	–	–	–	8.17	–	–	–	–	–	–	–
187	Gaitens, Rangitane Rd, Kerikeri	–	–	–	–	10.00	–	12.80	6.33	6.88	10.00	12.00	12.63	14.70	10.50	8.00	7.25	7.50	4.75	–	–	–	–	–	–
188	Blacksmiths Bay (east), Kerikeri (Lex Rennes)	–	–	–	–	–	–	–	10.25	10.30	7.67	8.26	6.20	6.00	8.00	4.50	6.88	8.75	6.40	0.00	–	–	–	–	–

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Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
188	Blacksmiths Bay (east), Kerikeri (Lex Rennes)	–	–	–	–	–	–	–	10.25	10.30	7.67	8.26	6.20	6.00	8.00	4.50	6.88	8.75	6.40	0.00	–	–	–	–	–
189	Doves Bay, Kerikeri (Lockyer)	–	–	–	–	4.17	–	–	2.00	–	3.78	2.46	–	–	4.50	7.50	15.25	18.25	–	–	–	–	–	–	–
190	Rangitu, Opito Bay Road, Kerikeri	–	–	–	–	–	–	–	–	–	–	–	–	9.10	16.00	15.50	15.50	–	–	–	–	–	–	–	–
191	Tikorangi Road, Opito Bay, Kerikeri	–	–	–	–	–	–	–	–	–	–	–	–	–	4.50	4.50	4.00	–	–	–	–	–	–	–	–
192	Kraus, Hansen Rd, Purerua	–	–	–	–	–	–	–	–	–	3.33	–	–	–	–	11.00		–	–	–	–	–	–	–	–
193	Mataka Beach, Mataka Station, Purerua	–	–	–	–	–	–	–	41.50	–	30.00	39.00	32.67	24.50	41.75	30	41.25	–	30.83	30.88	–	–	–	–	–
194	Mataka Station, Ninepin Track, Purerua	–	–	–	–	–	–	–	–	–	30.00	–	–	–	50.75	43.50	–	18.00	–	24.00	–	–	–	–	–
195	Mountain Landing (Lot 30) Wharengaere, Purerua	–	–	–	–	–	–	–	–	–	–	–	12.25	10.20	18.75	12.60	25.00	22.75	20.25	13.25	–	–	–	–	–
196	Mountain Landing, Mataka Ridgeline, Purerua	–	–	–	–	–	–	–	–	–	–	–	7.50	10.10	18.00	25.50	14.25	22.00	–	–	–	–	–	–	–
197	Mountain Landing, Paddle (Entrance), Purerua	–	–	–	–	–	–	–	–	–	–	–	8.50	10.20	12.50	14.25	17.00	–	–	–	–	–	–	–	–
198	Mountain Landing, Poraenui Point	–	–	–	–	–	–	–	–	–	–	–	–	7.30	14.50	16.00	13.75	–	–	–	–	–	–	–	–
	Top Vineyard Villa	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	36.88
	Twin tanks	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	42.63
199	Paoneone	–	–	–	–	–	–	–	16.67	–	–	–	–	–	–	–	–	37.60	–	11.25	–	–	–	–	–
200	Pattersons Big Hill	–	–	–	–	–	–	–	9.00	–	–	30.50	–	4.01	20.50	70.25	33.00	35.50	–	–	–	–	–	–	–
201	Pattersons, Rocky Bay	–	–	–	–	–	–	–	–	–	–	–	–	–	16.50	19.50	17.67	11.67	–	–	–	–	–	–	–
202	Tapuaetahi	–	–	–	–	–	–	–	–	–	–	–	5.00	–	3.00	3.25	16.50		-	7.38	–	–	–	–	–
203	Wharengaere Bay	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	14.50	15.50	–	–	–	–	–	–	–
204	Wiroa Station	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4.50	6.67	–	–	–	–	–	–	–
205	Wiroa Station Hill 11	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.50	–	–	–	–	–	–	–	–
206	Maintenance Facility, Kauri Cliffs	–	–	–	–	–	–	–	–	–	–	–	–	–	6.50	5.00	13.13	–	–	–	–	–	6.88	–	–
207	Waiaua Bay, Matauri X	–	–	–	–	–	–	–	–	2.25	–	–	0.50	0.50	–	–	–	–	–	–	–	–	–	–	–

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Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
208	Waterfall, Kauri Cliffs, Takou Bay	–	–	–	–	–	–	–	–	6.00	–	–	5.50	2.25	4.50	3.50	–	–	–	–	–	–	–	–	–
209	Hikurua Rd (end)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.00	–	–	–	–	–	–	–	–
212	Drivers Whitehills farm	–	–	–	–	–	–	–	–	–	–	–	–	–	7.50	2.00	8.00	8.00	7.88	–	–	–	–	–	–
213	Landcorp Takou Kiwi covenant	–	–	–	–	–	–	–	–	–	–	–	–	–	8.50	0.75	3.00	–	–	–	–	–	–	–	–
214	Maori Block	–	–	–	–	–	–	–	–	–	–	–	–	1.50	–	–	3.50	–	–	–	–	–	–	–	–
215	Otaha Station (south end)	–	–	–	–	–	–	–	–	–	–	–	–	3.00	–	–	3.00	–	–	–	–	–	–	–	–
216	Just past Clinton's	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.00	–	–	–	–	–	–	–	–
217	End of Te Ra Rd	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.25	–	–	–	–	–	–	–	–
219	Achtzhener, Bulls Gorge, Kerikeri	–	–	–	–	–	–	–	–	–	–	–	7.00	–	6.00	11.75	5.75	2.75	–	1.88	–	–	–	–	–
220	Airstrip Rd (Baigent-Mercer)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.00	–	3.25	–	–	–	–	–	–
221	Airstrip Rd (Sharp)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5.00	–	–	–	–	–	–	–	–
222	Candy Bush, Puketi Road, middle ridge	–	–	–	–	–	–	–	–	–	–	–	–	–	0.75	6.00	–	–	–	–	–	–	–	–	–
223	Candy Bush, Puketi Road, red cliffs	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8.50	–	-	5.75	–	–	–	–	–	–
224	Candy Bush, Puketi Road, white/yellow path	–	–	–	–	–	–	–	–	–	–	–	–	–	–	11.00	–	-	11.00	–	–	–	–	–	–
225	Kauri Hills, Totara North	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.00	6.25	–	–	–	–	–	–
226	Poultons, Kerikeri River, Mangaparerua Rd	–	–	–	–	–	–	–	–	–	–	–	–	–	9.00	–	6.50	–	5.38	4.63	–	–	–	–	12.25
227	Puketotara Rd = 709	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	10.00	–	–	–	–	–	–	13.75	–
228	Puketotara Rd = Kearney	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.50	–	–	–	–	12.88	–	–	–
229	Waipapa Rd West, Kerikeri (Anne C.)	–	–	–	–	–	–	–	–	–	–	–	–	–	0.00	–	–	–	–	–	–	–	–	–	–
230	Waipapa Rd West, Kerikeri (Isabella C.)	–	–	–	–	–	–	–	–	–	–	–	–	–	0.60	0.50	–	–	–	–	–	–	–	–	–
231	Waitoto, 500m west of Rhyolitic dome, Mangaparerua	–	–	–	–	–	–	–	–	–	–	–	4.00	–	–	–	–	–	–	–	–	–	–	–	–
232	Waitoto, Rhyolitic dome, Mangaparerua Road	–	–	–	–	–	–	–	–	–	–	–	4.50	4.60	8.00	5.00	–	–	–	–	–	–	–	–	–
233	Wharau Rd, Kerikeri (Manning)	–	–	–	–	–	–	–	–	–	–	–	–	3.60	2.50	–	5.50	3.50	4.50	–	–	–	–	–	–

