

Biological consequence and forensic resolution of pest incursions at Tāwharanui and Shakespear Open Sanctuaries.

M.J. Maitland. Department of Conservation, Tāmaki Makaurau

mmaitland@doc.govt.nz

D.P. Armstrong, Wildlife Ecology Group, Massey University, Palmerston North;

K.A. Parker, Parker Conservation, Nelson;

A.J. Veale, Bioeconomy Science Institute, Lincoln

PEOPLE—NATURE
TOGETHER WE FLOURISH
TUIA TE TAIAO

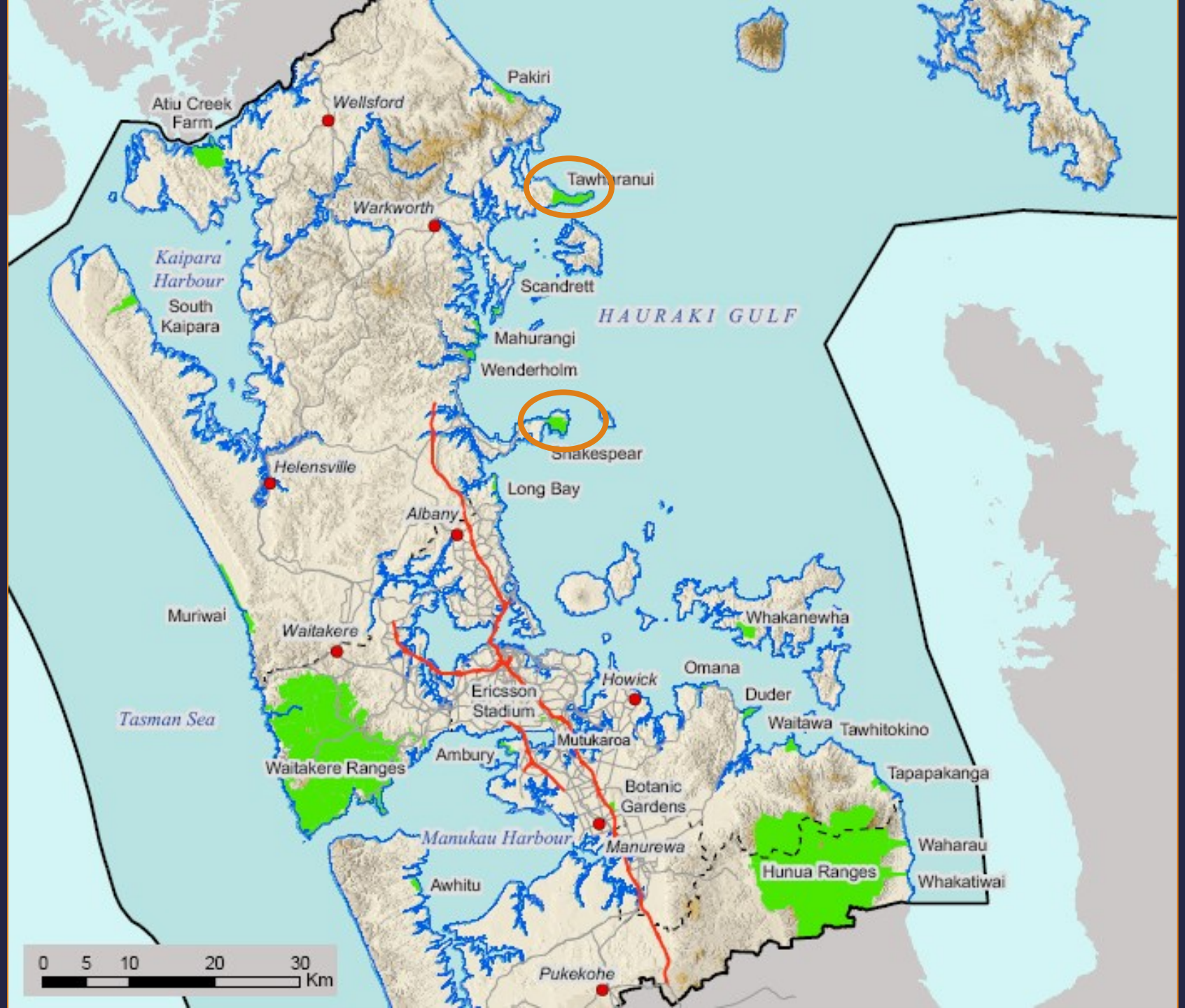

STOAT-ÉMON™
Gotta catch 'em all!


Auckland Council
Te Kaunihera o Tāmaki Makaurau
SOSSI
TOSSI
NGATI MANUHIRI
SETTLEMENT TRUST

Acknowledgements

- Tāwharanui and Shakespear Open Sanctuaries are delivered by **Auckland Council** with support of **Ngāti Manuhiri Settlement Trust**, **Tāwharanui Open Sanctuary Society Incorporated**, **Shakespear Open Sanctuary Society Incorporated**, **NZ Defence Force**, and **Watercare Services**.
- Auckland Council funded pest management, wildlife monitoring, pest dog surveillance and genetic analyses.
- **Ecogene Diagnostic Laboratories (Talia Brav-Cubitt, Frank Molinia and Julia Allwood**) analysed genetic samples from stoat scat and tissue.
- **Janine Duckworth of Landcare Research Manaaki Whenua** undertook reproductive assessment of stoats.
- **Brad Windust and dog Wero (the Hero)** delivered stoat and scat detection surveys.
- **Auckland Council rangers** led the sanctuary incursion responses, including the Shakespear stoat incursion response, **with special recognition of the leadership and innovation of Emma Whitton and Bruce Harrison**.

