A GUIDE ON HOW TO SURVEY FOR KIWI

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Save the kiwi

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Contents

About this Handbook

This handbook is a practical guide for people involved in kiwi conservation.

It has been developed as a key resource to assist with the training of participants new to kiwi conservation and has been produced by Save the Kiwi.

The objective of the handbook is to advise and enable consistent kiwi survey and management practices across all regions. This handbook should be read in conjunction with the Kiwi Best Practice Manual.

An attempt has been made to make the techniques described in this handbook as up to date as possible, readers should be aware that new techniques and technologies are being developed all the time. Kiwi practitioners and others involved in kiwi conservation should make an effort to keep themselves up to date with new developments.

1. Kiwi Surveys

Due to their cryptic nocturnal behavior, it is difficult to count all kiwi in a known area. For this reason we use surveys to give us an indication of kiwi presence and an estimate of kiwi numbers in an area. To survey kiwi we make use of their calls because we know that most territorial kiwi call regularly and very loudly. Birds can be heard calling up to one and a half kilometres away in ideal listening conditions.

Male and female kiwi produce different sounding (sexually dimorphic) calls allowing us to record the presence of pairs in an area. Often kiwi pairs can be heard duetting with the male and female calling together.

Survey techniques based on calls only allow an estimation of relative abundance. There is natural variation in how loud and often kiwi call. Young kiwi do not usually call in their first year and some non-territorial kiwi very rarely call. Males generally call about 2-3 times more frequently than females. In addition, the lower pitched calls of females don't carry as far as the whistle-like calls of the males.

Kiwi call year-round but there is seasonal variation. Brown kiwi call rates peak between April – June and September – November coinciding with mating before the 1st and 2nd clutches. Survey work can be carried out year-round but listening for long term monitoring projects should be carried out between April and June.

Some previous studies suggested brown kiwi are less active and less likely to call on bright moonlit nights, more work is being done in this area and until this work has been analysed it is best to avoid bright moonlit nights to survey for kiwi.

In this handbook we will look at two methods we use to survey for kiwi, acoustic recorder surveys and kiwi call surveys.

Which Survey Type do I use?

It depends on what you want to find out and what resources you have available to you. It may also depend on how accessible your sites are at night.

Survey Type	What do you want to find out?	Do you have resources available?	Are your sites accessible at night?
Acoustic recorder survey	Kiwi presence or absence	Resources are limited	No, sites are not easily accessible
Kiwi Call Survey	Estimate abundance, identify individuals and monitor population dynamics over time	Funding and skilled kiwi listeners are available	Yes, sites are easily accessible

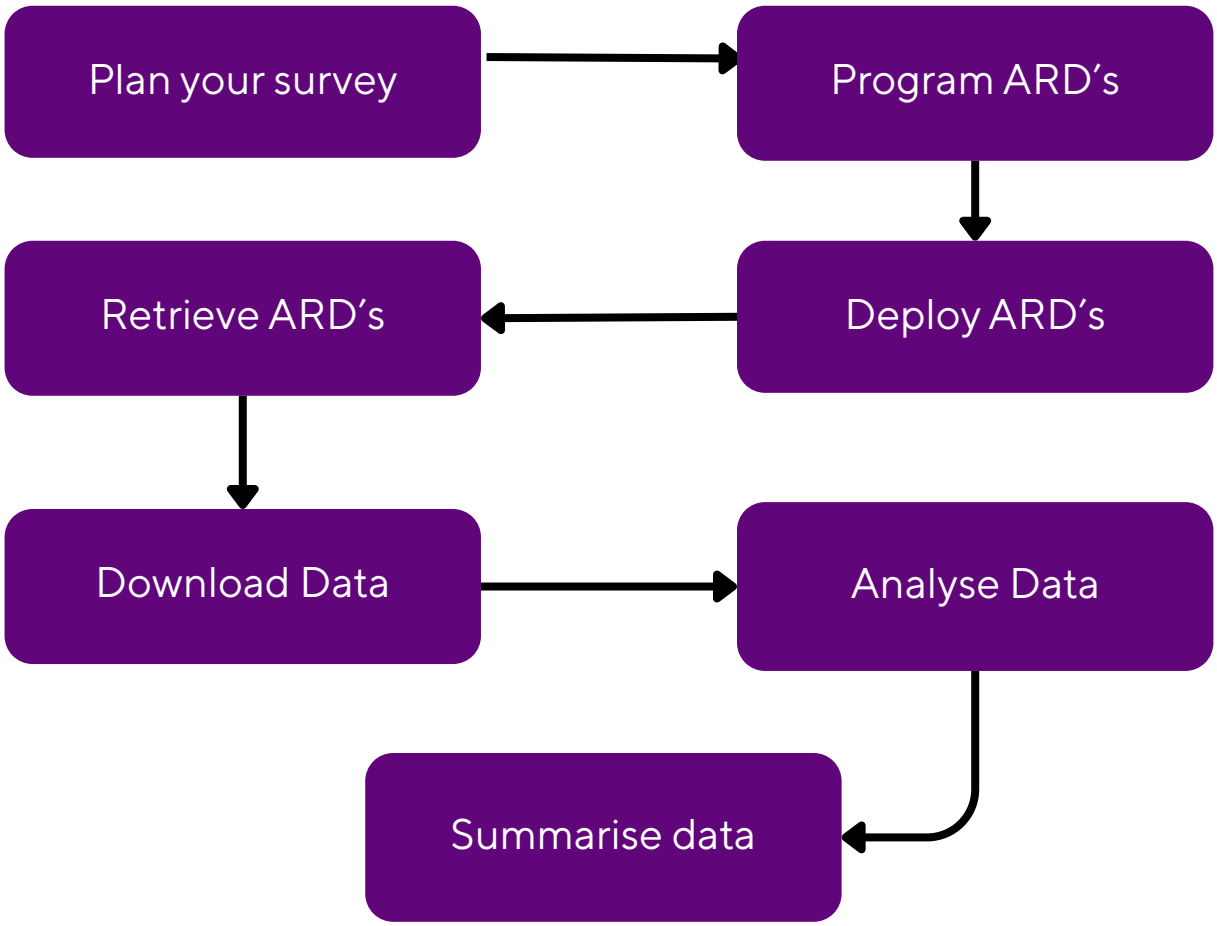
2. Acoustic Recorder Surveys

Acoustic recorder devices (ARD's) record sound files in a digital format on an SD card. The 15-minute sound files can then be downloaded and analysed using a computer program that converts the sound files into spectrograms. Spectrograms are pictures of sound and male and female kiwi calls can be identified from the spectrograms which can also be replayed and listened to for confirmation.

ARD's detect approx. 80% of calls compared to a person listening from the same location but they allow a large amount of data to be collected without a person having to sit out all night. The disadvantage of using acoustic recording devices is that the distance and direction of calls cannot be determined making it difficult to assess the number of individuals in an area.

Acoustic recorder surveys are often carried out at new sites to determine if kiwi are present. These surveys are relatively easy to set up and anyone with a bit of basic set up training can deploy and retrieve the recorders. To determine kiwi presence the recorders should be set to record 30 minutes after sunset until 30 minutes before sunrise (local sunrise and sunset times can be easily checked at www.timeanddate.com) for at least 3 calm nights.

