



THE
Cacophony
PROJECT

Monitoring with Thermal Cameras

September 2020

Monitoring Options

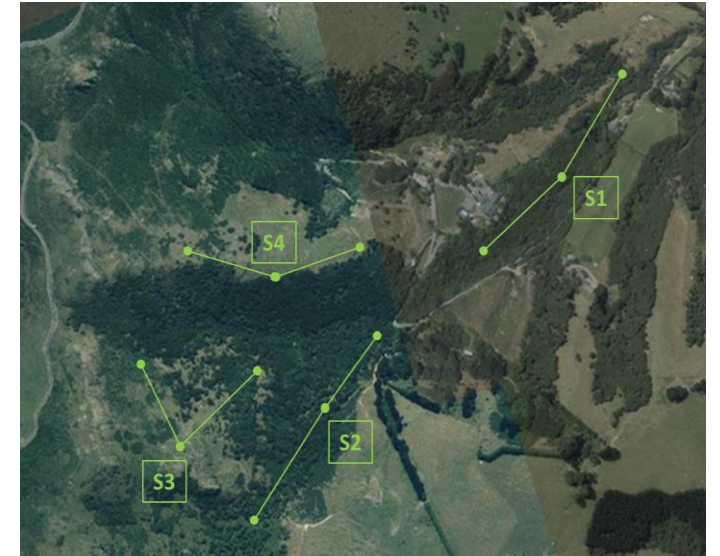
- Monitoring is a key element of any predator eradication programme
- Measuring the success (or otherwise) of interventions will be critical to ensuring we remain on track to rid an area of pests
- Existing monitoring methods suffer from a number of issues that lead to high effort and low confidence in results

Device	Possum	Mustelid	Rodent	Hedgehog	Cat	Bird
Chew Card	✓	✓?	✓	✓	✓?	✗
Tracking Tunnel	✗	✓	✓	✓	✗	✗
Trail Camera	✓	✓	✓	✓	✓	✓
Cacophony Camera	✓	✓	✓	✓	✓	✓

Device	Deployment Effort	Data Collection Effort	Interaction Rate	Data Quality	Data Volume	Scalability
Chew Card	Medium	Medium	Low	Low	Low	Low
Tracking Tunnel	Medium	Medium	Very Low	Low	Low	Low
Trail Camera	Medium	High	Medium	High	High	Medium
Cacophony Camera	Medium	Low	Very High	Very High	Very High	High

The Cacophony Monitoring Approach

- How many cameras?
 - A protocol has been developed that means saturation of a reserve with cameras is not required. Instead, a known number of cameras is deployed in known “sets” (see example on right)
 - A set deployment is repeated each season (i.e. four times a year), providing an annual pattern of seasonal variation
 - The cameras can then move to the next reserve
 - Sets can sweep across a reserve area and cycle round programme area, maximising the use of the cameras available
 - The total number of cameras will depend on the total size of the area to be monitored
- How much work to deploy?
 - Camera deployment is simplified using a simple setup utilising a wooden post and some simple fittings
 - A camera set is deployed for a known set of nights (7 nights)
- How much work to collect the data?
 - Recordings are automatically uploaded to the Cacophony Cloud
 - Recordings are analysed and content classified by the Cacophony AI
 - Data is automatically classified into visits and reported on the Cacophony Browser
 - Data is easily uploaded into the trap.nz platform (full automation of import is in progress)