mmaitland@doc.govt.nz


Pakiri
Atiu Creek Farm
Wellsford
Tawharanui
Warkworth
Kaipara Harbour
Scandrett
South Kaipara
HAURAKI GULF
Mahurangi
Wenderholm
Shakespear
Helensville
Long Bay
Albany
Muriwai
Waitakere
Whakanewha
Omana
Howick
Duder
Ericsson Stadium
Waitawa
Tawhitokino
Tasman Sea
Mutukaroa
Ambury
Waitakere Ranges
Tapapakanga
Botanic Gardens
Manukau Harbour
Manurewa
Waharau
Hunua Ranges
Whakatiwai
Awhitu
Pukekohe
0 5 10 20 30
Km



TOSSI

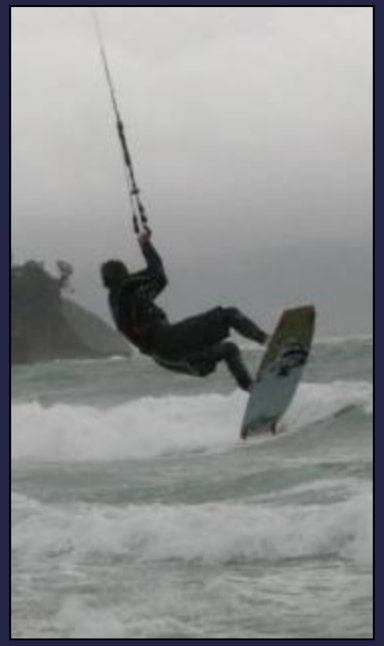
Auckland Council
Te Kaunihera o Tāmaki Makaurau



SOSSI

Auckland Council
Te Kaunihera o Tāmaki Makaurau

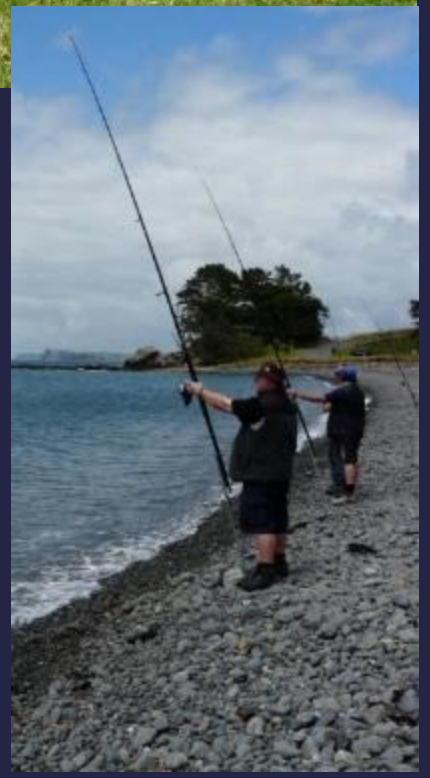



























Army Bay
Okoromai Bay
Pink Beach





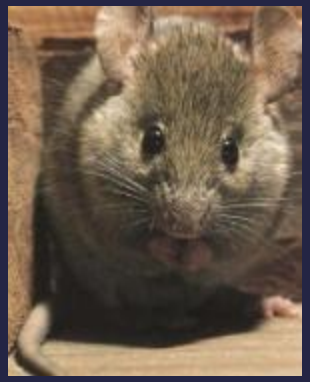


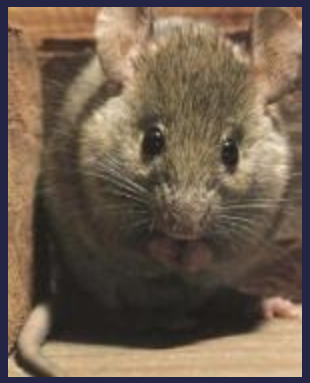

Army Bay
Okoromai Bay
Pink Beach













Species	Taxon	Site	Year(s)	Status 2026
Forest gecko	Lizard	Tāwharanui	2005	Established#
Elegant gecko	Lizard	Tāwharanui	2005	Established#
NI brown kiwi	Bird	Tāwharanui	2006-10	Established. Abundant
NI robin/ toutouwai	Bird	Tāwharanui	2007	Established
Whitehead/ pōpokatea	Bird	Tāwharanui	2007	Established
Pāteke	Bird	Tāwharanui	2008-10	Established
Red crowned kakariki	Bird	Tāwharanui	2009-10	Established
NI saddleback/ tieke	Bird	Tāwharanui	2012	Established
NI takahē	Bird	Tāwharanui	2013 onward	Established*
Whitehead/ pōpokatea	Bird	Shakespear	2015	Established
Duvaucel's gecko	Lizard	Tāwharanui	2015	Established
NI robin/ toutouwai	Bird	Shakespear	2016	Established.
Giant kōkopu	Fish	Tāwharanui	2017	Established
NI saddleback/ tieke	Bird	Shakespear	2018, 2025	Established
Hihi	Bird	Shakespear	2020, 20024-25	2020 failed. 2024-25 established.
Wētāpunga	Insect	Shakespear and Tāwharanui	2022-2025	Established.




TOSSI
Les Cave
TOSSI
TAWHAK










CORE_CAM
71F 21C
03-17-2020 07:29:18


4/24/2020
Current Track: 24 APR 2020 08:04
Scent
Feathers
Harrier
Moth Plant
Bruce Harvey Dr
© 2020 Google
Image © 2020 TerraMetrics
Image © 2020 Maxar Technologies
Google Earth
2004
Imagery Date: 4/29/2019 36°36'23.16" S 174°49'37.67" E elev 77 m eye alt 3.87 km