The steps needed to carry out an acoustic recorder survey are shown below:



2.1 Planning Your Survey

Number of Sites
It is best to have more sites for an acoustic recorder survey than you would a listening survey due to the recorders having slightly less listening coverage. The recorders are relatively easy and quick to deploy so large areas can be covered with multiple recorders easily. When surveying a new site it is good to try and get complete coverage of the whole area.

Deployment in the Field
To maximise listening coverage, it is best to deploy recorders on high points or ridges where they may pick up calls from multiple valleys. Be aware that recorders placed on high ground will have a wider listening range but are more likely to be adversely affected by wind noise, so it is important to ensure calm weather periods are selected for surveys. Some earlier studies suggested brown kiwi are less active and less likely to call on bright moonlit nights, more work is being done in this area and until this work has been analysed it is best to avoid bright moonlit nights.

Distance Apart
The recorders should be deployed at least 1km apart to avoid call cross over. It is also important to ensure recorders are placed at least 10m off public tracks and nowhere near camping sites.

Plan before heading out
Before heading out into the field it is important to identify sites on a map, so you are going out with a plan and not making it up as you go. This plan may need to be altered slightly due to accessibility or unexpected circumstances you may encounter in the field, so a plan that can be flexible is essential. The exact location for the recorder is determined in the field. Follow all health and safety guidelines when setting out recorders and carry a GPS so you can clearly mark where the recorders where placed.

How Long to Leave Recorders out
The amount of time you leave recorders out for will depend on what you need to find out and the practicality of being able to analyse the data. Where it is critical to determine kiwi presence or absence (e.g. A new roading project) a minimum of 10 full nights (100-120 hours) should be recorded. Birds will usually be detected during the first few nights, however the longer the recording period the more certainty you will have. If more than presence or absence is required and a reasonably accurate hourly call rate or detection rate is required a minimum of 4 nights is required.

Other Factors to Consider

It is important to consider weather when deploying ARD's. Rain and wind can significantly hinder the ability to identify kiwi calls during analysis. A clear weather period should be selected. Equally as important is ensuring ARD's are not deployed near running water, waterfalls, the sea, or nearby vegetation noise as this will also hinder the quality of the recordings and make it more difficult to identify kiwi calls.

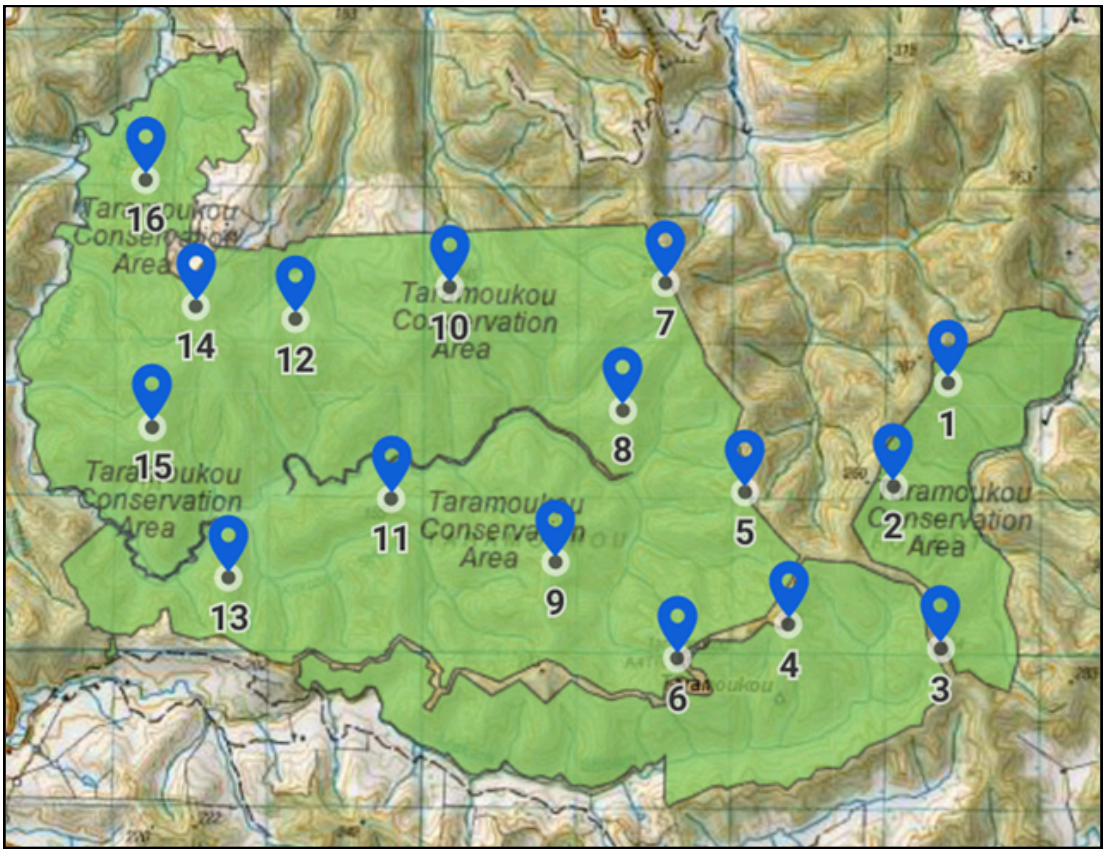


Figure 1 An example ARD kiwi survey plan for Taramoukou Conservation Area

2.2 Programming Acoustic Recording Devices

The Department of Conservation's (DOC's) Acoustic Recording Devices are waterproof, sensitive and can record for 120 hours on one set of four rechargeable NiMH batteries. If you are programming the recorders the day before the AA batteries can be removed after programming and put back in on the day or at the site. Access to full manuals for all versions of DOC ARD's can be found at https://www.doc.govt.nz/electronics, however basic set up instructions are below.

What you need:

- Batteries (4 x AA per recorder)
- 16 BG SD Card (or larger)

Methods:

1. Twist the metal ring near the microphone to open the recorder.
2. Put 4x AA batteries into their correct slots and insert the SD card into the SD slot
3. Press PAGE and the screen will light up and say Acoustic Rec ARM v1.41 (different recorder versions may display slightly different version numbers. All versions are programmed the same way). The page button is used to scroll through the different screens and the →,+ and – buttons are used to change values.
4. The screen will automatically go on to display time. Ensure the time is correct. If required change using the → and + and – buttons.
5. Press page. The date will then be displayed. Ensure the date is also correct.
6. Press page. Protocol 1 will be displayed. Ensure protocol 1 is set to LOW.
7. Press page. Start 1 should be set to 30 minutes after sunset. Span is the amount of time you wish to record. Eg If sunset is 7.45pm and sunrise is 6:45am the start 1 is: 20:15 and the span is 10:00
8. Press page. Protocol 2 will be displayed. This can be set to off. Protocol 2 is to allow a second recording if required.
9. Press page. Start 2 can be set to off and span can remain at 00:00
10. Press page. GPS log can remain off.
11. Press page. Card: Check Card will show up. Press the → button. Card: Checking, will show up. This will check if the SD card if free. Ideally 00% should be used to ensure you are starting with a clear SD card.
12. At any point the screen will turn off after 20 seconds of inactivity. All programmed information will be saved if the screen switches off. Press page to scroll through the menu again.
13. When you have finished programming put the cover back onto the recorder and ensure it is screwed on firmly but not too tightly. Ensure the silica gel sachet is always kept in the recorder casing to reduce the risk of water damage.