4 sets x 3 cameras ≈ 48 hectares



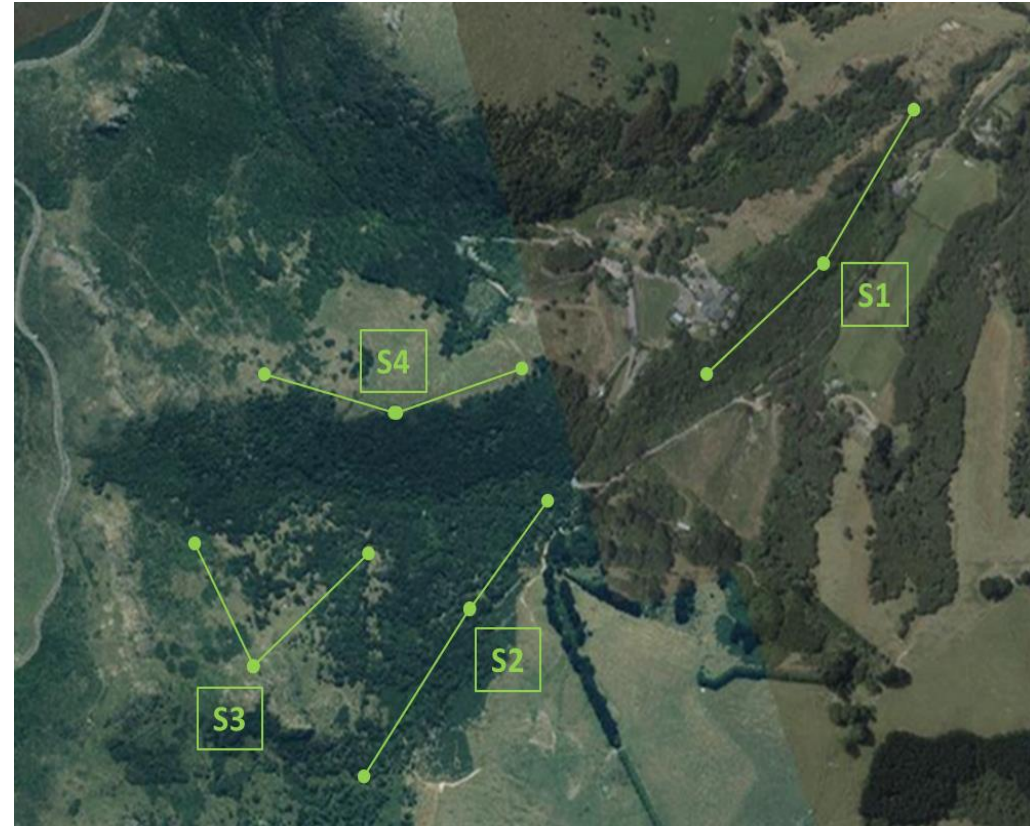
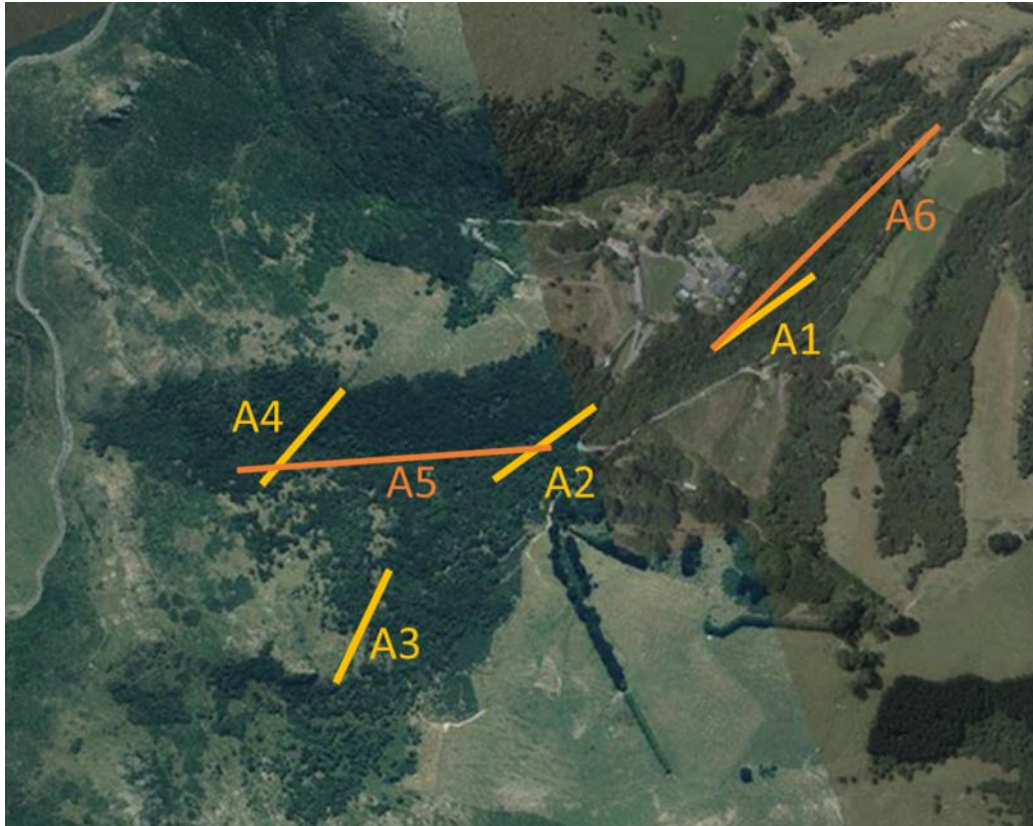
Field Site Section A Monitoring: Winter 2020