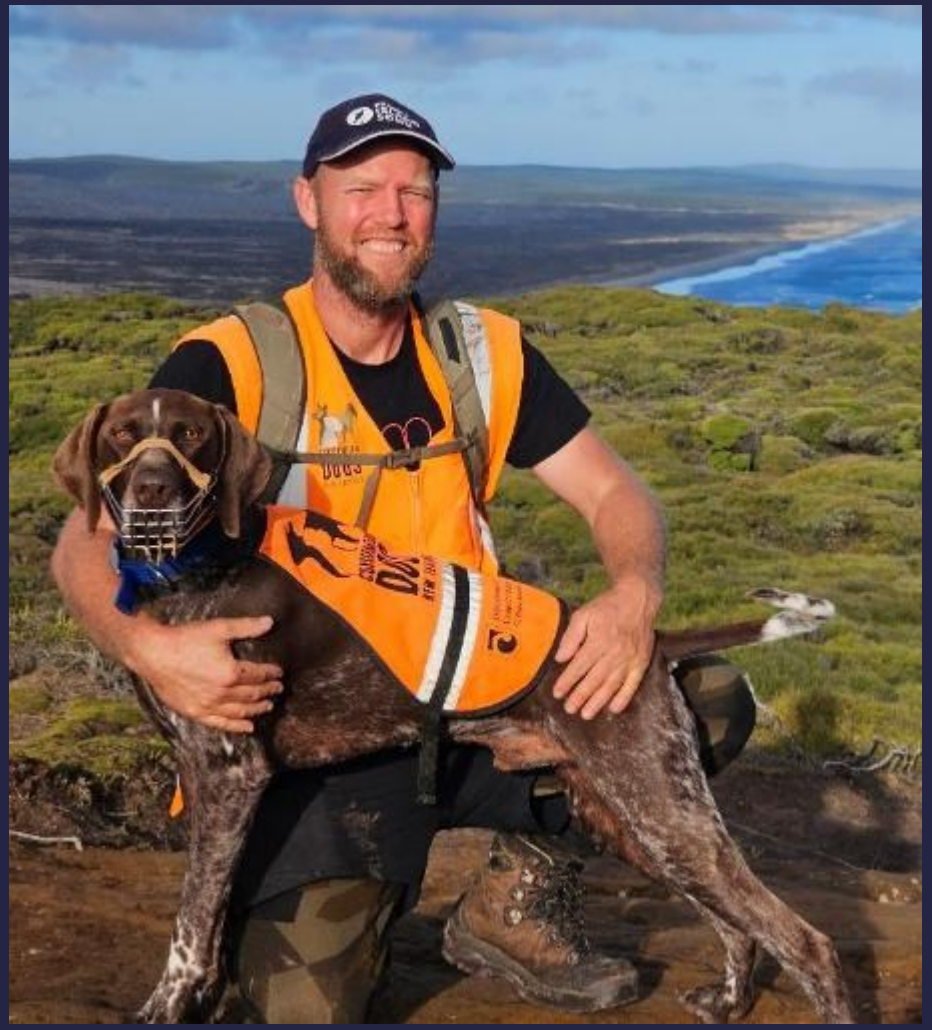

Bushnell
CORE_CAM
61°F 16°C
06-24-2020 19:33:29



At least the bird life loved the log trap.