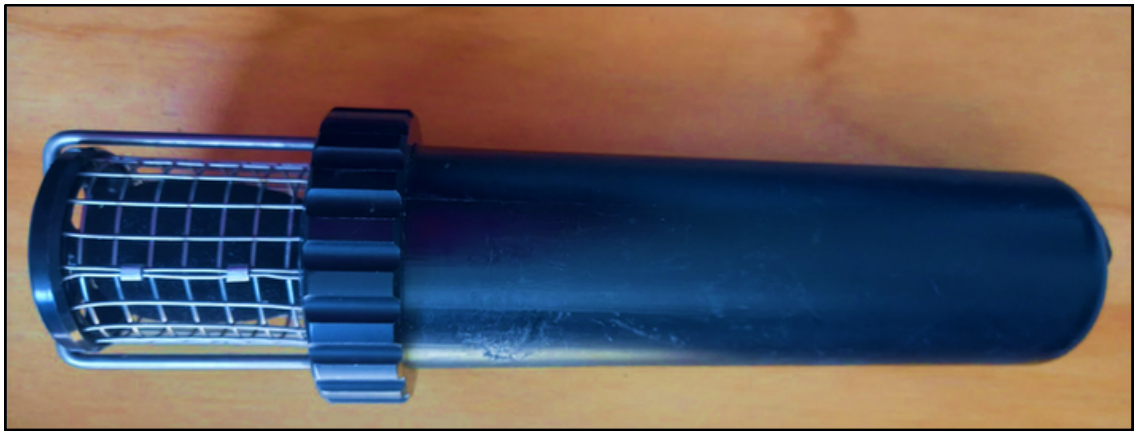


Figure 2 A DOC acoustic recording device (cover on)

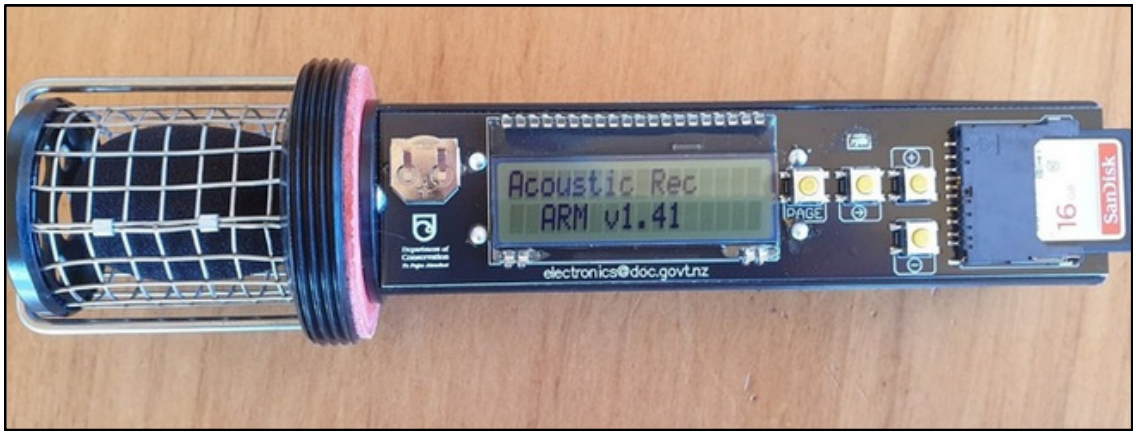


Figure 3 A DOC acoustic recording device (cover off)

2.3 Deploying Acoustic Recording Devices

It is important to ensure the person deploying the recorder has a good understanding of the aim of the survey and how the ARD works. It is best to have the same person deploying and retrieving recorders to ensure they can be easily relocated.

Recorder Deployment Instructions

What you need:

- Acoustic Recorder
- Electrical Tape
- Flagging Tape
- Batteries (If not already in recorders)
- SD Card (If not already in recorders)
- GPS

Methods:

1. Walk to the location the acoustic recorder is to be positioned (GPS coordinates should be pre-selected).
2. If a more suitable location can be seen nearby move to an area where listening can be optimised.
3. Attach the recorder to a tree or sapling with electrical tape. Position the recorder with the microphone at the bottom, the ideal position will allow the microphone to obtain a 360-degree listening range. A horizontal branch is ideal. Ensure branches and leaves will not brush against the microphone. Attach the recorder at head height or slightly higher.
4. Mark an accurate GPS waypoint at the recorder site.
5. Hang flagging tape near the recorder to ensure it can easily be re-located. A photo of the location can be taken, this can be especially helpful if the same person is unable to retrieve the recorder or the location is to be used for future surveys.
6. If the recorders were programmed the day before put all four AA batteries into their slots and press page to ensure they are in correctly.

Figure 4 Examples of good recorder attachment

2.4 Retrieving Acoustic Recording Devices

Before heading out to retrieve recorders label small ziplock bags with site numbers. These bags will be used to put SD cards into when the recorder is retrieved. It is very important to ensure you know which SD card comes from each specific site when analysing. The survey will need to be repeated if the individual recorder data is mixed up and each site cannot be identified.

Recorder Retrieval Instructions

What you need:

- GPS
- Small towel or clean rag
- Knife or scissors
- Small labelled snaplock bag per site (for batteries and SD cards)

Methods:

1. Locate the recorder
2. Remove the recorder from the tree by cutting or unwrapping the electrical tape
3. Dry the recorder exterior with a towel to prevent any moisture or debris getting inside the recorder
4. Open the recorder and remove one battery or turn one battery around
5. Remove the SD card and place into the specifically labelled bag
6. Close the recorder
7. Remove the flagging tape and ensure any rubbish leaves the bush with you
8. Double check you have the recorder number and GPS coordinates correct

2.5 Downloading Sound Files

It is important to keep SD cards in labelled bags until you are ready to download the data. Do not rush the download process and ensure you name a folder with the site id correctly before downloading the data.

The SD card in each recorder stores the recorded data. The SD cards will each contain a file labelled Low, in this file will be files for each night of recording, see below. Each of the night folders will contain a series of 15-minute-long WAV or sound files. The number of WAV files per folder will differ depending on the SPAN that was selected when the recorder was programmed.