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Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
234	Wharau Rd, Kerikeri (Starr)	–	–	–	–	–	–	–	–	–	–	–	–	6.25	7.00	–	–	–	–	–	–	–	–	–	–
	Lodore Rd																							6.88	–
Puketi Forest																									
102	Bramley's Rd	–	–	–	–	–	–	–	–	–	–	–	2.50	0.50	2.00	2.00	2.75	2.75	2.5	2.00	–	3.38	2.38	2.25	3.88
103	Pirau Ridge	–	–	–	–	–	–	–	–	–	–	–	0.00	–	0.00	1.00	0.50	1.25	1.25	1.38	0.50	1.63	0.88	1.00	-
104	Pond	–	–	–	–	–	–	–	–	–	–	–	4.50	1.00	3.75	5.00	3.50	8.00	6.88	4.63	5.88	3.25	4.88	2.88	9.50
105	Pudding Bowl Hill	–	–	–	–	–	–	–	–	–	–	–	0.30	0.75	1.13	2.04	2.00	1.00	–	3.00	–	–	–	–	-
106	Takapau Track	–	–	–	–	–	–	–	–	–	–	–	0.00	1.00	0.00	2.50	3.25	2.38	2.57	1.38	–	1.13	1.88	4.88	4.50
107	Takapau/Pirau Rd Junction	–	–	–	–	–	–	–	–	–	–	–	0.50	–	1.00	2.75	1.38	3.50	1.50	1.13	0.88	1.63	1.50	1.38	3.63
108	Totara Ridge	–	–	–	–	–	–	–	–	–	–	–	5.75	–	0.75	7.13	3.50	6.13	4.63	5.88	5.00	1.75	4.13	2.38	6.75
109	Waihoanga Gorge	–	–	–	–	–	–	–	–	–	–	–	2.00	–	3.75	5.38	3.25	6.25	4.5	4.25	–	5.75	5.50	4.38	8.13
110	Waihoanga Gorge 2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.50	2.50	1.50	–	4.50	–	–	–	–	-
111	Walnut	–	–	–	–	–	–	–	–	–	–	–	4.25	2.5	1.25	3.29	3.00	5.25	4.00	4.75	6.13	4.88	7.88	5.25	5.38
112	Stoat line 9 - Puketi	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5.13	4.00	3.63	1.38	4.00	1.00	3.63	3.38
259	Puketi Nature Trail	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3.13	–	3.25	–	–	–	–	-
Waimate North																									
113	W1	–	–	–	–	–	–	–	–	–	23.50	15.80	24.75	–	–	25.50	25.75	23.63	23.13	23.75	27.13	30.75	34.50	31.38	26.63
114	W2	–	–	–	–	–	–	–	–	–	12.25	7.00	9.50	7.90	11.50	5.75	14.5	11.63	12.50	7.13	5.13	8.60	4.75	8.83	7.63
115	W3	–	–	–	–	–	–	–	–	–	14.90	–	–	–	–	–	–	1.00	0.00	1.00	1.38	2.00	1.25	1.13	-
116	W4	–	–	–	–	–	–	–	–	–	9.40	10.50	6.00	–	8.00	–	8.50	13.50	10.50	10.88	8.50	8.00	7.00	12.13	9.38
117	W5	–	–	–	–	–	–	–	–	–	5.90	1.83	3.00	–	–	–	–	–	–	–	–	–	–	–	-
118	W6	–	–	–	–	–	–	–	–	–	22.30	11.00	5.70	8.50	7.30	9.13	5.63	10.63	8.00	7.50	10.38	11.00	13.25	10.88	15.88
119	W7	–	–	–	–	–	–	–	–	–	–	5.30	6.50	–	3.10	–	–	–	–	–	–	–	–	–	-
120	W8	–	–	–	–	–	–	–	–	–	13.75	2.83	1.00	8.10	8.00	5.50	8.13	9.13	11.88	9.13	11.25	8.13	7.13	5.25	5.63
121	W9	–	–	–	–	–	–	–	–	–	5.20	3.50	2.125	2.30	3.50	–	–	–	–	1.00	5.50	2.88	7.25	2.63	-
122	W10	–	–	–	–	–	–	–	–	–	–	–	7.33	8.30	5.90	5.25	4.13	7.25	5.13	4.13	8.00	4.43	5.25	–	4.38
123	W11	–	–	–	–	–	–	–	–	–	7.07	7.75	2.00	–	–	–	–	–	–	–	–	–	–	–	-
124	W12	–	–	–	–	–	–	–	–	–	18.90	9.75	6.10	3.60	5.90	6.00	7.88	6.25	4.63	5.13	8.00	8.13	7.38	6.13	5.50
178	W13	–	–	–	–	–	–	–	–	–	–	–	–	–	4.50	2.80	–	–	–	–	–	–	–	–	-
127	W14	–	–	–	–	–	–	–	–	–	–	–	–	–	1.00	0.88	0.50	0.00	–	–	–	–	–	–	-
128	W16	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.9	2.17	–	–	–	–	–	–		-