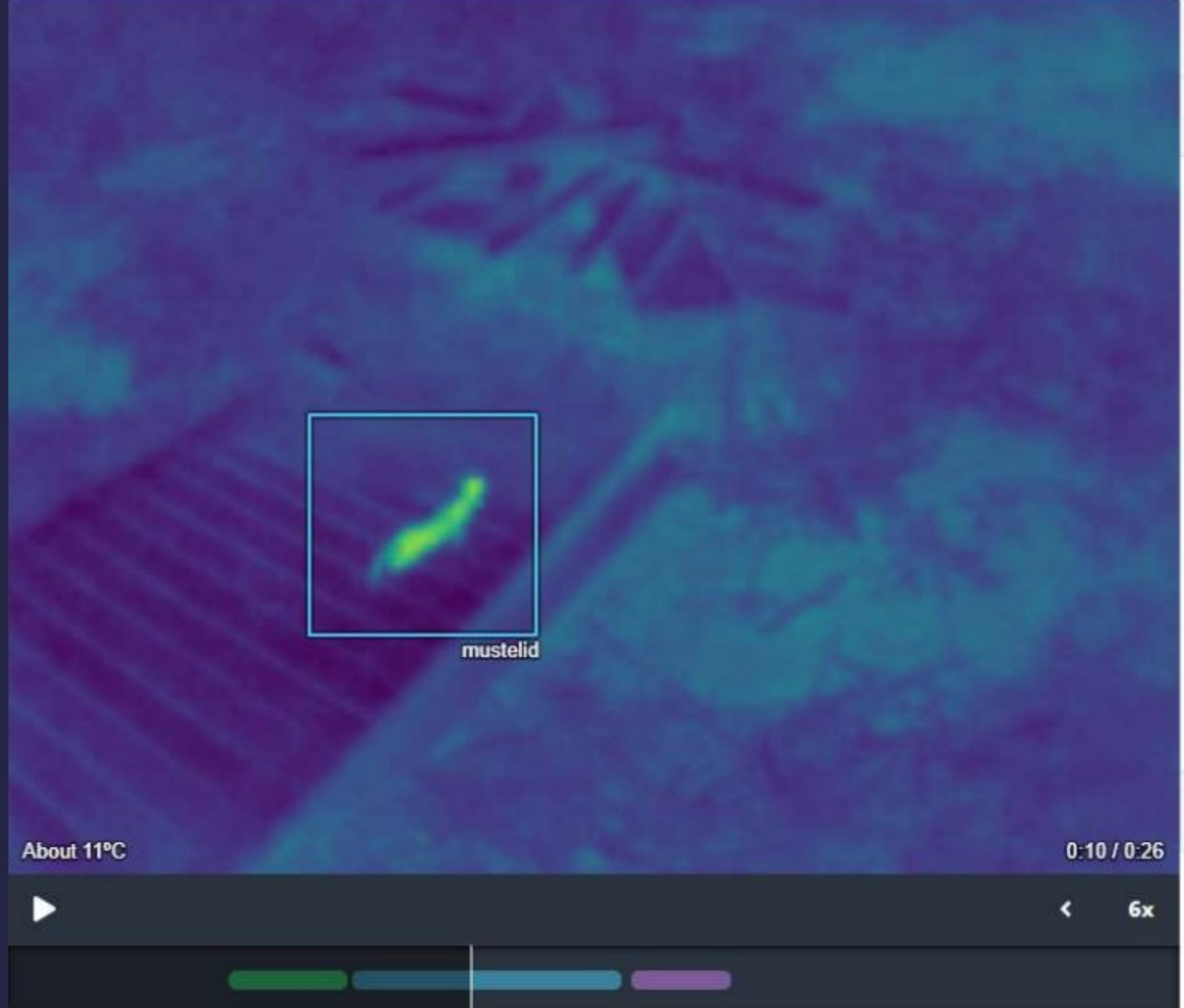

Bushnell
040
61F 16C
04-01-2021 04:39:35










mustelid
About 11°C
0:10 / 0:26
6x









ID	Sex	Mvi057		Mer082		Mer009		Mel1		Mer022		Rio19		Mer005		We7		We8		Mel4		Rio11		Mer041		Mut32		Mut27		Ma1		Mer030	
Princess	Female	105	113	119	119	208	208	259	259	262	270	276	276	282	284	269	291	331	335	138	138	145	149	161	161	182	182	196	196	194	204	220	232
Shak_7	Female	105	113	119	123	208	210	259	259	262	268	276	276	284	304	269	311	331	343	138	140	145	149	161	161	182	188	194	196	194	204	220	232
Crab	Male	99	105	119	123	208	216	259	259	262	268	276	276	282	304	269	311	335	335	138	140	147	149	161	161	182	188	194	196	194	194	220	232
Mirnda	Female	113	113	119	121	208	216	259	259	268	270	276	276	282	304	291	311	335	343	138	142	149	149	161	161	182	182	196	196	194	198	203*	220	220
Titus	Male	99	105	119	121	208	210	259	259	262	268	276	276	282	304	269	311	331	343	138	140	149	149	157	161	182	188	196	196	194	194	220	232
S1233_19	Male	113	113	119	123	208	216	259	259	262	262	276	276	282	282	291	311	335	335	138	140	149	149	157	161	182	182	196	196	194	204	220	232
S1233_34	Male	99	105	119	123	208	210	259	259	262	270	272	276	282	282	269	311	335	335	138	142	147	149	161	161	182	188	194	196	203	204	220	232
SRP_1																																	
SRP_2	N/A	0	0	119	127	214	214	0	0	252	254	274	274	296	302	291	295	0	0	0	0	137	143	151	157	0	0	198	200	190	190	0	0
Dad	Male	99	113	121	123	210	216	259	259	262	268	272	276	282	304	311	311	335	343	140	142	147	149	157	161	182	188	194	196	194	203	220	223

Figure 2 Genotypes for the known stoats, and the potential predicted father of the litter.