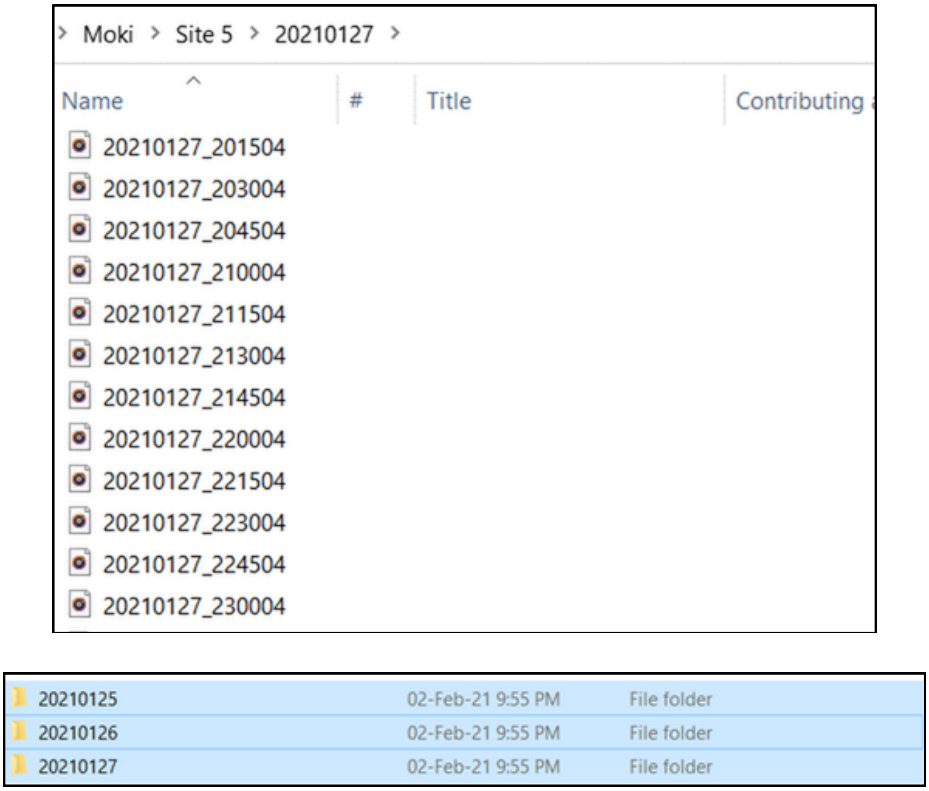


Figure 5 Examples of sound files

What you need:

- An external hard drive or alternative
- A laptop or desktop computer

Methods:

1. Copy the folder labelled Low from the SD card into a folder on your computer or hard drive labelled with a unique site name and number e.g. Moki 001
2. Always retain 2 copies of the data until analyses is complete. To do this keep the SD cards in their site-specific labelled bags throughout the analysis process.
3. Ensure a copy of the sound files are permanently retained on an external hard drive when analysis is complete.

2.6 Downloading Birdcall

In this handbook we will go into detail on how to analyse recorder data using Birdcall, there are however other programs that can be used to complete the recorder analysis (e.g. Raven and AviaNZ). The advantage of Birdcall is that it automatically records calls when you identify them and produces an Excel spreadsheet summarising the results at the end.

What you need:

- A laptop or desktop computer
- The Birdcall program on a USB stick

Methods:

1. Insert the USB stick into your computer
2. Select the entire Birdcall folder and copy it
3. Paste the folder on your desktop (or in another selected place on your laptop)
4. Open the folder and double click on the birdcall application (see below) to open the program

2.7 Recorder Analysis Using Birdcall

Analyses of recorder data involves scrolling through 15-minute recording segments while looking at a spectrogram. Suspected calls can be listened to through headphones if clarification is needed. Clear kiwi calls can easily be identified from a spectrogram, but distant calls are much harder to identify.

Male and female kiwi calls have a distinct shape and frequency on a spectrogram or a picture of the sound. A clear male kiwi call will usually appear around the centre of the page as two distinct patterns both increasing in frequency as the kiwi calls. Female calls generally appear as a single pattern and a clear female call will fill most of the page. However very faint calls can just appear as very faint lines or dots so any suspicious marks should be listened to using good quality earphones.

It is important to be aware of other nocturnal bird calls when carrying out the analysis work as kiwi can often be confused with other birds when people are learning to identify calls. A series of different birdcall spectrograms can be viewed in Appendix 1.

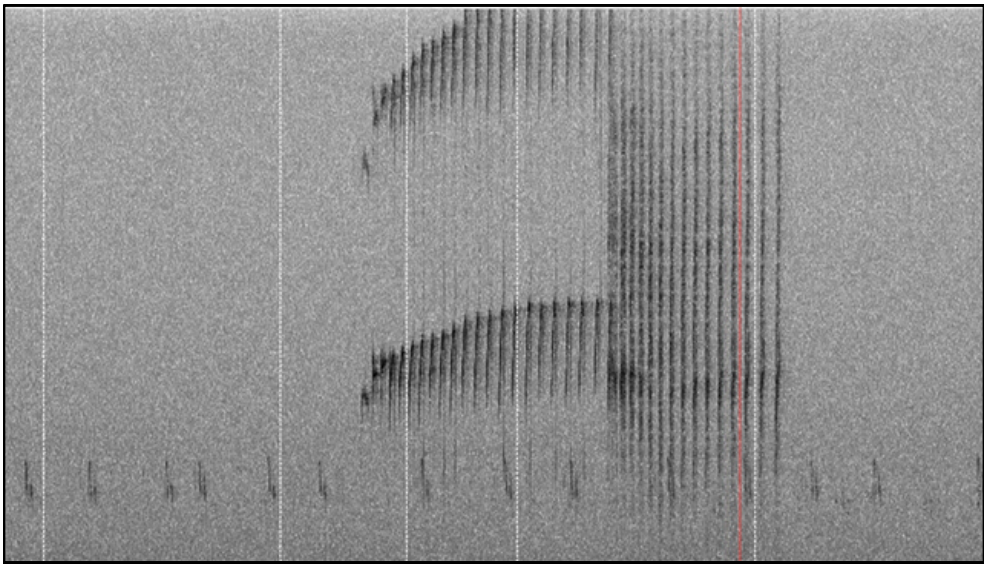


Figure 6 Spectogram showing kiwi calls

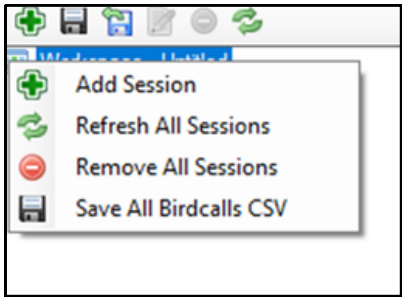
Recorder Analysis Instructions

What you need:

- The external hard drive with stored data
- Birdcall program downloaded onto your computer

Methods:

1. Open Birdcall. Click File – New workspace
2. Click Add session (the green cross in the top left-hand corner) Browse to find the folder to be analysed. Each night file will need to be added separately. Add all nights to be analysed for that site.
3. Save the workspace. Click File – save workspace as. It is usually easiest to save the workspace into the same folder with the sound files. Name the workspace with the unique Site name and number e.g. Moki 001
4. To view all files in each folder, click on the small + next to the folder
5. Double click on the first sound file to open it. Do not maximise the screen – the box can be moved and stretched so both the workspace and spectrum screens can both be viewed at the same time
6. Change colour scheme to colour (if preferred)
7. Under Work Locked tab change to work finished (this will tick off files as you go) – this may need to be adjusted for the first few files then it should stay on work finished
8. Scroll along the bar at the bottom from left to right to view the whole 15-minute slot
9. Click the Next Record icon Next Record when you have completed a 15-minute file. This will jump to the next 15-minute recording. Scroll through the next record from right to left.
10. Alternate the scrolling direction with each 15-minute recording.
11. To listen to a sound double click at selected start point and click again to play sound. A red line will move along as the sound plays. Do not scroll while playing the sound as the screen will keep jumping back to the point you are listening at.
12. When a kiwi call is identified click on the Work Finished tab in the top centre of the screen and change to Start Work. Right click where the call starts and click Add Tag – highlight the area and mark as Male, Female, Duet or unknown. Ensure you change back to Work Finished when complete.
13. Click next record until you have been through all files.
14. When you complete a site right click on the workspace box and click Save all Birdcalls CSV (see below). This will save a final excel spreadsheet of the results in the same folder. At the bottom of the spreadsheet a summary of male, female and duet calls can be seen.



If you wish to stop part way through a site simply shut down the program and it will save where you are up to. To reopen next time just click File Open workspace and select the file you are working on.