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Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	Sacro Bosco	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.88	0.88
Hupara																									
258	Hupara Land Care 1 (Bill's Plateau)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	31.25	15.13	21.38	25.00	26.38	21.38	24.8
245	Hupara Land Care 2 (Mike Sullivan's)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	20.88	11.00	16.00	–	–	–
246	Hupara Land Care 3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	19.38	–	–	–	–	–
257	Hupara Land Care 4 (Home Orange Tree)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	11.63	9.00	17.13	12.13	19.9
	Hupara Land Care Harrison's Property	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	35.29	–	–
Tutukaka & Sandy Bay																									
125	TLC 1	–	–	–	–	–	–	–	–	9.75	5.90	7.10	8.80	10.90	11.60	8.13	8.63	12.38	12.00	12.14	9.63	7.38	11.50	13.75	17.63
126	TLC 2	–	–	–	–	–	–	–	–	–	8.40	7.80	9.80	10.25	6.50	–	7.38	2.75	10.00	–	6.83	10.88	9.50	16.88	14.88
142	TLC 3	–	–	–	–	–	–	–	–	–	–	3.00	4.60	3.60	3.00	–	–	9.25	8.50	7.13	5.38	4.13	8.63	–	5.63
28	TLC 4	-	7.30	–	–	8.00	4.40	-	-	10.70	7.25	4.40	10.00	–	–	8.17	4.50	–	–	–	6.50	–	–	–	12.00
143	TLC 5	–	–	–	–	–	–	–	–	–	–	4.10	6.00	3.30	7.10	4.00	2.33	3.83	–	–	3.50	–	–	–	–
144	TLC 6	–	–	–	–	–	–	–	–	–	–	9.20	–	13.00	15.20	6.50	8.75	–	–	–	–	–	–	–	–
160	TLC 7	–	–	–	–	–	–	–	–	–	–	–	4.40	–	–	4.75	4.88	–	5.50	2.13	3.00	–	–	–	–
100	Kaiatea 1	–	–	–	–	–	–	–	–	–	1.60	–	–	–	–	–	–	–	–	–	–	–	–	–	–
101	Kaiatea 2	–	–	–	–	–	–	1.20	2.00	1.25	2.10	–	–	–	–	–	–	–	–	–	–	–	–	–	–
27	Sandy Bay 1	3.60	3.40	2.80	8.00	6.10	3.30	3.50	–	3.00	–	2.50	–	–	6.75	–	5.25	–	4.17	5.50	4.25	3.88	5.75	6.25	6.00
260	Sandy Bay 2	–	–	–	–	–	–	–	–	–	–	–	4.50	–	–	3.83	3.50	2.50	4.50	–	3.00	5.88	6.38	9.25	3.63
261	Sandy Bay 3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.00	–	4.00	7.50	3.88	3.88	8.50	5.50	4.75
	Rayonnier Forest																							5.13	–
	SFB																								4.75
	Te Toiroa																								14.00
	Pukenui Rd																								6.13
	Ngahere Pines																								15.00
Whangarei Heads																									
39	Bream Hd 1	–	–	–	–	–	–	5.00	3.10	5.75	3.10	4.70	5.10	3.50	5.00	6.00	3.00	7.13	9.50	9.63	9.63	10.00	12.13	7.38	11.25
40	Bream Hd 2	–	–	–	–	–	–	1.20	2.00	1.25	2.10	2.40	2.00	2.80	2.00	–	–	1.25	–	–	–	–	–	–	–
41	Bream Hd 3	–	–	–	–	–	–	–	–	–	–	1.50	2.00	1.30	1.60	–	–	–	8.38	8.63	8.63	6.13	6.88	6.00	4.50
42	Bream Hd 4	–	–	–	–	–	–	1.20	2.00	1.25	2.10	2.40	2.00	1.50	3.10	2.00	2.00	5.38	5.33	7.63	2.13	6.25	3.75	6.75	8.50