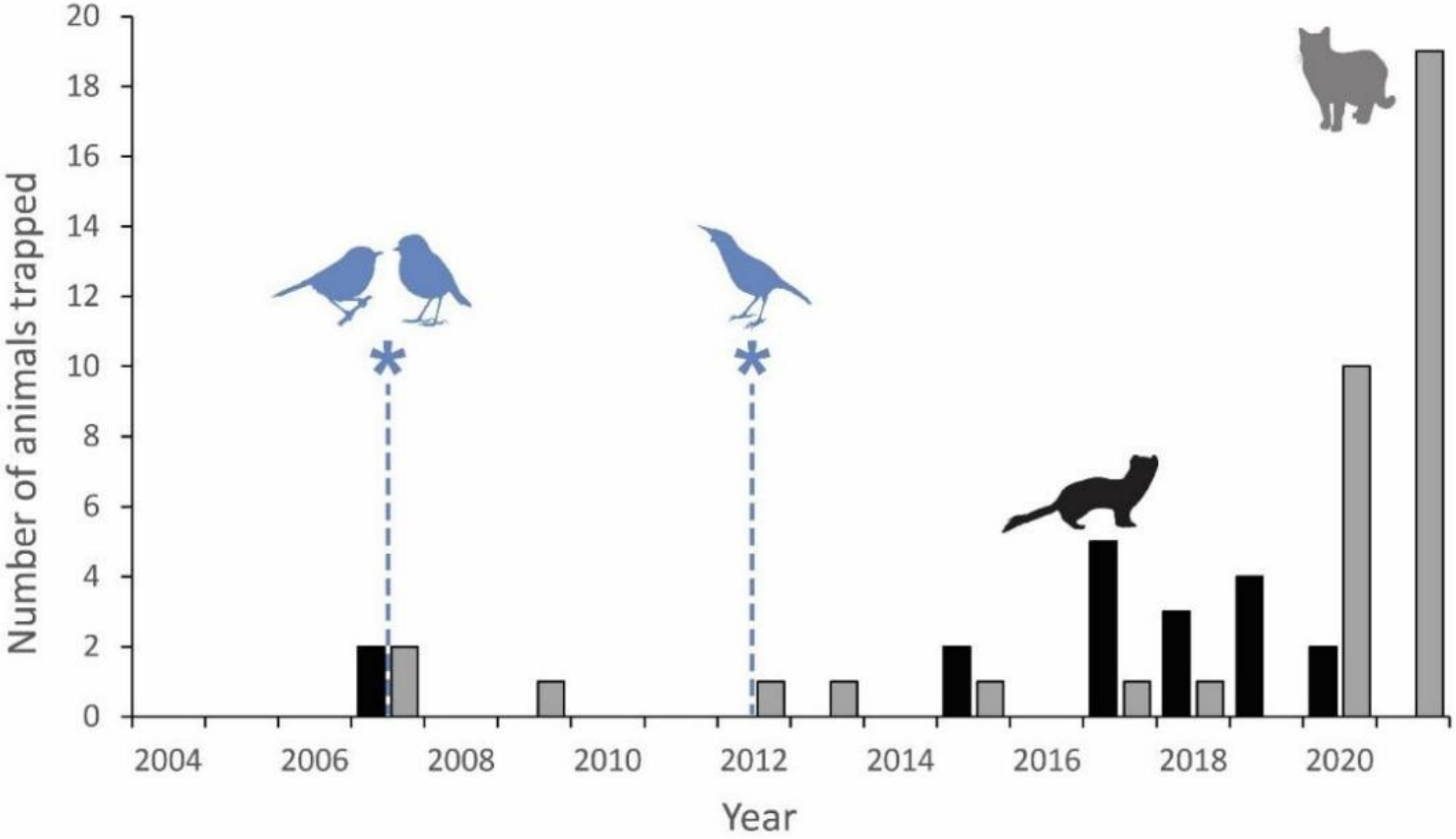

Stoat Kill July 7th
Individual A Scat
Princess Munch
Waterfall Gully Carpark
Waterfall Gully
Individual B Scat
Shakespear Regional Park
Stoat Kill July 27th
Giant Frame
Shakespear Woolshed
YMCA
Shakespear Lodge
Shakespeare beach
Shakespeare Beach
Te Haruhi Bay Campground
Te Haruhi Bay
Te Haruhi Bay
Okoromai Bay

An old stoat sett is found on the cliff edge at Hauroa point.

