An inventory of stoat trapping operations in 2001/02 and an assessment of the data collection methods

DOC SCIENCE INTERNAL SERIES 177

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Published by
Department of Conservation
PO Box 10-420
Wellington, New Zealand

DOC Science Internal Series is a published record of scientific research carried out, or advice given, by Department of Conservation staff or external contractors funded by DOC. It comprises reports and short communications that are peer-reviewed.

Individual contributions to the series are first released on the departmental website in pdf form. Hardcopy is printed, bound, and distributed at regular intervals. Titles are also listed in the DOC Science Publishing catalogue on the website, refer http://www.doc.govt.nz under Publications, then Science and Research.

ISSN 1175–6519

ISBN 0–478–22577–6

In the interest of forest conservation, DOC Science Publishing supports paperless electronic publishing. When printing, recycled paper is used wherever possible.

This report was prepared for publication by DOC Science Publishing, Science & Research Unit; editing and layout by Lynette Clelland. Publication was approved by the Manager, Science & Research Unit, Science Technology and Information Services, Department of Conservation, Wellington, New Zealand.

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ABSTRACT

Reducing the threat that stoats *Mustela erminea* pose to New Zealand's indigenous fauna would be helped by cost-effective tools for measuring control efficiency. Trapping is currently one of the main tools used for controlling stoat populations. The main objectives of this research were to compile an inventory of stoat trapping operations; identify ways of improving data collection and storage; and to establish which operations have data suitable for exploratory statistical modelling analysis. Of the 51 stoat trapping operations identified from throughout New Zealand in 2001/02, 13 had data with enough detail for an extended analysis. Methods of data collection and storage were variable. Four spreadsheet formats were used, and the quality of their data was measured by assessing whether the resulting data sets met six criteria important for modelling: number of stoats caught per trap, date of each trap check, by-catch species, trap sprung and / or bait gone, bait type and date of bait change. Some spreadsheets recorded only one or two of these criteria. We recommend recording trapping data on printed forms contained within waterproof notebooks; and in addition to the categories above, trapping data must include trap GPS positions. However, bait type and date of bait change need only be recorded if managers see a potential need to investigate the effect of bait freshness on predator capture rates. Data should be stored in a format suitable for both wider analysis and the needs of individual stoat control operations, and we recommend investigating the practicalities of capturing data electronically.

Keywords: Stoats, *Mustela erminea*, data collection, data storage, New Zealand.

Christie, J.E.; Murphy, E.C.; Westbrooke, I. 2004: An inventory of stoat trapping operations in 2001/02 and an assessment of the data collection methods. *DOC Science Internal Series 177*. Department of Conservation, Wellington. 13 p.

1. Introduction

Stoats *Mustela erminea* are a threat to native fauna across the whole New Zealand landscape. Our ability to secure threatened species populations is directly related to our ability to effectively control predators such as stoats. Trapping is one of the main tools currently used by the Department of Conservation (DOC) to control stoat populations and protect threatened native fauna. In recent years there has been an increase in the number and size of trapping operations. Although some protected species populations have responded positively to stoat control, predation continues to cause population decline for some species in all, or parts of their range (e.g. O'Donnell 1996; McLennan et al. 1996). Our ability to improve stoat capture rate efficiency is directly related to our ability to measure and analyse stoat capture data. However, a lack of standardised data collection restricts our ability to analyse trapping data and thus identify any relationships with stoat capture trends.

The specific research objectives of this report were:

- To compile an inventory of stoat trapping operations underway in 2001/02
- To identify ways of improving data collection and storage
- To establish which operations have data suitable for exploratory statistical analysis

2. Methods

2.1 INVENTORY OF CURRENT TRAPPING OPERATIONS

A list was compiled of all current mainland stoat trapping operations where trap positions have remained constant over time. This was collated from a list compiled in 1999 as part of a Stoat Technical Advisory Group benchmarking process (L. Fechney, DOC, unpubl. data), a detailed inventory of 16 trapping sites (Brown 2003) and by contacting all Conservancy Technical Support Managers, and other relevant staff, to update information. Type of operation (i.e. mainland island, kiwi sanctuary, mohua site etc.), native species protected, number of tunnels, whether traps are double or single set, length of time operating (years), and approximate size of control area (ha), were recorded for each stoat trapping operation.