Continued on next page

Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
42	Bream Hd 4	–	–	–	–	–	–	1.20	2.00	1.25	2.10	2.40	2.00	1.50	3.10	2.00	2.00	5.38	5.33	7.63	2.13	6.25	3.75	6.75	8.50
69	Bream Hd 6	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.88	6.75	4.38	–	5.00	3.25	3.25
44	Taurikura 1	–	–	–	–	–	–	–	–	–	–	1.50	2.00	–	4.40	4.88	3.13	12.63	9.63	10.75	–	–	–	–	–
45	Taurikura 2	–	–	–	–	–	–	–	–	–	–	–	–	–	9.00	8.50	10.88	10.25	5.50	10.38	11.88	8.63	11.25	10.25	9.75
46	Taurikura 3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.50	1.88	5.88	4.63	4.00	7.50	4.75	6.00	–	4.75
47	Manaia 1	–	–	–	–	–	–	3.50	2.50	4.25	4.00	3.30	3.90	2.10	5.10	3.88	3.25	10.25	2.88	2.75	3.63	1.50	9.38	8.75	13.50
48	Manaia 2	–	–	–	–	–	–	4.00	4.50	4.90	5.75	4.00	5.30	7.40	7.60	8.75	10.75	8.38	16.63	13.25	15.88	15.13	15.63	13.50	15.25
49	Manaia 3	–	–	–	–	–	–	3.25	3.90	2.90	–	2.10	3.00	–	4.00	3.13	3.50	6.25	3.13	5.13	3.63	7.50	7.13	9.25	6.75
71	Manaia 8	–	–	–	–	–	–	–	1.50	0.25	1.00	1.20	2.00	1.50	1.40	1.88	0.75	2.13	–	4.63	–	3.25	4.75	3.88	3.13
262	Manaia 9	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7.75	3.63	6.88	9.13	6.00	–	10.00	–
54	Kauri Mtn 1	–	–	–	–	–	–	4.50	1.50	–	3.10	7.40	1.30	–	1.40	3.00	2.13	2.50	3.63	4.63	4.38	3.75	7.38	6.50	5.13
72	Kauri Mtn 2	–	–	–	–	–	–	–	5.10	3.20	4.30	2.70	2.30	0.40	2.25	3.60	2.38	3.38	5.25	5.00	6.25	6.75	9.63	7.13	5.63
73	Kauri Mtn 3	–	–	–	–	–	–	–	2.00	1.00	1.00	1.30	2.50	–	5.00	3.38	1.13	6.00	3.25	3.17	5.13	6.88	7.00	6.75	4.75
74	Kauri Mtn 4	–	–	–	–	–	–	–	4.80	5.90	2.60	3.00	2.90	–	2.00	2.00	3.38	3.88	3.75	3.25	4.13	4.75	5.63	6.13	5.75
141	Kauri Mtn 5	–	–	–	–	–	–	–	–	–	–	2.30	1.90	1.25	2.50	3.13	3.25	4.75	4.13	3.00	4.88	4.75	8.86	8.88	6.30
127	The Nook 1	–	–	–	–	–	–	–	–	–	1.80	1.50	0.90	–	0.70	1.38	1.25	2.25	–	0.88	–	–	–	–	–
56	The Nook 2	–	–	–	–	–	–	6.00	2.10	3.25	3.80	4.00	5.30	–	5.00	4.50	7.75	9.25	8.38	6.38	4.13	1.63	3.88	8.50	6.13
128	The Nook 3	–	–	–	–	–	–	–	–	–	–	–	–	–	3.40	4.75	5.00	3.38	3.38	4.63	–	–	–	–	–
58	Nook Rd	–	–	–	–	–	–	–	–	–	–	–	–	–	3.75	–	3.67	4.63	1.50	–	–	–	–	–	–
263	Craig Road	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6.00	14.13	12.25	9.25	13.50	12.25	10.63	14.33
75	McCleod Bay	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	9.63	5.88	8.75	7.38	7.25
	Maungatika Scenic Reserve 1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.00	0.88	0.38	0.75	0.13
	Owhiwa Road Kauri Villas	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.38
Southern																									
21	Glenbervie 7A	5.00	6.40	7.10	7.50	5.00	0.50	1.00	2.40	1.00	–	1.30	–	2.40	2.50	1.88	1.75	2.63	1.13	4.25	–	–	–	1.88	3.88
22	Glenbervie 9A	11.20	3.80	4.30	7.30	5.90	12.60	6.75	5.25	4.50	6.50	–	1.80	2.80	2.90	1.38	2.88	1.63	6.75	6.88	2.75	2.00	–	5.25	–
23	Marlow Road	22.40	13.90	14.00	17.80	19.80	21.30	22.90	–	19.80	17.60	12.10	10.00	13.30	11.10	10.25	7.25	13.13	15.38	14.00	18.38	20.13	18.75	21.13	18.38
24	Purua North	12.10	13.00	10.30	10.50	10.60	15.00	12.75	12.50	13.25	10.90	12.60	13.60	18.30	9.90	13.50	10.00	16.13	16.00	17.63	14.88	16.25	13.75	13.50	–
25	Rarewarewa –early listen	–	–	–	8.00	10.40	4.60	7.00	6.50	4.60	5.90	5.60	4.80	6.00	–	–	–	–	–	–	–	–	–	–	–
25	Rarewarewa South	7.50	8.00	8.50	6.60	8.30	6.60	7.00	5.80	6.50	6.60	5.30	6.30	6.60	6.40	8.88	4.00	7.88	6.50	4.63	7.50	7.50	9.14	11.25	10.25
26	Mimiwhangata	11.00	5.60	3.50	3.60	0.30	9.40	19.10	20.30	13.80	20.25	14.30	21.00	19.50	12.90	11.00	8.38	–	11.00	9.00	12.13	9.63	10.75	14.63	9.75
34	Motatau 1	–	–	–	–	8.80	–	10.00	15.00	6.75	7.50	5.60	6.50	7.50	8.75	6.00	–	4.88	2.50	–	–	4.86	–	–	–
35	Motatau 2								2.70	–	–	1.50	3.00	2.50	–	–	–	4.25	–	5.50	–	–	–	–	–