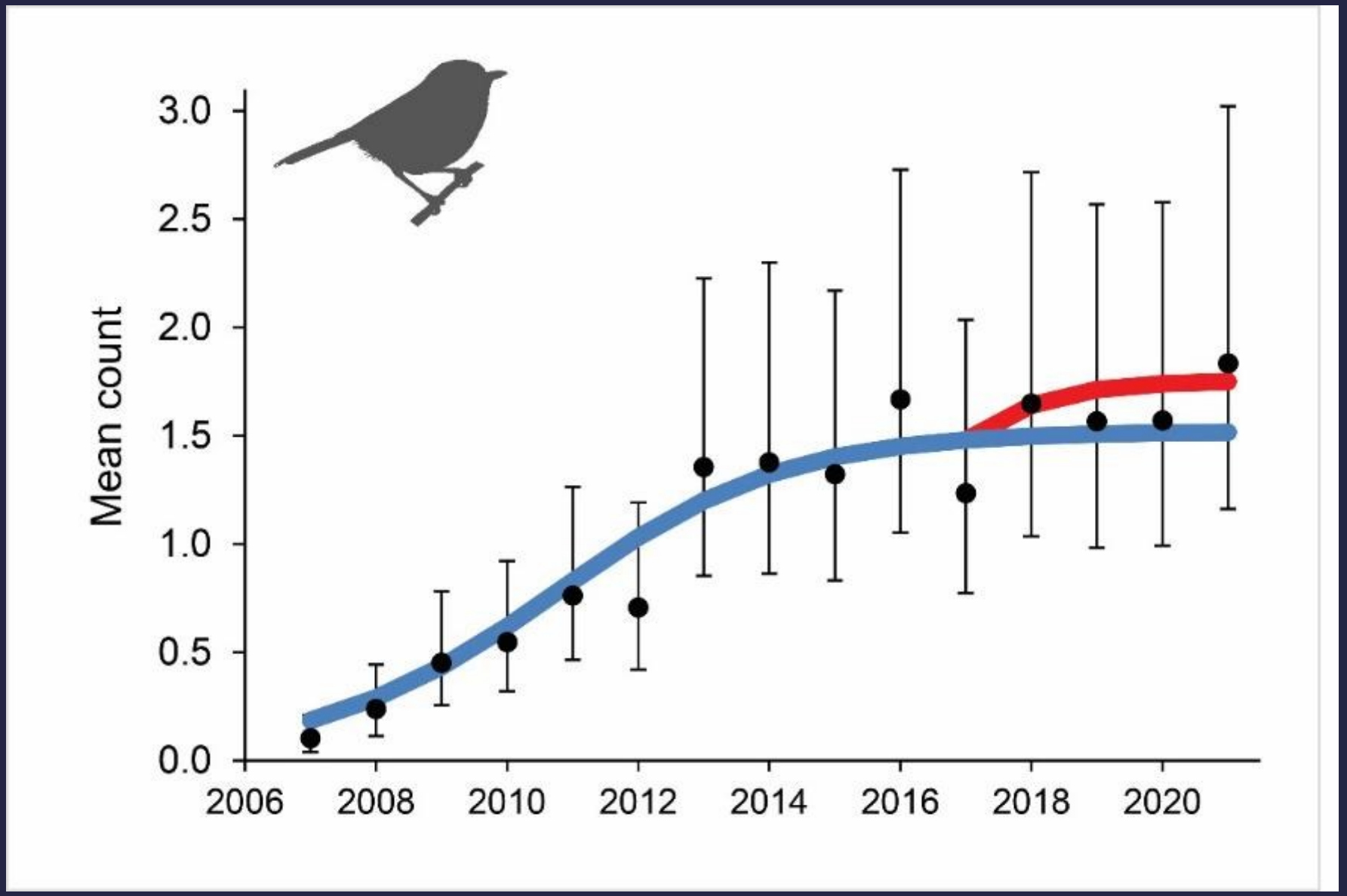


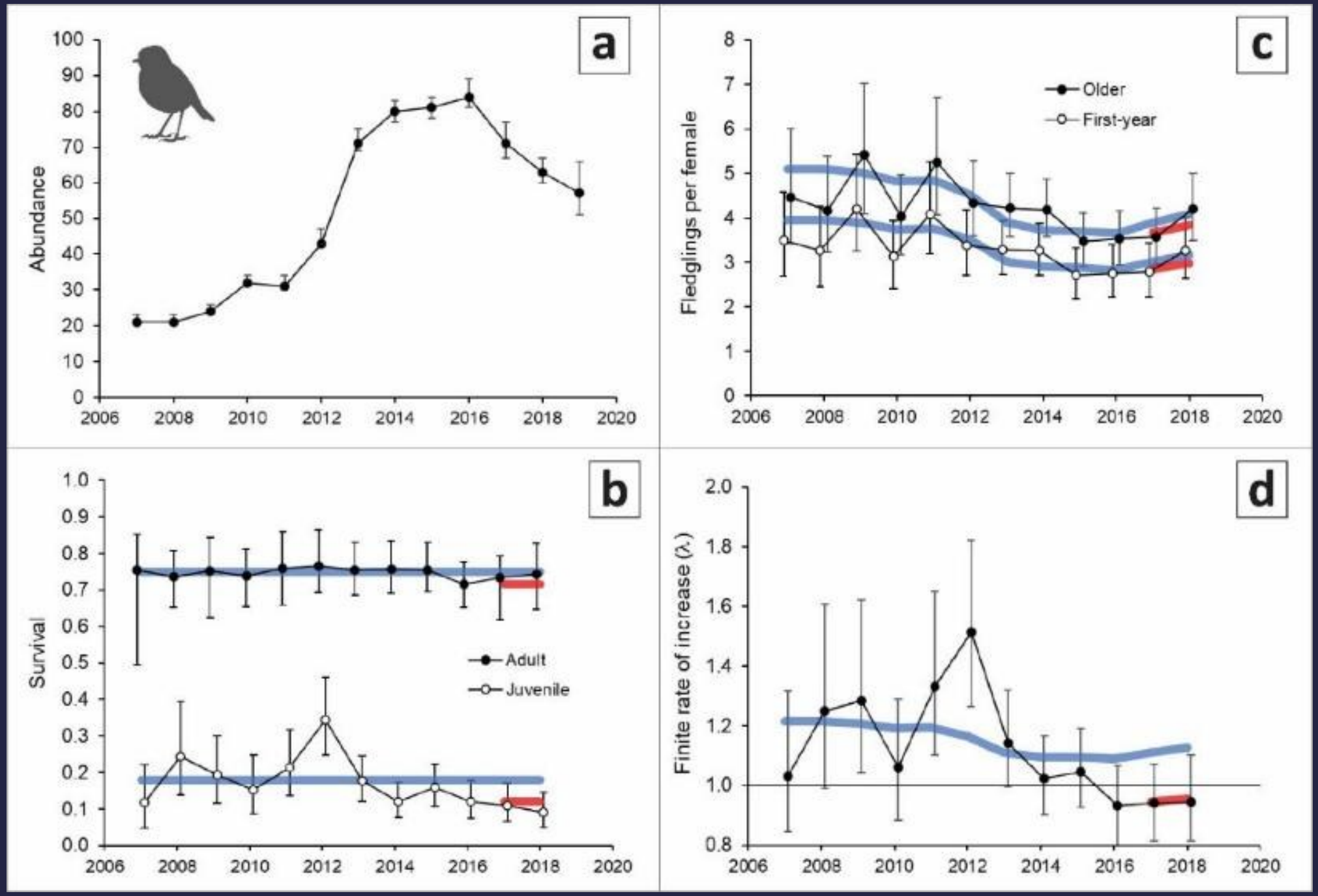


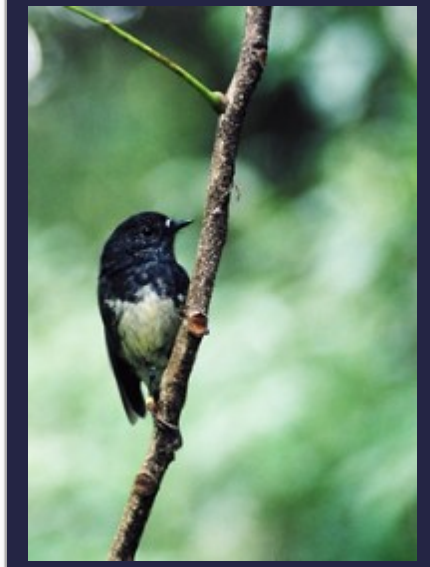
4 57F 13C ○ 08-22-2021 02:18:59

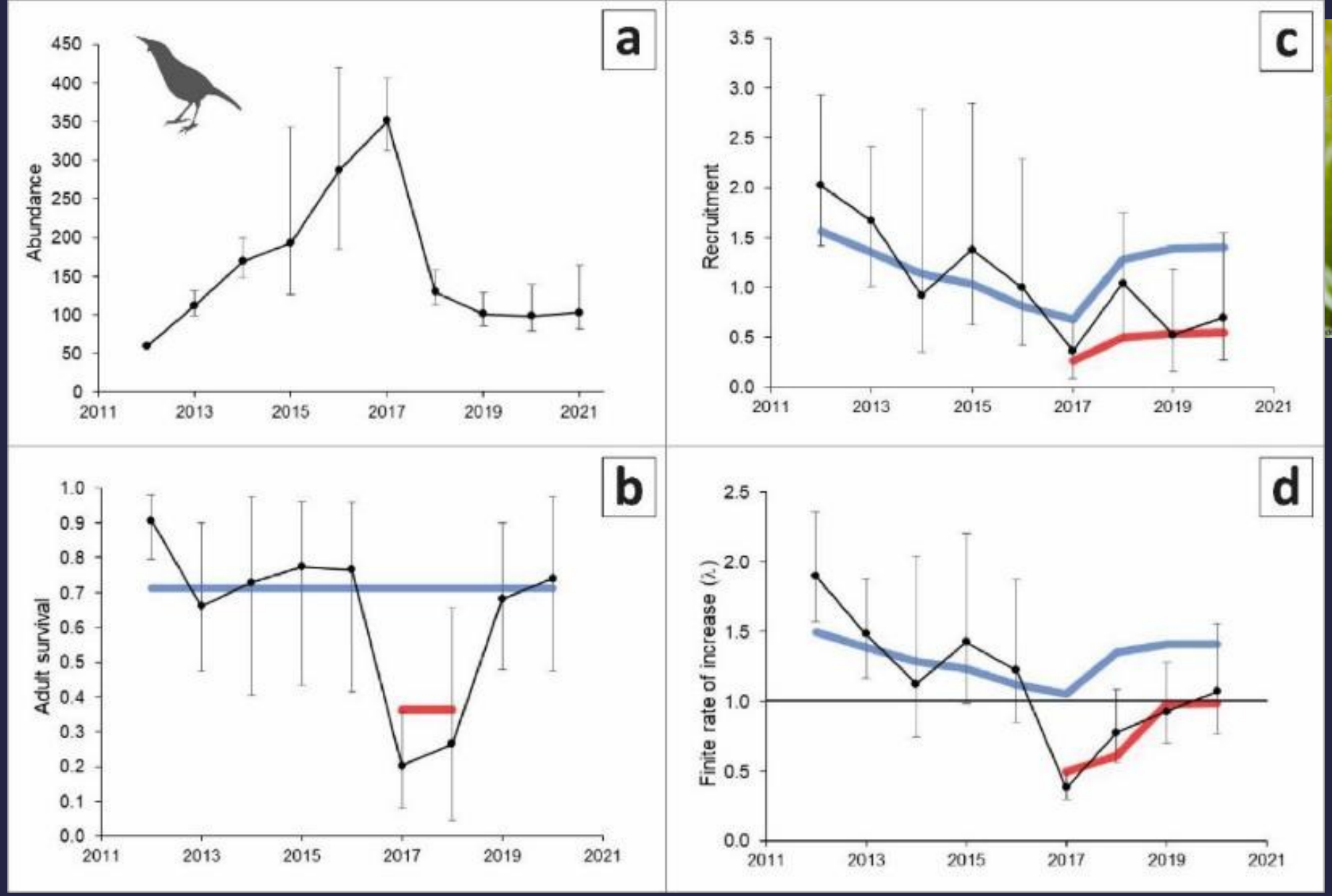

Number of animals trapped