Traditional Monitoring

- 40 x Chew Cards
- 20m spacing
- 10 per line
- 20 x Tracking Tunnels
- 50m spacing
- 10 per line

Cacophony Monitoring

- 3 x Cameras
- 200m spacing
- 4 sets

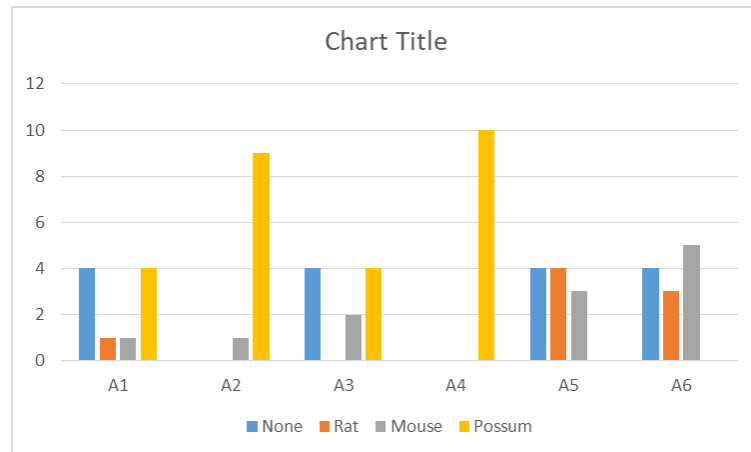


Line	Type
A1	Chew Cards
A2	Chew Cards
A3	Chew Cards
A4	Chew Cards
A5	Tracking Tunnels
A6	Tracking Tunnels
S1	Camera Set
S2	Camera Set
S3	Camera Set
S4	Camera Set

Field Site Monitoring: Winter 2020

Traditional Monitoring

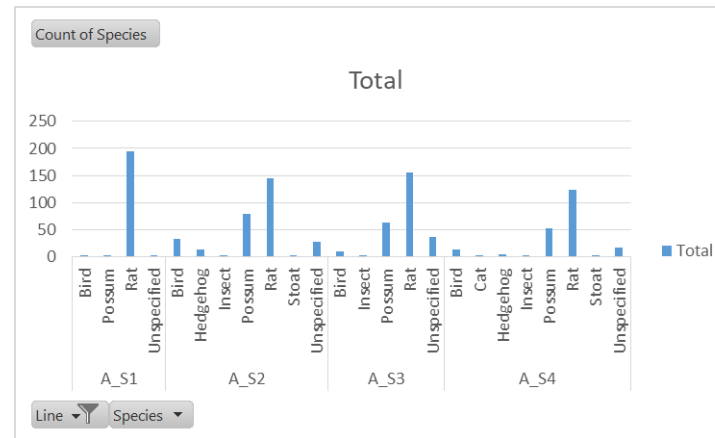
	Mean CCI	Mean TTI	Mean PAI
Possum	68%	n/a	68%
Rat	3%	35%	13%
Mouse	10%	40%	20%
Mustelid	0%	0%	0%
Cat	0%	0%	0%
Other	0%	0%	0%
Hedgehog	0%	0%	0%



- CCI: Chew Card Index
- TTI: Tracking Tunnel Index
- PAI: Predator Abundance Index

Cacophony Monitoring

	Mean PPI	Total Visits	Mean VAI
Possum	75%	196	16.33
Rat	100%	621	51.58
Mouse	n/a	n/a	n/a
Mustelid	17%	2	0.17
Cat	17%	2	0.17
Other	100%	140	11.42
Hedgehog	17%	17	1.42