Continued on next page

Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
36	Motatau 3	–	–	–	–	–	–	4.80	1.50	2.75	5.50	3.50	4.60	4.00	0.90	–	–	5.50	–	–	–	–	–	–	–
38	Motatau 5	–	–	–	–	–	–	1.50	1.25	0.90	1.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–
68	Motatatu 9/ Marlow 1	–	–	–	–	–	–	–	11.70	11.75	17.60	13.50	10.50	9.30	2.90	7.13	3.00	9.75	9.88	9.25	5.38	–	11.88	11.75	9.50
81	Purua South	–	–	–	–	–	–	–	–	14.75	15.90	14.40	14.10	14.60	10.50	12.5	11.13	17.50	10.75	7.25	18.63	9.50	7.25	11.50	29.75
82	Rarewarewa North	–	–	–	–	–	–	–	–	9.75	6.60	4.00	8.50	7.90	10.40	11.38	11.38	11.88	12.13	10.00	7.88	6.88	–	8.13	6.25
129	Motatau 10/ Marlow 2	–	–	–	–	–	–	–	–	–	7.10	7.50	10.90	9.00	5.75	2.17	3.38	5.00	5.38	7.75	2.25	4.50	3.88	5.88	5.17
139	Hodges Bush	–	–	–	–	–	–	–	–	–	–	9.80	13.00	16.10	17.75	15.50	16.63	9.50	13.75	28.63	22.00	23.13	11.75	16.00	15.50
145	Whangaruru	–	–	–	–	–	–	–	–	–	–	–	6.00	6.00	10.25	13.38	10.75	24.29	13.50	9.38	7.75	4.38	10.00	5.38	3.50
167	Kaikanui Rd	–	–	–	–	–	–	–	–	–	–	–	–	8.50	11.60	15.00	8.38	7.25	3.75	2.88	–	–	–	–	–
168	Worsp Rd	–	–	–	–	–	–	–	–	–	–	–	–	1.80	2.40	2.00	5.75	1.38	–	–	–	0.13	2.00	–	–
264	Whau Valley Dam	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.00	–	–	–	–	–	–	–
	Tanekaha 1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3.00	–
	Tanekaha 2	“	“	“	“	“	“	“	“	“	“	“	–	–	–	–	–	–	–	–	–	–	–	2.13	–
	Hay Rd																								1.67
Western																									
16	Katui	47.60	39.40	20.40	28.20	17.50	16.10	14.40	–	14.90	13.90	–	4.00	–	0.00	–	0.25	–	–	0.00	0.00	–	–	1.50	5.04
17	Trounson North	8.50	17.30	12.50	19.00	16.00	14.30	16.10	–	15.25	19.90	22.20	15.40	–	13.75	22.33	5.75	15.13	12.00	10.00	5.25	7.63	9.38	11.13	13.50
18	Cathedral	2.30	3.80	5.10	5.50	5.10	1.80	2.75	5.90	5.25	4.90	4.00	4.60	4.40	3.00	1.63	2.75	4.13	2.63	4.38	5.75	7.13	7.13	6.13	6.00
19	Waipoua L/Out	30.9	24.40	30.80	27.70	21.40	21.80	14.60	8.40	16.90	22.75	23.00	7.90	11.80	6.00	6.00	9.25	15.63	8.88	10.00	12.50	12.38	12.00	11.63	9.63
20	Paerata	9.90	1.30	3.10	6.50	2.80	3.10	1.25	–	0.00	–	–	–	0.90	1.10	1.63	0.25	0.38	1.13	0.25	0.63	–	–	–	–
31	Te Matua Ngahere	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3.25	4.13	–	–	–	–	1.17	–	3.38	2.00
33	Trounson South	–	–	–	–	–	–	12.25	–	23.75	19.10	–	–	8.20	8.90	–	11.13	12.33	10.00	6.00	7.75	7.75	10.50	5.88	7.88
79	Toronui Track	–	–	–	–	–	–	–	–	1.75	2.40	–	–	–	–	–	–	–	–	–	–	–	–	–	–
96	Kawerau Rd Cr	–	–	–	–	–	–	–	–	3.40	2.00	0.30	0.40	1.00	–	–	–	–	–	–	–	–	–	–	–
157	Opouteke CHH	–	–	–	–	–	–	–	–	–	–	–	6.60	6.10	2.80	11.25	–	–	–	–	–	–	–	–	–
158	Pipiwai CHH	–	–	–	–	–	–	–	–	–	–	–	7.30	0.50	1.50	–	–	–	–	–	–	–	–	–	–
179	Marlborough 13	–	–	–	–	–	–	–	–	–	–	–	–	–	6.50	–	–	–	–	–	–	–	–	–	–
244	Maunganui Bluff	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.00	–	–	–	–	–
265	River Road	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.00	–	–	–	2.63	–	5.00	3.13
266	Wekaweka LC 1 (Alf's Cottage)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.20	–	–	–	–	–	–	–
267	Wekaweka LC 2 (Rob's Place)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.67	–	0.13	0.13
268	Wekaweka LC 3 (Libby's track)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.25	–	1.25	1.38

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Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	Wekaweka (The drop)																								1.50
13b	Site 13	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5.13	–	–	–	–	–	–	–	–	–
14b	Site 14	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.00	–	–	–	–	–	–	–	–	–
16b	Marlborough Rd Site 16	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4.38	2.13	1.50	1.38	0.63	2.00	0.38	0.50	1.00	0.00
18b	Site 18	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.50	–	–	–	–	–	–	–	–	–
28b	Site 28 SH12	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6.25	8.88	3.63	4.13	5.13	–	7.63	4.50	8.43	5.13
30b	Site 30 SH12	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.00	3.00	0.88	–	–	–	1.50	–	–	0.38
31b	Site 31	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.50	–	–	–	–	–	–	–	–	–
32b	Site 32	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.88	–	–	–	–	–	–	–	–	–
Tawharanui																									
161	TWN 1 Marine triangle	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8.16	0.50	–	1.25	2.25	2.88	2.63	4.00	4.38	4.13
162	TWN 2 Trig triangle	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.16	0.67	–	3.88	1.88	1.25	2.88	6.63	5.88	10.75
163	TWN 3 Top ecology track	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.50	0.33	–	1.63	2.00	4.63	6.00	5.00	4.50	4.38
164	TWN 4 Possum gully	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.00	0.00	–	2.75	1.38	8.00	2.75	4.63	2.38	7.00
165	TWN 5 Twin hills	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.16	0.00	–	2.25	1.88	3.25	3.50	6.75	7.25	4.75
166	TWN 6 South coast water tank	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.83	0.33	–	4.88	6.50	8.00	9.50	6.38	3.00	12.63
Kawau Island																									
269	Bostaquet Bay	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5.57	–	–	–	–	–	–
270	South Cove	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.40	–	–	–	–	–	–
		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.38
		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.75
		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.75
Maranui																									
253	Marunui 1 (House 17 deck)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.13	2.63	4.25	3.25	5.63
275	Marunui 2 (Pebblebrook Rd)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.67	3.00	6.88	3.50
Mataia																									
254	Mataia 1 KLD (Top of fishing track)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.04	–	–	4.00	3.25
255	Mataia 2 KLD (Mid pa track)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.46	–	0.50	1.88	–
	Mataia 3 KLD (Cliffs)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.75	–	–
	Mataia Quarry	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.00

Appendix 3

Summary of Northland kiwi listening data (calls/hr) for stations listened from in 2018

