Southern NZ Dotterel/tūturiwhatu Recovery Programme

Season summary 2019/20

A review of the current dotterel fieldwork season and plans for 2020/21

Southern New Zealand Dotterel at Table Hill (Photo: Vojtěch Kubelka / DOC)

Contents

Department of Conservation
Te Papa Atawbai

DOC - xxxxxxx

New Zealand Government

Summary of outcomes

Monitoring

Nests

	Table Hill	Rocky Mt	Rakeahua	Hill 511	Hill 464	Blaikies	Mt Anglem	Total
***Nests;** (found [inferred])*	7 [2]	3	1 [1]	1	0 [1]	0	0 [1]	12 [5]
Eggs	23 [3]	7	1 [2]	2	0 [2]	0	0 [2]	33 [9]

- 12 found by Rangers, 5 presumed based on chicks seen with banded parents not associated with a known nest. Inferred eggs are those of chicks that were sighted but the nest they hatched from was not found.

Chicks

	Table Hill	Rocky Mt	Rakeahua	Hill 511	Hill 464	Blaikies	Mt Anglem	Total
Chicks presumed	8	2	1	0	0	0	0	11
Chicks confirmed	10	0	2	1	2	0	2	17
Total	18	2	3	1	2	0	2	28

- 'Chicks confirmed' is the number of chicks that were sighted with parents after hatching. 'Chicks presumed' is the total number of chicks not seen but inferred based on evidence of hatched eggs and no evidence of predation (e.g. nest with three eggs hatched, two chicks subsequently seen = 1 chick presumed and 2 confirmed)

Re-sightings

1st July 2016 – 30th June 2017	153
1st July 2017 – 30th June 2018	200
1st July 2018 – 30th June 2019	216
1st July 2019 – present	218

- The re-sightings from this season have had noticeably more detail in the comments section compared to previous years. The increase in the number of birds with bands is contributing to the increase in re-sightings data. This year could easily surpass 300.

Flock counts

2017/18	*167*	*2018/19*	*170*	*2019/20*	*TBC*

Predator control

Baiting

- Brodifacoum blocks (28g) used for rats and 1080 fishmeal bait (0.10%) for cats
- One cat confirmed poisoned based on photos (see Appendix 1)
- Two other cats appeared to have ingested bait. Not known whether they ate the bait themselves or ate rats that had ingested poison

	Table Hill	Blaikies	Mt Rakeahua	Rakeahua valley	Rocky Mt	Hill 511
First baiting	7th Sept	18th Sept	11th Sept	19th Sept	18th Sept	20th Sept
Bait removed	25th Jan	26th Jan	8th Jan	19th Dec	7th Jan	13th Dec
Bait present (days)	**140**	**130**	**119**	**91**	**111**	**84**

Trapping

- 22 cats caught in traps
- Most successful trapping season in the history of the project (by some distance)

	GS Leg-holds	Belisle/Conibear traps	Cage traps	Barrel-set Leg-holds	Raised-set Leg-holds
Cats 2018/19	4	0	0	0	0
Cats 2019/20	17	4	1	0	0

Hunting

- Opportunistic hunting and spotlighting with thermal scope
- Thermal hunting was carried out three times (8.5h total) and nothing shot. Rats and kiwi seen through thermal scope but no target species (deer, possums, cats).
- I know of one instance of deliberate hunting where a deer was seen and missed

Daylight hunting	Feral cat	Whitetail deer	Spur-winged plover
Number shot	1	2	1*
Notes	Encountered and shot near summit of Table Hill in daylight. Skink, rat fur and remains of poison bait in stomach.	One deer shot on Hill 511 on 12th Dec. Another was shot near Blaikies summit on 15th Dec.	Pair seen 6th Sept. One shot, one missed. A dead plover found nearby later. More seen at Blaikies later in season.

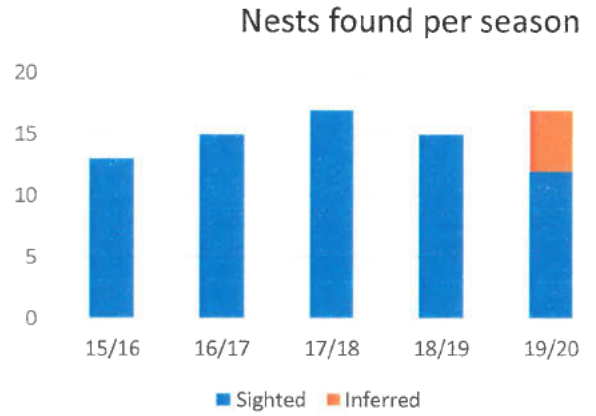
Timeline

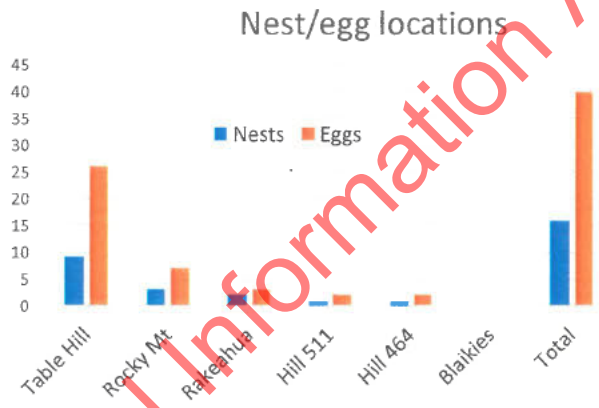
Aug	16	Ministry of Health (MOH) permission to use vertebrate toxic agents (VTAs) received
	19	Start date for temp staff 9(2)(g)(ii) [redacted]
	19-20	First visit to 'Satellite Hills' (Rocky Mt and Mt Rakeahua) – 9(2)(g)(ii) [redacted]
	27	DOC permission to use VTAs received
	27-28	First field trip for temp staff 9(2)(g)(ii) [redacted] o River Loop (Rakeahua Valley)
	31	Public notification in the Southland Times
Sept	4-10	First trip to Table Hill
	4	Last warning signs placed
	7	First toxin application (Table Hill & Hill 464)
	10	First cat seen on trail cam (Table Hill)
	11	First toxin application on Mt Rakeahua
	18	First toxin application at Blaikies and Rocky Mt
	19	First toxin application on River Loop
	20	First toxin application on Hill 511
	23	First dotterel nest of season
Oct	8	Helicopters grounded (until Nov 19th)
	18	Second dotterel nest of season
	27	First two cats trapped in leg-hold traps
Nov	9	Predation by Australasian Harrier of three chicks on Rocky Mt (pair nests again)
	12	First chicks of the season sighted on Mt Rakeahua
	18-22	November rat monitoring trip
	23	Cat shot in open on Table Hill summit
Dec	12	Last dotterel nest of the season found on Hill 511; First cat caught in Belisle trap
	13	Bait removed from Hill 511
	15	First cat caught in cage trap
	17	End of last field trip of 2019
	19	Bait removed from River Loop (Rakeahua Valley)
Jan	7	Bait removed from Rocky Mt
	8	First field trip of 2020, bait removed from Mt Rakeahua
	22	Last day at work for 9(2)(g)(ii) [redacted] (new job with DOC in St Arnaud)
	26-27	Bait removed from last of Table Hill and Blaikies bait stations
Feb	10-13	February rat monitoring trip
	21	Last day at work for 9(2)(g)(ii) [redacted]
March and April		Banding and blood sampling of dotterels at flocking sites by 9(2)(g)(ii) [redacted]
Apr	6-8	Annual flock counts
May	???	May rat monitoring trip

Discussion

Monitoring

Nests

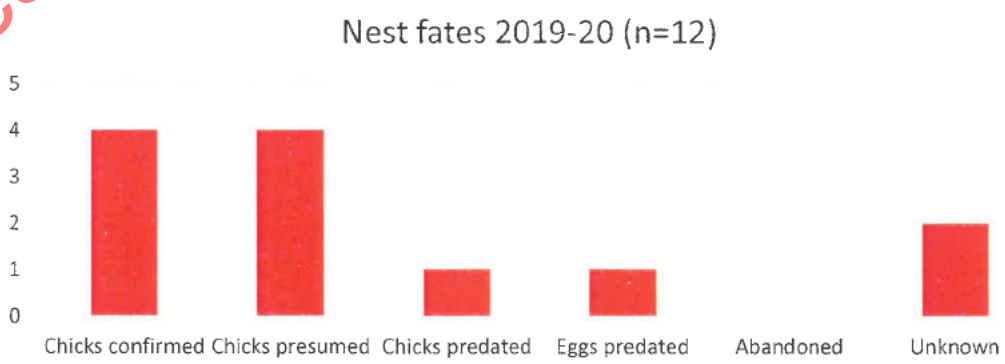




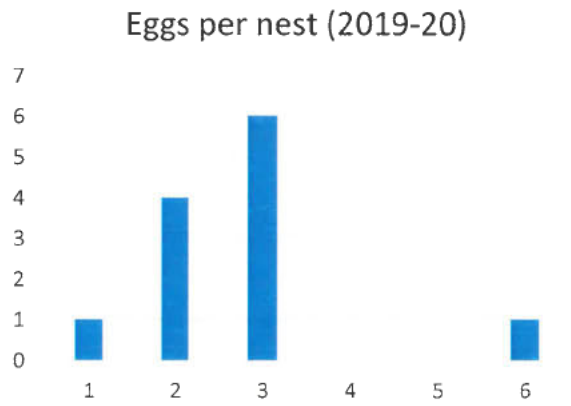
Nest search effort was similar to previous seasons, possibly more because only one of three team members had a controlled substances license at the beginning of the season and nest searching is a useful alternative to laying bait. One nest was found in late September, however it was three weeks until the next nest was found on October 18th on Rocky Mountain. All nests except the first were found in October and November.

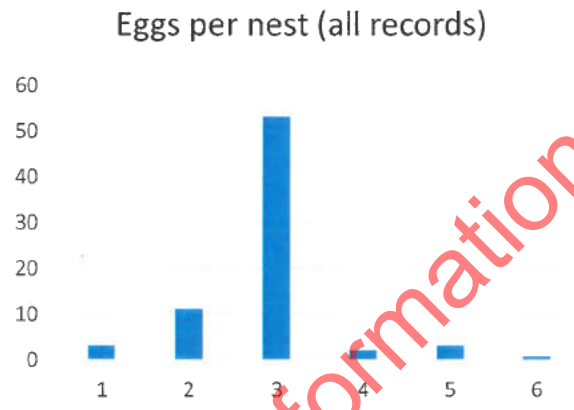
There was a greater focus on recording nest history this season, which has meant greater certainty in assigning fates to nests. The number of banded birds was very helpful in assigning fates as chicks could be traced back to a known nest through their banded parent birds. inferred nests from chick sightings.

Other than SNZD, most sightings at nests were kiwi. Some videos show kiwi chasing dotterel after dotterel flee the nest site. A rat was seen at nest NTHMW3 (Table Hill summit) doing the same thing, although again it may have been reacting to sudden movement. A harrier predated three chicks at a nest on Rocky Mountain on Nov 9th. The dotterel pair re-nested c. 100m away and a harrier was again seen at this new site on Nov 27th. The fate of this nest is unknown as inspection of the nest found small egg fragments in the bottom suggestive of hatching. No chicks were seen on Rocky Mt all season. The eggs from nest NTHRR3 appear to have been pecked, however the trail cam did not capture the event.



Eggs





Most nests had two or three eggs, which seems to be the norm. The other two were the only 6-egg and 1-egg nests that we have on record since 2015.

The 6-egg nest was laid by a banded bird – bM-bBg – and an unbanded (UB) bird. It was in the same territory as 3 previous 5-egg nests and the same bird (bM-bBg) is associated with two of the previous three. The only other 5-egg nest in this territory has parents listed as UB and unknown so the evidence strongly suggests that this is a stable female-female pair. Unknown if all of these eggs were infertile as eggs were destroyed before or after the nest was abandoned. Previous experience suggests that most if not all would be infertile.

The one-egg nest was on Mt Rakeahua. The pair was OM-GO x UB, a pairing that nested on Mt Rakeahua in 2018-19 although it can't be confirmed that the UB bird is the same. The trail cam footage shows the birds incubating and there were fresh egg fragments deep in the nest bowl. Unknown if this egg was fertile but circumstantial evidence suggests yes.

Of 33 eggs laid, fates are known for 21. The rest were destroyed (the 6-egg nest), predated (n=3) or the fate of the nest was unknown. Of these 21, hatching was confirmed in 18 eggs and the remaining three were single eggs left behind in 3- or 2-egg nests.

	Total	Hatched	Abandoned	Unknown
Eggs seen	33	18	3	12

We know of nine more 'cryptic' eggs that were laid this season because of sighted chicks that are not from any known nest. This brings the total number of eggs up to 42 and hatches up to 27, however only eggs from known nests are included in the table above.

Outer nesting survey

On December 12th we were finally able to carry out our outer nesting survey of the Anglem Range in the north of the island. Four staff were dropped on mountain tops (one on the The Paps, one on Little Mt Anglem and two on Hananui/Mt Anglem).

A pair of adult unbanded dotterel were seen on The Paps and their behaviour suggests that they were defending a chick or chicks. On the ridge west of the summit of Hananui/Mt Anglem a pair of adult birds including one banded bird (GM-K) were seen with two "downy" chicks. This was the first band recovery from Mt Anglem/Hananui and it will be interesting to see if this bird turns up in the same place again.

The original intended date for this survey was 12th November which was selected to take place at the height of breeding activity. It was delayed by the grounding of helicopters and then delayed again because of weather. The intention would be to complete the survey earlier next season, however the results were very similar to previous years (two pairs and chicks).

A search of southern breeding areas around the southern Tin Range, Frazer peaks and Smith's lookout was intended but time ran out to do this. Alternating the two areas each year may be a way to get a better picture of breeding outside the predator control areas. The results from the northern areas have been similar for the last three years so the loss of data might be minimal.

Baiting

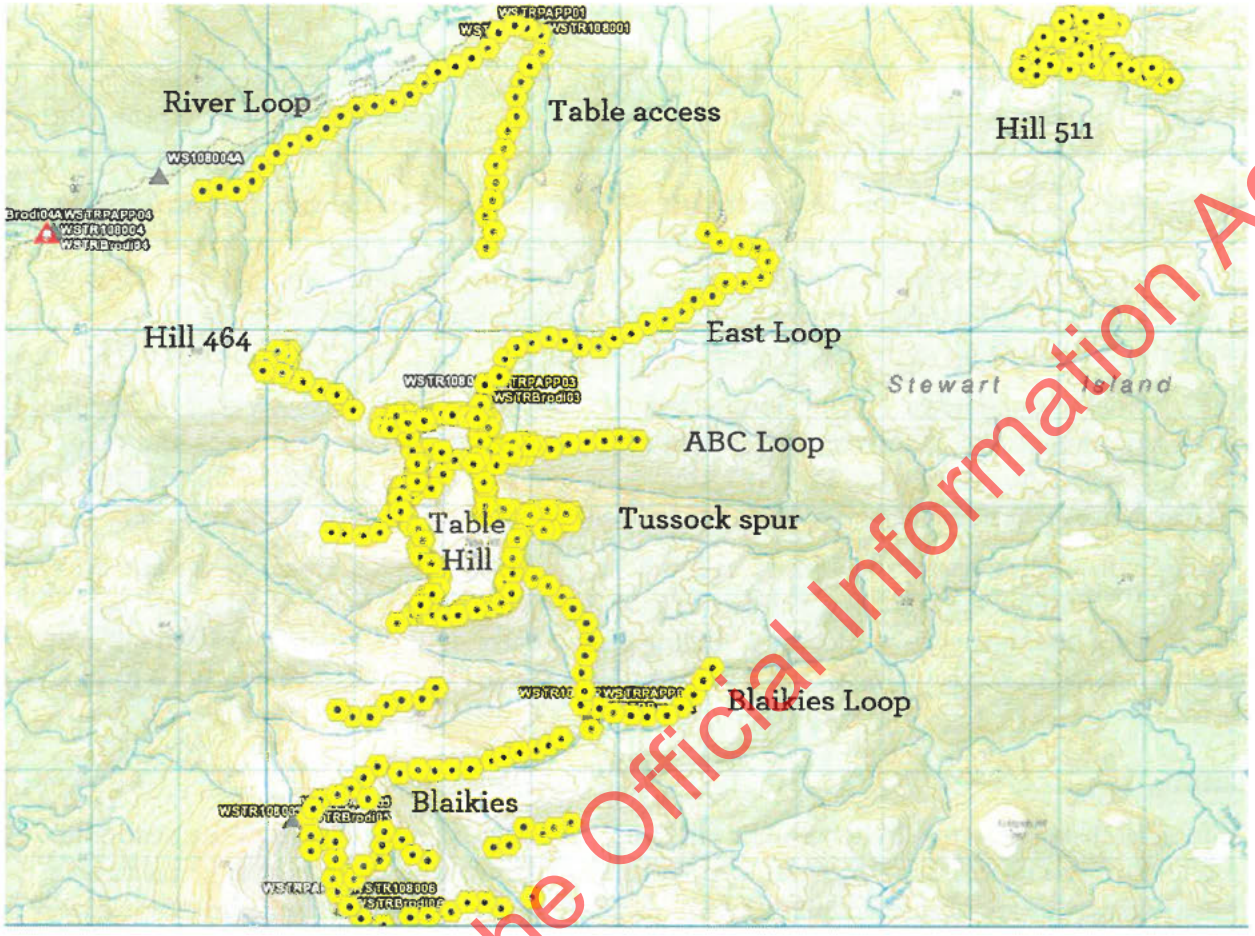
This season saw a change in how the brodifacoum application represented in the pesticides application. Rather than having three overlapping 3-year caution periods at any one time, there is now a 10-year brodifacoum block which has greatly simplified the representation of the programme in the pesticides application.

Brodifacoum 28g cereal blocks (Pest-off rodent blocks, V005099) were used to bait rats and 0.10% 1080 feral cat bait (V004107) containing fishmeal, fish oil and binders for feral cats.

Table Hill and Blaikies

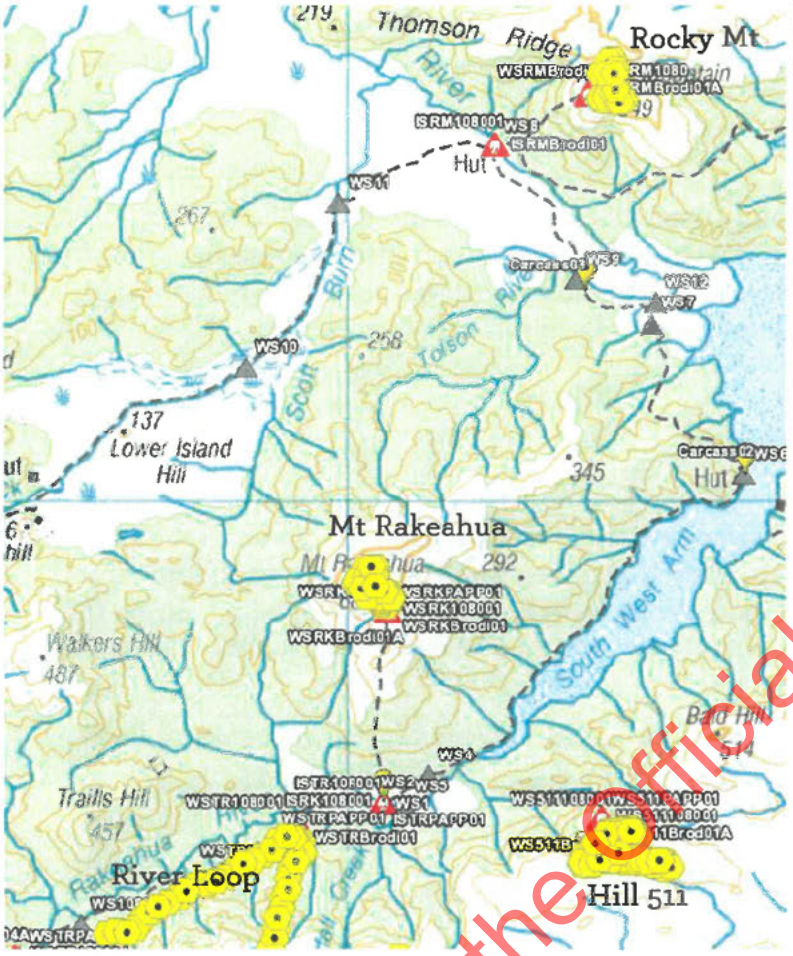
Toxin application began on September 7th 2019 and the last toxin was brought in on 26th January 2020. The bait station network was expanded with bait stations being placed along previously cut tracks at East Loop and Blaikies Loop. The installation of separate rat bait stations continued at Table Hill and Blaikies with only a few bait stations still left to be installed.

With three out of four staff new to the team this season we only had one Dotterel ranger able to lay toxic bait until mid-October.



Satellite Hills: Rocky Mountain, Mount Rakeahua, Hill 511 and River Loop

Staff found it difficult to manage all four 'satellite hill' sites (the line along Rakeahua Valley – River Loop – is typically grouped with the other three areas as it is usually done at the same time by the same staff member) within the space of a working week. This was mainly due to having to time logistics around tides at the Freshwater and Rakeahua rivers. Theoretically it is possible but only with ideal tide times. Additionally, without a bivvy at Hill 511 this season the round trip to bait the hill from Rakeahua hut becomes 9-10 hours including two short boat trips. With a new bivvy in place next season this should be easier.



Of the satellite hills Hill 511, Rocky Mt and Mt Rakeahua are still without separate rat tunnels for brodifacoum (see photo). Baiting on these hills stopped in December for Hill 511 and River Loop (Rakeahua valley) and early January for Rocky Mt and Mt Rakeahua.

The decision to cease baiting of Hill 511 and River Loop in December was driven by resources and the fact that no evidence of breeding had been detected on Hill 511. However, while removing bait the only Hill 511 nest of the season was found. A visit 5 days later showed that one of two eggs had hatched and parents were nearby behaving as if they had a chick.

Again, the decision to remove bait from Mt Rakeahua and Rocky Mt was due to the loss one one team member and a lack of staff members within the wider team with controlled substance licences and boat tickets who could make up the shortfall.

We had strong evidence that at least three cats had consumed bait either directly or through secondary poisoning. One kitten was found dead on Table Hill with blue-coloured vomit and scat nearby. Another cat shot in the open on Table Hill summit was found to have a skink, rat fur and what appeared to be ground-up bait in its stomach contents and a third cat caught in a Belisle 220X trap on Blaikies Loop was found to have a large amount of blue-green bait in its stomach. A nearby bait station had a large take of 1080 bait (see photos Appendix 1).

Combined, the evidence shows that some cats are consuming bait. However, we can only attribute one of the three causes of death to poisoning, so we don't know if the cats shot and trapped would have otherwise died of the bait they had consumed. The bait in the cat shot on

Table Hill could also have come from consuming a rat that had eaten brodifacoum bait and the efficacy of this secondary poisoning in our project area is unknown.

Trapping

Three types of traps were predominantly used this season; ground-set leg-hold traps, Conibear/Belisle 220 X kill traps and Haveaheart live-capture traps. The trapping effort (trap nights) is still being calculated for the season but most effort was put into leg-hold trapping, especially after staff started catching cats in these traps in later October.

Ground-set leg holds

Total cats: 17

Following training on hazing leg-hold traps against non-target species, ground-set (GS) leg-hold trapping effort begin in earnest in early November. The first two cats caught in these traps were caught on October 27th [redacted] had already been signed off during the previous season). Between then and January 28th a further 15 cats were caught in GS leg-holds and no non-target species other than rats.

All sets were baited with cat food ('Fancy Feast' – either chicken (n=15) or beef (n=2) flavour) and feathers as a visual lure. Photos of hazing around GS leg-holds are in Appendix 2.

Conibear/Belisle 220 X

Total cats: 4

All traps double-set in chimney boxes. We started the season with 'Conibear' traps but following best practice guidelines these have gradually been replaced with Belisle 220 X traps purchased from Canada which arrived mid-way through the season. All traps were baited with 50x50mm salted rabbit meat baits purchased from Ray Moffat Pest Control in Alexandra.

First male tabby cat caught 12th December in a Belisle 220 X trap at Blaikies. This cat had consumed a lot of toxic bait so it may have otherwise died from poisoning or had its instinctual suspicion of the chimney box impaired by symptoms of poisoning. Two further juvenile tabby cats were caught on 10th and 23rd January. The first was in a Belisle 220 X trap at Blaikies and the second was in a Conibear trap at Table Hill.

Finally, a fourth cat was caught in a Belisle 220 X trap at Blaikies on 28th January. This trap failed to kill the cat instantly and when the trap was checked by a member of staff the cat was crouched, still breathing, but semi-conscious. The trap had apparently set off correctly had caught the cat by the neck but with insufficient force. It is thought that the trap may be defective, and it will be replaced on the next planned trip (early Feb 2020).