- PPI: Predator Presence Index = the % of monitoring stations where the predator was found to be present
- VAI: Visit Abundance Index = the average number of visits by the predator to a device

Summary

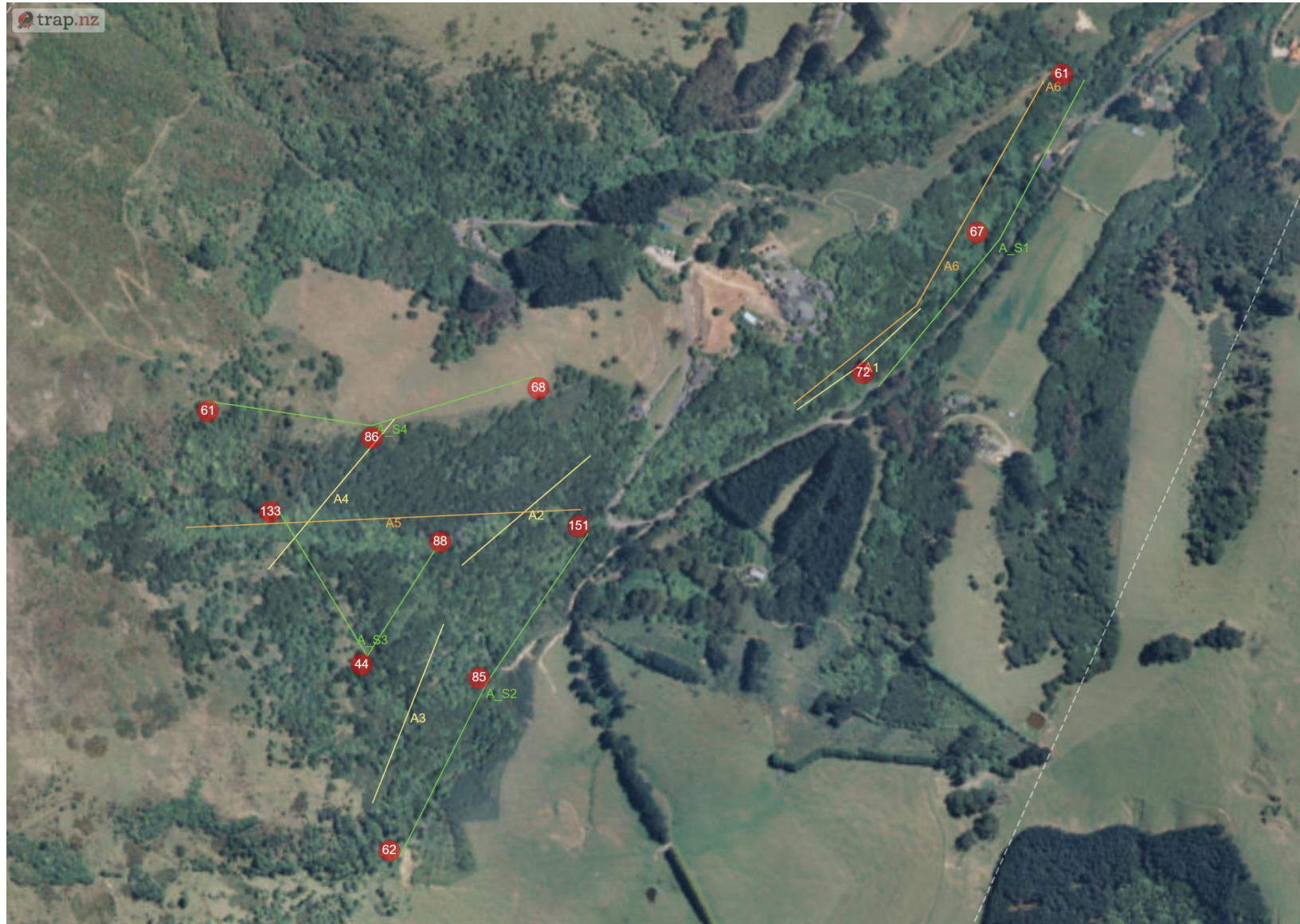
Species	Traditional Monitoring (# of interactions)	Cacophony Monitoring (# of visits)
Possum	27	196
Rodent	8	621
Mouse	12	n/a
Hedgehog	0	17
Mustelid	0	2
Cat	0	2
Other	0	140
Totals	47	978