STN NO.	STATION NAME	LISTENER	1		2		3		4		TOTAL	MEAN
			1	*2*	*1*	*2*	*1*	*2*	*1*	*2*		
Northern												
7	Puketi	D. O'Halloran	5	8	13	5	10	5	11	9	57	8.25
8	Puketi SR	J.&H. Bonham, I. Wilson	13	9	19	10	11	9	15	11	86	12.13
Mangatete												
3	Lightning Hill	L. Baigent	20	17	25	11	13	15	17	23	141	17.63
256	Home drive	A. Baigent	28	12	26	10	12	19	22	11	140	17.50
Honeymoon Valley												
	NZFRT reserve, campsite	M. Schmid	4	6	4	2	9	0	6	4	31	4.38
	Toa Toa Ridge	R. Parsonson	3	0	0	0	0	1	0	0	4	0.50
271	Green Bach	Y. Steineman	0	0	-	-	-	-	-	-	0	0.00
Whakaangi												
131	Wha 2	M. Aldrich	4	2	4	1	4	2	-	-	17	2.83
132	Wha 3	T. Vuksich	4	2	10	5	2	2	-	-	25	4.17
133	Wha 5	D. Bell	0	9	3	14	2	3	-	-	31	5.17
135	Wha 7	B. Jarvis	0	8	0	0	2	1	4	6	15	2.63
136	Wha 8	P.&P. Johnston	10	5	8	10	6	8	8	3	55	7.25
137	Wha 9	A. Goodwin	2	2	1	5	1	1	0	2	12	1.75
140	Wha 11	J. Landridge	8	13	14	5	8	14	7	2	69	8.88
	Wha 12	S. Scott	16	10	10	-	-	-	-	-	36	12.00
Mahinepua												
90	Site 0	N. Cox, N. Redmond, R. Lawlor	2	2	3	6	5	10	13	8	41	6.13
83	Site 1	G. Wade Ferrell, K. Gilhespy	5	3	3	10	6	11	12	15	50	8.13
84	Site 2	S. Moore, K. Heath et al.	7	9	11	14	8	19	16	14	84	12.25
85	Site 3	F. Barnes, J. Atwell	9	5	13	10	21	11	23	8	92	12.50
Eastern												
10	Marsden Cross	C. Hambrook	62	24	46	27	39	29	48	42	275	39.63
11	Puketotara	A. Kearney	12	11	5	24	13	11	23	13	99	14.00
12	Rangitane	D.&D. Wright, F. Corbett, A. Walker	19	19	13	15	15	18	20	26	119	18.13
13	Waitangi No. 12	D. Lawson	10	7	3	2	6	11	2	7	41	6.00
14	Mt Bledisloe	R. Hutchings	20	11	18	11	12	4	20	6	96	12.75
15	Tikitikikiore	L. Gordon	28	38	29	12	25	27	28	10	187	24.63
Bay of Islands												
226		A. Kearney	14	15	16	13	14	6	12	8	90	12.25
185	Akeake Reserve	V.&W. Gooch	3	1	6	7	0	2	1	2	20	2.75
58	Waitangi Forest/ Te Puke	T. Holland, T., E.&J. Smith	6	9	2	7	6	9	9	7	48	6.88
	Takau Bay River SR	M. Phillips	3	4	2	0	1	2	-	-	12	2.00
	35	J. Hutchings	19	8	23	7	7	8	19	6	91	12.13
	Dome	J. Kearney	0	4	2	3	7	3	1	1	20	2.63
	Dome + 500w	J. Kearney	0	5	0	2	5	1	2	7	15	2.75
	Blunden W Maori Block	J. Kearney	6	4	1	8	3	3	0	1	25	3.25

Continued on next page

Appendix 3 continued

STN NO.	STATION NAME	LISTENER	1		2		3		4		TOTAL	MEAN
			1	*2*	*1*	*2*	*1*	*2*	*1*	*2*		
	Blunden East	J. Kearney	10	6	1	3	6	3	1	0	30	3.75
	1273A Bulls Rd	S. Wright	4	1	0	1	0	0	0	2	6	1.00
	Poulton	A. Mentor	19	12	8	12	11	9	10	21	81	12.75
	The Landing – Top Vineyard Villa	B. Michalivk/A. Hull	36	16	35	38	48	40	48	34	295	36.88
	The Landing – Twin Tanks	R. Frear/D. Hawker	47	31	48	31	50	57	43	34	341	42.63
Russell												
59	Opito Farms	E. Harwood/L. Collins	15	13	18	19	14	8	15	6	108	13.50
60	Te Maiki/Flagstaff	C. Maynard	10	4	6	4	8	2	5	1	40	5.00
62	Uruti Road	L. Gordon/C. Richmond	14	16	19	12	31	9	24	12	137	17.13
170	Nikau Block	S. Scowen	23	9	18	13	18	20	16	12	129	16.13
171	Mace/Farmer	M. Cadogan	44	28	41	24	34	22	-	-	193	32.17
172	Pipiroa	M. Pasco	7	1	0	7	10	2	8	3	38	4.75
173	Shortlands	L. Gordon/M. Cadogan	9	4	22	9	15	14	10	6	89	11.13
174	Johnsons	M. Frankum	15	15	14	12	15	7	7	10	95	11.88
Puketi Forest												
102	Bramley's Ridge	G. Adams, A. Linton, S. Manunui	3	3	0	1	5	7	4	8	31	3.88
104	Pond	R., J.&B. Hall	8	6	6	6	15	11	16	8	76	9.50
106	Takapau Track	Tricia	6	5	5	10	3	2	4	1	36	4.50
107	Takapau/Pirau Rd Jn	D. France, I. Wilson	5	3	5	2	5	2	4	3	29	3.63
108	Totara Ridge	D. France, I. Wilson, G. Adams	9	5	10	10	8	9	3	0	54	6.75
109	Waihoanga Gorge	H.&R. Robinson	14	7	7	3	7	6	16	5	65	8.13
111	Walnut	S. Manunui, G. Adams	7	7	8	2	2	3	7	7	36	5.38
112	Stoat line 9 – Puketi	P. Quinlan, A. Linton et al.	3	5	1	1	2	2	8	5	27	3.38
Hupara												
258	Hupara Land Care 1 (Bill's Plateau)	S.B. Brown	22	7	30	19	23	24	26	8	159	19.88
257	Hupara Land Care 4 (Orange Tree)	S.B. Brown	27	37	20	18	37	20	15	24	198	24.75
Waimate North												
113	W1	S. Brown	43	25	45	22	27	17	22	12	201	26.63
114	W2	P. Saunders, M. Moore	15	5	12	3	13	6	5	2	59	7.63
116	W4	H. Horrobin et al.	5	8	13	14	8	8	9	10	65	9.38
118	W6	D. Way, J. Dryburgh	20	13	18	19	14	12	17	14	113	15.88
120	W8	A. Chiaroni, A. Renton, D. Way	5	5	6	9	3	0	11	6	39	5.63
122	W10	D. Henderson, L. Hanley, D. Way	8	5	1	2	3	7	2	7	28	4.38
124	W12	C. Smith, C. Matthews	5	4	7	2	10	1	11	4	40	5.50
	Sacro Bosco	B. Gabler	2	0	0	1	1	1	0	2	5	0.88
Sandy Bay												
27	Sandy Bay 1	N. Pullman	7	5	3	4	7	8	9	5	43	6.00
260	Sandy Bay 2	ALD	2	5	3	1	6	6	-	-	23	3.83
261	Sandy Bay 3	N. Pullman	1	4	11	7	7	5	1	2	36	4.75
Tutukaka												
125	TLC 1	M. Camm	19	24	29	17	15	7	17	13	128	17.63
126	TLC 2	N. Davies	21	18	19	8	11	11	20	11	108	14.88
142	TLC 3	S.&D. Young	4	5	6	8	8	2	7	5	40	5.63
28	TLC 4	S. Seitzer	14	11	15	3	12	15	19	7	89	12.00