2.2 DATA COLLECTION AND STORAGE

We assessed how stoat trapping data was recorded in the field, as well as how it was stored in the office.

Data sets from a number of stoat trapping operations were examined to determine the level of trapping detail recorded, spreadsheet layout, and the availability of data for an extended analysis. The quality of trap catch recording spreadsheets was measured by assessing whether six criteria, important for effective modelling analysis, were met. These criteria were:

- Number of stoats caught per trap
- Date of each trap check
- By-catch species
- Trap sprung and / or bait gone
- Bait type
- Date of bait change

The first four criteria show the numbers and types of predators captured in relation to trap checking effort and trap spacing effort. Effort greatly influences the probability of predator capture. Even simple comparisons are likely to be less accurate without a measure of effort. The last two criteria—bait type and date of bait change—address the question of the effect of bait type and freshness on the probability of predator capture.

Data selection criteria for stoat trapping data analysis included whether a trapping operation had more than 250 tunnels, and / or had been operating for more than 5 years, whether they were operated by DOC and, to our knowledge, no other similar analysis was planned or had already been undertaken.

3. Results

3.1 INVENTORY OF TRAPPING OPERATIONS

A total of 51 stoat trapping operations covering an area of approximately 103 200 ha were identified. Both the number of trapping operations and total size of area trapped varied considerably among conservancies. Nearly 75% of the total area trapped was in three Conservancies: Southland, West Coast and Waikato (Table 1).

Most of the stoat trapping operations were relatively small scale, while the large-scale operations had only been operating for a relatively short period of time. Of the total 51 stoat trapping operations studied, 36 (71%) were small scale with less than 250 tunnels, 8 (16%) had between 250 and 500 tunnels, and 7 (14%) had more than 500 tunnels. Thirty-four (67%) of the total 51 stoat trapping programmes had been operating for less than 5 years, 12 (24%) had been operating for between 5 and 10 years, and 4 (8%) had been operating for more than 10 years (Appendix 1).

A total of 19 stoat trapping operations met our data selection criteria. Of the operations that met the criteria, 13 definitely had data suitable for an extended analysis. This total comprised 4 kiwi sanctuaries, 4 mainland islands, 2 mohua sites, 2 Takahe Recovery Programme sites and 1 Kakapo Recovery Programme site (Appendix 1).

3.2 METHODS OF DATA COLLECTION AND STORAGE

Data collected in the field were generally recorded into notebooks. Some operations (e.g. Haast Kiwi Sanctuary, Okarito Kiwi Sanctuary) used waterproof notebooks of printed forms. Field notebooks were generally transcribed into computer spreadsheets back in the office. No workers recorded trapping data in the field using electronic recording devices. The level of detail collected and format for trapping data storage were highly variable. Most data from stoat trapping operations were stored in Microsoft Excel spreadsheets, with some large datasets stored in Microsoft Access databases (e.g. Okarito Kiwi Sanctuary, Moehau Kiwi Sanctuary and Rotoiti Mainland Island).

There were four different types of spreadsheet layout used, and these recorded varying levels of detail (Table 2). The predator trapping record (designed by Craig Gillies, DOC) was the most effective. Other stoat trapping programmes used a similar layout to this, but recorded only one or two of the six criteria. In addition, a few trapping operations only recorded the number of stoats caught per trap line on the date checked, rather than per trap.

4. Discussion

The main objective of predator trapping programmes is to protect threatened native fauna. Improved predator capture rate efficiency would help to maintain a number of threatened native species populations. Our ability to improve stoat capture rate efficiency is directly related to our ability to be able to measure and analyse stoat capture data from trapping operations. Despite the increasing number of stoat trapping operations and, therefore, increasing investment in

TABLE 1. SUMMARY OF THE SIZE AND NUMBER OF CURRENT STOAT TRAPPING OPERATIONS UNDERWAY IN 2001/02 BY CONSERVANCY (PERCENTAGE OF TOTAL IN PARENTHESES).