2.8 Summarising and presenting data

Recorder surveys produce a lot of data and it is important that everyone working in this space records the same data so it is easily comparable.

When working out the number of calls per hour duets are recorded as 2 calls in the summary (as there is a male and female call). To work out the calls per hour divide the number of calls by the number of hours analysed.

Calls per hour eg:

4 male calls, 1 female call and 2 duets = 9 calls
9 calls in 20 hours (9/20) = 0.45 calls per hour

A simple spreadsheet or summary table is the easiest way to present this data and an example template is provided below.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Area	Recorder	Easting	Northing	Date recorders out	Date recorders in	# nights analysed	# hours analysed	Analyser	# male calls total	# female calls total	# duets total	#calls/hr	Recorder Notes	Site Notes
2	Moki 001	K4K 17	1752894	5684399	########	########	3	30	Sian	0	0	0	0		
3	Moki 002	K4K 20	1751253	5684780	########	########	3	30	Sian	2	0	0	0.07		
4	Moki 003	K4K 07	1749437	5685030	########	########	2	20	Sian	4	1	2	0.45		

Figure 7 Example of spreadsheet headings for data capture

3. Kiwi Call Surveys

Kiwi call surveys can be used to

- Help determine the national distribution of kiwi
- Determine the minimum number of individuals at a specific location
- Monitor population dynamics over time
- Determine the presence or absence of kiwi

Listening sites should be selected to optimise listening conditions. High on ridges, spurs or hill tops are ideal away from any traffic, stream or livestock noise. Optimal weather conditions should be selected with no wind or rain. Neighbouring listening sites should be more than 1km apart and an estimated listening range should be worked out prior to going out to the site.

Kiwi call surveys take time and require a number of skilled listeners however they can be a great way to involve and train volunteers by pairing a trainee with a skilled kiwi listener at each site. Before heading out to listen at sites ensure all lead listeners are familiar with the kiwi call scheme card (see Appendix 2) and if needed have recently refreshed their listening skills at https://savethekiwi.nz/about-kiwi/kiwi-facts/kiwi-calls/. Listening should begin 30 minutes after local sunset time and during the first 2 hours of darkness.

To monitor populations over time a standardised national call scheme has been established. Several sites have been set up around the country and the monitoring procedure requires 3-6 permanently marked sites and 2 hours of listening at each site for 4-8 nights. This gives a total of 48-50 hours of hours per site per session. Baseline data is collected over the first 3 years then the survey is repeated at 5 yearly intervals.

Figure 8 A night listener preparing for a call survey

General Kiwi Listening Instructions

Please also refer to Save the Kiwi's Community Kiwi Call Count Monitoring Training Package for more information to prepare your group/project for a kiwi call count event.

What you need:

- Torches (x2) plus spare batteries
- Compass
- A time device
- Kiwi call scheme card
- Pencil or Pen
- Map/s
- GPS
- Warm clothing

Methods:

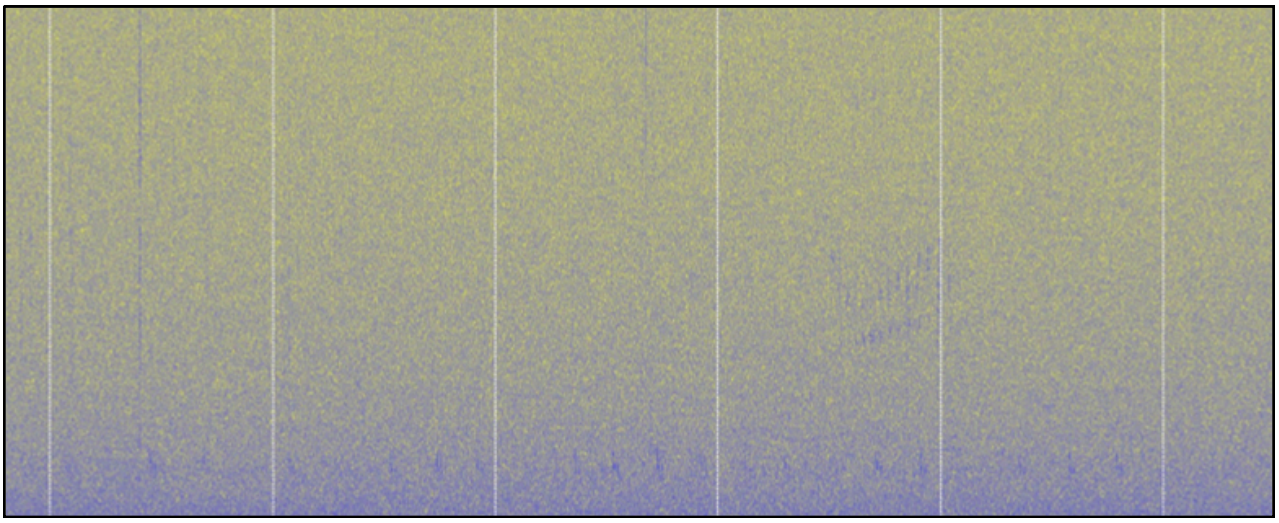
1. Ensure all listeners have synchronised time devices to allow you to determine if the same kiwi was heard from multiple sites at the conclusion of the survey.
2. Arrive at the listening site with enough time to prepare your form, have a drink and a snack and put on warm clothes ready to begin listening in silence. Have any gear you may need handy so you can put on extra clothing etc quietly.
3. Start your listening period no earlier than 30 mins after local sunset.
4. Listen in silence for a 2-hour period and record the time, direction, sex of the bird and any other notes as the calls occur.
5. At the end of each hour of listening, total up your calls and estimate the total number of male and female birds heard (allow for movement of birds during the listening period).
6. Record any birds heard outside your planned listening period in the notes section as these will not be included in your totals but will be of interest to you.
7. Do not solicit calls.
8. At the end of your 2-hour listening period tally up the total number of calls throughout the period and estimate the total number of individual birds in the notes section.

If you are using call surveys to determine kiwi presence or absence Do not solicit calls in the first hour but calls may be solicited during the second hour. If you do solicit calls make a note of the exact time calls are solicited to ensure these calls are not recorded by other teams in the field.