Traditional Monitoring



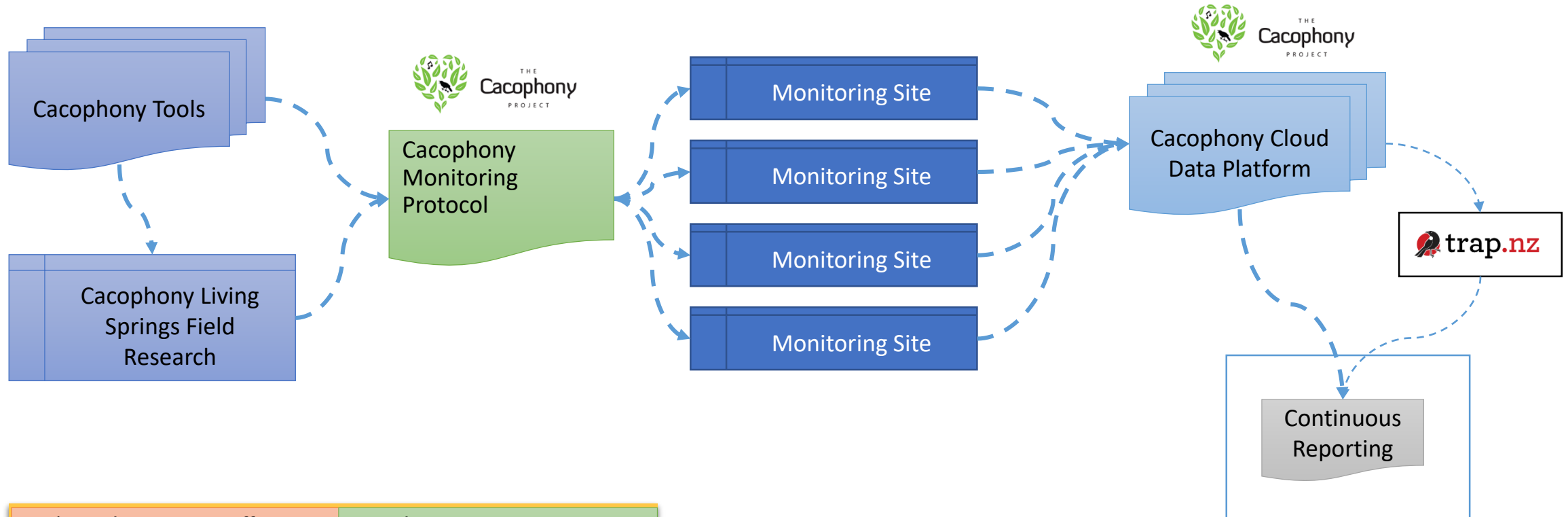
Row Labels	Count of Species
A1	10
Mouse	1
None	4
Possum	4
Rat	1
A2	10
Mouse	1
Possum	9
A3	10
Mouse	2
None	4
Possum	4
A4	10
Possum	10
A5	11
Mouse	3
None	4
Rat	4
A6	12
Mouse	5
None	4
Rat	3
Grand Total	63

Cacophony Monitoring



Row Labels	Count of Species
A_S1	200
Bird	1
Possum	2
Rat	195
Unspecified	2
A_S2	298
Bird	32
Hedgehog	13
Insect	1
Possum	79
Rat	145
Stoat	1
Unspecified	27
A_S3	265
Bird	10
Insect	1
Possum	63
Rat	155
Unspecified	36
A_S4	215
Bird	13
Cat	2
Hedgehog	4
Insect	1
Possum	52
Rat	126
Stoat	1
Unspecified	16
Grand Total	978

Next Generation Monitoring



Traditional Monitoring Efforts	Cacophony Monitoring
<ul style="list-style-type: none"> • High Effort activity • Low sample rate • Low accuracy of results • Low volume of results • Snapshots of status 	<ul style="list-style-type: none"> • Medium Effort activity • High sample rate • High accuracy of results • High volume of results • Continuous view of status