CONSERVANCY	APPROX. AREA TRAPPED (ha)		TOTAL NO. OF TRAPPING OPERATIONS
Southland	25 500	(25%)	7
West Coast	24 500	(24%)	4
Waikato	23 100	(22%)	4
Canterbury	7 800	(8%)	4
East Coast	7 500	(7%)	5
Otago	6 400	(6%)	7
Auckland	3 600	(3%)	4
Northland	2 900	(3%)	9
Nelson / Marlborough	1 000	(1%)	2
Bay of Plenty	500	(< 1%)	3
Tongariro / Taupo	300	(< 1%)	1
Wellington	100	(< 1%)	1
TOTAL	103 200	(100%)	51

trapping by DOC, methods of data collection and storage are highly variable in style and content. This lack of standardised data collection restricts our ability to use the data for meaningful comparisons such as between sites or over time or to look at relationships with stoat capture trends. Therefore, we recommend that data collection and storage techniques be standardised across all predator control operations.

Data collection and storage should be improved. At the simplest level, data collection could be improved by using printed forms contained within waterproof notebooks, similar to those already used in a number of kiwi sanctuary trapping operations. Printed forms act as prompts, reducing the likelihood of missing data. Additional improvements could be made by capturing data electronically in the field, which would allow data to be downloaded directly into spreadsheets, without the cost and errors of inputting data from raw field sheets. The Department of Conservation is presently carrying out a scoping exercise to establish the most appropriate technology for electronic recording of information in the field (pers. comm. S. Waring, DOC). Limited field trials investigating how efficient electronic data recording devices are for recording ecological data have already been carried out. The results of these trials (recording possum folio-browse data) have supported electronic data recording in the field (pers. comm. M. Maitland, DOC). Although electronic recording may be expensive and unpractical in some field situations, we believe it is still worth investigating for larger predator-trapping operations.

The minimum amount of information recorded should include:

- number of stoats caught per tunnel
- Date of each trap check
- By-catch species
- Trap sprung and / or bait gone
- GPS position of traps

This level of detail provides information on the relationship between trap checking effort and predator capture. Spatial records of trapping effort would allow for computerised modelling analysis. Many trapping operations already record near to this level of information, so improvements should be readily achievable. Bait type and date of bait change could also be recorded, but only if managers see a potential need to investigate the effect of bait freshness on predator capture rates.

TABLE 2. LEVEL OF IMPORTANT DETAIL RECORDED FOR EACH TYPE OF TRAPPING DATA RECORDING SPREADSHEET.

DETAIL TYPE	PREDATOR TRAPPING RECORD	TRAPPING RECORD	2 × 2 TABLE	STOATS PER TRAP LINE
Number of stoats caught per trap	✓	✓	✓	×
Date of each trap check	×	×	✓	✓
By-catch species	✓	✓	×	×
Trap sprung and / or bait gone	✓	×	×	×
Bait type	✓	×	×	×
Date of bait change	×	×	×	×
Total ticks	4	2	2	1

Data should be stored in a format suitable for both the reporting needs of individual stoat control operations and for ease of statistical / modelling analysis. Most predator trapping operations currently store their predator capture data in MS Excel spreadsheets. MS Excel is the only data storage programme widely available to staff on the DOC computer network. Three trapping operations use MS Access database programmes to record trapping data. Although a database is probably more powerful in terms of data manipulation, we believe MS Excel is preferable because its use requires a lower level of computer literacy, set-up is simpler in terms of complexity and time spent, a well designed MS Excel spreadsheet can be easily imported into a database programme for manipulation and analysis, and finally, most DOC staff are already familiar with MS Excel and, therefore, are more likely to use it.

We found that it was hard to access information on what trapping programmes were operating, and the details of these operations. This was because information on trapping operations was generally only held by the field staff carrying out the trapping, and it was not always clear who to approach. Furthermore, information on community trapping operations was even harder to access, mainly because we were uncertain how to find out about them. Therefore, our list is probably an underestimate, as some operations may have been missed. While the DOC Pestlink database will make accessing this information easier in the future for DOC trapping operations, community operations will not be covered. Community-operated stoat trapping operations represent a valuable contribution to stoat control, which will probably increase over time. It would be good to get some centralised list of community-operated trapping operations so everyone can learn from each other.