0
2
4
6
8
10
12
14
16
18
20
2004
2006
2008
2010
2012
2014
2016
2018
2020
Year



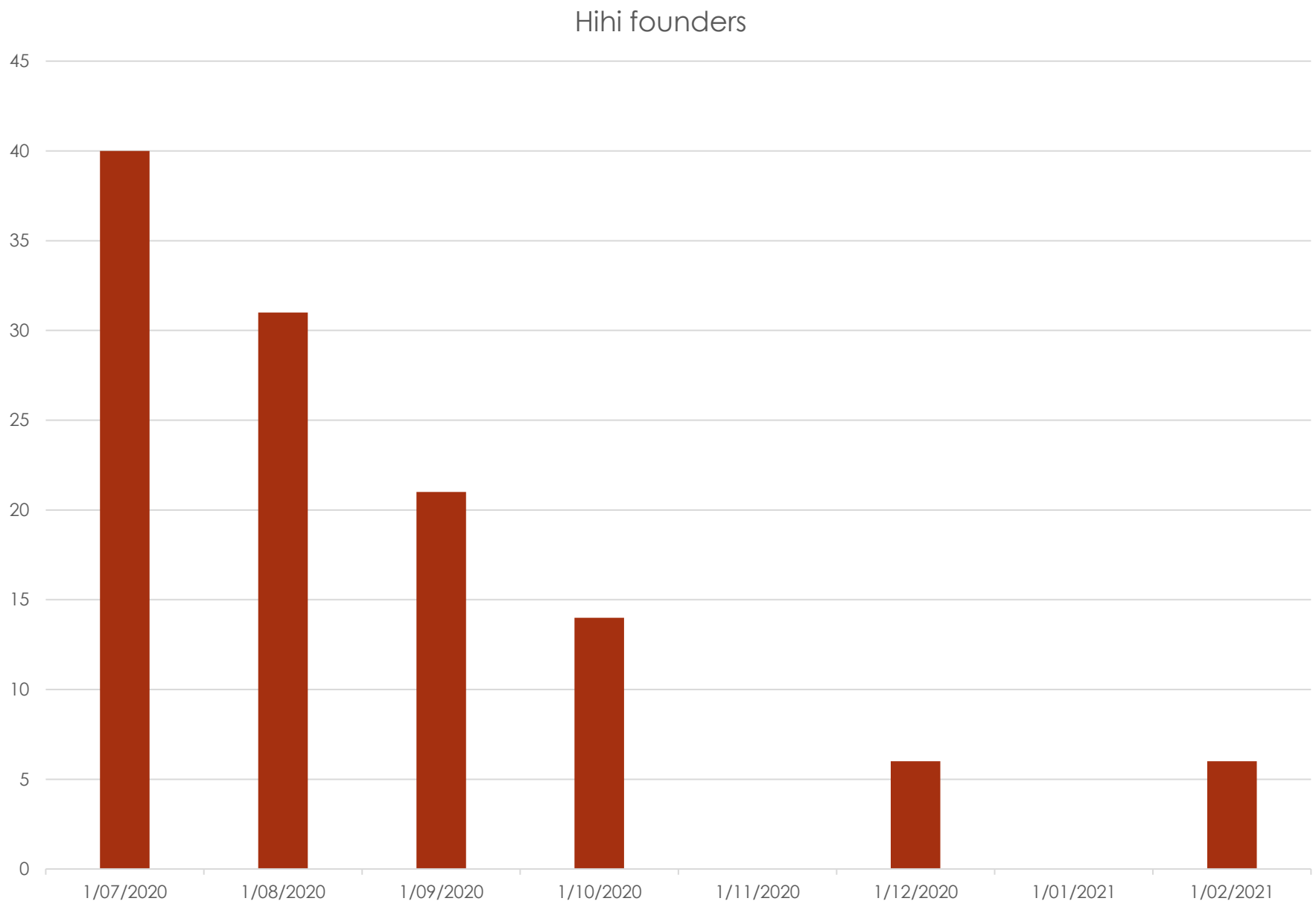

Mean count
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2006
2008
2010
2012
2014
2016
2018
2020