Haveaheart live-capture/cage traps

Total cats: 1

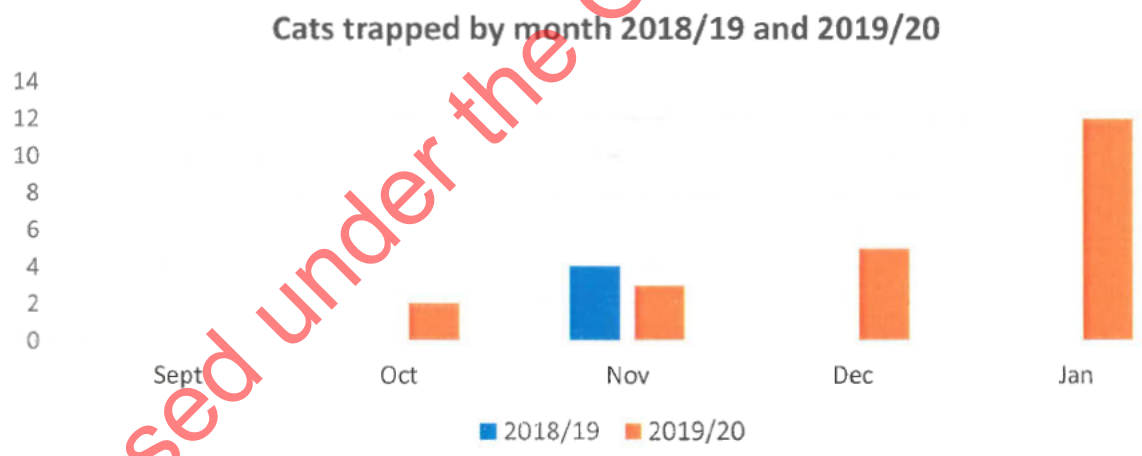
Seven Haveaheart cage traps were placed out along the northern edge of the 'Home Paddock' area where most breeding activity has historically occurred. These traps were initially baited with raw chicken pieces and feathers but were later baited with the same 50x50mm salted rabbit meat baits purchased from Ray Moffat Pest Control in Alexandra.

On December 14th a black feral cat kitten was caught in one of these traps that was baited with rabbit meat. Black cats are rare in the project area with one other adult black cat seen on trail cam footage at Blaikies this season. In Sept 2018 a black adult cat was seen on a trail cam near Table Hill biv (which could be the same animal) and it's possible that these cats are related to this black kitten.

Other: Barrel-set leg-holds, Timms traps, platform-set leg-holds, Steve Allen 2 (SA2) traps

Total cats: 0

Not much effort was put into these trapping methods. Barrel-set leg-holds were set mainly at the beginning of the season by staff not signed off for GS leg-holds and abandoned thereafter. Footage of cats interacting with these sets has never shown them jumping up onto them leading to a lack of trust in their usefulness. One Timms platform was set with leg-holds but not used after early October and no Timms or SA2 traps were set.



Infrastructure

- New bait stations added to previously cut tracks at East Loop and Blaikies Loop
- Rat bait stations (tunnels) placed out at most of the bait stations in the Tin Range area. Only remaining tunnels to be placed are around 5 at the southern end of the Table Hill loop and the furthest south part of the Blaikies area (Southern Loop). Hill 511, Rocky Mt and Mount Rakeahua still need rat bait tunnels.
- The network of Conibear traps is being replaced with the newly-delivered Belisle 220 X traps following guidance that the particular Conibear traps we had bought were not the

exact ones that had passed their humane testing at Lincoln. Replacement of these is nearly complete.

- Blue triangles have been bought to mark bait stations. This is due to happen on an ad hoc basis during regular trips
- Snap trap lines for rat monitoring have almost fully been laid out. Of 10 trap lines, 6 had been completed by start of season and this season we have laid out or re-done 3 more. One more line is left to be completed.
- Hill 511 bivvy removed and due to be replaced with a larger 2-person biv on Feb 18th. This should allow overnight work on Hill 511 again including GS leg-holds
- New toilet for Table Hill has been completed at the contractor in Te Anau and is awaiting delivery. This will hopefully be placed over the winter or at the beginning of the next summer season.
- There is an urgent need to install second sinks at huts where toxin is being used regularly. This should be an aim for next season

Health and safety

- Toxin handling
    - Toxin store: this has been untidy this season for a number of reasons, some beyond our control. Once the old bait is disposed of it is important that this storage area has a good clean and some ownership is taken by our team of this facility since we are the primary users of it.
    - PPE: there has been some inconsistency in the use of PPE for toxic baiting across the team this season. It may be a good exercise to review the most up-to-date safe handling sheets before toxin application begins next season.
    - Toxin storage in the field: we have had two issues with storing toxin in the field this season:
        - An aluminium toxin bin that was secured to a tree was flooded by rising water, see table below. The long term solution to this is to do away with so-called 'dinghy bins' completely and have the whole seasons' supply of bait for satellite hills flown into the field with the toxin bins for Table Hill and Blaikies at the start of the season. These bins need to be purchased.
        - The toxin bin at Blaikies appears to be letting in rainwater through an unknown route. The immediate corrective action for this of covering the bin with a tarp between trips does not appear to be effective. We intend to inspect the bin when it is flown back to base in the second week of February and potentially add seals around the rim.
    - Helicopters: there have been two near misses with helicopters this season (see table; ID1113264 & ID1122413). In the first incident a helicopter door opened during flight and the machine landed so that it could be closed. This incident went unreported for 2 ½ weeks and sparked an ICAM investigation into the slowness of reporting. Training was undertaken in the use of helicopter doors

and visually checking that they are closed properly. Embedding team learning processes, sharing of learnings and risk manager training following the investigation has been very successful and we now lead the office in our understanding of the health and safety reporting and learning process. In the second incident a cardboard box of food broke while unloading next to the helicopter and spilled contents on the ground. The team dealt with the immediate situation perfectly and received praise from the pilot and the incident was reported from the field and received praise from the Director SSI for its timeliness.

- Reporting: Since the helicopter incident reporting, engagement with the team learning process and sharing of knowledge has improved significantly. The three most recent incidents in the table below were all reported within 2 days.

- Risk manager incidents relating to the project this season (to date):

Incident ID	Date	Title	Reported
1065853	28 Aug 19	Discovery of mouldy 1080 in pack	10 Sep 19
1113264	18 Sep 19	Heli door not shut	7 Oct 19
1069124	20 Sep 19	Right knee strain	27 Sep 19
1115191	7 Oct 19	Aggrevated Kneee injury	14 Oct 19
1115809	8 Oct 19	Trip	17 Oct 19
1114909	10 Oct 19	Staff member falling into bog	11 Oct 19
1118148	24 Oct 19	Cut on finger	24 Oct 19
1120393	6 Nov 19	Toxin Key left on 511 with toxin bin	8 Nov 19
1122413	19 Nov 19	Spilled contents of Box	19 Nov 19
1123068	20 Nov 19	Slip	21 Nov 19
1127205	20 Nov 19	Finger caught in leghold trap while resetting it	4 Dec 19
1123620	21 Nov 19	Knee soreness	25 Nov 19
1123611	22 Nov 19	Slip on track	25 Nov 19
1124885	26 Nov 19	Non-water-tight (locked and anchored) toxin aluminium box became submerged in rising river	28 Nov 19
1124792	27 Nov 19	Rapid heart beat	28 Nov 19
1131752	28 Dec 19	Discovery of a rat cache of bait pellets	30 Dec 19

Data management

- Trail camera data management this season means each image is tagged with a location, grid reference and dates that the camera was running. Using a batch renaming function on the IrfanView software package, hundreds of image or video files can be renamed in a few seconds with the information (location, dates, grid ref) that gives context to the image. This should help future staff looking back through archived images to get the right context for the image.
- The EXIF data from images has then been extracted and turned into a .csv (Excel) file using another piece of software called BR's EXIFextracter. This .csv file can then be copied into our pest control database and the results filtered by date, time, location, grid ref or species seen (cat, rat, possum, kiwi, deer etc). So far 2380 images from 183 'camera trap nights' have been archived in this way. A preliminary analysis shows that cats are sighted on these cameras once every 13 trap nights (see table). Once all the camera data is in the spreadsheet it will be possible to sort the results by location, time of day, and date, allowing us to ask if some species are seen more often in certain locations or at certain times (e.g. cat sightings in the Rakeahua valley vs. alpine scrub). Unfortunately, this software has not been able to extract EXIF data from video files (.mp4) so this data is not currently included. I am looking at how to include this data.

	Cat	Rat	Kiwi	Possum	Deer	Fantail	Fernbird	Unknown
Total interactions	14	89	53	58	3	1	1	6
Avg. days per interaction	13.07	2.06	3.45	3.16	61.00	183.00	183.00	30.50

NB - Preliminary analysis based on 183 camera trap nights

- Re-sightings of banded birds have increased steadily over the past four years and roughly two thirds of the birds seen in the breeding areas this year have had bends. This has greatly helped in assigning outcomes to nests as the chicks leave the nest very quickly. The only way to confirm successful hatching is seeing the chicks with parents. When the parents have bands the nest and the chicks can be associated which makes this task much simpler. There was a particular focus on recording all checks of nests this season in order to construct a timeline for each nest. In some cases this 'nest history' lasts up to 8 weeks (see Appendix 3).

The re-sightings data is also beginning to show patterns, such as the territories occupied by different birds. Appendix 4 shows territory mapping using four years of re-sightings for three different birds and shows the spatial separation and site fidelity over four seasons. One of these birds (bM-OgK) has also nested in the same small area (<20m diameter) for the previous three years and has retained the same banded partner (YM-GR) for the last two seasons. The number of pairs this season where both birds were banded shot up from one to four and this will provide good data on pair fidelity going forward. Incidentally all four birds hatched chicks which should confirm or undermine the theory that successful breeding in dotterel strengthens pair bonding.

The re-sightings data is also being used to construct a 're-sighting curve' of how long birds continue to be re-sighted after banding (Appendix 5). This is not straightforward

to interpret as the age of the birds at banding is not known, however the results for each cohort appear to be quite similar from year to year with approximately 70% of birds re-sighted a year after banding, dropping to 50% two years after banding.

- The GPS track data and the pesticides application (pest app) are our main means of reporting our work via thirdly reporting. The GPS data is easy to download and store on the Q:Drive and this has been happening after each trip. Some days do not have tracks but these have been marked using .txt files to show that the files do not exist. At present all data has been entered up to January 15th across all baited areas on the pest app. This will be completed by the end of the season in time for thirdly reporting in February.
- The data from all Ecogene reports was consolidated into one database. This allowed the diet data from scats and carcasses to be matched with each cat (Appendix 6)

Future plans (work in progress)

- Toxin: replacing Brodifacoum with something more humane and biodegradable
  - 'Double-tap' (Diophacinone 0.005% and cholecalciferol 0.06%) is an option, see table below from technical data sheet on Connovation webpage
  - See also; Charles Eason, Lee Shapiro, Candida Eason, Duncan MacMorran & James Ross (2019) Diphacinone with cholecalciferol for controlling possums and ship rats, New Zealand Journal of Zoology
  - Has been shown to be effective on ship rats and possums, need to ensure that it has the same effect on Norway rats

		Half Life in Days	Likely persistence of residues in sub-lethally exposed game
Brodifacoum		>250	>24 months
Diphacinone	Double Tap	<3*	2-4 weeks
Cholecalciferol (Vitamin D3)		30	N/A natural occurring in all animals

* rats. Fisher et al 2003

Half-life and persistence in the environment of Brodifacoum vs. 'Double-tap' ingredients

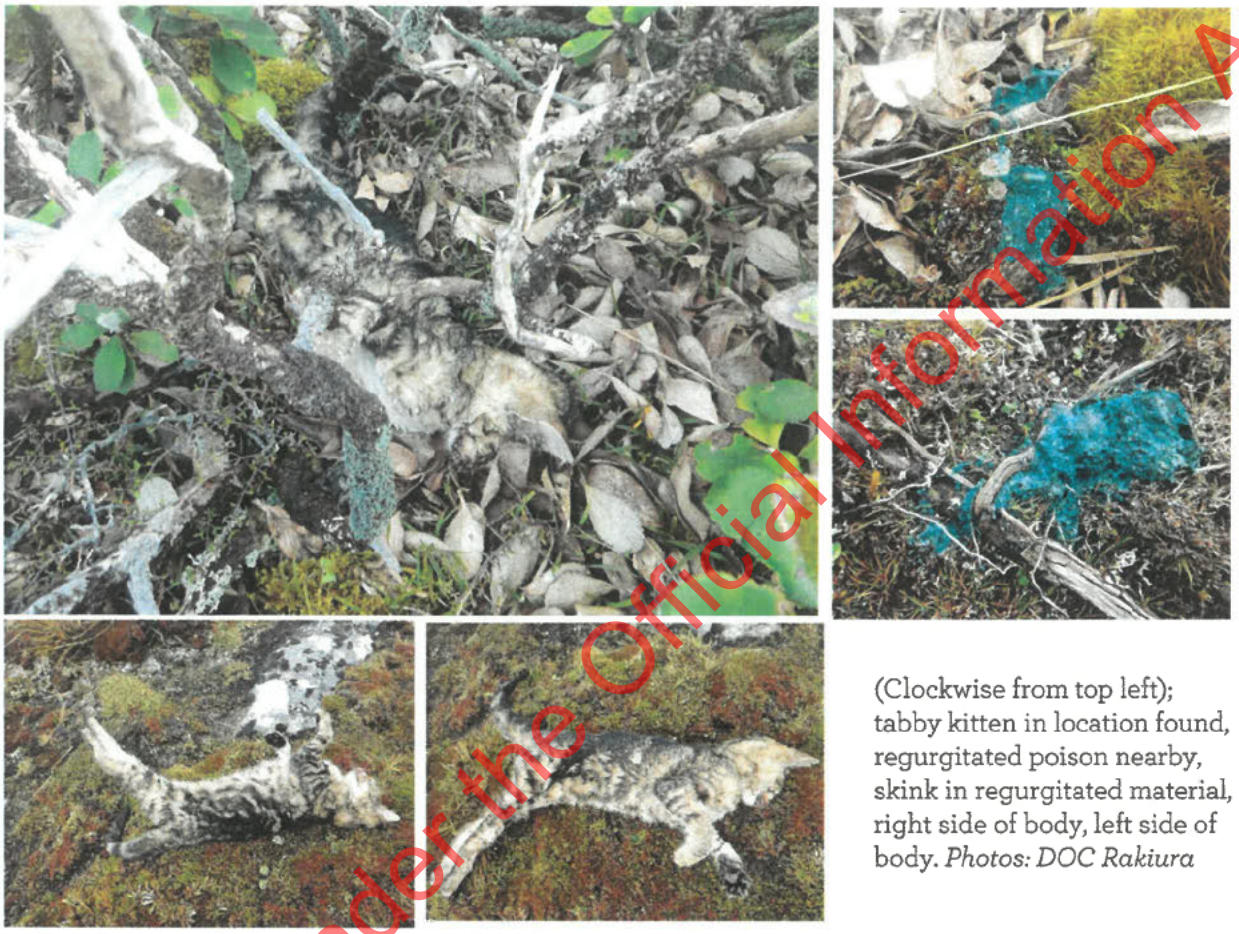
- Hill 511 breeding area:
  - Gull control – Alphachloralose operation at Black-backed gull breeding colony
  - Cat trapping on 511 – only baiting at present
- Track cutting
  - A short section on Southern Loop could be cut to make this area easier to bait
- Winter predator control
  - Cat trapping in Rakeahua valley

    - Toxin baiting at lower altitudes
- Infrastructure
    - Complete installation of rat bait tunnels
    - Complete installation of bait station blue markers
    - Complete installation of rat monitoring lines
- Rat monitoring
    - Need to identify and lay out a control area

Appendices

Appendix 1

Photos of cat suspected to have died from poisoning.



(Clockwise from top left); tabby kitten in location found, regurgitated poison nearby, skink in regurgitated material, right side of body, left side of body. *Photos: DOC Rakiura*

Other images of feral cat stomach contents with suspected bait inside.

(Left); Male tabby caught in Belisle 220 X trap at Blaikies. There was bait take from a nearby bait station. (Right) tabby shot in open on Table Hill. *Photos: DOC Rakiura*

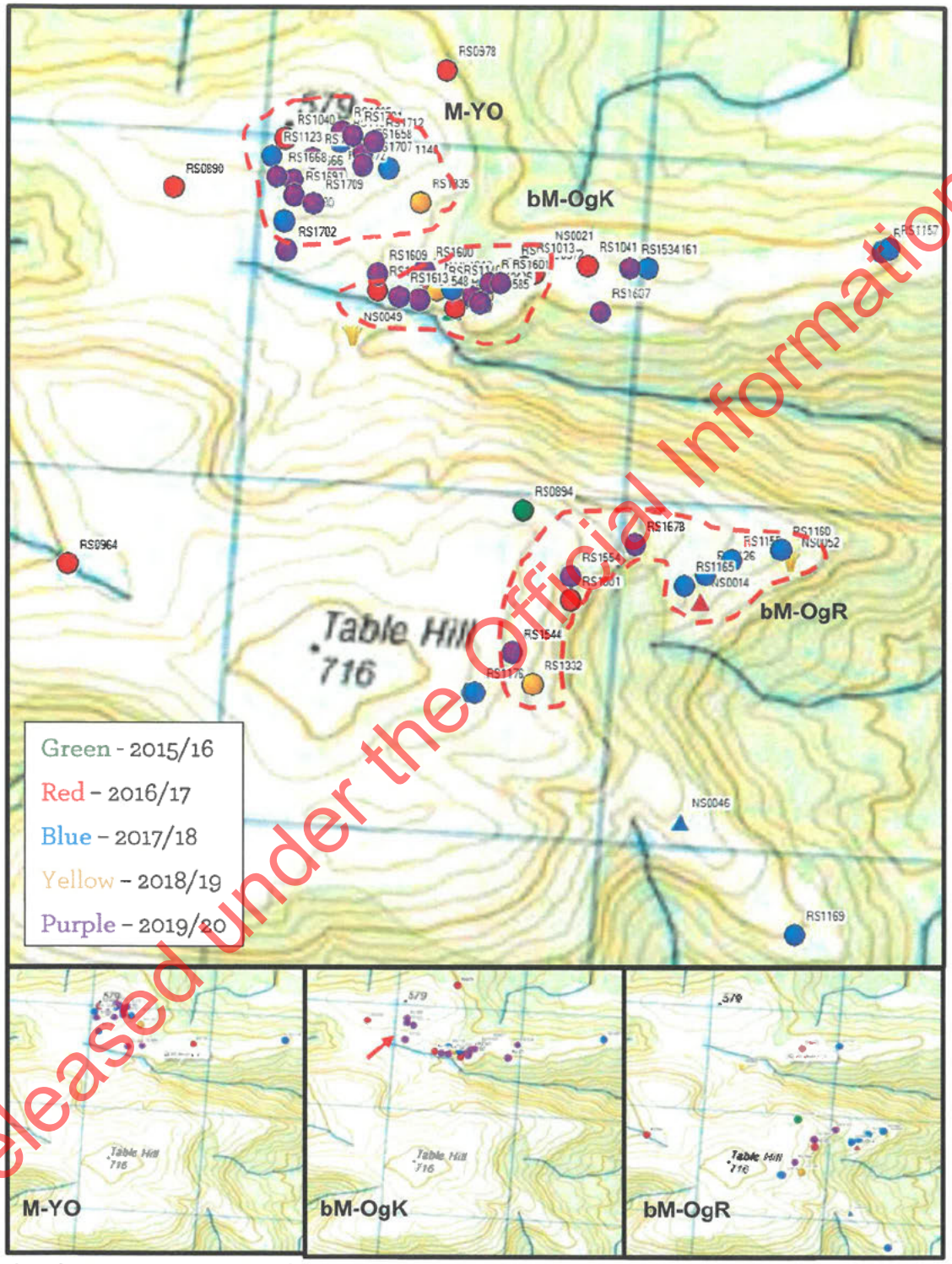
Appendix 2

Photos of hazing around GS leg-holds. Previously hazing was more commonly made from manuka branches as in this photo of a set from the 2018/19 season (top left) but most hazing now uses strong branches driven into the ground to create a fence (top right, bottom row)

Appendix 3 – Nest history for the first nest found this season.

Unique ID	Year	Month	Day	Location	Eastings	Northings	Nest code	No. eggs	Bird on nest	Pair bird 1	Pair bird 2	Outcome/Fate	Number of chicks	Comments
NS0067	2019	09	23	Table Hill	1208294	4778440	NTHRR1	1 egg	UB	UB	YM-OW	n/a	n/a	Unbanded bird consistently incubating during day. Camera placed on nest 5/10 and second camera added 9/10.
NS0067	2019	10	5	Table Hill	1208294	4778440	NTHRR1	3 eggs	UB	UB	YM-OW	n/a	n/a	Photo taken of nest. Camera 1 placed.
NS0067	2019	10	9	Table Hill	1208294	4778440	NTHRR1	Not sighted	UB	UB	YM-OW	n/a	n/a	Second camera placed, SD card in camera 1 changed. YM-OW seen with other birds nearby. UB seen returning to nest afterwards.
NS0067	2019	10	24	Table Hill	1208294	4778440	NTHRR1	3 eggs	unknown	UB	YM-OW	n/a	n/a	Briefly checked to see state of eggs. Bird ran off before being identfied as banded or not.
NS0067	2019	10	25	Table Hill	1208294	4778440	NTHRR1	Not sighted	unknown	UB	YM-OW	n/a	n/a	Sighted bird sitting on nest as walking through area. Bird did not leave nest and was facing away from area of approach.
NS0067	2019	10	26	Table Hill	1208294	4778440	NTHRR1	3 eggs	UB	UB	YM-OW	n/a	n/a	Changed SD cards and batteries of both cameras. Bird stayed on nest while this was done and only jumped up when nest was directly approached to check egg status. Bird followed across the stream before returning to nest.
NS0067	2019	11	7	Table Hill	1208294	4778440	NTHRR1	1 egg	N/A	UB	YM-OW	2 eggs likely hatched. 1 remaining in nest bowl abandonded	2 presumed	Unbanded bird followed on approach to nest and stayed nearby as bowl checked. 1 egg remaining, seems to have failed. UB flew off and joined YM-OW higher up slope. On approach both birds took up distraction techniques so chicks assumed to be nearby though not sighted.
NS0067	2019	11	11	Table Hill	1208294	4778440	NTHRR1	1 egg	N/A	UB	YM-OW	-	2 presumed	No birds present as nest approached. Egg still remaining. On closer inspection egg has rotten smell. Collected.
NS0067	2019	11	20	Table Hill	1208199	4778385	NTHRR1	N/A	N/A	Not seen	YM-OW	-	1 confirmed	YM-OW seen with 1 chick
NS0067	2019	11	21	Table Hill	1208202	4778399	NTHRR1	N/A	N/A	Not seen	YM-OW	-	2 confirmed	YM-OW seen with 2 chicks
NS0067	2019	12	11	Table Hill	1208124	4778633	NTHRR1	N/A	N/A	UB	YM-OW		2 near fledging	Both parents present with 2 chicks, very close to fledging. About the same size as adults but still have chick feathers.
NS0067	2019	12	16	Table Hill	1208026	4778618	NTHRR1	N/A	N/A	UB	YM-OW		2 near fledging	Same as above. Parent birds very territorial of chicks against other birds in immediate area.

Appendix 4 – Territory mapping

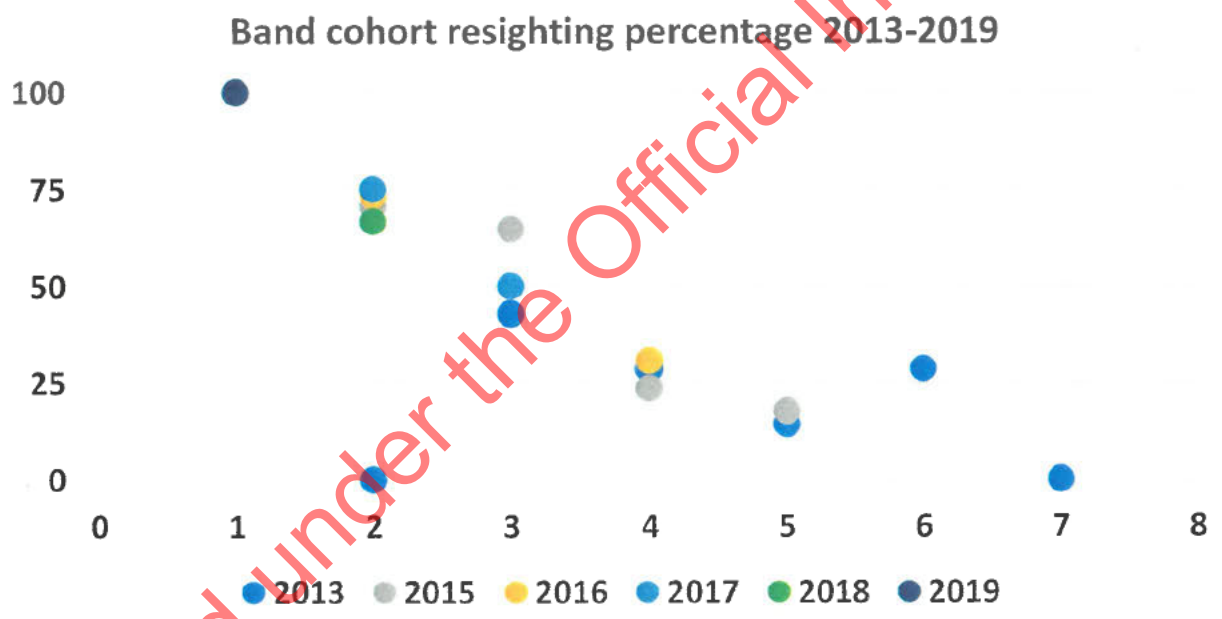


(Top) Territory mapping for three banded birds that have a long (c. 3- or 4-season) record of breeding in the Table Hill area. The red dotted lines contain most of the re-sightings for each bird and roughly indicate the core breeding territory for each bird. (Bottom row) individual mapping for each bird showing 'outliers'. The red arrow shows sightings of bM-OgK with chicks this season, showing the behaviour where birds rapidly leave the nest territory once chicks have hatched.