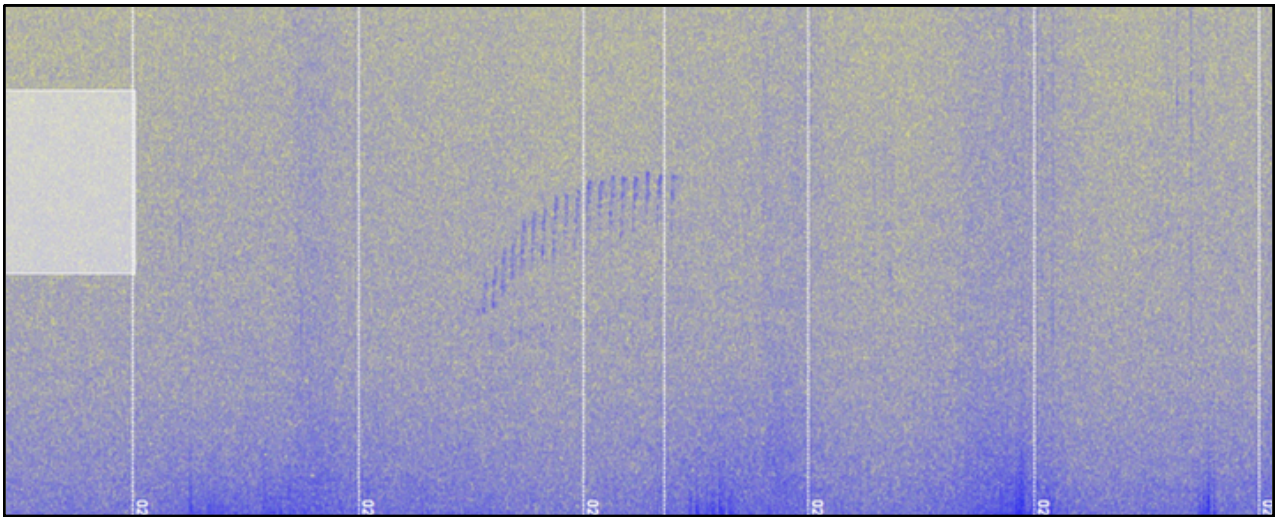
References

Colbourne, R; Bean, E; Coad, N; Fuchs, R; Graham, I; Robertson, H; Scrimgeour, J. 2020: Kiwi Best Practice Manual. Department of Conservation, Wellington.