Continued on next page

Appendix 3 continued

STN NO.	STATION NAME	LISTENER	1		2		3		4		TOTAL	MEAN
			1	*2*	*1*	*2*	*1*	*2*	*1*	*2*		
	SFB	ALD	4	2	7	3	2	0	12	8	38	4.75
	Te Toiroa	ALD	16	23	17	9	10	6	16	15	112	14.00
	Pukenui Road	ALD	2	12	3	11	7	3	5	6	49	6.13
	Ngahere Pines	ALD	19	14	20	5	16	15	17	14	120	15.00
Whangarei Heads												
39	Bream Head 1	W. Newbold	20	8	12	14	17	3	11	5	85	11.25
41	Bream Head 3	O. Petel	7	7	5	3	3	3	7	1	35	4.50
42	Bream Head 4	T. Hall	10	6	11	8	12	6	8	7	61	8.50
69	Bream Head 6	C. Cook	4	1	5	2	3	3	7	1	25	3.25
54	Kauri Mt 1	J. Nairn	5	2	4	7	5	6	5	7	41	5.13
72	Kauri Mt 2	A. Willets	7	7	7	4	5	7	4	4	41	5.63
73	Kauri Mt 3	T. Bull	0	3	4	3	5	4	11	8	30	4.75
74	Kauri Mt 4	G.&R. Faber	12	0	6	1	8	8	9	2	46	5.75
141	Kauri Mt 5	L. Brown	9	5	6	1	10	7	-	-	38	6.33
47	Manaia 1	L. Ogle	13	16	7	10	19	15	15	13	95	13.50
48	Manaia 2	F. Clayton, J. Lawrence, Z. Bell	17	16	25	19	18	3	16	8	114	15.25
49	Manaia 3	P. Richards	5	7	2	12	10	3	4	11	43	6.75
71	Manaia 8	W. Fieldhouse	3	3	3	2	7	1	5	1	24	3.13
56	Nook 2	M.&J. Butcher	7	5	12	2	6	6	5	6	43	6.13
45	Taurikura 2	G. Pike, R. Hohmann	16	11	20	7	8	5	6	5	73	9.75
46	Taurikura 3	K. Lange	9	2	7	3	14	0	3	0	38	4.75
263	Craig Rd	M. Topping	26	19	14	5	14	8	-	-	86	14.33
75	McLeod Bay	W. & V. Biddle	8	10	5	5	11	6	7	6	52	7.25
	Kohinui	J. Marshall, P. Gardner, R. Bigelow	0	0	0	0	0	1	1	1	2	0.38
Southern												
21	Glenbervie 7A	ALD	7	0	10	7	3	0	2	2	29	3.88
23	Marlow Rd	G. Coulston	18	30	12	13	25	18	18	13	134	18.38
25	Rarewarewa S	C. Robles	11	16	8	9	3	12	13	10	72	10.25
26	Mimiwhangata	R. Taylor	12	10	7	10	-	-	-	-	39	9.75
68	Motatau 9	I. King/N. Hawkins	10	17	12	6	7	5	-	-	57	9.50
81	Purua S	A. Wiles/J. Brady	52	36	46	13	21	34	13	23	215	29.75
82	Rarewarewa N	R. Fuchs	6	5	1	5	10	7	7	9	41	6.25
129	Motatau 10	I. King	1	3	6	5	8	8	-	-	31	5.17
139	Hodges	G.J. Lovell	17	9	20	19	12	16	-	-	93	15.50
145	Whangaruru	D.&R. Hughes	2	1	5	4	3	3	6	4	24	3.50
276	Hay Rd	G. Copstick	5	0	2	2	0	1	-	-	10	1.67
Western												
16	Katui	R. Booth et al.	0	4	0	5	1	2	0	0	12	1.50
17	Trounson Nth	M. Leach	5	8	20	9	14	5	15	13	89	11.13
18	Cathedral	J. McLaughlin/N. Krivec	5	10	6	6	5	8	9	0	49	6.13
19	Lookout	O. Knox	10	14	9	13	13	13	14	7	93	11.63
31	Te Matua Ngahere	N. Krivec/J. McLaughlin	5	4	3	1	5	3	4	2	27	3.38
33	Trounson Sth	M. Topia	4	7	13	3	7	8	2	3	47	5.88
16b	Malborough Rd Site 16	M. Calder	0	2	0	0	2	0	2	2	8	1.00
28b	Site 28 SH12	I. Farrent/S. Downey	4	7	9	15	7	6	11	–	59	8.43
265	River Road	J. Matthews/Z. Birch	5	6	4	6	3	6	–	–	30	5.00
267	Wekaweka LC 2 (Rob's Place)	R. Anderson	0	0	1	0	0	0	0	0	1	0.13