Appendix 5 – The percentage of banded birds re-sighted after banding by year. The percentage of each cohort re-sighted in a particular year is displayed on the Y-axis and the number of years after banding along the X-axis. The raw data is shown in table below.

Not all years have the same number of birds in a cohort (range 7 – 48, average 21.66), however the most recent cohort (2019) is the largest and it will be interesting to see if the re-sighting percentage follows those of previous years. The age of birds at banding is not known since they are caught at overwintering sites and ageing dotterel from physical characteristics is subjective.

The different cohorts seem to show a reasonably consistent trend with the percentage of birds re-sighted dropping to approx. 70% after a year, and then 52% and 28% in the two years after that. Whether this reflects adult mortality from year to year is hard to tell and the number of 'cryptic' birds that are not sighted is hard to guess. A good example of this is the uptick in the percentage of 2013 cohort birds seen between Year 5 and 6 – clearly some birds came out of the woodwork after not being sighted in Year 5. If the adult mortality rate is 20-25% each year then that would represent a significant obstacle to our management efforts.



Cohort re-sighting %

	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8
2013	100.00	0.00	42.86	28.57	14.29	28.57	0.00	
2015	100.00	70.59	64.71	23.53	17.65			
2016	100.00	73.08	50.00	30.77				
2017	100.00	75.00	50.00					
2018	100.00	66.67						
2019	100.00							
Avg.	100.00	71.33	51.89	27.62	15.97			

Appendix 6 – Consolidated cat genetic and diet data from EcoGene. The whole table is too large but the data from three cats is shown as an example. The data was brought together from four different reports and the diet and genetic data shown next to each other for the first time.

SNZD Recovery Programme

Cat library

Unique ID	Report	Sample type	Year	Month	Day	Location	NZTM E	NZTM N	Cat ID	Sex	Diet
S697_01	Feb-18	Scat	2016	12	13	Hill 511	1213828	4784650	Cat01	F	Ship Rat
S697_11	Feb-18	Scat	2016	12	13	Hill 511	1214648	4784484	Cat01	F	Ship Rat
S830_02	Mar-18	Scat	2017	11	20	Hill 511	1213167	4784554	Cat01	F	Ship Rat, Silvereye
S830_03	Mar-18	Scat	2017	-	-	Hill 511	1213186	4784562	Cat01	F	Ship Rat
S830_12	Mar-18	Scat	2017	11	9	Hill 511	1213829	4784644	Cat01	F	Ship Rat
S830_16	Mar-18	Scat	2017	11	8	Hill 511	1214011	4784628	Cat01	F	Ship Rat
S830_18	Mar-18	Scat	2017	11	7	Hill 511	1214181	4784579	Cat01	F	Ship Rat
S830_20	Mar-18	Scat	2017	11	20	Hill 511	1213827	4784644	Cat01	F	Ship Rat
S866_05	Jun-18	Scat	2017	9	28	Hill 511	1213647	4784649	Cat01		Ship Rat
S866_12	Jun-18	Scat	2017	9	13	Hill 511	1214680	4784484	Cat01	F	Ship Rat
S830_10	Mar-18	Scat	2017	10	20	Table Hill access	1208692	4782065	Cat02	M	Kiwi
S830_11	Mar-18	Scat	2017	10	20	Table Hill access	1208823	4782399	Cat02	M	Ship Rat
S866_01	Jun-18	Scat	2017	9	22	Table Hill access	1209168	4783221	Cat02	M	Kiwi, Ship Rat
S866_06	Jun-18	Scat	2017	9	22	Table Hill access	1208815	4782725	Cat02	M	Ship Rat
S866_19	Jun-18	Scat	2017	9	22	Table Hill access	1208854	4782752	Cat02	M	Possum, Red-crowned parakeet
S866_23	Jun-18	Scat	2017	9	22	Table Hill access	1208471	4781284	Cat02	M	Ship Rat
S947_03	Mar-19	Carcass	2018	11	30	Table Hill	1208529	4779381	Cat02	M	-
S830_14	Mar-18	Scat	2017	10	20	Table Hill access	1208778	4782314	Cat03	F	Ship Rat
S830_22	Mar-18	Scat	2017	11	-	Table Hill access	1209096	4783126	Cat03	F	-
S830_24	Mar-18	Scat	2017	10	20	Table Hill access	1208774	4782306	Cat03?		Ship Rat
S866_03	Jun-18	Scat	2017	9	22	Table Hill access	1208819	4782725	Cat03?	F	Ship Rat, Sooty Shearwater
S866_24	Jun-18	Scat	2017	9	22	Table Hill access	1209106	4783162	Cat03?	F	Ship Rat, Kiore

Southern NZ Dotterel/tūturiwhatu Recovery Programme

Season summary 2020/21

A review of the current dotterel fieldwork season and plans for 2021/22

Southern NZ Dotterel 'RM-GR' at Freshwater mudflats May 2020 (Photo: Jake Osborne / DOC)

Contents

Department of Conservation
Te Papa Atawhai

DOC - xxxxxxx

New Zealand Government

Summary of outcomes

Monitoring

Nests

	Table Hill	Rakeahua	Hill 511	Smith's Lookout	Rocky Mountain	Hill 464	Blaikies Hill	Total
Nests; (found [inferred])	12 [3]	6	3	3	1	1	1	27 [3]
Eggs	30 [6]	16	8	8	3	3	3	71 [6]

- 27 nests found by Rangers, 2 more presumed based on chicks sighted that could not be associated with a known nest.
- 2019/20 - Nests: 12 [5], Eggs: 33 [9]

Chicks

	Table Hill	Rakeahua	Hill 511	Smith's Lookout	Rocky Mountain	Hill 464	Blaikies Hill	Total
Chicks presumed	0	2	3	?	0	0	0	5
Chicks confirmed	11	5	1	?	3	0	0	20
Total	**11**	**7**	**4**	**?**	**3**	**0**	**0**	**25**

- Chicks presumed = evidence of hatching but no sighting; Chicks confirmed = chicks sighted
- Of the chicks confirmed this season, at least 7 appear to have survived to 3-4 weeks old (as of 5/2/21) based on their age and appearance at their most recent sighting
- 2019/20 – Chicks presumed: 11, Chicks confirmed: 17

Resightings

1st July 2016 – 30th June 2017	153
1st July 2017 – 30th June 2018	200
1st July 2018 – 30th June 2019	216
1st July 2019 – 30th June 2020	481
1st July 2020 – 30th June 2021	632

- Recent resightings have had noticeably more detail than previous seasons

Flock counts

2017/18	167	2018/19	170	2019/20	173	2020/21	155

- 2021 flock counts completed 26th–30th April but affected by staff sickness and weather
- 2021 flock counts repeated 23rd-25th July and provided current count of 155

Predator control

Baiting

2019/20	Table Hill	Blaikies	Mt Rakeahua	Rakeahua valley	Rocky Mountain	Hill 511
First baiting	7th Sept	18th Sept	11th Sept	19th Sept	18th Sept	20th Sept
Bait removed	25th Jan	26th Jan	8th Jan	19th Dec	7th Jan	13th Dec
Bait present (days)	**140**	**130**	**119**	**91**	**111**	**84**

2020/21	Table Hill	Blaikies	Mt Rakeahua	Rakeahua valley	Rocky Mountain	Hill 511
First baiting	8th Oct	7th Oct	14th Oct	13th Oct	30th Sept	15th Oct
Bait removed	28th Jan	9th Jan	28th Jan	10th Nov	26th Jan	13th Jan
Bait present (days)	112	94	105	28	118	90

Trapping

Trapping effort by trap type

	GS Leg-holds	Chimney-set leg-holds	Raised-set leg-holds	Belisle 220 Super X	Cage traps	SA Kat Trap 2	Timms traps
Trap nights	354	51	4	5836	227	850	2095
Feral cats caught	1	0	0	8	0	3	1
Trap nights/cat	354	-	-	729.5	-	283.3	2095

Feral cat catches by trap type

	GS Leg-holds	Chimney-set leg-holds	Raised-set leg-holds	Belisle 220 Super X	Cage traps	SA Kat Trap 2	Timms traps
Cats 2018/19	4	0	0	0	0	0	0
Cats 2019/20	17	0	0	4 *(+8 over winter)*	1	0	0
Cats 2020/21	1	0	0	8	0	3	1

Feral cat catches by trap location

	Table Hill	Blaikies	Mt Rakeahua	Rakeahua valley	Rocky Mountain	Hill 511
Cats 2018/19	4	0	0	0	0	0
Cats 2019/20	14	7	0	1	0	0
Cats 2020/21	1	1	1	1	3	6

Hunting

	Whitetail deer	Spur-winged plover	Feral cats
Number shot	2	0	0
Notes	Both shot on 2nd Sept but in two different locations (Hill 511 and Rocky Mt)	Pair sighted at Hill 464 in September, not seen again. Another single bird sighted at Blaikies in November.	A staff member staked out a nest that had been preyed upon by a cat at Hill 464 but did not encounter the cat

Timeline

Key	Staff start/finish dates	Baiting	Trapping	Birds

Aug	10	Start date for returning temp staff 9(2)(g)(ii) [redacted]
	13	New toilet installed at Table hill bivvy
	13-18	First trip to Table Hill 9(2)(g)(ii) [redacted] Trap setting and maintenance.
	14	Three cats caught in Belisle/Conibear kill traps left set over winter found on Table Hill
	16	One cat caught in a Belisle/Conibear kill trap left set over winter found near Blaikies bivvy
	17-21	Chimney boxes and Belisle 220 Super X traps placed on Rakeahua and Rocky Mt access tracks
	20	First traps set on Hill 511 access track
	24	Start date for temp staff member 9(2)(g)(ii) [redacted]
	25	Remaining traps set on Hill 511 access track and summit
	27	First feral cat of the season trapped on Rocky Mt access track, less than a week after the trap was placed
	28	Four cats caught in Belisle/Conibear kill traps left set over winter found on Table Hill (eight in total)
Sept	18	0.1% 1080 feral cat bait delivered to Stewart Island/Rakiura DOC office
	22	Toxin bins, loaded with toxic bait for the season, flown to five locations around the project area
	23	First dotterel nest of season found (same pair, same location, same day as 2019/20)
	28	Start date for temp staff member 9(2)(g)(ii) [redacted]
	30	First toxic bait application of the season on Rocky Mountain
Oct	7	First toxic bait application of the season at Blaikies
	8	First toxic bait application of the season at Table Hill
	9	Second dotterel nest of season found
	14	First toxic bait application of the season on Rakeahua
	15	First toxic bait application of the season on Hill 511
	22	First chick sighting of the season, on Rakeahua (bird bM-bOW seen with one downy chick near nest)
	25	Remains of male bird YM-OW found at nest on Table Hill. Preyed upon by feral cat and nest destroyed. Remains of male bird OM-YR found at nest on Table Hill. Preyed upon by feral cat and nest destroyed.
	29	Second chick sighting of the season, also on Rakeahua (OM-BG seen mantling two chicks)
Nov	3	Outer nesting survey of southern Tin Range, Smith's Lookout and Doughboy Hill. Three nests found.
	18	Predation of male bird GM-O and eggs in nest at Hill 464 by feral cat caught on trail cam.
	28	Predation of eggs in nest NTHRD2 by feral cat
Dec	14	Leg bands of male bird GM-RK found next to nest site on Rakeahua. Evidence supports cat predation.
	20	Last new nest of the season found
	23	Start of Christmas/New Year break
	27	Predation of eggs in nest NTHRR6 by feral cat
Jan	6	End of Christmas/New Year break
	9	Bait removed from Blaikies
	12	Last feral cat catch of the season, and only cat trapped in ground-set leg-hold trap

	13	Bait removed from Hill 511
	26	Bait removed from Rocky Mt
	28	Bait removed from Table Hill
Feb	1	Toxin bins flown back to base from field locations
	5	Last day at work for 9(2)(g)(ii) [redacted]
	15	First southern NZ dotterel of the season banded (at Awarua Bay) and blood sample taken – BM-BB
Feb - Apr		Banding and blood sampling of dotterels at flocking sites by 9(2)(g)(ii) [redacted] d team
Mar	5	Sick dotterel, BM-Y, uplifted from Mason Bay and taken to Dunedin Wildlife Hospital for treatment
	10	BM-Y released at Mason Bay following treatment. Subsequently seen at Mason Bay and Freshwater.
Apr	13	Last (45th) southern NZ of the season banded (at Mason Bay) and blood sample taken – BM-WW
	26-30	Annual flock counts

Discussion

Monitoring

Nesting

- One pair (OM-GO x UB) fledged a chick (last seen at 52 days old) from their second nest after apparently abandoning their first nest

- One bird, M-YO, laid eggs in three nests. Her first nest was predated, with her partner from 2019/20 (OM-YR) predated on the nest on 24th/25th October. On 6th November (12 or 13 days later) she was found sitting on two eggs c. 90 metres away. This second nest was abandoned and on 20th December she was again found incubating 2 eggs 1500m away. M-YO and the two eggs from this nest were gone when staff returned on 22nd December and the fate of this third nest is unknown

- One individual (bM-OgK) nested for the sixth straight season, no more than 240m from all five of her other nest sites – the most stable territory we know of. She nested with the same partner for the third straight season (YM-GR) and, although a feral cat appears to have eaten the eggs from their nest, both survived the season

- One nest was found with 5 eggs, in line with the previous three seasons which have seen one female-female pair each. This was a new female-female pair and the pair bM-bBg x UB was not seen. Two eggs were laid in the nest bowl of bM-bBg x UB from 2019/20 and bM-bBg has not been seen since March 2020. One possibility is that bM-bBg is either dead or no longer attempting to breed and her UB partner laid the eggs in the nest bowl from last year instinctively.

- At least seven nest locations were correctly predicted this year based on the nest locations and territories from previous years. This allowed staff to direct their nest searching effort to likely spots and was more efficient

Nest locations

- Most nests found on Table Hill. This was also where most of the predated nests were located (Home Paddock – 3, Hill 464 – 1, South Table – 1)

- Six nests found on Rakeahua which was the most since 2015 for this location. Four clear territories were observed, two with the same birds or pairs from the previous season.

- Four nests were found or inferred on Hill 511 which is the most since 2015 for this location

- One nest that hatched three chicks was found on Rocky Mt. This was the same pair that had their nest preyed upon by an Australasian harrier in 2019-20. The nest location was in the same clearing as the two nests from the previous season.

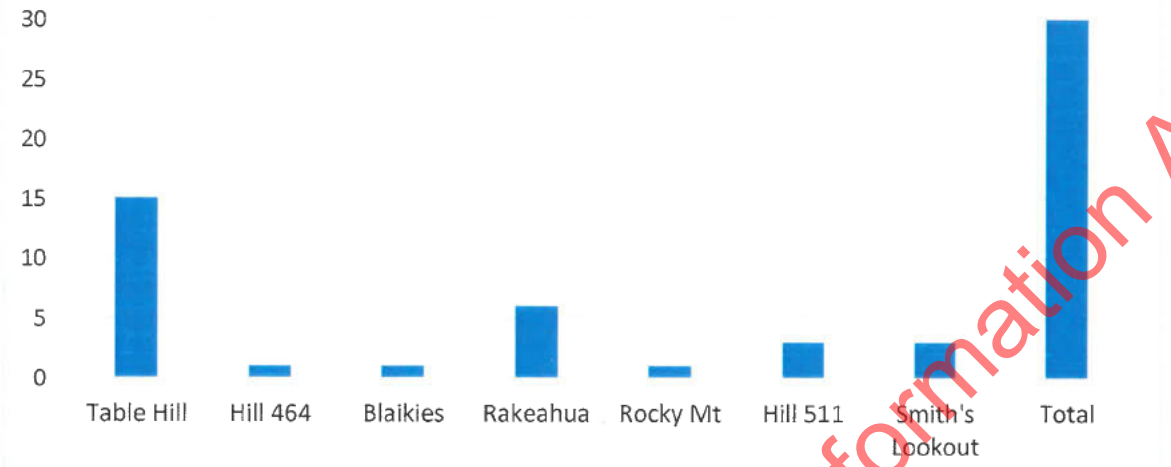
Outer nesting survey

- A decision was made to alternate the location of the annual outer nest survey between northern breeding areas (Anglem Range; odd years) and southern breeding areas (southern Tin Range, Smith's Lookout; even years). Three nests were discovered on Smith's Lookout, and a pair was found on the southern end of the Tin Range. The nesting on Smith's Lookout was the first confirmation of breeding in this area for nearly two decades, although it was assumed that birds might still be breeding there. This was a welcome confirmation that this breeding site has not been abandoned.

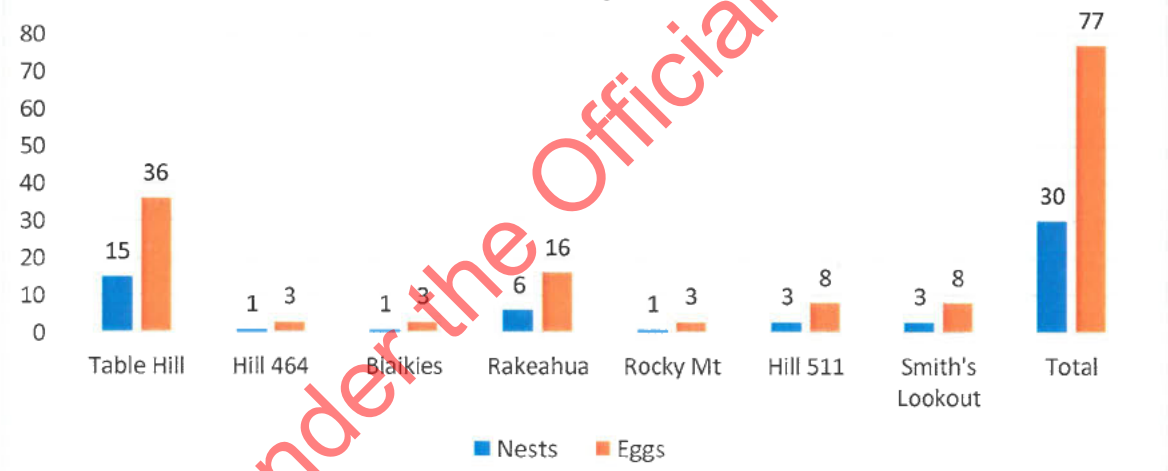
- One of the nests featured a bird with leg bands - OM-GR – which is often seen during winter flock counts at Freshwater/Mason Bay but has not been seen during the breeding season until now. Another banded bird – bM-O – was observed at the southern end of the Tin Range with an UB partner. This bird was previously seen once in the same location in 2017, and flocks at Awarua each winter. From the behaviour of these birds (close association, chasing away a third bird) it seems that they have a territory in this area.

- No nests or pairs were spotted on Doughboy Hill, which continues a long spell of no confirmed nesting happening in this location

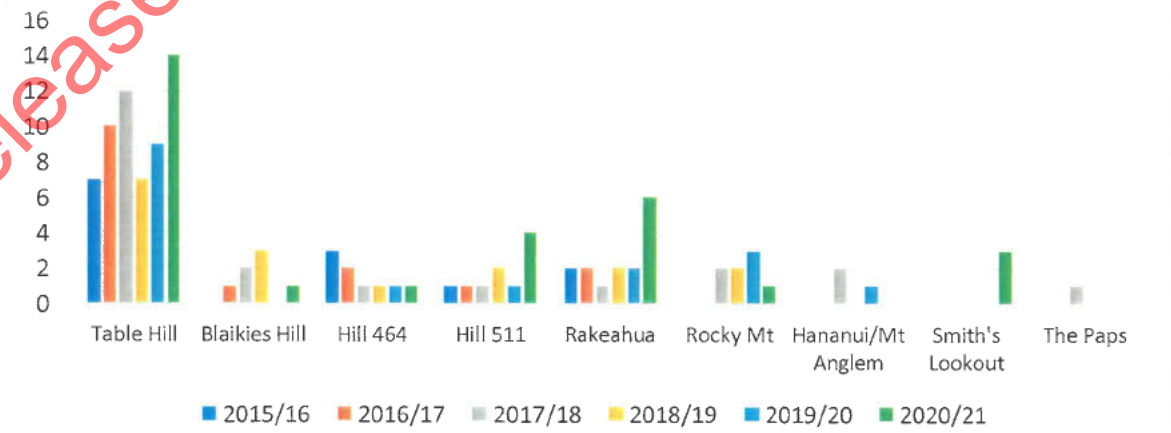
Nests numbers by location 2020/21



Nest/egg numbers by location 2020/21



Nest locations per season 2015-present



Nest fates

- Seven nests were either preyed upon or strongly suspected of being preyed upon, which was more than in previous years. This was 23% of all known or inferred nests (30).

- Four of these nests suffered predation of male birds at night by feral cats. In two cases, the remains of birds were found nest to the nest and were consistent with cat predation (see Appendix). The metal bands were recovered from the remains, meaning the birds could be identified as YM-OW and OM-YR. In one case, the act of predation was caught on the trail cam at the nest. This showed the male bird (GM-O) in the mouth of the feral cat. The trail camera showed that the cat had chased the bird off the nest a few hours before but returned to the site after dark to catch the bird. This event is described in more detail below. The fourth nest was on Rakeahua. It was found empty but with egg fragments deep inside the bowl of the nest, however a metal leg band and a green leg band with tooth marks were found about a metre from the nest (see Appendix). The metal band identified the individual as GM-RK, which had not been sighted at all during the season, despite nesting in a well-visited area. The partner bird GM-KB was seen incubating on each previous nest check and was seen afterwards helping OM-BG to protect her nearly-fledged chick.

- Three more nests had eggs predated but without adults being preyed upon. Two were caught on trail cameras monitoring the nest.

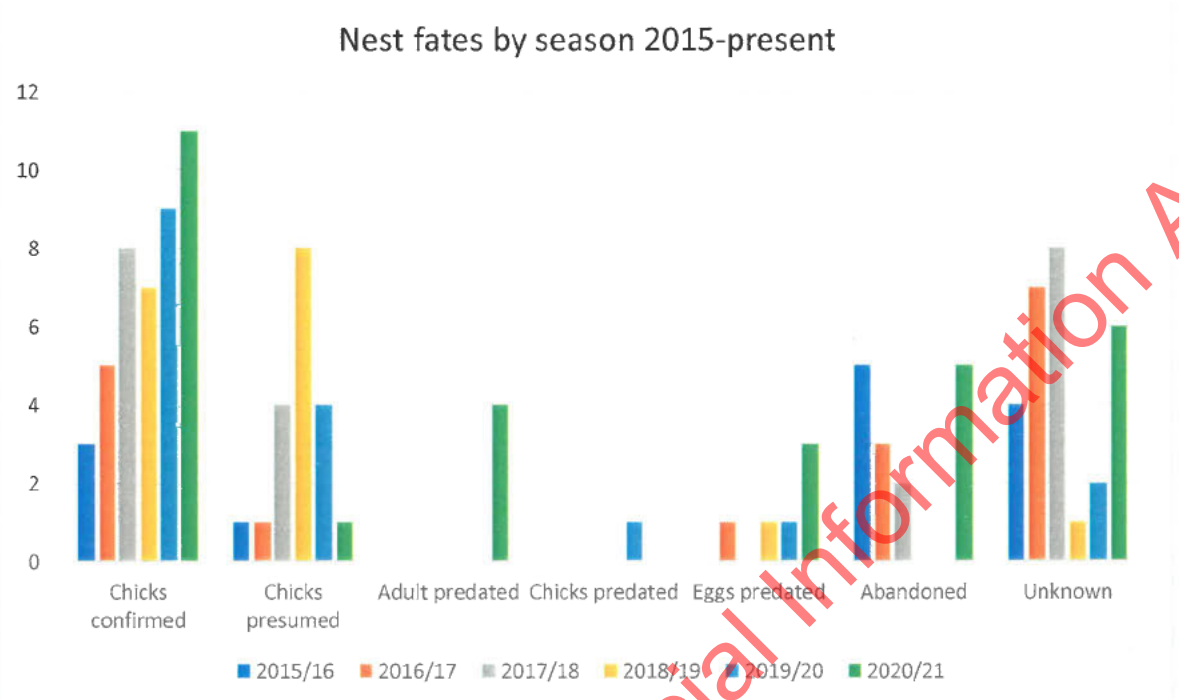
- One of these nests was nest NTHRD2 (bM-OgK x YM-GR). In all, three visits by feral cats were recorded to this nest and on the first visit the cat appears to pause at the nest site for five minutes before moving on. The following day, an image captures bM-OgK in flight with a broken egg shell in her beak, apparently cleaning out the damaged eggs from the nest (see photo below). Egg fragments were seen in the nest bowl on the next check and it was the trail camera images that showed the predation.