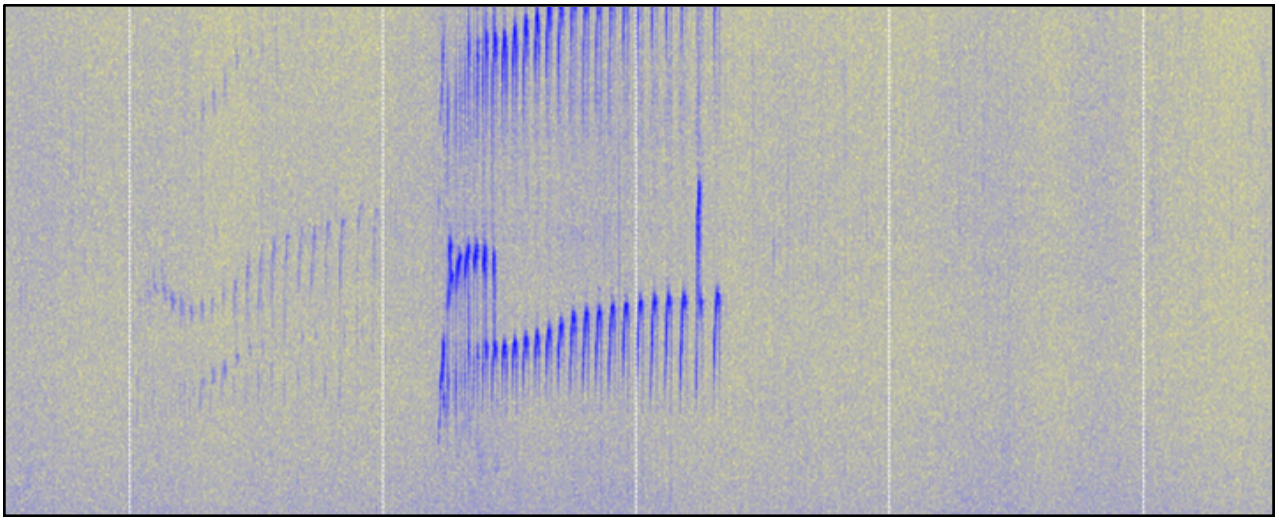
Appendix 1. Spectrograms of kiwi calls



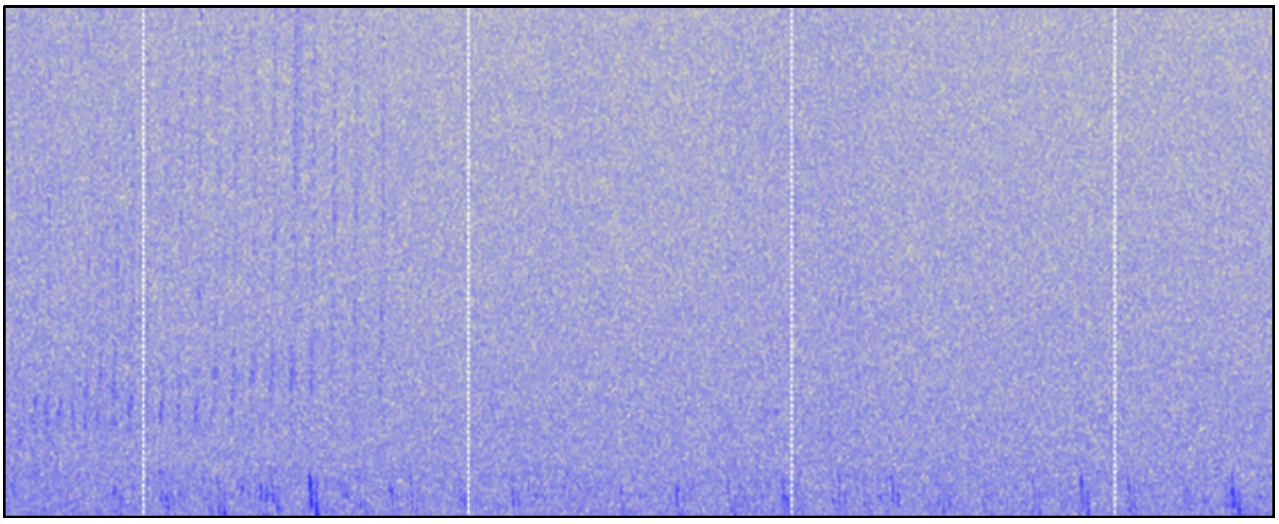
Distant male calling



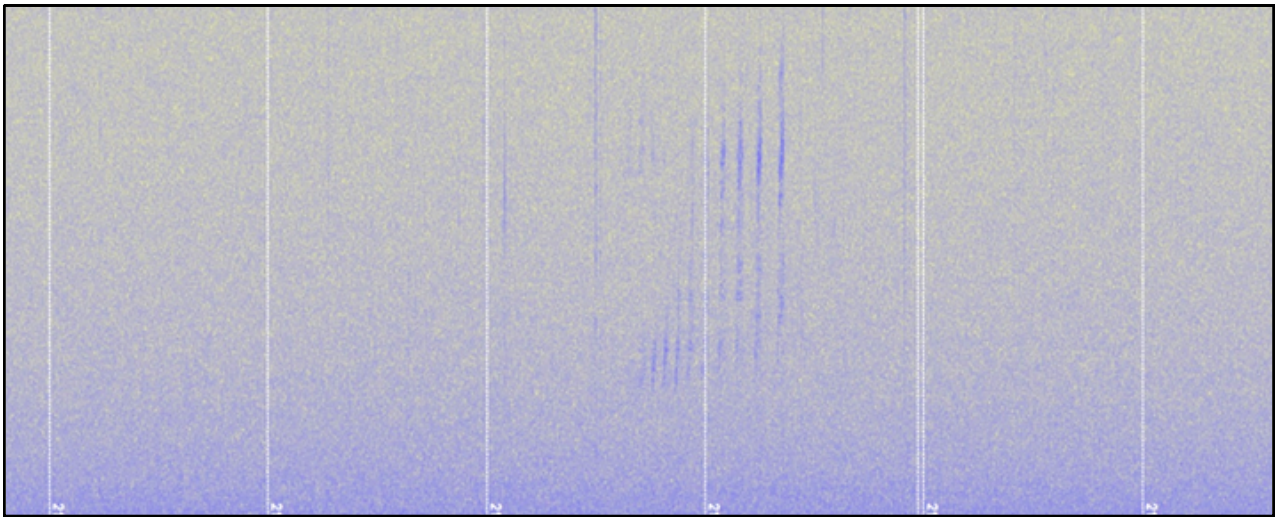
Distant male calling



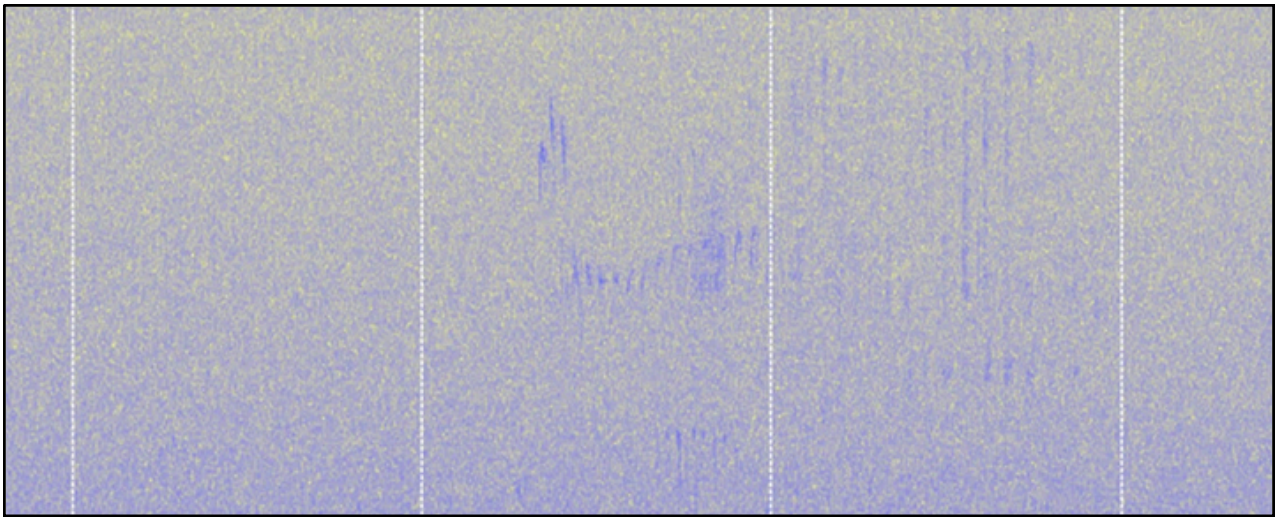
Distant then close male calling



Female calling with underlying ruru call

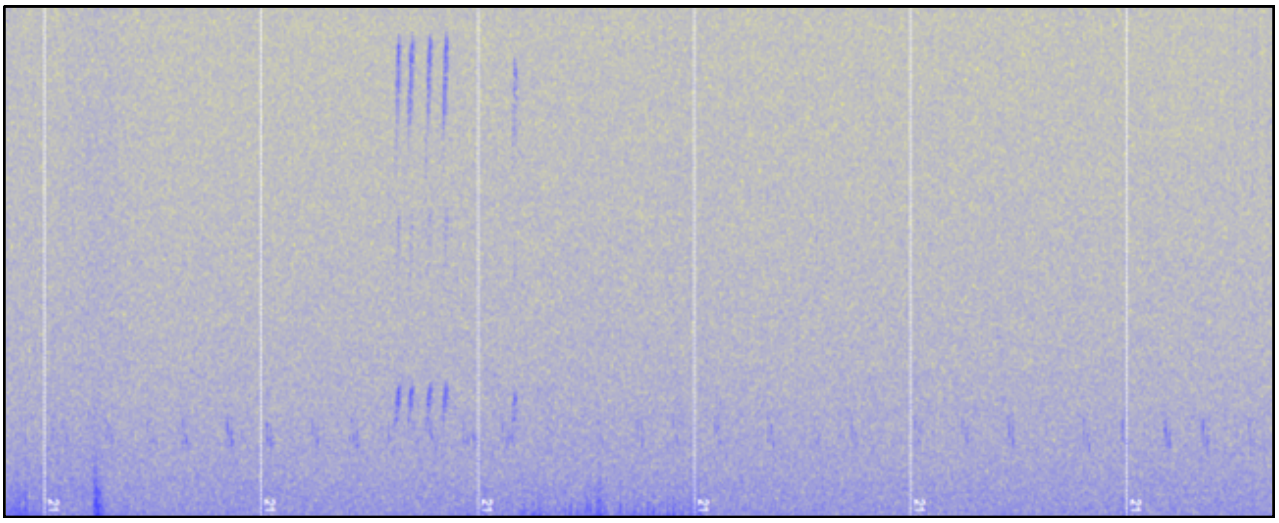


Female call

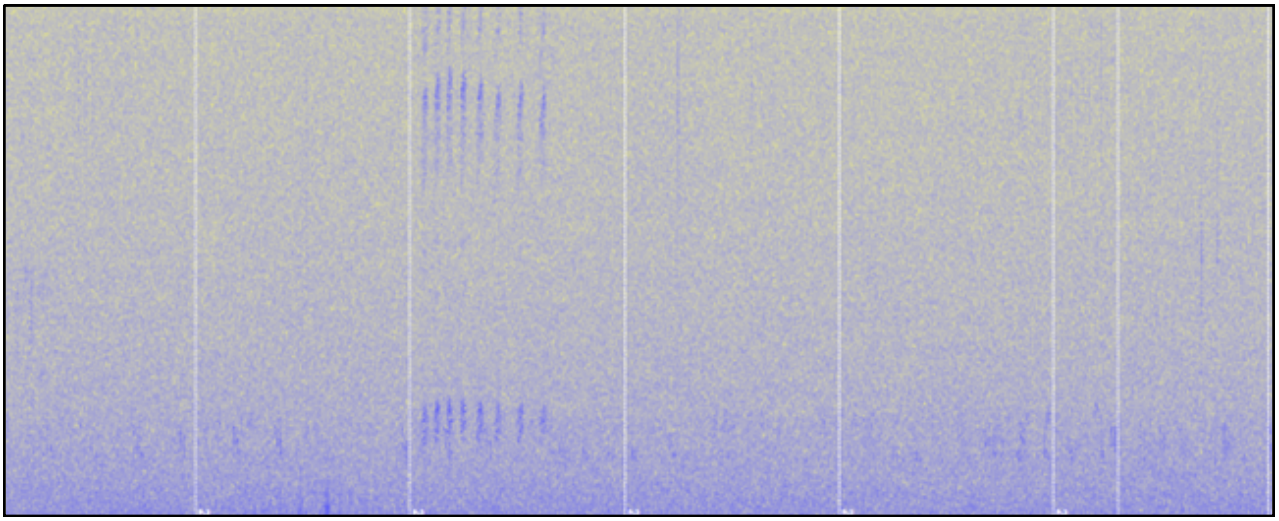


Kiwi duet

Appendix 2. Spectrograms of ruru calls

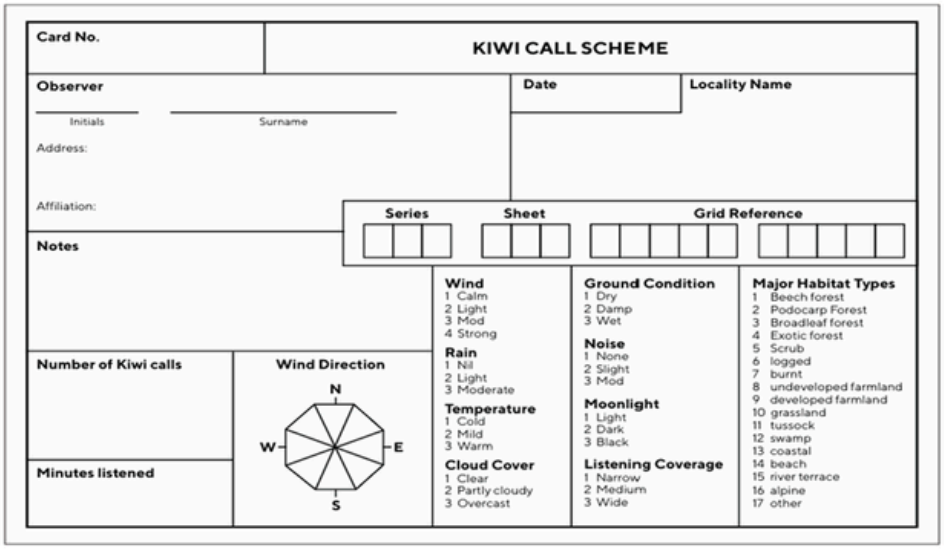


Ruru



Ruru

Appendix 3. Kiwi Call Scheme Card



Card No.

KIWI CALL SCHEME

Observer

Initials _____ Surname _____

Address:

Affiliation:

Date

Locality Name

Series | Sheet | Grid Reference

Notes

Number of Kiwi calls

Minutes listened

Wind Direction

N W E S

Wind
1 Calm
2 Light
3 Mod
4 Strong

Rain
1 Nil
2 Light
3 Moderate

Temperature
1 Cold
2 Mild
3 Warm

Cloud Cover
1 Clear
2 Partly cloudy
3 Overcast

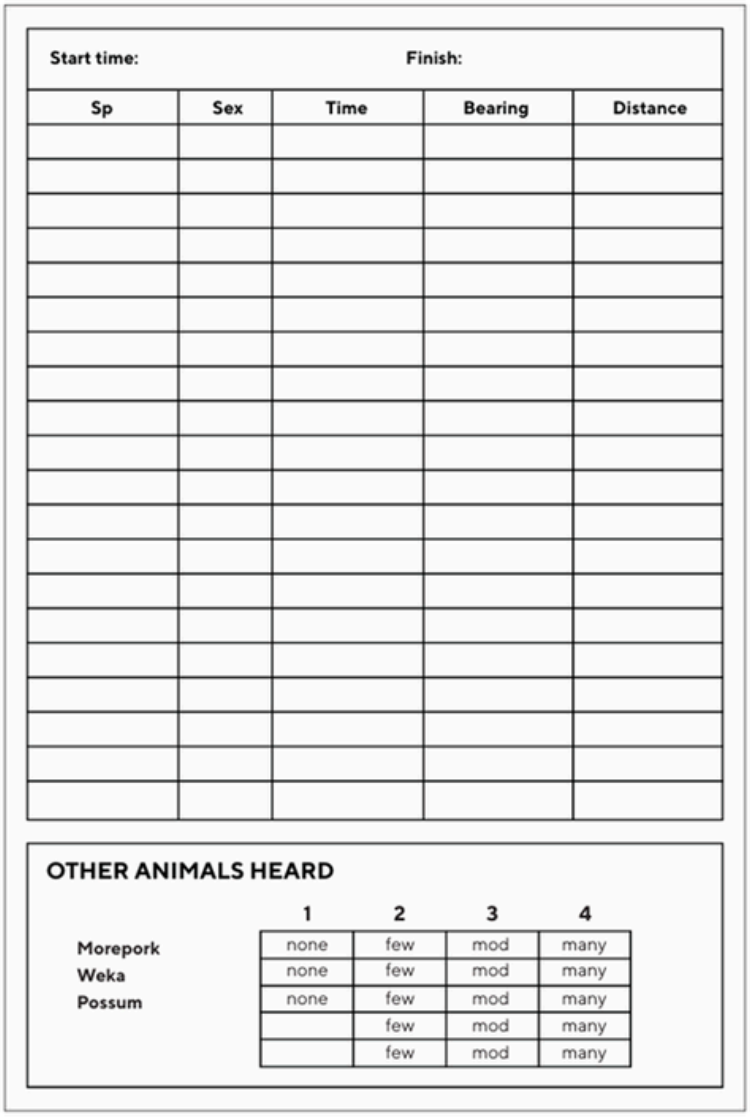
Ground Condition
1 Dry
2 Damp
3 Wet

Noise
1 None
2 Slight
3 Mod

Moonlight
1 Light
2 Dark
3 Black

Listening Coverage
1 Narrow
2 Medium
3 Wide

Major Habitat Types
1 Beech forest
2 Podocarp Forest
3 Broadleaf forest
4 Exotic forest
5 Scrub
6 logged
7 burnt
8 undeveloped farmland
9 developed farmland
10 grassland
11 tussock
12 swamp
13 coastal
14 beach
15 river terrace
16 alpine
17 other



Start time: Finish:

Sp	Sex	Time	Bearing	Distance

OTHER ANIMALS HEARD

	1	2	3	4
Morepork	none	few	mod	many
Weka	none	few	mod	many
Possum	none	few	mod	many
		few	mod	many
		few	mod	many

Kiwi Call Scheme Cards instructions

The information required from the surveys needs to be written down in a Kiwi Call Scheme Card. It is of great importance that everyone collects the same information and in the same way each time a survey is carried out. Without careful recording it will not be possible to use the data collected to make valid assumptions regarding the health of kiwi populations.

Below is a run-down of the various sections of the card. Please read carefully and apply this information when you use the card.