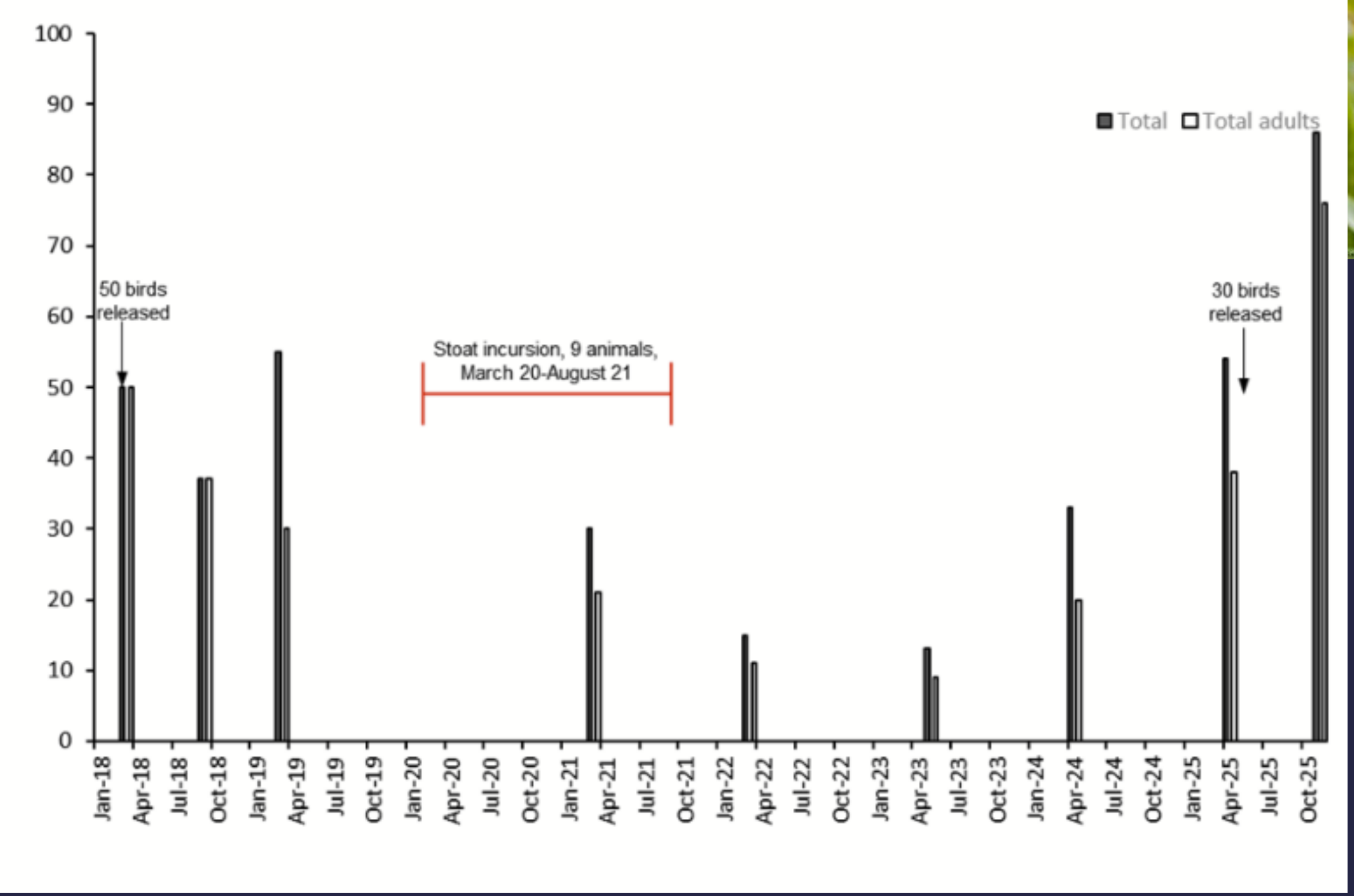

a
Abundance
100
90
80
70
60
50
40
30
20
10
0
2006
2008
2010
2012
2014
2016
2018
2020
c
Fledglings per female
8
7
6
5
4
3
2
1
0
Older
First-year
b
Survival
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Adult
Juvenile
d
Finite rate of increase (λ)
2.0
1.8
1.6
1.4
1.2
1.0
0.8




a
Abundance
0
50
100
150
200
250
300
350
400
450
2011
2013
2015
2017
2019
2021
c
Recruitment
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
b
Adult survival
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
d
Finite rate of increase (λ)




Hihi founders
45
40
35
30
25
20
15
10
5
0
1/07/2020
1/08/2020
1/09/2020
1/10/2020
1/11/2020
1/12/2020
1/01/2021
1/02/2021


100
90
80
70
60
50
40
30
20
10
0
Total
Total adults
50 birds released
Stoat incursion, 9 animals, March 20-August 21
30 birds released
Jan-18
Apr-18
Jul-18
Oct-18
Jan-19
Apr-19
Jul-19
Oct-19
Jan-20
Apr-20
Jul-20
Oct-20
Jan-21
Apr-21
Jul-21
Oct-21
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
Apr-23
Jul-23
Oct-23
Jan-24
Apr-24
Jul-24
Oct-24
Jan-25
Apr-25
Jul-25
Oct-25





















Acknowledgements

- Tāwharanui and Shakespear Open Sanctuaries are delivered by **Auckland Council** with support of **Ngāti Manuhiri Settlement Trust**, **Tāwharanui Open Sanctuary Society Incorporated**, **Shakespear Open Sanctuary Society Incorporated**, **NZ Defence Force**, and **Watercare Services**.
- Auckland Council funded pest management, wildlife monitoring, pest dog surveillance and genetic analyses.
- **Ecogene Diagnostic Laboratories (Talia Brav-Cubitt, Frank Molinia and Julia Allwood**) analysed genetic samples from stoat scat and tissue.
- **Janine Duckworth of Landcare Research Manaaki Whenua** undertook reproductive assessment of stoats.
- **Brad Windust and dog Wero (the Hero)** delivered stoat and scat detection surveys.
- **Auckland Council rangers** led the sanctuary incursion responses, including the Shakespear stoat incursion response, **with special recognition of the leadership and innovation of Emma Whitton and Bruce Harrison**.

mmaitland@doc.govt.nz