- The second case was the five-egg nest (NTHRR6) which is believed to be a female-female pair (GM-RB x UB). Trail camera images and staff observations suggest this nest was abandoned between 6 and 9 weeks after it was found. The trail camera was left and shows a feral cat discovering the nest and consuming the eggs. In this case the cat cannot have been attracted by bird activity as there was no incubating bird. Again, the next morning the trail camera images catch one of the birds (GM-RB) removing at least two damaged eggs from the nest, but not the remaining intact egg or a nearby broken egg (see photo below). This 'nest cleaning' behaviour has important implications for how we interpret empty nests, especially since egg fragments consistent with hatching were found in both the bM-OgK x YM-GR nest and the predated GM-KB x GM-RK nest on Rakeahua this season and could have been assumed to be 'presumed hatched' in previous seasons.

- The third nest in which the eggs appear to have been taken by a predator is the first nest of OM-GO x UB on Mt Rakeahua – nest NRKST1. On three subsequent checks the number of eggs in the nest reduced from three to two to one over 22 days, with the birds still incubating after the first egg disappeared. This was confirmed by photos. By the third check, with one egg remaining, the nest appeared to be abandoned. It is hard to interpret what happened to this nest, however the two theories we have are:

    - A predator damaging the eggs on two occasions, which were subsequently removed by the adult birds, or;
    - A predator taking the eggs one by one

  Either way, the observed evidence is hard to explain without some form of mammalian or avian predator being involved. This pair did go on to hatch two chicks from their second nest, of which one was seen with OM-GO at 52 days old.



Predation of nest NTHRD1 – Hill 464, 13 Nov 2021. Pair GM-O x UB

Predator control

Baiting

- Brodifacoum blocks (28g) used for rats and 1080 fishmeal bait (0.1%) for cats
- For most of the season, four of the eight staff working in the field had Controlled Substance Licences (CSLs). Two more gained their CSLs during the season but mostly too late to lay bait. One of the three staff on the Tin Range did not have their CSL for the entire season, leaving us shorthanded for this work.
- Baiting was delayed this year as a knock-on effect of the COVID-19 lockdown in March-April. Tiakina nga Manu/Battle for our Birds operations were delayed and so the supplier, ACP, were busy making cereal 1080 possum bait until mid-september. The 1080 fishmeal bait eventually arrived on September 18th.
- Aluminium toxin bins were purchased for placement on Mt Rakeahua and Rocky Mountain. This meant that toxin wasn't being transported to the field by dinghy for

the first time and meant less weight for staff to carry up hills, less chance of interaction between the public and toxin bins, and more secure areas for toxin storage away from waterways. These toxin bins were deployed on 22nd September and brought out from the field on February 1st.

- Bait stations were placed along the tracks known as Blaikies Loop and East Loop during the season, adding around 40 new bait stations to the network.

[Map]

Trapping

- Ground-set leg hold, chimney-set leg hold, Havahart cage traps, chimney-set Belisle 220 Super X, Steve Allen Kat Trap 2 and Timms traps all used
- 13 cats caught in traps during the season (8 caught in Belisle 220 Super X chimney-set traps, 3 in Steve Allen 'Kat trap 2' traps, 1 in a Timms trap, 1 in a leg-hold trap
- 8 cats found in Belisle 220 Super X traps left set over winter

Belisle 220 Super X traps

- These traps were a welcome addition to our array of traps, these are currently our most successful kill trap since 2016, accounting for four cats in the previous season, eight more over the winter in traps that were set and another eight during the summer
- The traps that were set over winter caught a total of eight cats, these were all found in August on the first two Tin Range trips. The traps were not left open under instruction, but rather because a shutdown trip was weather-affected. Following discussion about the maintenance of traps and feral cat reinvasion rates these traps were not set again over the winter in 2020, however this may be reviewed again. Nevertheless, leaving these traps open accidentally provided a proof on concept if we wished to trap over the winter in the future.
- The chimney boxes were designed to accommodate Conibear traps which are smaller than the Belisle 220 Super X traps. This created a few issues with setting the traps inside the boxes, such as one set of springs being bent downward to fit through the side slots and concern amongst the team that the springs would expand and get stuck inside the vertical slot – reducing the force of the traps. The traps were also found to not sit nicely due to one set of bars not being quite flat. This mostly was not a problem, however on a couple of occasions the traps were found to have blown over when they were rebaited.
- The correct way to set the traps was also discussed amongst the team. Initially, some were pacing the bait on the prongs inside the traps whilst others were placing the bait on hooks attached to the mesh behind the trap. Likewise, some were setting the traps with the trigger facing in and others with the trigger facing the mesh. These inconsistencies were gradually erased over the course of the season. At the end of season debrief it was decided that we would have a team meeting at the beginning of the next season to agree on a consistent way to set traps.

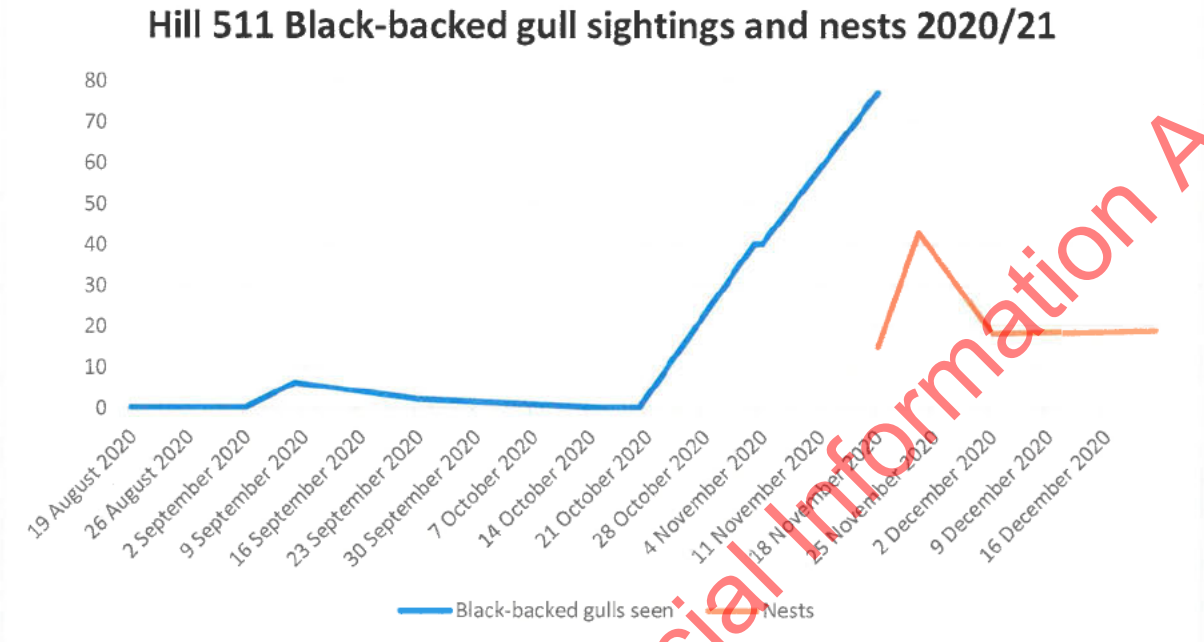
- Two feral cats were caught in Belisle 220 Super X traps in a way that had evidently not killed them quickly. These cats were caught with their head and one leg inside the trap, causing the kill bar to come down across the chest rather than the back of the head. All other trap catches had hit the back of the head and neck, hitting the nerve centres or the spine. On both occasions the trap had been set with the trigger facing into the middle of the chimney box, leading to all traps being set with the trigger facing outward after this. It is not known if this was coincidence or if there is some unknown subtlety of how the trap is triggered that leads to the trap not catching correctly.

Hunting and predator sightings

- Opportunistic hunting and targeted hunting only. No spotlighting with the thermal scope was attempted this season.
- Two deer were shot on field trips but no cats or birds
- Immediately following the detection of a nest predation on Hill 464 and the observation on the trail camera that the cat was returning to the site, a staff member took a rifle to the area and hunted for the cat without luck
- Two Spur-winged plover (SWP) were seen at Hill 464 on 14th Sept, three days after SWP were heard calling from Table Hill biv. There was no rifle to hand so no shot was taken. This pair were not seen again. On 9th Nov another, single, bird was seen at Blaikies. Again, there was no opportunity to take a shot at this individual
- An Australian magpie was seen and photographed near the summit of Mt Rakeahua on 5th Nov. The conditions did not allow for hunting. This bird was chased away by a southern NZ dotterel, thought to be band combination OM-GO
- A NZ Falcon/Karearea was seen near the summit of Hill 511 in dotterel breeding territory on 22nd Sept. It flew past a staff member low to the ground. Around the same time, a local skipper noted seeing a NZ Falcon/Karearea preying upon fledgling shags on the Faith, Hope and Charity Islands close to Oban.

Hill 511 Black-backed gull colony

- Consistent monitoring of the Black-backed gull (BBG) colony on Hill 511 was undertaken for the first time this season
- In 2019-20 there was a single record from 12th November 2019 of 30-40 BBG that flew up and hovered over the colony site as the Ranger walked through. Between six and ten nests found, two with eggs (3 eggs and 2 eggs). Seashells everywhere on the ground and piles of fur (possibly regurgitated) that looked like rat
- In 2020-21 we focused on monitoring the colony more thoroughly and this was entered into task assignments. This was to define the timeline of breeding at this colony in more detail which in turn would inform an operational plan for targeting these birds with alpha-chlorolose



Infrastructure

- The **Hill 511 bivvy** was installed on site over the course of two days. The bivvy was flown to site on Feb 19th 2020 and was attached to the wooden foundation beams. Two of the dead man anchors were dug in, however the weather conditions deteriorated and the helicopter pickup was brought forward before the work could be completed. This work was completed in late May 2020 and at the time of writing (27/08/2020) the bivvy has been in place for 18 months. The bivvy was available for overnight operations at Hill 511 in the 2020-21 season and this increased the amount of work that could be completed here considerably.

- The **Table Hill toilet** was delivered from Te Anau Engineering over the winter and was installed at the Table Hill hut site on August 13th. The toilet weighs over 500kg and was lifted to the site by helicopter. Two staff had previously visited Table Hill over the winter to prepare the site, cut scrub for dead man anchors and build the foundation. The toilet was secured with four dead man anchors and was attached to the wooden foundation which is concreted into the ground based on the engineering plans.

- The installation of **rat bait tunnels** was completed in all locations. They were emplaced at all of the satellite hills (Rocky Mt, Rakeahua, Hill 511) and finished off at Table Hill and Blaikies. This ultimately meant more than 400 bait tunnels for brodifacoum block were placed by Rangers.

- **Blue triangles** were deployed in all areas to number bait stations and point the direction to the next bait station. This was in response to a navigational issue up on Table Hill in the previous season and the make the less straightforward satellite hills loops easier to follow for new staff members. The vast majority of these were in place by the end of the season with just a few more remaining to be placed

- Placement of bait stations along East Loop and Blaikies Loop was completed

- Chimney boxes at a location south of Blaikies were constructed and placed in the environment. There is one cache of pre-cut wood ready to be made into five chimney boxes at a location near Triangle Hill (E1208006, N4773422). These may end up being uplifted, constructed at Rakiura base and then flown back to the operational area to avoid manually placing the traps, which Rangers found difficult in the boggy area of the Tin Range.

- The remainder of the Conibear traps left on the hill were replaced with Belisle 220 Super X traps and the Conibear traps were brought back to base

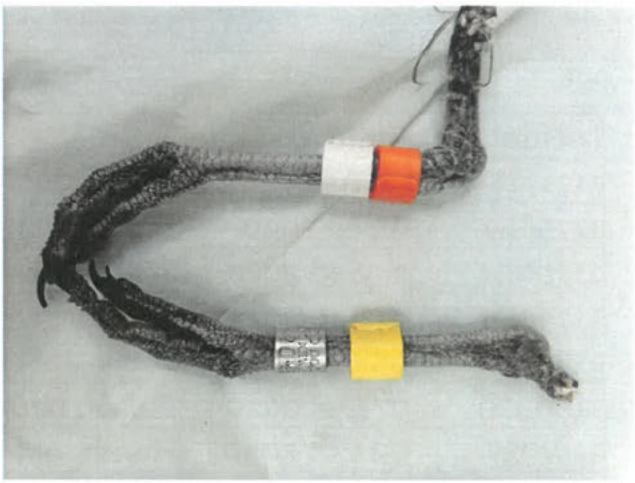
Health and safety

- Soft tissue injuries quite common
- Extreme weather event
- Poison buckets review
- Out of date gas cylinders
- Gas cooker replacement

Incident ID	Incident Date	Title	Date Reported
1171718	20 Aug 2020	Pulled Calf Muscle	24 Aug 2020
1175637	9 Sep 2020	Interaction with tramper	11 Sep 2020
1179054	24 Sep 2020	Slip on track	28 Sep 2020
1179580	27 Sep 2020	Extreme weather event	30 Sep 2020
1180503	06 Oct 2020	Loose JSA book beside heli	06 Oct 2020
1180979	07 Oct 2020	Poison bait spill/broken bucket	08 Oct 2020
1181337	09 Oct 2020	Handtool fell on hand	11 Oct 2020
1181480	13 Oct 2020	Gas cylinders out of date	13 Oct 2020
1182116	14 Oct 2020	Achellies strain	14 Oct 2020
1182122	14 Oct 2020	Infected middle finger	16 Oct 2020
1183112	22 Oct 2020	Injured back	23 Oct 2020

1183194	22 Oct 2020	Faulty gas cooker	23 Oct 2020
1183515	23 Oct 2020	Sat on branch sticking from ground	27 Oct 2020
1185607	06 Nov 2020	Soreness in calf	06 Nov 2020
1190511	02 Dec 2020	Sore Achillies	02 Dec 2020

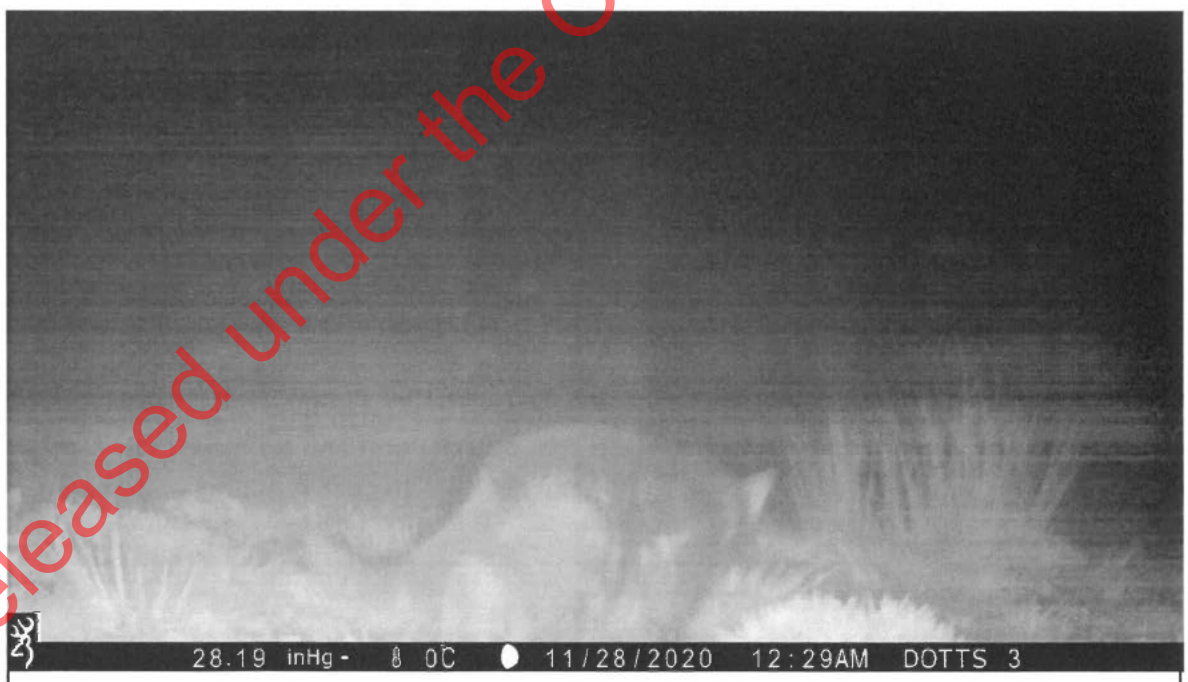
Appendix



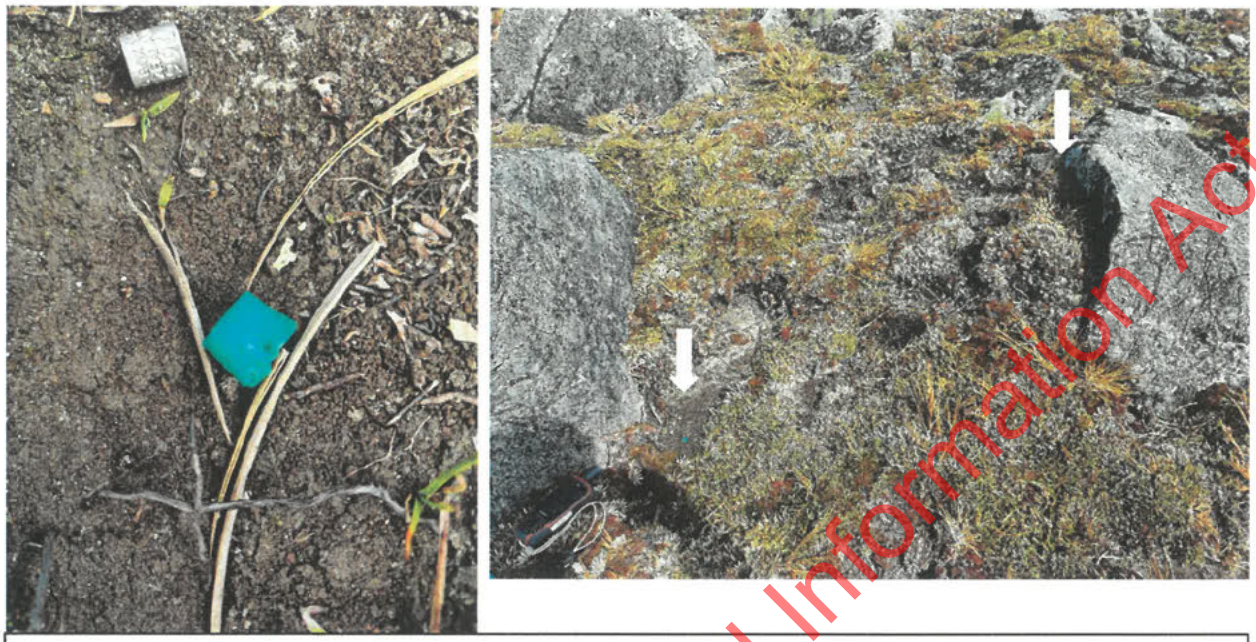
Remains of dotterel YM-OW found beside nest NTHET1. The remains were found 25/10/2020. The eggs had disappeared from the nest and it is not known if the UB partner survived. Both legs were removed from the carcass by the cat and feathers were spread over a wide area.

Remains of dotterel OM-YR found beside nest NTHAB1. The predation occurred the night of 24/10/2020. The eggs had disappeared from the nest and fortunately the partner bird – M-YO – survived. The yellow leg band had been completely crushed and the cat had removed one of the legs from the carcass – the other leg was not found.

Cat predation of dotterel GM-O on nest NTHRD1 13/11/2020. The trail camera footage shows the cat holding GM-O by the head/neck and it returns afterwards to eat the eggs.



Cat predation of NTHRD2 28/11/2020. Both birds of the pair survived, however the eggs were eaten.



Leg bands of dotterel GM-RK (left image), showing chew marks and location that the leg bands were found in relation to the nest (right image; right arrow – nest, left arrow – bands). GPS device for scale.

Cat predation of NTHRR6 27/12/2020. Both birds of the pair survived, however the eggs were eaten.

Season summary for 2021-22 season debrief

SNZD/Tuturiwhatu recovery project (1 Feb 2022)

Purpose

An overview of the season to aid discussion and ensure that important facts and figures are freely available for reference

Overall

1. Five feral cats trapped (two in Belilse traps, three in leg-holds)
2. Ten nests found, and eight chicks sighted
3. Three of ten monitored nests preyed upon by feral cats, with the loss of two adult birds

Predator control

Trapping

Trapping effort by trap type

2021/22	GS Leg-holds	Chimney-set leg-holds	Raised-set leg-holds	Belisle 220 Super X	Cage traps	SA Kat Trap 2	Timms traps
Trap nights	1395	117	0	5891	228	908	3670
Feral cats caught	3	0	0	2	0	0	0
Trap nights/cat	465	-	-	2945.5	-	-	-

Previous season:

2020/21	GS Leg-holds	Chimney-set leg-holds	Raised-set leg-holds	Belisle 220 Super X	Cage traps	SA Kat Trap 2	Timms traps
Trap nights	354	51	4	5836	227	850	2095
Feral cats caught	1	0	0	8	0	3	1
Trap nights/cat	354	-	-	729.5	-	283.3	2095

Feral cat catches by trap type by season

2020/21	GS Leg-holds	Chimney-set leg-holds	Raised-set leg-holds	Belisle 220 Super X	Cage traps	SA Kat Trap 2	Timms traps	Total
Cats 2018/19	4	0	0	0	0	0	0	4
Cats 2019/20	17	0	0	4 *(+8 over winter)*	1	0	0	22 (+8)
Cats 2020/21	1	0	0	8	0	3	1	13
Cats 2021/22	3	0	0	2	0	0	0	5

Feral cat catches by trap location

	Table Hill	Blaikies	Mt Rakeahua	Rakeahua valley	Rocky Mountain	Hill 511
Cats 2018/19	4	0	0	0	0	0
Cats 2019/20	14	7	0	1	0	0
Cats 2020/21	1	1	1	1	3	6
Cats 2021/22	1	3	**0**	**0**	**1**	**0**

Hunting

	Whitetail deer	Spur-winged plover	Feral cats
Number shot	0	0	0
Notes	Plenty of sightings but no deer shot this season (2 shot in 2020-21)	No sightings of these birds this season	No feral cats shot this season. Only cat shot to date was in 2019 on Table Hill summit during daylight.

Baiting

2021/22	Table Hill	Blaikies	Mt Rakeahua	Rakeahua valley	Rocky Mountain	Hill 511
First baiting	Sept 16th	Sept 22nd	Sept 14th	Sept 22nd	Oct 8th	Sept 22nd
Bait removed	Jan 24th	Jan 22nd	Jan 20th	-	Jan 13th	Jan 19th
Bait present (days)	132	122	130	139 (as at 31st Jan '22)	97	119

Previous seasons:

2019/20	Table Hill	Blaikies	Mt Rakeahua	Rakeahua valley	Rocky Mt	Hill 511
First baiting	7th Sept	18th Sept	11th Sept	19th Sept	18th Sept	20th Sept
Bait removed	25th Jan	26th Jan	8th Jan	19th Dec	7th Jan	13th Dec
Bait present (days)	140	130	119	91	111	84

2020/21	Table Hill	Blaikies	Mt Rakeahua	Rakeahua valley	Rocky Mt	Hill 511
First baiting	8th Oct	7th Oct	14th Oct	13th Oct	30th Sept	15th Oct
Bait removed	28th Jan	9th Jan	28th Jan	10th Nov	26th Jan	13th Jan
Bait present (days)	112	94	105	28	118	90

Dotterel monitoring

Nests

2021/22	Table Hill	Rakeahua	Hill 511	The Paps	Rocky Mountain	Hill 464	Blaikies Hill	Total
Nests; (found [inferred])	5 [1]	3	1	[1]	1	0	0	10 [2]
Eggs	14 [1]	9	5	[1]	3	0	0	31 [2]

- 2019/20 - Nests: 12 [5], Eggs: 33 [9]; 2020/21 - Nests: 27 [3], Eggs: 71 [6]
- 'Inferred' eggs are eggs from chicks that were sighted without the nest ever being found

Chicks

2021/22	Table Hill	Rakeahua	Hill 511	The Paps	Rocky Mountain	Hill 464	Blaikies Hill	Total
Chicks presumed	0	0	0	0	0	0	0	0
Chicks confirmed	3	3	0	1	1	0	0	8
Total	3	3	0	1	1	0	0	8

- 2019/20 – Chicks presumed (Cp): 11, Chicks confirmed (Cc): 17; 2020-21 – Cp: 5, Cc: 20
- 'Presumed' chicks are from nests where the eggs appeared to have hatched but chicks were not sighted

Band re-sightings

1 July 2016 – 30 June 2017	153
1 July 2017 – 30 June 2018	200
1 July 2018 – 30 June 2019	216
1 July 2019 – 30 June 2020	481
1 July 2020 – 30 June 2021	632
1 July 2021 – present (31 Jan 2022)	171

Timeline 2021/22

Key	Staff	Baiting	Work	Trapping	COVID-19	Birds

Aug	3	0.1% 1080 feral cat bait delivered to Stewart Island/Rakiura DOC office
	9	Start date for returning temp staff [redacted] and new staff member [redacted]
	16	First Belisle traps set on Hill 511 and Rakeahua
	17	First Belisle traps set on Rocky Mt
	17	Start of NZ-wide COVID-19 Alert Level 4 – all field work suspended, staff working from home
	18	Field staff returned from field under Alert Leve 4
	31	Stewart Island drops to COVID-19 Alert Level 3 – no overnight fieldwork, staff working from home
Sept	1	DOC/EPA permission granted for use of 1080
	8	Stewart Island drops to COVID-19 Alert Level 2 –fieldwork can begin, staff start to move back to office
	13	First field trip following return to Alert Level 2 – Rocky, Rakeahua, Hill 511 and Tin Range
	14	[redacted] working remotely from Murihiku prior to birth of child
	14	Toxin bins flown to Table Hill, Blaikies, Hill 511, Rakeahua and Rocky Mt First toxic bait application of the season on Rakeahua
	16	First toxic bait application of the season on Table Hill
	22	First cat trapped of the season, in a Belisle trap at Table Hill
	22	First toxic bait application of the season on Hill 511
	23	Last day at work for [redacted]
	28	First two nests of the season found on Mt Rakeahua
Oct	8	Second cat of the season trapped on Rocky Mt (Belisle trap) | Fourth nest of the season (Rocky Mt)
	10	Feral cat predation of 3 eggs in Table Hill nest NTHEM1 – adults re-nested and hatched two chicks
	11	First day back for staff member [redacted]
	26	First day for staff member [redacted]
Nov	10	Feral cat predation of adult bird on Mt Rakeahua. Carcass found with orange leg band.
	22	First day back after paternity leave for [redacted]
Dec	2	Adult male BM-O preyed upon by feral cat on nest NTHEM2. Predation captured on trail camera.
	17	Third cat of the season trapped at Blaikies (Ground-set leg-hold)
	22	Last day of work on Table Hill and Blaikies before Christmas break
Dec 23 - Jan 4		Christmas break
	27	Last nest of season found – a five-egg nest on Hill 511
Jan	5	First trip to the Tin Range after Christmas break
	9	Fourth cat of the season trapped at Blaikies (Ground-set leg-hold)
	11	Fifth cat of the season trapped at Blaikies (Ground-set leg-hold)
	13	Toxin removed from bait stations on Rocky Mt
	19	Toxin removed from bait stations on Hill 511

	20	Toxin removed from bait stations on Rakeahua
	22	Toxin removed from bait stations on Blaikies Hill
	23	First detection of COVID-19 Omicron variant in the community, all of NZ moves to 'Red' alert setting
	24	Toxin removed from bait stations on Table Hill
Feb	1	**End of season debrief session**
	8 – 15	First dotterel banding trip of the season with 9(2)(g)(ii) (planned)
	9	Last day for temp staff 9(2)(g)(ii)

Southern New Zealand Dotterel Recovery Project - 22/23 Season Report

July 2022 to June 2023

Photo by Dan Cocker

Author: 9(2)(g)(ii) [redacted] - August 23

Department of Conservation
Te Papa Atawbai

New Zealand Government

1. Brief Summary

The 22/23 season was semi successful with the employment of 4 new permanent dotterel team staff. Due to many delays in employment and lack of boat support, effective predator control in the breeding sites did not begin until late in the season. This may be leading factor to the further decline of the population, though, the species gained a lot more media attention, and the team managed to initiate some research projects over the winter to help gain a better understanding of the population.