CARD NUMBER
The top right-hand space is to remain blank.

OBSERVER
If more than one person listens from a listening station give the name of the most experienced observer first. This helps with computer processing. For each new observer give address and affiliation.

LOCATION
Give, in order, the region, the forest or reserve etc. and the nearest named locality or feature (such as river, stream, trig etc.). Finally give a brief description of the exact location of the listening station (use the notes section for more space).

GRID REFERENCE
This section of the form is slightly outdated. Please just ensure you add your coordinates and what coordinate system you have used. E.g 1739543 5688471 (NZTM2000)

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

NOISE
This is a subjective score of interference to listening caused by strong wind, river, waterfall or sea noise, talking by non-listening members of the party or noise from other animals, wherever possible.

MOONLIGHT
Some previous studies of North Island brown kiwi, in particular, showed that these birds call noticeably less often on bright, moonlit nights.

LISTENING COVERAGE
When listening from a ridge on a calm night choose ‘wide’ as the descriptive term. Conversely, when listening from a campsite in a gully underline ‘narrow’.

MAJOR HABITAT TYPES
Mark with a maximum of three categories of vegetation types found within the zone of listening. If other than those types listed are present, ring 17 and explain in notes. Developed farmland is typical New Zealand pasture, well fenced, intensively grazed, and with few trees. Undeveloped farmland has rank grasses, interspersed with manuka and other scrub throughout and may include extensively grazed river flats or frost flats.

MINUTES LISTENED
Total the time listened in minutes. The number of calls will eventually be expressed as number of calls per hour.

CALLS
Record the direction, distance and sex of the call.

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