Summary

- ✓ For much less effort the Cacophony method shows about 20 times the amount of predator activity
- ✓ Recordings are automatically uploaded to the cloud to allow for easy analysis over time
- ✓ The current version of AI can already give more sensitive automated predator monitoring without the need for human processing
- Data will soon be automatically integrated with Trap.NZ (for rich reporting)

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Search recordings
Device: **livingsprings (prod)**

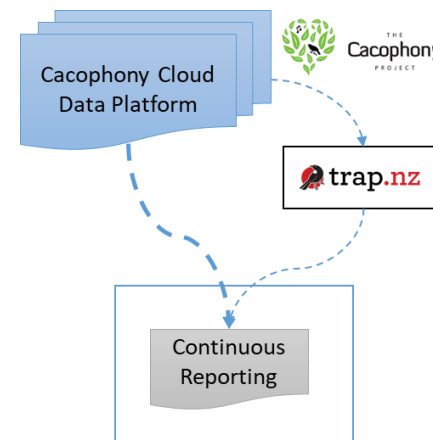
Recording Type: **Video only**

Date range: **Custom range**
From Date: 05/08/20 To Date: 09/09/20

Advanced search **Search**

Recordings
3905 matches found (total)
1 device, video recordings and all animals between 08/05/2020 and 09/10/2020

ID	Type	Device	Group	Location	Date	Time	Duration	Tags
669349	Video	TrapCam02	livingsprings	-43.65585, 172.63125	9/09/2020	20:34:14	13s	🟢 false positive 🟡 0
669346	Video	TrapCam03	livingsprings	-43.65585, 172.63125	9/09/2020	20:26:12	13s	
669344	Video	TrapCam02	livingsprings	-43.65585, 172.63125	9/09/2020	20:13:22	17s	
669330	Video	TrapCam02	livingsprings	-43.65585, 172.63125	9/09/2020	19:31:25	15s	
669328	Video	TrapCam01	livingsprings	-43.65585, 172.63125	9/09/2020	19:30:41	18s	
669327	Video	TrapCam02	livingsprings	-43.65585, 172.63125	9/09/2020	19:30:38	13s	
669325	Video	TrapCam02	livingsprings	-43.65585, 172.63125	9/09/2020	19:29:47	18s	🟢 possum 🟡 2
669324	Video	TrapCam02	livingsprings	-43.65585, 172.63125	9/09/2020	19:28:56	16s	
669329	Video	TrapCam03	livingsprings	-43.65585, 172.63125	9/09/2020	19:28:44	130s	
669326	Video	TrapCam01	livingsprings	-43.65585, 172.63125	9/09/2020	19:28:34	89s	🟢 possum 🟡 2
669331	Video	TrapCam03	livingsprings	-43.65585, 172.63125	9/09/2020	19:28:34	130s	🟢 possum 🟡 2



Track 1 Time: 3 - 93.78s (Δ 90.8s)

ANIMALS

- possum
- rodent
- hedgehog
- cat
- bird

OTHER

- unknown
- false positive
- other...

Tag history

Classifier details

Track 2 Time: 83.44 - 94.33s (Δ 10.9s)

Appendices

Data Visualisations

Identifying Hotspots: Possums



Species: Possum	
Stations	Species Count
A_S1	2
A_S1_C1	1
A_S1_C2	1
A_S2	79
A_S2_C2	39
A_S2_C3	40
A_S3	63
A_S3_C1	9
A_S3_C2	36
A_S3_C3	18
A_S4	52
A_S4_C1	5
A_S4_C2	47
Grand Total	196

Identifying Hotspots: Rats



Species: Rat	
Station	Species Count
A_S1	195
A_S1_C1	59
A_S1_C2	65
A_S1_C3	71
A_S2	145
A_S2_C1	127
A_S2_C2	3
A_S2_C3	15
A_S3	155
A_S3_C1	74
A_S3_C2	3
A_S3_C3	78
A_S4	126
A_S4_C1	38
A_S4_C2	33
A_S4_C3	55
Grand Total	621

Identifying Hotspots: Hedgehogs



Species: Hedgehog	
Station	Species Count
A_S2	13
A_S2_C2	13
A_S4	4
A_S4_C1	4
Grand Total	17