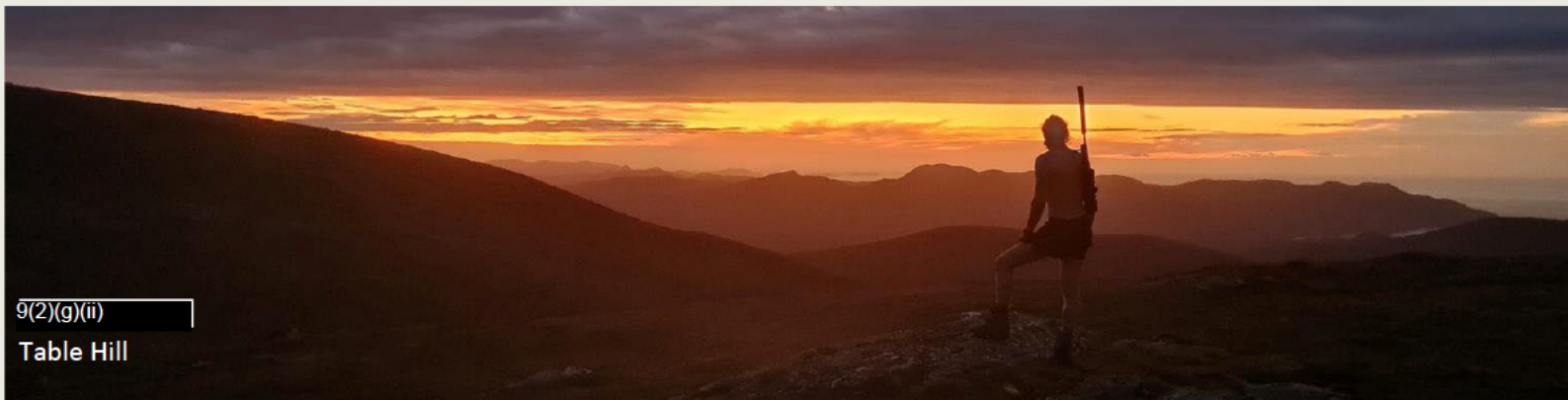
Contents

2. Project Team

In late October to early January of 2023, four new permanent field staff were employed to undertake predator control all year round, to help further reduce the risk of predation of southern NZ dotterels and aid the recovery of the species.

The Project Team 22/23

- 9(2)(g)(ii) – Ranger
- 9(2)(g)(ii) – Ranger
- 9(2)(g)(ii) – Ranger
- 9(2)(g)(ii) – Team lead



3. Predator Control Objectives

Outcome target

To reach the project goal of 300 birds by 2035, the flock count estimate in 2023 needed to be 157 individuals or more (to meet the yearly increase rate over 13 years to reach our goal). Instead, the population had dropped to 126 birds from the 144 estimate in 2022. Therefore, our outcome target was not met this season.

Result targets

Feral cats

- Cat densities were unknown, but suspected to be high by the amount of cat sign around and the number of cats caught per trap night for leg holds. The team successfully removed 11 feral cats from the control area, though only 4 of these overlapped the breeding season between late November and the end of December. The other 7 were caught in January once all the birds had moved back to their coastal feeding grounds.

  7 of these cats were caught in leg hold traps, 2 in Steve Allens and 2 in Belisle traps. Salted rabbit and tinned cat food were the most successful bait types for the season, despite not being naturally found in their environment. See below map of cat catch locations for the season.

Southern black-backed gull

The Operational plan pushed to kill of all resident nesting gulls and their eggs of 511, though due to lack of staff and the timing of recruitment, this plan did not go ahead. The gulls were observed to be disturbing dotterel breeding pairs on 511 hill during the season.

Spur-winged plover

- The operational plan pushed for all resident spur-winged plover to be removed from the management area so that no further sightings are made for the remainder of the breeding season, though luckily, none were sited on the tops the whole season.

White-tailed deer

- The operational plan pushed for white-tailed deer encounters to decline to 1 sighting per 10 field days in the Northern Tin Range and Hill 511 dotterel breeding habitat. This was unsuccessful as 6 more deer were reported to be seen around Table Hill. Night shooting did not take place during this breeding season due to staff not getting signed off in time. Three deer were shot on the northern Tin Range out of 4 planned morning/evening hunts.

Australasian harrier

- The operational plan pushed for Australasian harrier to be removed from the management area so that no further sighting are made for the remainder of the breeding season. Unfortunately, this was not achieved. #### harriers were sited on the range, and none were shot or trapped this season. In February, a ranger witnessed 12 harriers take off from the mouth of the Freshwater Fiver.

Other Non-Target Species

- In total, 15 rats and 16 possums were trapped this season. We re-cycled the rats and possums and used them as bait in other leg hold sets, two of these baited with possum caught cats. Thankfully, no kiwi were caught by the dotterel team this season, although, another team on Rakiura (NET team) accidentally caught a kiwi. Luckily, the kiwi had no sign of damage or injury from the leg hold trap.

4. Nest Monitoring

During the season the focus was primarily on predator control, though the team still managed to come across three dotterel nests on their travels, two on Table Hill and one on 511 Hill. All three nests seemed to have failed when revisited shortly after, although game cameras were not set up to monitor these, so the true outcome is uncertain.

5. Flock counts

The annual flock counts went ahead as planned on the 19th, 20th and 21st of April. A team of four were stationed at Mason Bay, a team of six on the Freshwater Flats, and a team of five at Awarua Bay. The overall season estimate from the flock count data was **126** individuals. This estimate was calculated by adding the counts from the four-five sites (including one bird at Ringaringa Beach) and

then adding 5% to consider the likely outliers at other remote beaches around Southland such as Doughboy Bay and Wakapatu Beach.

Mason Bay

The team at Mason Bay Lead by 9(2)(g)(ii) managed to successfully identify every banded bird at the bay over the three days. In total over the three days, the team consistently counted 52 birds. 48 banded and 4 un-banded birds. This population seems to have decreased since the 2022 count of 60 individuals.

Awarua Bay

The team lead by 9(2)(g)(ii) at Awarua Bay had their biggest reliable count on their first day of 54 birds. This population was the only one to be increasing slightly with only 51 birds being counted here the year prior. This is a 6% increase since the previous count at this site.

Freshwater Flats

The team lead by 9(2)(g)(ii) had their biggest reliable count of 47 birds before they all took off to Mason Bay an hour and 45 minutes after low tide. All the birds which bands were identified at Freshwater were seen later at Mason Bay, so it's worth re-thinking if having 6 people for 3 days to get data that's already going to be collected at Mason Bay is worthwhile in future flock counts.

Port Pegasus

9(2)(g), in-between doing sealion work in Port Pegasus, paddle boarded up Cook Arm to count the birds up there as he usually does in February. This year, he found only 13 individuals compared to the 26 he saw up there the year before. This population had taken the biggest hit out of the lot, at a 50% decline. All birds were un-banded too.

Winter Flock Count

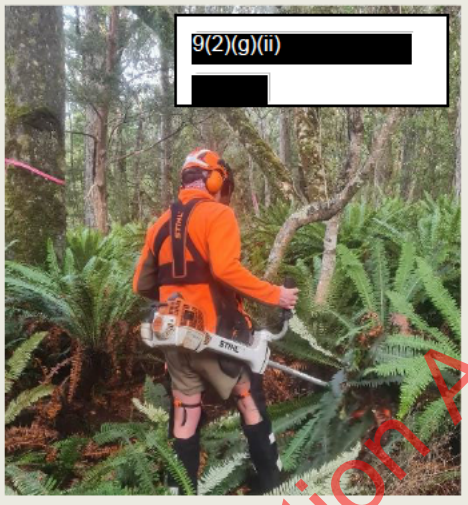
The opportunity was taken two months after the April flock count to do a second "pre-breeding season" flock count on the 18th and 19th of June 2023. The reason was we wanted to answer the question of "are we loosing birds over the winter too?". The result of the two-day count was that to populations had remained stable since the count two months prior. A couple birds had swapped sites including the Ringaringa beach bird moving to Mason Bay, and an Awarua Bay bird swapping with a Mason Bay bird. This

6. Banding

Banding season went well with the recruitment of 27 new banded birds all with 'white metal' on their left leg. There were still approximately 25 un-banded left by the end of the banding season (13 at Pegasus, 4 at Mason Bay and 8 at Awarua Bay). 9(2) begun training some members of the team to become level 2 banders. Approximately 28 Possums were clubbed in the dunes at night during the banding trips.

7. Trap Line Cutting

The team managed to start and complete Freshwater Loop track and flagged and cut most of SWARM track from SW Arm to the 511-access track. A total of 9.4kms of new track was cut. The team were also trained up on chainsaw use to help improve their track cutting performance, though the bio chainsaw was quite faulty so most of the cutting was done by silky saws this season.



8. Research

DNA analysis

Dotterel team member 9(2)(g)(ii) took the lead on getting more research done on the species by initiating the analysis of many southern NZ dotterel DNA samples taken over the past few years. This was done in collaboration with Otago University's geneticist 9(2)(g)(ii). This information will help us understand the sex ratio of the population and gather data on the genetic diversity of the species. This is expected to take approximately 8 months to complete.

GPS tracking of SNZD's

9(2)(g)(ii) also took the lead on initiating an agreement to fund the GPS tracking of southern NZ dotterel to further understand their migratory habits and hopefully to help answer our question of "where are the majority of the southern NZ dotterels breeding?". This is expected to go ahead in August 2023 and the following banding season if we're confident the devices didn't cause too many issues to the species over the breeding season.

9. Infrastructure

Table Hill hut - Solar upgrade

Early in the season, the team accepted the exchange of 120 staff hours (to assist NET work) for a solar power generation system and diesel heater from the Auckland Island eradication project team. Unfortunately, due to lack of time, electrical experience, and money, this was not installed this season, although a lot of electrical components and gear were purchased to make this installation feasible the coming breeding season.

Boardwalks

The board walks outside Blakies Hut and Table Hut were repaired towards the end of the season as they were very unstable and were found to be sinking into the mud early on.

Gas fittings

A plumber assessed all the gas fittings in the three huts and made them all compliant.

Signage

Two new hunting warning signs were installed near Mount Allen, and all other poison signs and hunting warning signs were checked throughout the season. "DOC Staff Only" signs were installed at each of the three huts after many trampers were seen on game-cams walking near the hut.

10. Logistics

Boats

During this season, we had no signed off boat operators in the team, so water taxi's were our main method of transport to and from the project sites, though these were not a very cheap. In early 2023 both Guy and Easti were signed off. 9(2)(g)(ii) (Bio team) was boating for the team every second week until January.

Helicopters

Only three Heli flights happened this season for the dotterel team. These were the initial hut re-stock flights, gas fitting flights and an opportunistic back flight from Mason Bay dunes team. The use of back flights from Mason Bay is a reasonable cheep option for being dropped up the hill costing about $700 for a full heli load dropped at Table Hut on its way to Mason Bay.

Fixed wing flights

Planes were used multiple times this season, especially for Mason Bay banding ops and flock counts. These are cheaper than heli flights, but still around the $600 mark for a one-way flight from Oban to Mason Bay.

Work roster

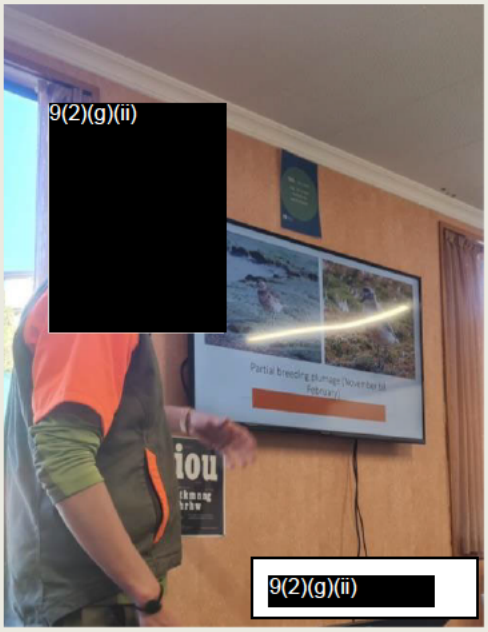
The team made a call early in the season that five-day trips just weren't productive enough, so switched to a 'nine days on, five days off' work pattern. This meant leg hold traps could be open for more than just 1 or two trap nights, increasing cat catch rate.

11. Media attention

9(2)(g)(ii)

Dotterel team member 9(2)(g) gave presentations on the challenging situation of the southern NZ dotterel population to many key stakeholders over the season. Some of these included Southland Forest & Bird, The Southland Conservation Board, the DDG of DOC and was even interviewed on live TV about the birds. 9(2)(g)(ii) also updated the DOC page for southern NZ dotterel and was planning on leading the campaign for them to be 'Bird of the Year'.

The team also managed to get the DDG Mike Tully, operations director Henry Western, and regional director Aaron Flemming out to Freshwater Flats one day to see our precious birds.



Operational report for predator control across the Southern NZ dotterel breeding sites

August 2023 – Feb 2024

Rangers 9(2)(g)(ii) banding a Southern NZ Dotterel at Cook Arm

Contact	9(2)(g)(ii), Field Team Lead Rakiura Office Southland
Report status	[Draft / Final]
Approved by	[Ops manager to enter name and date to confirm their approval]
docCM ID	DOC-7678156
Operational reporting master	Entered into the Operational reporting master spreadsheet (DOC-7194322)? [Yes / No]

Department of Conservation
Te Papa Atawbai

Operational report - Southern NZ Dotterel Recovery Project - Animal Pests - DOC-7678156

Operational reporting master spreadsheet – animal pests

Enter high level details of this operational report into the Operational reporting master spreadsheet (DOC-7194322).

Contents

1. Operational summary

The southern New Zealand dotterel or Pukunui is a distinctive and charismatic sub-species of New Zealand Dotterel. Their threat status is considered Nationally Critical and they require on-going conservation management to ensure their long-term persistence. The population declined from an estimated 300 birds in the 1950s to 62 birds in 1992. Feral cat control was initiated in 1994 and this was successful until 2009 when the population plateaued at 290 birds before beginning a consistent decline at approximately 10% per annum from 2011-2015. This decline rate accelerated in the 15/16 year to an estimated 29%.

A technical review of the SNZD project followed which recommended the introduction of new control methods, an expansion of the control grid, additional species targets and increased monitoring work. An updated operational plan was developed to include the recommendations from the technical review which has been approved and is now being implemented with the aim of increasing the recovery rate of the southern New Zealand dotterel.

The flock count for April 2017 rose 21% to an estimated 153 birds and a further 9% in 2018 to 167. The 2019 flock count estimated a population of 170 birds increasing to 173 in 2020, 144 birds in April 2022, 126 birds in 2023 and just 101 birds in 2024. Ongoing predator control and monitoring work through an adaptive management approach is required to give the southern dotterel their best chance of a population increase.

1.1 Project scope

In scope

- Multi species target predator control programme with a primary focus on feral cats and a secondary focus on Southern black-backed gulls, spur-winged plover, Australasian harriers and white-tailed deer covering a 4-part area of key SNZD breeding habitat and surrounding buffer control including:
    1. Tin Range (2889ha)
    2. Hill 511 (624ha)
    3. Rakeahua (1572ha)
    4. Rocky Mountain (880ha)
    5. Southern 511 (10ha) – southern black-backed gull colony
- Predator reduction achieved through, trapping and ground hunting.
- Ongoing support from NZ Nature Fund with a goal to raise $400’000 for the project over four years.
- GPS tracking of a small percentage of birds.
- Genetic sampling and disease screening of birds via cloacal and clonal swaps.
- Annual flock counts.
- Colour banding adult birds.

Out of scope

- Nest fate monitoring.
- Alphachloralose poison opp on Southern black backed gulls.
- Long term species recovery planning/strategy

1.2 Site description

Conservation Values

Locations

This operational plan covers four main areas focussing on capturing a large portion of the SNZD breeding habitat and adjacent buffer areas of preferred cat den habitat. These include the northern part of the Tin Range and surrounding forest, Mt Rakeahua and surrounding forested slopes, Rocky Mountain including southern and north-western slopes and Hill 511 including northern slope (Figure 1).

Vegetation

Northern Tin Range

The lower slopes are covered in mixed podocarp forest including kamahi, southern rata, rimu, miro and totara among others.

The upper elevations of the management area is mostly dense montane scrub and shrub-tussock-land with a range of native species values. Alpine ecosystems too harsh for forest are found on the Tin Range. They comprise dense, low and often wind-affected shrublands and herb moors, which have been referred to as 'tundra-like' communities because of their waterlogged nature and often ponded appearance. Herb bogs and cushion-fields are two distinctive expressions of 'tundra-like' communities.

- CF9 (Kaimahi, Southern rata, podocarp forest)
- CF13(*Olearia, pseudopanax, dracophyllum* scrub.
- WL9 (*Oreobolus* cushionfield)
- WL6 (Wire rush, tangle fern, restiad rushland-fernland)
- AL8 (Stewart Island snow tussockland-shrubland)
- BR4 (Bare rock, including sandstone pavements associated with coal measures)

Mt Rakeahua

The summit vegetation class is essentially the same as the Northern Tin Range although the overall aspect of the land differs. Mt Rakeahua is more or less conical rather than flat and there are fewer tarns and minor waterways. The summit is comparatively more boulder strewn than the other management areas.

The lower slopes are covered in mixed podocarp forest including kamahi, southern rata, rimu, miro and totara among others. The southern slopes are wetter and colder and considered less productive overall than the northern facing slopes. The western slopes of Rakiura face into the prevailing winds are likely to be affected by salt, sand and other marine influences more so than the other slopes. A dense band of sub-alpine scrub separates the forested lower slopes from the open alpine zone.

- CF9 (Kaimahi, Southern rata, podocarp forest)
- CF13(*Olearia, pseudopanax, dracophyllum* scrub.
- AL8 (Stewart Island snow tussockland-shrubland)

Hill 511

The summit of Hill 511 is vegetatively similar in broad terms to other open alpine hill tops of Rakiura. There are some minor altitudinal changes throughout but the area is essentially flat and generally wet with a series of tarns and waterways. This open area is surrounded by a sub-alpine scrub layer at a lower altitude

before reaching forested slopes which extend down to sea level. The main aspect of the forested slope is North-West facing and so is generally considered warm and productive. The areas closet to sea level are moist and can be prone to flooding.

- CF13(*Olearia, pseudopanax, dracophyllum* scrub.
- AL8 (Stewart Island snow tussockland-shrubland)

Rocky Mountain

Rocky Mountain summit is somewhat similar to the other open hill tops of Rakiura, however the area is more fragmented and interspersed with sub-alpine scrub areas. There are some areas of rock near the summit itself while the rest of the area is roughly flat and therefore can get quite wet following rainfall. There is a band of sub-alpine scrub surrounding these areas and extending downhill before it gives way to forested slopes of mixed podocarp, including southern rata, kamahi, miro and rimu.

- CF13(*Olearia, pseudopanax, dracophyllum* scrub.
- AL8 (Stewart Island snow tussockland-shrubland)

Past management

Previous management for the last 2 operations

	Operation Name	Control Method	Pestlink ref./Op report
	SNZD Predator control	Trapping / ground hunting	N/A
	SNZD Predator control	1080 polymer fishmeal bait / trapping / ground hunting	docCM

1.3 Block and treatment area boundaries

Copy from section 16. Block and treatment area boundaries of your operation plan and edit as necessary. Include size in hectares of blocks and treatment area. Include DOC permission map.

The treatment area broadly covers four main areas as follows:

- Northern Tin Range and northern slope
- Mount Rakeahua summit and surrounding slopes
- Hill 511 and northern slope
- Rocky Mountain, southern slope and north-western slope

These sites are entirely contained within the Rakiura National Park and so there are no boundaries with other landowners/occupiers. Kill trapping is planned to overlap with public track going up Mount Rakeahua and Rocky Mountain and along a section of the Southern Circuit from near the Tolson swing bridge to Rakeahua public hut (see map below).
All GIS data is stored on the following Q Drive folder: Q:\GIS_Users\Rakiura\Projects\Biodiversity Programme\Species Management\SNZD Recovery Project.

1.4 Summary of methods

List as a summary all control methods, their target pests and start and end dates for the area/blocks

Table X. Summary of methods

Treatment area/block, hectares (ha)	Control method	Target pests	Dates
Four key mountain tops (5975ha)	Trapping. Kill traps and live capture sets	Cats	17 August 2024 to present

2. Targets and monitoring results

2.1 Outcome target/s and monitoring results

Copy from section 3. Objectives and targets of your operational plan and edit as necessary. Summarise the pre- and post- monitoring results, monitoring methods and monitoring dates (if available) ***(mandatory for EPA for aerial 1080 operations)****. If results are* ***not*** *available give contact name and contact details. State when results are expected.*

When results are available consider updating this report with a brief summary or a link to the monitoring report.

Long-term conservation goal

Increase current population growth of the southern New Zealand dotterel (SNZD) to achieve increased security against extinction with a population size of at least 300 individuals by 2035.

Outcome target

2023 flock count indicates that the SNZD population size is of 157 birds or greater (the average annual increase required over thirteen years to achieve the long-term goal).

Result targets

Feral cats

- Feral cat captures decline to 1 cat per 1000 trap nights for traps set in SNZD breeding habitat.

Southern black-backed gull

- 100% kill of all resident nesting gulls and their eggs

Spur-winged plover

- Resident spur-winged plover are removed from the management area so that no further sightings are made for the remainder of the breeding season.

White-tailed deer

- White-tailed deer encounters decline to 1 sighting per 10 field days in the Northern Tin Range and Hill 511 dotterel breeding habitat.

Australasian harrier

- Australasian harrier are removed from the management area so that no further sighting are made for the remainder of the breeding season.

2.2 Result target/s and monitoring results

Copy from section 3. Objectives and targets of your operational plan and edit as necessary. Summarise the pre- and post- monitoring results, monitoring method and monitoring dates (if available) ***(mandatory for EPA for aerial 1080 operations)***

Long-term conservation goal

Increase current population growth of the southern New Zealand dotterel (SNZD) to achieve increased security against extinction with a population size of at least 300 individuals by 2035.

Outcome target

The 2024 SNZD flock count showed a total of 101brd remaining. This indicated a loss of 19% of the population from the year prior which means we are not getting any closer to reaching our project targets.