Continued on next page

Appendix 3 continued

STN NO.	STATION NAME	LISTENER	1		2		3		4		TOTAL	MEAN
			1	*2*	*1*	*2*	*1*	*2*	*1*	*2*		
268	Wekaweka LC 3 (Libby's track)	E. Hooten	2	0	2	0	2	1	2	1	10	1.25
	(The Drop)	Andy/Georgie	3	0	2	0	3	1	3	0	12	1.50
Tawharanui												
161	TWN 1 Marine triangle	K. Mcgee/K. Hoksbergen et al.	10	9	4	0	1	1	6	2	31	4.13
162	TWN 2 Trig triangle	S. Kast/M Vanderkok et al.	13	23	12	6	9	9	9	5	81	10.75
163	TWN 3 Top ecology track	N. Sutherland/S. Corbett et al.	7	4	2	3	0	6	11	2	33	4.38
164	TWN 4 Possum gully	G. Dallimore/N. Maye et al.	6	7	8	3	5	10	9	8	48	7.00
165	TWN 5 Twin hills	J. Poole/B. Trigg et al.	6	4	4	3	4	2	5	10	28	4.75
166	TWN 6 South coast water tank	D. Chambers/R. Williams et al.	9	20	19	12	5	10	9	17	84	12.63
Marunui												
253	House 17 Deck	J. Hawley	5	8	5	5	2	5	7	8	37	5.63
275	Pebblebrook Rd	L. Steiner	5	4	4	3	4	4	3	1	27	3.50
Mataia												
254	Mataia 1	ALD	0	5	8	1	1	2	7	2	24	3.25
	Quarry (new site)	ALD	0	3	4	0	4	2	3	0	16	2.00
Kawau Island												
	Skid 1	ALD	4	0	3	1	3	3	5	0	19	2.38
	Harris Bay	ALD	2	6	2	3	3	3	2	1	21	2.75
	Not specified	ALD	4	3	0	6	5	0	1	3	19	2.75

Appendix 4

Trends in mean kiwi call rates (calls/hr) from annual monitoring at selected stations of managed Northland kiwi populations

AREA	NO. STNs	STATION NUMBERS	2017 STATION NUMBERS	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Mangatete	2	3, 256	3, 256	–	–	–	–	–	–	–	–	–	–	–	11.00	15.88	17.94	15.94	17.56
Honeymoon Valley	4	271–274	Insufficient data	–	–	–	–	–	–	–	–	–	–	–	–	1.47	–	–	–
Whakaangi	7–9	29, 130–137	135–137	–	–	11.80	10.70	10.10	10.80	11.68	12.23	10.88	9.93	7.33	6.52	8.08	4.67	4.00	3.97
Mahinepua-Radar Hill	8	83–85, 87–89, 98, 99	83–85, 88, 99	–	3.60	2.80	4.90	2.70	1.90	2.46	4.65	5.50	10.23	6.65	5.73	6.45	7.79	7.46	10.96
Russell Peninsula	5	15, 59, 62, 170, 173	15, 59, 62, 170, 173	–	–	4.53	4.01	7.04	5.35	4.61	5.54	11.44	9.77	11.4	12.83	13.8	19.7	11.33	16.50
Puketi Forest	6	102, 104–106, 108, 111	102, 104, 106, 108, 111	–	–	–	2.88	1.15	1.48	3.66	3.00	4.25	4.11	3.60	5.67	2.88	4.23	3.53	6.00
Hupara	3–4	245, 246, 257, 258	257, 258	–	–	–	–	–	–	–	–	–	–	18.46	14.7	16.7	21.8	16.75	22.31
Waimate North	5	114, 118, 120, 122, 124	114, 118, 120, 124	–	10.46	4.28	–	6.80	6.48	4.68	8.05	8.98	8.43	6.6	8.55	8.06	7.55	7.77	10.94
Sandy Bay	3	27, 260, 261	27, 260, 261	–	–	–	–	–	–	–	3.25	–	4.22	4.33	3.71	4.54	6.88	7.00	4.86
Tutukaka	5	125, 126, 142, 143, 144, 28	125, 126	–	–	6.24	7.30	8.21	8.68	5.67	6.77	7.05	10.17	9.63	6.25	7.46	9.88	15.31	12.53
Manaia-Nook	5	47–49, 56, 71	47–49, 56, 71	3.10	3.50	2.90	3.90	–	4.60	4.43	6.31	7.25	7.75	6.43	6.81	5.80	8.15	8.78	8.95
Kauri Mountain	5	54, 72–74,141	54, 72–74, 141	–	–	3.30	2.20	–	2.60	3.02	2.45	4.10	4.00	3.83	4.95	5.38	7.7	7.08	5.52
Bream Head-Taurikura	5	39, 41, 42, 44, 69	39, 41, 42, 69	–	–	2.50	2.60	2.20	3.20	4.29	2.70	6.59	7.14	8.68	6.19	7.46	6.94	5.84	6.88
Motatau-Marlow	6	23, 34–36, 68, 129	23, 68, 129	–	–	7.30	7.60	7.50	4.90	6.39	4.54	7.08	8.28	9.13	8.67	9.83	11.5	12.92	11.01
Purua-Rarewarewa	5	24, 25, 81, 82, 139	24, 25, 81, 82, 139	–	–	9.20	11.10	12.70	10.90	12.35	10.63	12.58	11.83	13.6	14.18	12.70	10.50	12.08	15.44
Waipoua	4	16–19, 33	16–19, 33	13.08	15.36	15.78	7.98	8.90	5.69	7.49	4.50	11.80	8.38	6.08	5.60	8.72	9.75	7.25	8.41
Tawharanui Open Sanctuary	6	161–166	161–166	–	–	–	–	–	–	2.30	0.31	–	2.77	2.65	4.67	4.54	5.56	4.56	7.27
Maranui Conservation Limited	2	253, 275	253, 275	–	–	–	–	–	–	–	–	–	–	–	1.13	2.15	3.63	5.06	4.56
Mataia Restoration Project	2	254, 255	254, 255	–	–	–	–	–	–	–	–	–	–	–	1.25	–	1.13	2.94	–

Note: In previous reports up to 2009: where a single station was not covered, the previous year's results were used. However, some of the stations had not been listened from for several years, so the mean call count rates for the data from 2010 and beyond were calculated only from the relevant stations listened from for that year.