Result targets

Feral cats

- A total of 33 feral cats were caught between 17th August 2023 and 29th February 2024.

Trap_type	cat_count	trap_nights	trap_rate
Leghold	11	1574	0.698856
Belisle	12	8121.5	0.147756
SA Cat	7	5772	0.121275
Timms	1	3673	0.027226

Southern black-backed gull

- Unfortunately due to not having technical advisor support, the alphachloralose operation did not go ahead. Gulls we're seen to be disturbing the dotterels on numerous occasions, so this will be reviewed for the coming season.

Spur-winged plover

- No spur winged plover were sited on the breeding sites this season.

White-tailed deer

- XXXX White tail deer were seen on the breeding sites this season, yet, no deer were shot or removed this season due to most staff not being competent in firearm use and injuries.

Australasian harrier

- A number XXXX of Australasian harriers were sited flying high and low around the breeding sites this season, yet none were shot or culled due to lack of proper hawk traps set up, and lack of having approval for shotgun use on national park.

3. Consents, consultation and notification

Most of the information for this section can be copied from section 6. Consents required and section 7. Consultation of your operational plan. Edit to align with what actually happened.

3.1 Consents

Summarise from section 6. Consents required of your operational plan. Include the Permission ID for DOC and MOH consents - the docCM ID of the DOC consent and the MOH permission id e.g., 09-72-DAH-WAPH, and any landowners etc.

Comment on any changes you made to the operation as a result of consent conditions.

Table x. Summary of consents

1. Landowner or occupier consent **(The operation is contained within the Rakiura National Park)**	**Not required**
2. Resource consent	Not required (DOC-2837856)
3. Public health permission (Public Health South)	☐ No (PHP not required for alpha-chloralose
4. DOC permission (Provider: TBC – Acting Operations Manager, Rakiura) (Assessor: SSI Pesticide Permissions process)	☒ Yes (operation involves traps and pesticides that require permission)
5. EPA permission	Not required

3.2 Consultation

Summarise consultation completed under these headings: Iwi, adjoining landowners/occupiers, key stakeholder groups.

Summarise methods and outcomes of consultation, including any complaints and how these were addressed ***(mandatory for EPA for aerial 1080 operations)****.*

This is an ongoing annual predator control programme and so local residents, iwi and key stakeholders are well acquainted with the nature of this work. This is an adaptive programme,

however, and so we treat each year as an independent operation. We go through standard consultation processes accordingly.

The main drive of the consultation plan is listed in the Communications Plan (DOC-7131311). This document also contains a running communications log which contains data from previous years as well, reflective of the on-going, annual nature of the recovery programme.

Iwi

Treaty Partners are prioritised for consultation and so we aim to initiate refreshed discussion with each of the four local rūnaka before approaching other stakeholders on an annual basis. This ensures that we have a "no surprises" approach to Treaty Partner engagement. Kāi Tahu look to papatipu runaka to engage with the department on pest control matters and this is formally done through the Kaitaiki Rōpu ki Murihiku framework. A presentation regarding the mid to long-term future of the recovery programme was offered to a Kaitiaki Rōpu in November 2019. Iwi remained supportive of the programme and indicated support for a move to increasing control to landscape scales. Further to this, we have directly contacted the four local papatipu runaka annually, most recently in September 2022.

Adjoining landowners/occupiers

Not required as the operation is completely within the Rakiura National Park.

Key stakeholder groups

The following groups have been identified for proactive consultation as per the Communications Plan:

- New Zealand Deerstalkers Association – Southland Branch
- New Zealand Deerstalkers Association – National Office
- Predator Free Rakiura
- Ornithological Society of New Zealand/Birds NZ – Southland Branch
- Southland Conservation Board
- Rakiura residents
- Stewart Island District Nurse
- NZ Police – Oban
- Halfmoon Bay School

The records of this consultation are recorded in the communications plan (DOC-7131311).

4. Contracts

Copy from section 5. Contracts of your operational plan and edit as necessary.

Helicopter contractors will be engaged as the primary method of field transport. Services will be secured through DOC's revised Heli Order process selecting operators from the national supplier panel. As this is a logistics contract, it will be supervised by the Operations/Logistics Lead (Mike Southworth).
Water taxi suppliers may also be engaged as a back-up contingency when constraints prevent use of DOC dinghies. No formal contract is in place with these service suppliers.

5.

Methods

Kill trapping for feral cats

125 x double-set Belisle Super X220 kill traps in chimney/submarine boxes and 50 x Steve Allan Kat Trap 2 on running boards will be placed near key breeding areas, targeting areas of known feral cat presence and traditional patrol routes. These sets will also be placed on access tracks to Mount Rakeahua, Rocky Mountain and Hill 511 which are known to be frequented by feral cats moving to those breeding areas. Kill traps will be baited using salted rabbit meat, tinned cat food or other meat/fish available (eg: possum). Trapping will conform to the standards laid out in the Currently Agreed Best Practice "Kill trapping for feral cat control" and treated as "supplementary trapping" (DOCDM-29437). Kill traps will be rechecked on a fortnightly cycle.

Live capture trapping for feral cats

Hav-a-hart cage traps will be deployed on trap lines, access tracks and areas of known feral cat presence and traditional patrol routes and checked daily. These traps will be baited with salted rabbit meat, tinned cat food or other meat/fish available (eg: possum). Trapping will conform to the standards laid out in the Currently Agreed Best Practice "Cage trapping for feral cat control" and treated as "supplementary trapping" (DOCDM-29441).
Victor 1.5 soft catch traps will be used in hazed ground-sets, raised with running boards and on up-turned barrels to create a platform that feral cats will jump onto to reach the bait/lure. Trap locations will vary and target linear landscape features such as contours, areas of known feral cat presence including traditional patrol routes, access tracks and areas including a high number of dotterel nests. Trapping will conform to the standards laid out in the Currently Agreed Best Practice "Leg hold trapping for feral cat control" (DOCDM-29439).

Live Capture trapping for Australasian harrier

Australasian harrier will be targeted using Victor 1.5 soft catch traps raised on platforms at least 1m in height and calibrated to a heavier trigger weight (500g) to exclude non target capture (SNZD mean weight is approx. 160g). Active traps will be monitored daily and caught individuals euthanised by either a sharp blow to the head or being shot with a firearm.
Live capture cage traps will also be used as these have been noted to catch Australasian harrier in other projects. Baiting and rechecking will by synergistic with feral cat cage trapping as meat and visual lures are likely effective for both targets.

Ground hunting

White-tailed deer will be shot on sight as practical using a .223 or greater calibre rifle. White-tailed deer hunting will follow the "Ground shooting of deer – best practice for human pest animal control" standards (DOCDM-642613).
Spur-winged plover will be shot on sight as practical using a .22 or greater calibre rifle. Australasian harrier will be shot on sight as practical using a shotgun.
Thermal scope and spotlights will be used in combination during night hunting work in strictly defined boundaries in key breeding habitat. This will primarily target feral cat nocturnal activity but opportunities to remove white-tailed deer, spur-winged plover and possums will be taken advantage of using this methodology. This work is subject to approval from the Operations Manager and has stringent health and safety procedures to further mitigate any risks on top of the existing New Zealand Firearms Safety Code.
The Managerial authorisation prescribes set personnel of proven hunting experience, set locations as identified on the map used in public consultation, specifies the locations of warning signage and best practice standards required, safety briefing procedures and a 16 hour minimum notification of intended operation to allow contact with stakeholders and transport operators to identify any people in the area. A secondary verbal approval is then required before commencement and this will only be issued if there's a high degree of confidence that no people are in the shooting area.

An example of the approval and conditions is available on DOC-6048511. A similar approval will be sought for the 2022/2023 season.

Be very clear what methods were used in what places by reference to treatment blocks shown on map in section 1.3 of this report.

5.1 [Treatment block 1], [control method 1], [target pest(s) 1]

Hunting has been used the main method of controlling deer numbers on the breeding sites, and any cats or possums if seen. Due to most of the team now having firearms competency, no deer were shot this past season, but over 5 deer were observed on the breeding sites.

Hunting - ground

Target pest	Cats, deer, possums
Firearms (type/calibre/action)	Howa .270 bolt action, Howa .223 bolt action
Number of hunters	2
Describe hunting method	Day time thermal hunting
Number and style of hunting dogs	0 N/A
Total productive hunting hours/days	6
Average ha's covered per day	50
Animals shot	0
Animals seen, not shot (escapees)	5
Catch per unit effort (number of animals shot ÷ effective hunter days)	0
Hunt start and completion date	Only three days where active hunting occurred. 30/11/23 (two hunters in separate locations) and 15/01/24
Location of saved waypoints and hunting tracks	DOC-2901677
Other details about this method: [Any other information not covered above to provide a full picture of the method.]	

Trap

Trap type - 1.5 Victor soft-jaw Leg hold traps	**Trapping method Hazed ground sets**	**Target pest – Feral cats**
Trap style (kill/leghold/cage)	1.5 victor Leg hold traps	
Lure(s) used for prefeed and set traps	Either Salmon, salted rabbit, pet cat food, fish, feathers, salmon oil, possum meat, venison, and cat toys	One or a mix of different lures used for each set
Trapping start date and completion dates	17th August 2023 to 29th February	261 leg hold traps set for a total of 1574 trap nights
Number and frequency of lure renewals	Daily when sets are active if necessary	
Total number of traps used	261	
Pattern of trap lines (e.g., grid/contour/spur-ridge)	Traps are generally set up only cut trap lines or public walking tracks	
Trap spacing	200m apart	
Frequency of trap checking	Daily when activated	
Trap placement	Hazed set to avoid non target by catch eg:kiwi	
Trap height	Anywhere from ground level to 1m above the ground	
Total trap effort (trap-nights) [double trap sets = 1]	574	
Trap set density per ha	4	
Project type	Ongoing	
Trap.nz project name and link	Southern NZ dotterel recovery project	

Trap type - Steve Allen Kat trap 2	**Trapping method Raised set with ramp**	**Target pest – Feral cats**
Trap style (kill/leghold/cage)	Ramp to a raise kill trap set	
Lure(s) used for prefeed and set traps	Either Salmon, salted rabbit, pet cat food, fish, feathers, salmon oil, possum meat, venison, and cat toys	One or a mix of different lures used for each set
Trapping start date and completion dates	Start on 17th August 2023. Trapping ongoing	5772 trap nights
Number and frequency of lure renewals	Every 14 to 21 days	
Total number of traps used	52	
Pattern of trap lines (e.g., grid/contour/spur-ridge)	All traps are raised sets on cut trap lines or, open tops or public walking tracks	
Trap spacing	200m apart	
Frequency of trap checking	fortnightly	
Trap placement	Raszed to avoid kiwi bycatch	
Trap height	Minimum 70cm above the ground	
Total trap effort (trap-nights) [double trap sets = 1]	5772	
Trap set density per ha	2	
Project type	Ongoing	
Trap.nz project name and link	Southern NZ dotterel recovery project	

Trap type - Belsile 220 super X	**Trapping method Double set in chimney box**	**Target pest – Feral cats**
Trap style (kill/leghold/cage)	Double Kill trap in chimney box	
Lure(s) used for prefeed and set traps	Either Salmon, salted rabbit, pet cat food, fish, feathers, salmon oil, possum meat, venison, and cat toys	One or a mix of different lures used for each set
Trapping start date and completion dates	Start on 17th August 2023. Trapping ongoing	8121 trap nights
Number and frequency of lure renewals	Every 14 to 21 days	
Total number of traps used	45	
Pattern of trap lines (e.g., grid/contour/spur-ridge)	All traps are stations on cut trap lines or, open tops or public walking tracks	
Trap spacing	200m apart	
Frequency of trap checking	fortnightly	
Trap placement	Chimney to avoid kiwi bycatch	
Trap height	70cm tall	
Total trap effort (trap-nights) [double trap sets = 1]	8121	
Trap set density per ha	2	
Project type	Ongoing	
Trap.nz project name and link	Southern NZ dotterel recovery project	

6. Environmental effects

Non-target species: no native species were caught or killed as bycatch in our traps.

Human health and community wellbeing: All traps have warning signs on them to prevent human harm.

7. Lessons learned

Result monitoring: We learnt that Belisle traps caught the most cats this particular season, yet leg holds traps have the best catch rate per trap night.

Outcome monitoring: The 2024 flock count saw a 19% decline in the population of southern NZ dotterels, so these methods were not effective enough at controlling cats unfortunately.

General recommendations

A poison operation involving 1080 may be the best set forward at reducing the feral cat numbers sufficiently enough to give the dotterels a good chance at surviving.

8. Project team

Name	Role in the operation
9(2)(g)(ii)	Project Manager
9(2)(g)(ii)	Field Team Lead
9(2)(g)(ii)	Field ranger
9(2)(g)(ii)	Field ranger
9(2)(g)(ii)	Field ranger
9(2)(g)(ii)	Field ranger

9. References

Key project documents

Document	Reference
Project home page	DOCDM-1117452
Operational plan	docCM ID 7081788
Communication plan	docCM ID 7501262

10. Appendices

Map of treatment area (use DOC permission map) that meets minimum mapping standards in the SOP. State reference to file where map is held. ***Include post operational application map showing sow lines and application rates.***

Include other maps relevant for review purposes e.g., map of tracking tunnel locations in relation to bait station locations or deer kill locations in a different catchment to FPI lines.

Add additional appendices as required.

Figure 1: Map showing the treatment area for xxxx

Insert map

16/17 Southern New Zealand Dotterel Response

MID BREEDING SEASON REPORT (December 2016)

Photo Credit: Tyron Conner

The southern New Zealand dotterel population has been in decline since 2010 after benefitting from previously successful feral cat control which grew the population from just 62 individuals in 1992 to 290 in 2009. For more information on the project background, please see the supplementary document.

9(2)(g)(ii) (DOC Science Advisor – Threats) and 9(2)(g)(ii) (formerly DOC Threats Manager) visited the Rakiura Office to discuss possum control works on the island with local rangers in April 2016. At the same time, DOC field rangers were out alongside Ornithological Society of New Zealand members undertaking flock counts to form the 2016 population estimate. As the data poured in from the field, it was evident that the population had suffered another year of decline and that the rate of decline was accelerating.

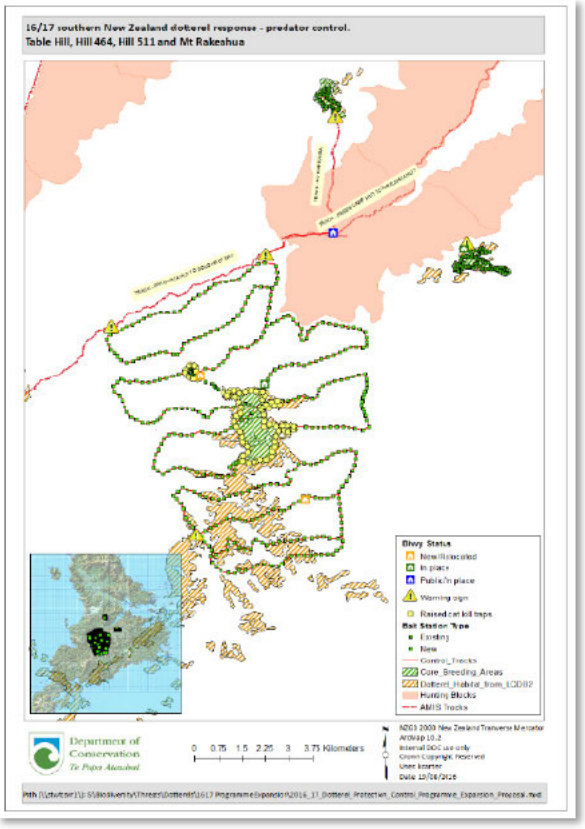
Discussion quickly turned from possum control to assessing the emerging picture of the southern New Zealand dotterel's deepening plight.

The next three days were spent discussing key issues and questions. Whiteboards were up, maps were scattered across the meeting room table and a screen was on showing previous data, research and reports.

What had changed? Why was the feral cat control no longer effective? Had new threats emerged? Why was the decline rate accelerating? How would we find out? How much longer did we have? These were just some of the many questions raised by the review team which quickly expanded to include experts such as 9(2)(g)(ii) (dotterel specialist), 9(2)(g)(ii) (Principle Scientist – Threats), 9(2)(g)(ii) (Science & Policy) and front line field rangers who undertake the on-the-ground work aimed at securing the dotterel population. One of these rangers was 9(2)(g)(ii) – who has been centrally involved in the initial recovery of southern dotterel in the early 1990s.

The critical constraint was time. Population trends were extrapolated from the average decline rate and it became clear that if the decline continued, the southern New Zealand dotterel would be functionally extinct in two to three breeding seasons.

The team knew that we wouldn't be able to conclusively determine the exact nature of the cause(s) of decline before implementing management. Based on previous experience and expert advice, it was accepted that the major driver remained predation, most probably by feral cats. Evidence of other predation pressures such as footage of white-tailed deer eating eggs, harriers disturbing dotterel nests (field study by 9(2)(g)(ii)) and sightings of spur-winged plover breaking eggs gave us further options for predator control.



A key consideration of long-term pest control is that using a single method consistently can create a local pest population that is resistant to that method. Toxic feral cat control with fishmeal 1080 pellets for some 20+ years could well have led 1080-shy feral cats.

We also discussed other possible factors including disease and inbreeding depression due to the genetic bottle neck of the early 1990s and the effects of a changing climate. There were a lot of potential issues to manage and it would take time to find out which were the ones that mattered. Time was something we didn't have.

Based on our discussions and the technical review, we decided to design a broad-spectrum management option which included introducing new control methods to target feral cats such as kill trapping, spotlighting and using a new toxin – PAPP. We also increased the number of targeted predators with the addition of white-tailed deer and spur-winged plover control in the core-breeding areas on the Tin Range as these are known to damage and predate on eggs. The other major change was to significantly expand the area receiving feral cat control. Research from the 1990s indicated that feral cats maintain very large home ranges (♀ = 1200ha avg/♂ = 2000ha avg). Advice received from many individuals indicated that to effectively control feral cats, we needed to expand the area treated. Work followed to draft up a control grid covering approximately 5500ha buffering the most important breeding sites on the Tin Range. This is where most breeding is believed to take place.

We also incorporated disease screening, on-going nest monitoring and banding work to better understand survivorship and breeding success. We'd also continue with using field cameras to ascertain the fate of nests and attempt to capture nest, bird and bait-station interactions to better inform management practices.

The project update proposal was two prong. Firstly, broad scale wide spectrum *in situ* predator control to respond to the critical situation immediately. The other was a bolstered monitoring programme designed to gather data and attempt to answer remaining questions. This allows us to be adaptive with our management approach and apply new information as it becomes available.

A brief draft proposal was put together and funding was confirmed in late July 2016 after which detailed operational planning took place. The operational plan was developed on the foundations of the draft proposal and included further technical input from a range of people including 9(2)(g)(ii) (Senior Ranger Biodiversity), 9(2)(g)(ii) (DOC Scientist) and Allan Munn (Operations Director – Southern South Island). By early September we had a peer-reviewed plan and the necessary consents to proceed.

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Photo Credit: Daniel Lee

16/17 SNZD Response Implementation

THE RUBBER MEETS THE ROAD

9(2)(g)(ii) scout bivvy sites

There was no time to lose. The first major constraint was field accommodation. Until this point we only needed room for one to two people for a few days every fortnight. Now we had rangers on the tops every week and were anticipating the arrival of new temporary rangers and field contractors.

There was an unused two person bivvy on Bench Island (Nature Reserve off the eastern coast of Rakiura) which needed to be removed. With a bit of planning and some work on installing foundations, we could relocate the larger flyable bivvy from the Hill 511 breeding site to the southern end of the newly proposed predator control grid and replace it with the spare bivvy from Bench Island.

A heavy lift B3 helicopter was brought in to help us shift the bivvies on a good weather day. After a long day of helicopter operations, we now had permanent accommodation for this and future breeding seasons strategically spaced within the proposed grid.

We still needed more space. The solution was the use of temporary personnel shelters which can be put together in half a day. These sturdy structures were rated to withstand winds of up to 200km/h, perfect for where we were going to put them.

Once our permanent bivvies were in place it was time to consider the draft feral cat control grid proposed in the operational plan. A 1km x 200m grid was recommended but it had to make sense on the ground, taking the very thick vegetation and undulating terrain into account.

Our first step was to scout the area to understand the lay of the land. The flight was filmed using a portable rugged camera while being tracked on a GPS so that we could review the footage back at the office and adjust the grid accordingly.

9(2)(g)(ii) works on Blakies bivvy foundations

Helicopter scouting proposed track lines

Temporary personnel shelter near Table Hill.

Existing rangers starting scouting and flagging new tracks while undertaking the updated predator control plan. This included laying three types of toxin (1080, brodifacoum and PAPP) in existing bait stations and spotlighting for cats on good weather nights. PAPP has initially been placed in existing bait stations to speed up delivery, however we plan to construct PAPP specific bait stations.

Rangers were spread thin and we needed more support. 9(2)(g)(ii) was the first temporary ranger to join the project and brought with him two years of dotterel field experience – a great win for the project.

Raised Timms cat kill trap. Photo credit: 9(2)(g)(ii)

We've recently had three additional temporary rangers join the project, 9(2)(g)(ii) who will be with us until the end of the breeding season. With four dedicated dotterel rangers complimenting the permanent Rakiura biodiversity team (9(2)(g)(ii)), the project is moving along rapidly.

Hundreds of new feral cat and rodent bait stations have been constructed on wet weather days in the workshop, ready for placement in the field. The current focus is on placing new bait stations throughout the breeding habitat on the open tops where tracks don't need to be cut. This allows us to quickly expand the effective area receiving feral cat toxic control. Rangers are also working on placing out raised cat kill traps through the core breeding area on the Tin Range, an additional tool in the suite available for feral cat control. Kill traps provide us with a contingency control method for cats which may be toxin shy.

Track cutting contractors are set to begin cutting new track through the demanding sub-alpine scrub surrounding the breeding habitat. As these lines are opened, they'll form attractive highways for feral cats traversing the landscape. Bait stations will be placed on freshly cut tracks to increase the area receiving treatment.

9(2)(g)(ii) heads out to place rodent bait stations. Photo credit: Cherie Hemsley

Dotterel rangers at shift change. Photo credit: 9(2)

Rangers have been completing systematic grid searches for dotterel nests and have found 14 at time of writing. Two of the 14 were deemed infertile due to holding two clutches of eggs at once – a sign of a female-female pair. Keeping track of unbanded chicks is quite a task, however, based on their location and their association with banded adults we estimate that at least 16 individual chicks have been sighted over the 3 managed breeding sites.

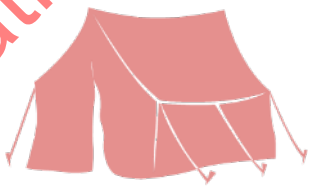
Nest outcome	Hatched	Incubating	Predated	Abandoned	Unknown
Frequency	4	2	1	1	6

Project Achievements

GETTING THINGS DONE

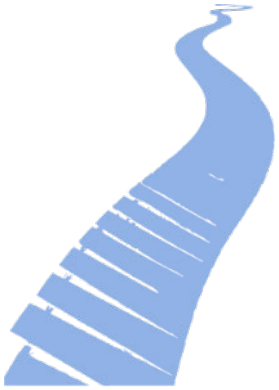
2 new bivvies in place taking the total to 3

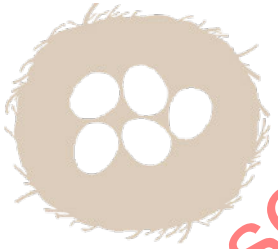
2 personnel shelters erected



40% of new tracks marked

6km of new track cut





14 nests and 16 chicks located so far

74 band re-sightings in breeding areas
26 individual birds re-sighted

2 deer and 1 spur-winged plover removed from core breeding areas via targeted shooting

1572 person-hours spent on project so far

4 dedicated dotterel rangers appointed

16 multi-person, 5 to 10 day trip task assignments issued

Disease screening tests being designed

14.5 hours of helicopter ops to transport bivvies and field supplies

Fortnightly PAPP, 1080 & Brodifacoum bait station servicing at key breeding sites.

Project Work Forecast

WHAT'S NEXT?

16/17 Breeding Season (January to March)

We're a little over half way through the estimated 16/17 breeding season and there's still a lot of work to be done.

Our focus over the next two months will be to increase the effective treatment area further by employing track cutting contractors to cut bait station lines running east-west and radiating out from core breeding habitat. Rangers will then follow installing new cat and rodent bait stations and servicing these with our three main toxins.

Work to install raised Timms cat kill traps will continue where we aim to complete the deployment of 130 traps in a ring around the Tin Range core breeding area. We will continue to undertake routine monitoring, shooting and toxin application to provide predator suppression over the second half of the breeding season.

The use of cat-detecting dogs is planned for the start of February. The dog will assess presence-absence of cats in the core breeding area to give us an indication of the results of our efforts. 9(2)(g)(ii) (DOC Wildlife Vet and Health Co-ordinator) is working on developing disease screening which is targeted at answering one of our initial questions regarding factors possibly affecting the population trend. This work is being planned to occur during flocking site banding work in April.

The team is planning a follow up technical review of the project, aiming to be held in February. This will allow us to discuss challenges and information gathered over the first five months of the 16/17 response. A key focus of this will include contingency recommendations based on a variety of possible outcomes from the April 2017 flock count.

Final Thoughts

The first half of the 16/17 breeding season has been a great success with the largest amount of resource and effort being applied to the predator control programme since it began in 1994. Four months later we're settling in to our newly established predator control regime while actively working on the remaining expansion to reach the goal of approximately 5500ha of treatment area.

For the first time in 20 years, new toxin types and non-toxic control methods have been employed to maximise our chances of success. Infrastructure is in place to support an on-going need for more boots on the ground each breeding season delivering increased predator control and intensified population monitoring.

We've been privileged to have the wide-ranging support of technical specialists, senior management and front-line ranger staff who hold a shared vision of first halting the rapid decline and secondly assisting a long-term population recovery *in situ*.

Ultimately the success of our collaborative efforts will be measured in the April 2017 flock counts and the years to come.

For further information please direct any queries to:

9(2)(g)(ii)
Senior Ranger (Biodiversity)
Rakiura National Park Visitor Centre
9(2)(g)(ii)
9(2)(a), 9(2)(g)(ii)

Acknowledgements & Thanks

The team supporting this project is large and each of us contributes in a variety of ways. The success of the project rests on the shoulders of many skilled and dedicated people. We would like to offer our thanks to those following.

Technical review team (science support, previous research, peer review)

9(2)(g)(ii)

Operational support (toxin & trap best practice and legislation)

9(2)(g)(ii)

Management support (funding, resourcing, prioritisation)

9(2)(g)(ii)

Front-line ranger staff (project management, implementation and delivery)

9(2)(g)(ii)

Stakeholders (advice, support, volunteer effort, advocacy)

- Birds New Zealand (formerly the Ornithological Society of New Zealand)
- Birdlife International
- Les Hutchinson Foundation

Department of Conservation
Te Papa Atawhai

Southern New Zealand Dotterel/Tūturiwhatu Recovery Programme 17/18 FIELD SEASON REPORT

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Cover photo: 9(2)(g)(ii)
Author: 9(2)(g)(ii)

DOC-5655733

CONTEXT & PROJECT BACKGROUND

The southern New Zealand dotterel (*Charadrius obscurus obscurus)* are a subspecies of New Zealand dotterel which is listed as *Nationally Critical* on the New Zealand Threat Classification System. They are only known to breed on Stewart Island / Rakiura and almost exclusively on the open alpine tops of the island's mountain ranges. In this often-extreme environment, they nest from September and raise their chicks to fledging in December and January before they head to their winter flocking sites on the beaches of Rakiura and Awarua Bay near Bluff.

Southern NZ dotterel were present throughout the South Island but declined to extinction after the introduction of cats, mustelids and rodents. They were believed to have been largely absent on the mainland by around 1900 with a relict population remaining on Rakiura.

Carcass of banded bird discovered by rangers in November 2016, likely cat predation according to Massey University's WildBase. Photo: 9(2)(g)(ii)

The population fell from 109 birds in 1990 to an estimated population of just 62 individuals in 1992. It was noted that there was a sex ratio imbalance with far fewer males, probably as few as one male to every four females. The breeding population was estimated at as little as only 12 pairs squeezing the population through a genetic bottle neck resulting in future generations having diminished genetic diversity.

Feral cat predation was believed to be the major driver of the declining population. Initial feral cat control was undertaken in 1994 on the Tin Range followed shortly thereafter by an expansion to other key breeding habitat hotspots around the island (1997). Work largely focussed on toxic control of cats using 1080 fish polymer baits and brodifacoum or bromadiolone for rodents, and this proved successful with a population recovery beginning around 1995.

The population continued to increase as the result of successful management until 2009 when the population peaked at an estimated 290 birds. This was followed by a sustained decline beginning in 2010 averaging at approximately 10% per annum. The decline rate later accelerated to approximately 29% over the 2015/2016 year. The total population was estimated at between 118 and 126 birds during the April 2016 flock count.

An emergency technical review of the work programme took place immediately after the 2016 flock count was completed. The existing predator control work was reassessed and it was determined that new control methods were required for feral cat suppression. It was believed that over 20 years of consistent use of 1080 polymer baits may have selected for 1080 shy cats. New toxins such as PAPP (PredaStop for Cats), shooting, live and kill trapping were introduced to target any such individuals.

Furthermore, evidence had been collected of new predator species impacting on nesting dotterel and chicks such as spur-winged plover, Australasian harrier and white-tailed deer. Control methods specifically targeting these additional predators were included in the revised Operational Plan.

A strong recommendation was made to increase the spatial extent of the predator control network. Up until 2016, the control work focussed on several cordons of bait stations placed immediately around the breeding habitat. The revised Operational Plan introduced a landscape scale buffer control network around the most productive breeding habitat on the Tin Range while retaining the cordons on Rakeahua Mountain, Rocky Mountain and Hill 511.

These elements were combined with the non-toxic control methods and an increase in nest monitoring intensity to gain more insight into productivity and chick survivorship. Achieving this in the field meant relying heavily on bird banding and motion activated cameras to identify individuals and determine interaction rates.

It was recognised that the additional work programme would require a large injection of additional resourcing to cover a range of new cost elements such as cutting new tracks, purchasing new traps and bait stations and securing field rangers to deliver the work on the ground.

A brief summary document, the 16/17 Draft Response Plan, outlining the findings of the technical review and the request for additional resourcing to implement the recommendations was produced and provided to funders.

Shortly afterward the revised, detailed Operational Plan for 2016/17 was released.

This was ultimately successful with the expanded programme falling under the auspice of the Battle For Our Birds programme. The first year of the expanded programme occurred in the 2016/17 year focussing on increasing the length of bait station and trapping lines, installing new infrastructure such as additional field accommodation and deploying the new predator control methods. This appeared to be largely successful with the subsequent annual flock count in April 2017 increasing from 126 birds to 153 representing an estimated 21% increase in the population (Figure 1).

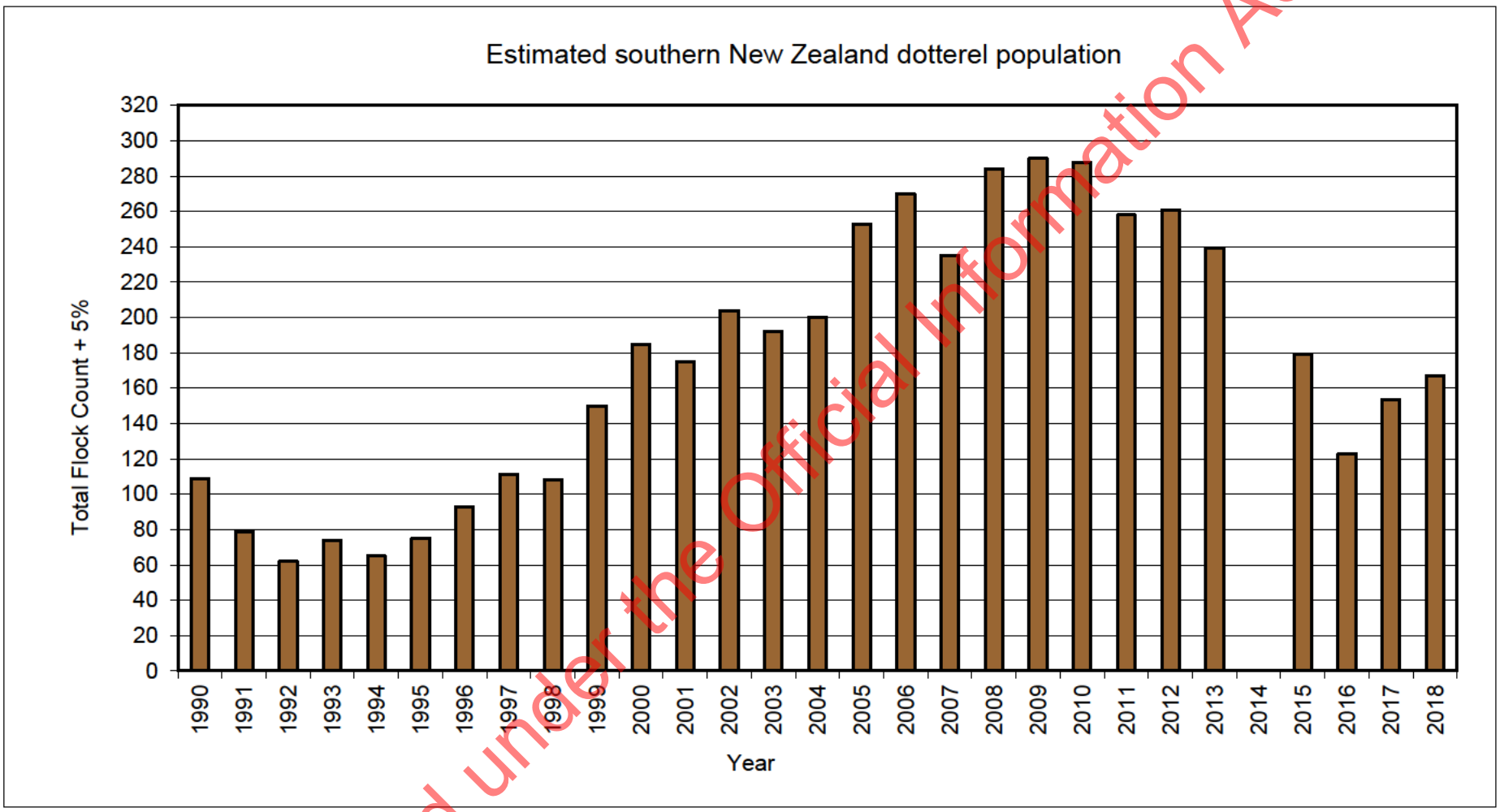


Figure 1. Annual flock count data representing cumulative counts at multiple standardised flocking locations including; Mason Bay, Awarua Bay, Cook Arm and The Neck. 5% has been added to the total number of birds counted to account for those missed during flock counts. This figure was calculated by comparing flock count data and banded bird resightings through the 1990s and early 2000s.

SEASON PREPARATION

This section of the report now focusses on the 2017/2018 season including field season preparation, breeding season predator control and monitoring, flock counts and banding work.

Operational Planning

Planning began in late July after confirmation of continued funding under the Battle For Our Birds (BFOB) programme was received. The 2016/17 Operational Plan (DOC-2824345) covering predator control and monitoring activities was used as a starting point for planning the 2017/18 field season of work (DOC-3124929).

A notable point of difference between the two plans was the absence of PAPP (PredaStop for cats) in the 17/18 year. Our first experience with the toxin was during the previous 16/17 field season and it was noted that the preparation of baits and need for successfully establishing pre-feeding before laying the toxic baits was very labour intensive. Furthermore, we were unable to unequivocally show successful pre-feeding of feral cats despite extensive camera trap placement on bait stations. It is believed this is because feral cats present on the Tin Range maintain very large territories, constantly roaming over large distances. It was felt that this heavily reduced our ability to train a feral cat onto a particular bait station. Pre-feed baits were taken but we estimate that this was more likely to be rodent interference than uptake by cats. The current bait matrix is a ball of dyed raw mince which we found degraded very quickly in the weather conditions present on the open tops. It was decided that the predator control programme would be more effective overall if field rangers reallocated their time to trapping and deployment of 1080 and brodifacoum.

It should also be noted that Rocky Mountain was not included in the Operational Plan at this stage as birds had not been seen there for the previous two years. It would later be reactively included after nesting birds were found there during a survey targeting unmanaged breeding habitat.

The draft Operational Plan was submitted to 9(2)(g)(ii) (Technical Advisor – Threats) for peer review feedback (DOC-5499222).

The peer review made several recommendations notably including strong advice to initiate proactive ground-set leghold trapping given it is widely recognised as the most effective control tool for feral cats. The previous draft only included ground-set leghold trapping as a reactionary measure should cat sign be detected in the core breeding habitat.

The peer review also strongly advised that the trapping and bait station track network be further expanded to continue the up-scaling of predator control area.

The third major recommendation was to endorse the continued use of brodifacoum to target rats directly and possibly feral cats secondarily.

The feedback was incorporated in the revised 17/18 Operational Plan.

Permissions and consents

The 17/18 Operational Plan relied on receiving permissions as follows:

- DOC/EPA permission to use Vertebrate Toxic Agents (1080 and Brodifacoum)
- Operations Director's exemption to use a second-generation anti-coagulant on the mainland (brodifacoum).
- Public Health permission to use Vertebrate Toxic Agent (1080).

A pesticide application was lodged and included an assessment of environmental effects which included both toxic predator control and trapping (DOC-3135196). This also included PAPP as a precaution to allow reactive use if it was deemed advisable during the field season.

All three permissions were granted:

- Brodifacoum use exemption (DOC-3136192)
- DOC/EPA permission (DOC-3171973)
- Public Health permission (DOC-3165982)

The permissions were issued with a range of performance targets and conditions attached.

Compliance with these standards, the Animal Pest Operational Planning SOP and the Safe Handling of Pesticides SOP were recorded in a compliance register (DOC-3135153).

Consultation

Treaty Partner and stakeholder consultation was undertaken according to the Animal Pest Operational Planning SOP. The Operations Manager decided that Consultation on Effects was the most appropriate given that there were no effective or feasible alternatives to the then current proposed Operational Plan (DOC-3135342).

A Key Facts Sheet (DOC-3137484) was developed and circulated to the local community, agencies, Treaty Partners and stakeholders. This was accompanied with e-mails, phone calls and face to face visits in various cases.

Almost no feedback was received, which was consistent with our experience over previous years. It is believed that given that the operation has been annual since 1994 in various forms, much feedback has already been provided and stakeholders view the programme as business as usual.

However, during this consultation period we did receive feedback regarding the inclusion of white-tailed deer as a target predator species. The respondent believed that there was no evidence to suggest that white-tailed deer were predators of eggs. When invited to review the local evidence and published international literature from the native range of white-tailed deer they declined. No further feedback was received and so the revised 17/18 Operational Plan was finalised.

Public notification was initiated nearer to the operation start date with a new Key Facts Sheet (DOC-3166844) being circulated, posters placed on public notice boards and an advert in the Southland Times (DOC-3166035).

Ranger recruitment

The 17/18 BFOB funding allocation enabled us to recruit 4 new temporary rangers for approximately 6 months. The additional personnel resource was required to deliver the increased work programme and would continue to be supported by a core of permanent staff traditionally responsible for the oversight, strategy, management and delivery of the SNZD programme.

The four temporary roles would consist of 3 dedicated field rangers to deliver predator control and monitoring work and a fourth ranger to oversee the field team, assisting in both the field and the office with data management and field logistics.

The roles were advertised in early August ahead of the breeding season and all four positions filled after a single advertising period.

The recruitment workload involved for permanent staff was considerable. The recruitment could only progress after funding was confirmed which meant temporary field rangers began work at the start of the breeding season rather than ahead of it, allowing a pre-breeding season predator knockdown as hoped

This was an artefact of the funding confirmation timeframes and that BFOB was operating on an annual basis. This has since changed with funding being allocated over four-year periods which creates the opportunity for long term temporary contracts. The benefits of this approach will be considerable including reduced recruitment workload and allowing rangers to build experience and skills for future breeding seasons. We will also be able to start predator control work ahead of the estimated breeding season to ensure that nesting birds receive the benefit of proactively reduced predator densities.

PREDATOR CONTROL

Toxin warning signage

Standard warning signs regarding the use of 1080 and Brodifacoum were placed at all identified points of entry into the operational areas, any nearby public huts and ranger bivvies. A register of these signs is maintained through the Pesticide GIS system.

Signs were rechecked during the operation. PAPP signage had been removed as we had chosen to not to proceed with this toxin type in 17/18.

Toxic feral cat control

Toxic predator control began in late September with all then present bait-stations receiving their first treatment of 1080 and brodifacoum.

- 0.1% 1080 fishmeal polymer baits
- 0.02g/kg brodifacoum rodent blocks

This treatment was then re-applied on an approximate fortnightly basis depending on logistics and weather conditions. 11 bait station rounds were completed with all toxin being removed from the field on the 2nd of March 2018. No active nests or pre-fledgling chicks remained at this time.

Detailed application records are available on DOC-2901677 and through PestLink report 1819SI02

The bait station network consisted of 323 points which consisted of either one or two bait stations (Fig 2).

Figure 2. "Stewart Island Bait Station for Cats" shown on the left and 500mm long novacoil tubing used as brodifacoum bait station for rats on the right.

Previous practice had been to place brodifacoum blocks on a wire in the rear of the cat bait station, however, to avoid conferred bait shyness between 1080 and brodifacoum work began in 16/17 to add rodent specific bait stations to each location. This work is on-going.

Figure 3 below shows the extent of the existing and planned bait station network as at the start of the 17/18 field season. Note that this map excludes existing bait stations on Rocky Mountain because this site wasn't included in initial planning (see above section under *Operational Planning*).

Bait station locations have been partially captured in the Pesticide GIS system but work is on-going to capture the remaining bait stations. Future application and maintenance records will be captured in the GIS system once it is up to date, replacing the current Excel database.

Bait take was recorded as the difference between the number of 1080 pellets placed and the number retrieved during a subsequent rebaiting trip. Brodifacoum blocks were replaced when more than 50% of the original block had been consumed or the block quality had degraded. The number of brodifacoum block replacements was recorded to estimate bait take.

It was estimated that 390 grams (260 pellets) of 1080 and between 3.002 and 6.132 kg (219 blocks) of brodifacoum was "taken" during the 17/18 season. The brodifacoum estimate is expressed as a range due to the variability (50 to 100%) of proportions of blocks consumed prior to being replaced with a new block.

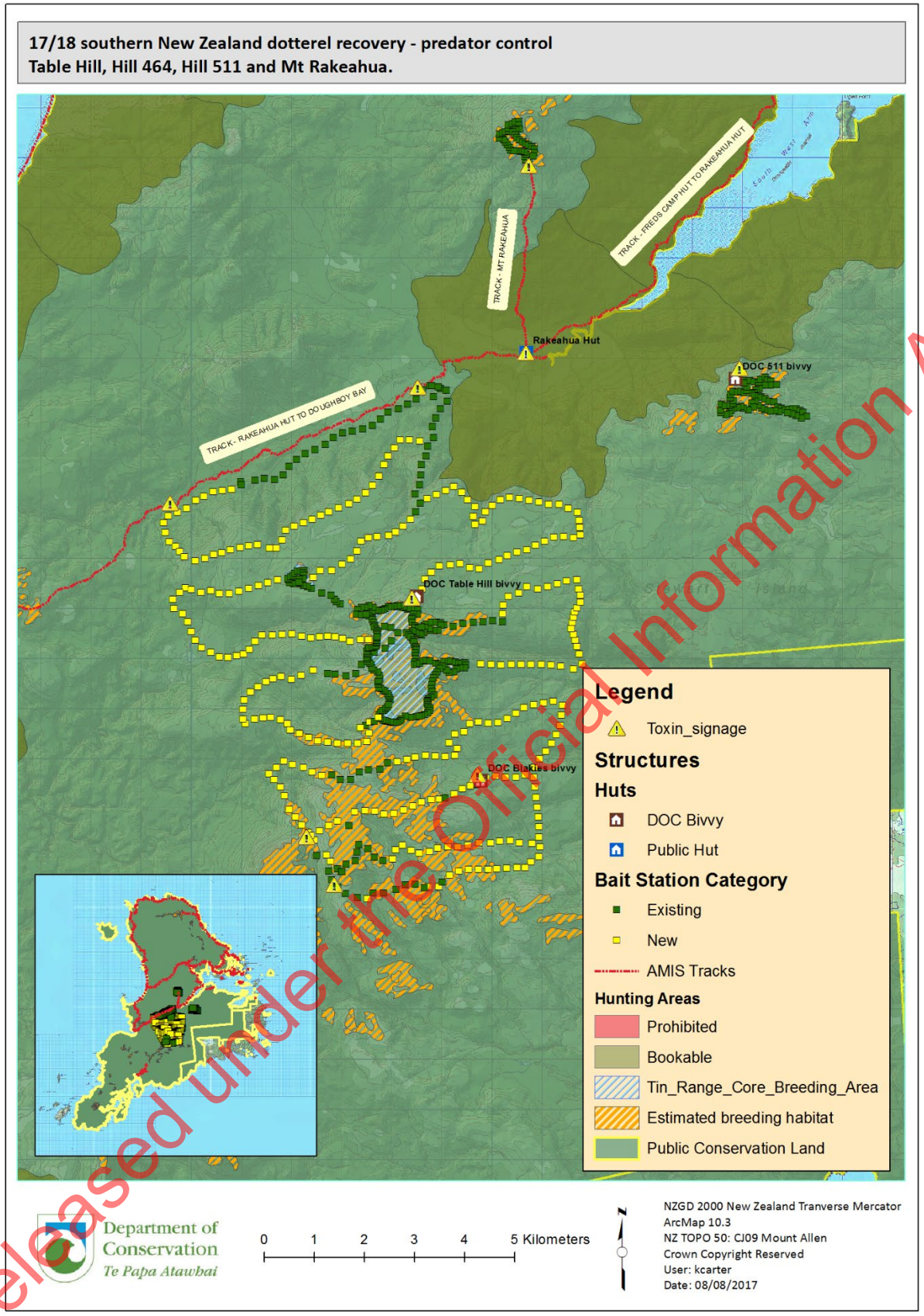


Figure 3. The extent of the planned bait station network for 17/18 at the start of the season. Active bait stations are shown in green squares and future planned bait stations are represented by yellow squares. Future bait stations will be deployed once the necessary track cutting has been completed.

Attempts have been made to assign 1080 bait take to feral cats in an effort to estimate how many cats are likely to have received a lethal dose. This was done by assessing the arrangement of any remaining bait pellets from a previous baiting round. We ceased recording this data in the 17/18 season as we had doubts over the accuracy. It was felt that motion activated cameras focussed on a sample of bait stations may provide more definitive data.

The availability of trail cameras was limited, and decisions needed to be made between placing cameras on active nests, possible predator target trails, traps and bait stations. Priority was given to nest cameras as we felt determining nesting success and relative predation and disturbance interaction rates were crucial data for refining the predator control methodology.

As such, of the limited camera trap nights dedicated to bait station interactions, we found a very low overall frequency of feral cat interactions. Generally speaking feral cats were as likely to walk past a bait station as they were to investigate one. Of those that did investigate bait stations only a small proportion were seen to eat 1080 bait pellets. This was later found to be consistent with fishmeal polymer bait palatability trials on Auckland Island.

Kill trapping

75 raised modified Timms traps on 700mm high platforms with a running board were spread around the traditional core breeding area including "home paddock" and the Table Hill summit (Figure 4). Traps were baited with either fresh possum or dried Erayz (rabbit and fat mixture).

Traps were active for approximately 150 nights across the season equating to 11,250 Timms trap nights.

No target species were caught using a raised Timms trap during the season. It was noted that bait was frequently removed from traps and trail camera footage indicated this was predominantly due to rodent interference.

The field season debrief also highlighted that the frequent high winds were blowing traps off the platforms and that the setting cord would often get caught on the platform when triggered, potentially preventing the full movement of the kill bar.

Establishing these trap set ups was labour intensive with hardware needing to be walked out over several kilometres in some cases. Once in place the Timms were relatively easily serviced as these traps were placed along existing bait station lines but the overall investment to result ratio was believed to be unsatisfactory.

It should be noted that the decision to install the raised Timms traps was made to quickly introduce a kill trapping control method for feral cats to diversify the number of options for targeting feral cats. This was considered of key importance given the concerns over possible bait station and/or 1080 shy cats following 23 years of consistent effort using toxic pellets. Timms traps were the only feral cat kill trap that we could source in New Zealand which also met NAWAC welfare standards and DOC best practice.

Figure 4. 700mm raised Timms trap on platform with a 1.5m running board.

Live capture trapping

Following the peer review advice received we sought further feedback from the Kiwi Recovery Group given the increased risk of non-target capture, in particular with regard to the ground-setting of leg hold traps.

A combination of four Have-a-hart XL cage and 55 leghold traps were used (plus an additional 14 700mm raised leg hold traps with the primary aim of sourcing possums to use as bait meat). Leghold traps were set either in pairs on 700mm raised flat top barrel platforms (Figure 5), in threes inside a chimney trap box (Figure 6) or on the ground using hazing to reduce non-target exposure (Figure 7).

Cage trapping

The four cage traps were set while rangers were present in the operational area allowing for daily trap rechecking as per DOC Best Practice. These were run over 40 nights resulting in 160 cage trap nights through the breeding season. Traps were baited with a variety of commercial pet cat food or possum meat. Trail cameras were placed on cage traps but very little cat interaction was noted (see trail camera section below regarding quantitative data analysis). No cats were caught during the breeding season using this method.

Figure 5. 700mm raised flat top barrel surface with two camouflaged leg hold traps.

Figure 6. Triple set leg-hold traps in chimney box, inset shows disguised trap.

Figure 7. Ground-set leghold trap placement in progress. Hazing work to exclude non-target species followed what is pictured here.

Baits used

Various types of bait were trialled across the different trap set types including cat-nip extract, cat food, possum, Erayz (rabbit and fat), cat scat and used cat litter material (from domestic pet cat owners in Oban).

No definitive determinations were made regarding the relative efficacy of the different bait types. More interaction and capture data is required to gain confidence in determining a preferred lure combination.

Interest was expressed in trialling the use of audio and visual lures in addition to traditional scent-based lures. This is based on the understanding that feral cats are predominantly visual oriented predators. The open and relatively flat terrain of the dotterel breeding habitat lends itself well to visual lures.

Leghold trapping

Leghold trapping was done using Victor 1.5 soft-catch sets in the following ratios:

- 10 x 3 set chimney traps
- 9 x 2 set raised barrel traps
- 7 x ground-set leg hold traps

Leghold trap set type	Trap set replicates	Traps per replicate	Total number of legholds	Nights run	Total trap nights	Cat captures	Non-target captures
Chimney box sets	10	3	30	26	780	0	0
700mm raised barrel sets	9	2	18	26	468	0	0
Ground-set legholds	7	1	7	17	119	0	0

Table 1. A breakdown of the Victor 1.5 soft-catch use and results during the 2017/18 breeding season.

The primary focus on leghold trapping was on using raised barrel sets and chimney box sets during the majority of the breeding season. The proactive use of ground-set traps was initially deferred pending an assessment of the efficacy of the barrel and chimney set traps. A decision was made in mid-January to initiate ground-set trapping following the apparent lack of success using barrel and chimney sets.

Trail camera footage indicated that there was some cat interest in these devices but this was only noted when traps were closed and rangers weren't present on the tops. The team later speculated that human scent around recently set traps may act as a deterrent. A season debrief also highlighted the value of using cameras to determine trap and bait efficacy. Trail camera footage also revealed kiwi forcing their way through hazing surrounding inactive ground-set traps which was noted with concern.

Chimney sets were noted to have issues in that they acted as wind-tunnels which occasionally led to the dislodging of wire baffles over the two ends. Chimney boxes also needed to be staked down and/or slightly dug into the substrate to prevent them from being blown over in the strong winds.

Barrel sets were initially proposed by 9(2)(g)(ii) [redacted], Technical Advisor to the programme, based on Australian cat control trials. The field team speculated on the likelihood of a cat to jump 700mm and considered the placement of rocks near the base to facilitate ease of access to the barrel top. It was noted from trail camera footage that non-target birds occasionally landed on trigger plates but were not heavy enough to activate them.

Further data is required to refine live capture trapping methodology, including bait, lures and trap set types, given the low rate of cat interactions with devices.

Figure 8. A relatively infrequently captured cat interaction with barrel set leghold traps. This cat failed to jump onto the barrel surface, rather choosing to stand on its hind legs with fore paws resting on the barrel top rim.

Targeted hunting

Ground-based hunting was the primary control method for the remaining identified target predator species, specifically white-tailed deer, spur-winged plover and Australasian harriers.

Hunting was either opportunistic where rangers were completing other tasks or proactive where rangers entered the operational area with the specific purpose of shooting target species. As such determining hunting effort is confounded by the opportunistic control work.

A total of four white-tailed deer and three spur-winged plover were shot over the course of the breeding season.

Hunting results					
White-tailed deer seen	White-tailed deer shot	Spur winged plover seen	Spur winged plover shot	Australasian harrier seen	Australasian harrier shot
11	4	20	3	3	0

Table 2. A breakdown of hunting results relative to number of instances targets were spotted. Numbers seen do not reflect number of individuals as the same animal may have been spotted multiple times.

It was noted that spur-winged plover became more cautious around humans after several birds were shot. This is not unexpected and reinforces the desirability of shooting both birds in the pair if possible, though the difficulty of doing so is acknowledged.

White-tailed deer prevalence was seen to increase from late November/early December and it has been suggested that this may coincide with the flowering period for alpine plants on the Tin Range given the apparent palatability of this food source.

Many of the observations were made when rangers did not have immediate access to a firearm.

MONITORING

The second major component of the Recovery Programme focusses on monitoring to determine a range of information which helps us track the recovery of the population and inform future management strategies.

Nesting effort

Southern NZ Dotterel nests are relatively cryptic in the alpine turf vegetation. Incubating birds can hunker down, especially in windy conditions, and become difficult to spot. Detection of nests are often made through observing the paired, non-incubating bird's behaviour which can help to narrow down the nest location. The most successful nest searching strategy so far has been to complete systematic grid searching with line spacing determined by visibility.

Grid searching in this way takes time and represents a considerable investment of a field ranger's availability. As such an inherent trade-off between resourcing nest searching and predator control exists during the dotterel breeding season. The team generally base decisions on the weather forecast as this has the most influence on the effectiveness of various tasks in the alpine zone.

Nest search effort is considerably higher in managed habitat where logistics are already catered for and rangers are already on site. The team is also able to complete a nesting survey in more remote unmanaged habitat but this is restricted to one day per season given the need for helicopter access which carries a high cost.

A total of 19 nests (DOC-2641608) were located through the season in the following locations:

- Table Hill – 13
- Mount Rakeahua – 1
- Rocky Mountain – 2
- Hill 511 – 1
- Blaikies Hill – 1
- * Mount Anglem – 1

* Note that Mount Anglem is a currently unmanaged site.

Once a nest is found, rangers will decide whether it is appropriate to place a trail camera nearby based on an assessment of any disturbance created by the camera place by judging the bird's behaviour. If a camera is not able to be placed on a nest, repeat visits are scheduled to try and ensure that a confirmed nest fate can be recorded. Only 3 of the nests this season were monitored using trail cameras due to concerns over the disturbance to nesting birds.

Assigning nest fates has been relatively subjective given the lack of complete data captured on nests. The repeat visitation method is unreliable given that it is generally unknown how old a nest is when found. Rangers often return to a previously monitored nest only to find ambiguous remains and possible associated chick presence.

Egg candling or similar methods of egg aging have been considered to determine nest age and ensure revisits are scheduled for estimated hatching periods, however, concerns over disturbance of incubating birds has prevented this from being implemented. It is generally felt that the possible benefit to monitoring data quality is insufficient to justify experimenting with that level of disturbance to nesting birds, especially given the imminent risk of extinction to the small population.

Accordingly, the below nest fates are our best estimates only and we have been deliberately cautious around making assumptions. This has resulted in a high number of "unknown" fates being assigned but we believe this is the most representative categorisation for the amount of data available.

17/18 nesting success						
	Suspected hatch	Confirmed hatch	Nest abandoned	Predation	Unknown	Non-viable (F/F pair)
Number of nests	4	5	1	0	8	1

Table 3. A breakdown of the size of the data set generated by approximately 20 trail cameras through the 2017/18 breeding season.

One nest produced an unexpected outcome when an egg in a 5-egg clutch successfully hatched. Clutch sizes of more than 3 eggs have been assumed to be laid by a female-female pair and the eggs have been considered non-viable as it unlikely that they have been fertilised and/or that they will be incubated at night, which was previously found to be the role of males.

This event has forced us to reconsider our approach to monitoring 4 or 5 egg clutches and they are now monitored in the same way as other nests.

Chick sightings

12 chicks were recorded but it is important to note that chicks can cover large distances in a short amount of time. Banded pre-fledglings in 2015/16 were recorded on two consecutive days at two locations approximately 500m apart. Furthermore, chicks are extremely cryptic when hiding. Adult birds appear to raise alarm calls more readily with increasing exposure to human presence and so it becomes increasingly difficult to encounter chicks as a breeding season progresses as chicks "go to ground" and hide amongst vegetation. With these confounding factors we believe that reported chick sightings are an unreliable estimate of the actual number of chicks present in breeding habitat.

Bird banding

A total of 12 birds were banded in the first half of 2018 using a "Yellow-Metal" band combination on the left leg to denote the banding year (DOC-2641608). The main method used was ground-set noose mats placed near dotterel flocks at Awarua Bay. To date this has been the most successful method, considerably out-performing other methods trialled in earlier seasons such as spotlighting and hand-net capture.

We were hopeful that a large cannon netting operation at Awarua Bay would prove feasible in order to source the required genetic and disease screen sample sizes, as well as band a significant portion of the remaining unbanded population. At attempt was made in July-2017, led by national experts, 9(2)(g)(ii) from the Ornithological Society of New Zealand and supported by Department of Conservation rangers and volunteers. This was ultimately unsuccessful due mostly to the speed at which the incoming tide covers the mudflats, impact of an unanticipated low pressure weather system and the unpredictable location of the dotterel flock. A protocol for cannon netting at Awarua Bay was developed following the attempt (DOC-3171943).

Banding work was completed by 9(2)(g)(ii), a Level 3 bander with a wader certification and the assistance of a range of temporary rangers and volunteers. We were able to facilitate the involvement of the temporary staff who delivered much of the predator control and monitoring work during the breeding season.

Birds caught were banded with a unique metal D-sized band and yellow plastic wrap-around band on the left leg and two-coloured plastic wrap-around bands on the right leg. Plastic bands are sealed using a solvent called Tetrahydrafuran (THF) which is injected between the coils.

Faecal and feather samples were retrieved as well as photos, bill length, head and bill length, tarsus length and weight. A coarse condition assessment was made as well as search for external parasites.

Date	Band #	Left leg	Right leg	Faecal sample	Feather sample	Photos	Bill (mm)	Head & bill (mm)	Tarsus (mm)	Weight (g)	Comments
29/5/18	D-204973	YM	GY	N	Y	Y	28.4	65.4	37.5	155	Good condition, no external parasites found
30/5/18	D-204974	YM	OW	Y	Y	Y	28.2	66.4	39.7	173	Good condition, no external parasites found
30/5/18	D-204975	YM	RO	N	Y	Y	27.6	62.5	38.6	160	Good condition, no external parasites found
30/5/18	D-204976	YM	GR	N	Y	Y	29.2	65.5	39.4	160	Good condition, no external parasites found
30/5/18	D-204977	YM	RB	N	Y	Y	28.2	63.5	37.8	177	Good condition/fat, no external parasites found
31/5/18	D-204978	YM	WB	N	N	Y	29.1	66	41.3	159	Good condition, no external parasites found
31/5/18	D-204979	YM	GW	N	Y	Y	28	65.4	41.4	187	Good condition, no external parasites found
31/5/18	D-204980	YM	RY	Y	Y	Y	28	65.2	41	180	Good condition, no external parasites found. Unable to find a pin feather on breast
31/5/18	D-204981	YM	BY	N	Y	Y	26.4	64	41.7	164	Good condition, no external parasites found
1/6/18	D-204982	YM	BO	N	Y	Y	28	64.9	40.6	174	Good condition, no external parasites found

Table 4. Banding records from 2018 at Awarua Bay.

In general birds were found to be in good overall health which is consistent with disease screening results in previous years. One remarkable bird survived an open compound fracture in one leg. It was later observed with a healed over, albeit out of shape, leg.

The addition of these 12 banded birds took the total banded count between 2012 and mid 2018 to 84, assuming zero mortality, representing 54% of the estimated population.

Resighting/band recoveries

201 resighting records were logged in the 2017/18 breeding and flocking seasons. These data represented 51 unique individuals ranging in capture/banding dates from 4th of March 2013 to 1st of June 2018.

A resighting of an apparent Metal/Orange combination was made at Awarua Bay which is consistent with a 1992 banding record on Mount Allen. While it is remotely conceivable that this is an accurate resighting of that particular bird, we remain dubious given the 25 year gap and speculate that it's perhaps more likely to be a 2016 banding event using a Metal/Yellow, Orange combination where the yellow band may have fallen off or been obscured during the resighting.

Trail camera data

Field camera data storage and analysis practices were poor in the 17/18 season and so it has been difficult to derive quantitative data. A backlog of data needs to be re-analysed to attempt to determine camera trap nights so that interaction rates can be quantified in terms of a relative index. The best information we have are anecdotal reports from field rangers reviewing camera footage and storing footage of interactions.

We have not yet been able to secure the capacity resourcing required to run a data grooming and analysis on archived data. Funding levels only allow for six-month contracts which are enough to cover training, field logistical set up, predator control and nesting monitoring through the breeding season and field logistical wrap up. Data management and analysis, especially archived data from previous seasons has always been difficult to prioritise over the immediate needs of the then current breeding season. The trail camera workload is considerable as shown in Table 5.

2017/18 trail camera data load	
Disk storage	98.3 GB
Files	15,959

Table 5. A breakdown of the size of the data set generated by approximately 20 trail cameras through the 2017/18 breeding season.

Trialling various models of trail cameras continued over the 17/18 season and the Browning Black Ops (no glow) and Bushnell Trophy options were considered the best investment. While Little Acorns had a low cost-point they weren't well suited to the weather conditions, had a lower image quality and slower trigger speed. They also emitted a visible light when recording which raised concerns over interfering with target behaviour and possibly drawing predators into nest locations.

Flock count

The annual flock count was undertaken at the following standard locations:

- Mason Bay – The Great Stonefield
- Awarua Bay – Bandy Point, Cow Island, Bridge peninsula
- Freshwater river mouth – northern and southern banks from North Arm to Fred's Camp
- The Old Sand Neck
- Port Pegasus – Cook Arm

Doughboy Bay was included as a non-standard site as we had received reports of dotterel as this location.

The counts were taken over 3 consecutive days between the 16th and 18th of April 2018 with the following results:

Flocking/feeding site	Best reliable count (highest quasi-mode)
Mason Bay/Freshwater River mouth	64
Awarua Bay	72
The Old Sand Neck	0
Port Pegasus	21
Doughboy	2
Total	159

Table 6. A breakdown of the 2018 flock count data by location.

Standard practice has been to increase the raw flock count total by 5% to account for birds absent from these flock sites. The 5% figure was calculated using band resighting rates during the 1990s and so has become standardised for consistency with the remainder of the 29-year data set. This gave us our 2018 population estimate of approximately 167 birds.

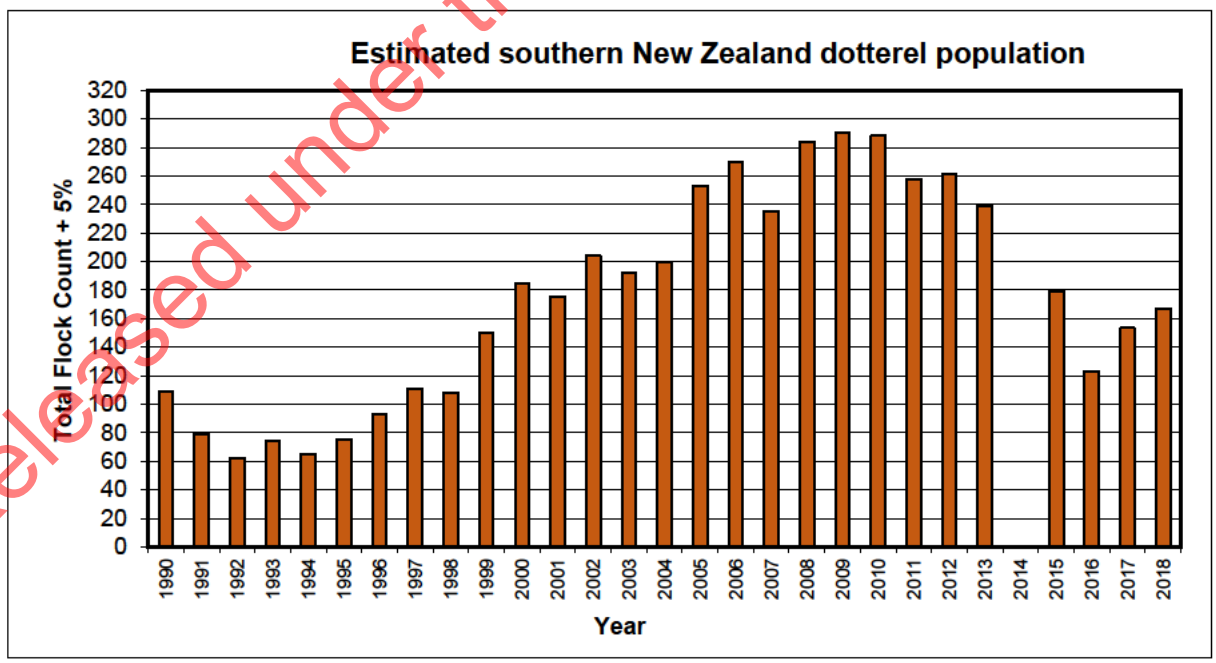


Figure 9. Annual flock count data from 1990 to 2018 which provides us our best estimate of the size of the population.

Counts for the Mason Bay/Freshwater were taken from the Freshwater mudflats due to concerns about unreliability of the data from Mason Bay due to bad weather conditions limiting visibility.

It was noted that the Awarua Bay counts were also considerably affected by poor weather conditions, so much so that a May count completed by 9(2)(g)(ii) doing banding work was used for the final count.

The count for Cook Arm was taken during the New Zealand sea lion pup tagging trip in March due to the logistical difficulties in accessing this site. Doing the count in March allows us to take advantage of the Southern Winds travelling to the site which provides accommodation and a second skipper required in that maritime zone.

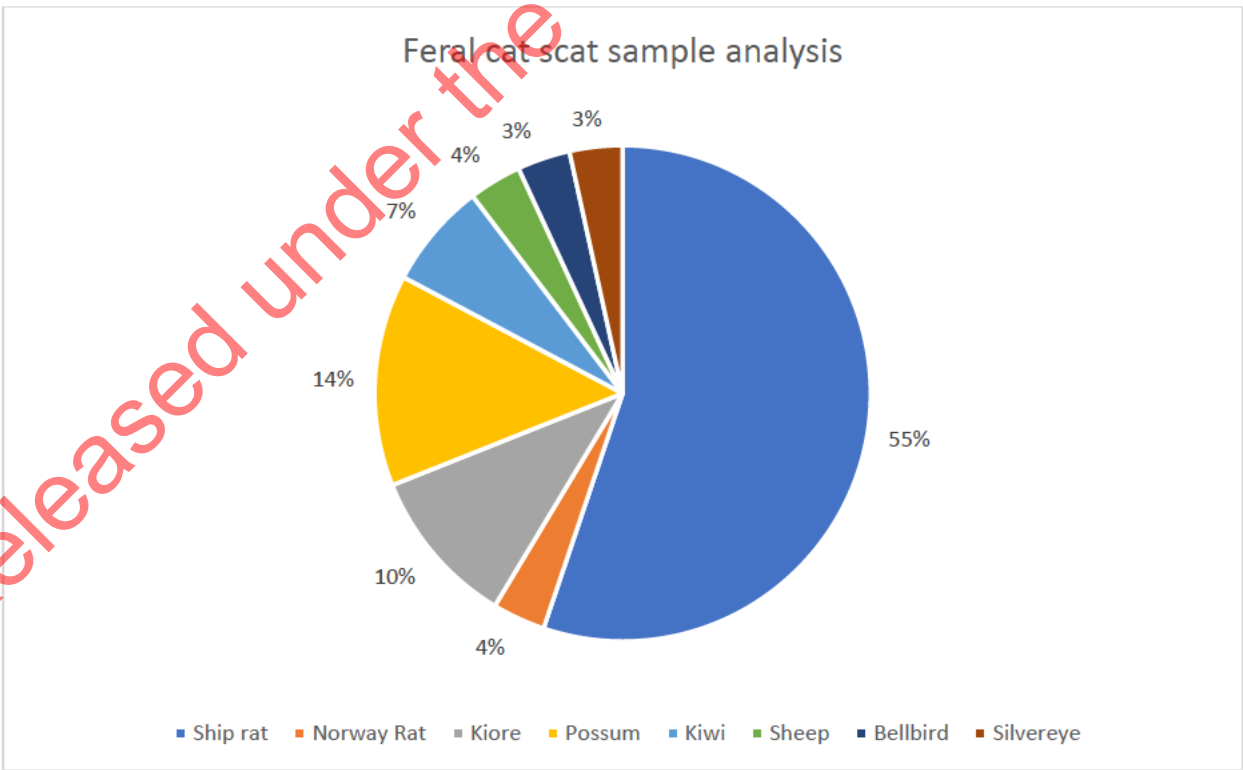
Feral cat genetic profiling and diet analysis

Feral cat scats were collected with the primary aims of estimating the number of individuals active in management areas and to analyse diet.

Field rangers recorded encountering a total of 43 feral cat scats over the course of the breeding season, however 53 samples were sent to EcoGene for analysis which suggests data entry failure.

Analysis occurred in three stages and it was estimated that 24 individual cats were represented.

The samples found a 60:40 female to male ratio. In some cases multiple samples from spatially and temporally dispersed collection points were assigned to the same individual, effectively giving us a retrospective resighting record and some idea of range within the breeding habitat. Age of the samples was not able to be identified and so this limited the value of analysing this aspect of the genetics project.



REPORTING

Data management

We made on-going use of the SNZD Recovery Programme homepage system on DOCDM-1117452 to create a categorised link library and ensure documents stored on the DOC CM system were easily retrievable.

Programme specific data for the 2017/18 season was split into two main Excel databases, one for predator control records, including toxin application (DOC-2901677) and the other for bird banding, nesting and resighting data (DOC-2641608).

GIS data was stored on the newly created Q:\ national network drive as follows: Q:\GIS_Users\Rakiura\Projects\Biodiversity Programme\Species Management\SNZD Recovery Project\Annual Operations\2017-18

We initially aimed to run our pesticide application data through the Pesticide GIS App, however, this proved impossible due to technical errors arising from the 3 year caution period attached to brodifacoum use. Bait stations can only be re-assigned to a new treatment block after the previous treatment block has been retired, however, given the 3 year caution period, we were

unable to remove the brodifacoum warning signs and so therefore unable to retire the treatment block which meant we could not enter data from the 2017/18 season using the existing bait station network. As a fall-back measure we elected to store this data in the pest records database.

The Rakiura shared drive folder was also used as a working file. Rangers on the project had a tendency to use this system rather than DOC CM due to its comparative convenience and ability to create a folder-based filing system. Follow up work occurred to migrate relevant documentation onto the DOC CM system and link files on the homepage. The shared drive folder used was as follows: \\stwfcsvr1\groups$\Biodiversity\Assets\Dotterels\2017-18.

PestLink reporting

A PestLink report was entered on 20 August 2018. It should be noted that poor field data management practices reduced the level of detail and precision of some elements of the PestLink report. This remains unverified by the Operations Manager at time of writing.

Community & stakeholder comms

Regular updates were provided in the Stewart Island News throughout the breeding season. Further results were published after the annual flock count and following bird banding work.

Reports were provided through the breeding and flocking season to the Southland Conservation Board and Kaitiaki Rōpu ki Murihiku.

Media publications

There was some interest from the Otago Daily Times and Southland Express to run articles on the programme but local staff did not have capacity to resource these requests.

Presentations

A presentation was offered the Ornithological Society of New Zealand's annual conference held

SEASON DEBRIEF AND RECOMMENDATIONS

Debrief notes

Detailed debrief notes are available on DOC-5734890.

Recommendations

The below recommendations are categorised in terms of season chronology.

Pre-season prep

- Secure Controlled Substance Licences for staff as early as possible

- Include apparently dormant/inactive breeding sites in permissions as they may become active during the breeding season
- Phase temporary staff start dates earlier in the season prior to breeding start to allow staff time to get set up and achieve pre-breeding season reduction in target pest species
- Ensure trail camera placement and operation are covered in detail during induction of new staff
- Resource additional trapping at lower altitudes on access track lines to increase the size of the buffer control effect
- Complete track infrastructure work prior to breeding season, if possible, to reduce disturbance effects
- Investigate alternatives to predator control for *in situ* population management such as captive breeding viability and predator proof fences around breeding habitat
- Ring-fence capacity for predator control work to protect it from competing priorities that invariably arise during a field season
- Proactively plan contingencies for unexpected staff turnover

Breeding season

- The use of trail cameras on traps has been valuable in helping determine interaction rates and non-capture events
- Brodifacoum bait stations (65mm nova-coil tubing) need to be upgraded to smooth tubing as the corrugations are retaining water, degrading bait and are difficult to clean well
- Consider better placement of raised Timms traps as the wooden platforms appear ineffective
- Rotate field staff between sites with 2 on the Tin Range and an additional person every second week to complete Satellite Hills (Hill 511, Mount Rakeahua, Rakeahua River Loop)
- Set up traps on 511 access track
- Establish a new/better field bivvy at Hill511 as the current one is not fit for purpose
- Increase trapping effort and install more bait stations at Blaikies Hill
- Develop a step-by-step instructional sheet for setting and maintaining ground-set leg hold traps to assist staff with prior ground-setting experience
- Build cross-team collaboration with other predator control programmes (eg: Macraes Flat)
- Target ground-set trapping to longer field trips to reduce interference from human scent on traps soon after handling
- Consider staggering 10-day trips amongst team to allow for continuous trapping effort, avoiding break periods between field trips for the whole team
- Consider running field freezer throughout season to allow stockpiling of possums for bait
- Ensure good record keeping is maintained for possum leg holds as these could be easily forgotten amongst all the other predator control tasks
- Consider camouflaging live capture cage traps to mitigate neophobia
- Consider covering the baited end of a live capture cage trap to increase bait longevity
- Chimney boxes can act as wind tunnels which removes hazing from leg-hold traps, try to orient trap ends 90 degrees to the prevailing wind
- Chimney boxes need to be weighed down to keep them stable
- Chimney boxes could be partially dug-in/benched into the surrounding ground to reduce the effect of wind on stability

- Raised leg-holds on up-turned barrels are susceptible to hazing loss through exposure to high winds and rain.

ACKNOWLEDGEMENTS

APPENDICES