Four kiwi sanctuaries and four mainland island stoat trapping operations have data in a suitable format with the required level of detail for extended modelling analysis. However, there is some variability in the level of detail recorded and stored between trapping operations, and this may place some limits on the variables used in model development or the degree of inference possible from this type of analysis.

5. Conclusions

- Standardisation of data collection and storage for stoat trapping data is needed.
- Improved MS Excel data collection and storage techniques are required.
- Extended analysis of data should be undertaken for the four mainland islands and four kiwi sanctuaries with appropriate data.

6. Recommendations

- Predator capture data should be recorded on printed forms contained within waterproof note books.

- The practicalities of recording stoat trapping data electronically in the field need to be investigated.
- Trapping data must include number of stoats caught per tunnel, date of each trap check, by-catch species, trap sprung and / or bait gone and trap GPS positions.
- Bait type and date of bait change could also be recorded, but only if managers / scientists specifically want to investigate the effect of bait on stoat capture rates.
- Data should be stored in a format which can be used both for wider analysis and for the needs of individual stoat control operations.
- A centralised list of community-operated trapping operations should be compiled to allow knowledge to be shared more readily.

7. Acknowledgements

This pilot study was funded by the Department of Conservation Science & Research Unit (Science Investigation no. 3629). We would like to thank all the staff involved in stoat trapping operations for their help. We would also like to thank Colin O'Donnell, Craig Gillies, Brenda Greene, Terry Greene and Rod Hay for their helpful comments on the draft manuscript.

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Appendix 1

Summary of Department of Conservation mainland stoat trapping operations in New Zealand as of 30 September 2002. Shaded areas denote sites which potentially meet data selection criteria. Bold text denotes sites with data suitable for analysis (table overleaf). 'Native species protected' names main threatened species and / or species assemblages, when known.

SITE NAME	NATIVE SPECIES PROTECTED	CONSERVANCY	APPROX. NO. OF TUNNELS	TRAPS/ TUNNEL	APPROX. TIME OPERATING (y)	APPROX. SIZE (ha)
Moehau Kiwi Sanctuary	**Kiwi + other forest birds**	**Waikato**	**2 200**	**1**	**2**	**16 500**
Okarito Kiwi Sanctuary	**Kiwi + other forest birds**	**West Coast**	**1 500**	**2**	**2**	**10 000**
Lake Waikaremoana	Kiwi + other forest birds	East Coast	900	1	7	1 500
Northern Te Urewera Mainland Island	**Forest birds**	**East Coast**	**840**	**2**	**6**	**4 500**
Murchison Mountains	**Takahe**	**Southland**	**800**	**2**	**3**	**15 000**
Kuaotunu (Project Kiwi)	Kiwi	Waikato	700	1–2	7	4 100
Haast Kiwi Sanctuary	**Kiwi + other forest birds**	**West Coast**	**615**	**2**	**1**	**12 000**
Whenuakite (Community)	Kiwi	Waikato	500	1–2	2	2 500
Eglinton Valley	**Mohua and other forest birds**	**Southland**	**193**	**2**	**5**	**4 000**
Dart Valley	**Mohua + other forest birds**	**Otago**	**370**	**2**	**3**	**2 600**
Haast Highway	Mohua + other forest birds	Otago	304	1–2	4	500
Rotoiti Nature Reserve Mainland Island	**Forest birds**	**Nelson / Marlborough**	**297**	**1**	**5**	**1 000**
Hurunui (South Branch) Mainland Island	**Forest birds**	**Canterbury**	**272**	**2**	**2**	**6 000**
Boundary Stream Mainland Island	**Forest birds**	**East Coast**	**258**	**1–2**	**6**	**800**
Mimiwhangata / Whananaki	Brown teal	Northland	250	1–2	2	500
Burwood Bush Reserve	**Takahe**	**Southland**	**220**	**2**	**18**	**260**
Hawdon Valley	Mohua + other forest birds	Canterbury	220	2	3	1 500
Oparara	Blue duck	West Coast	220	1–2	0	2 200
Ohope Scenic Reserve	?	Bay of Plenty	219	2	2	500
Karioi Rahui (DOC / Iwi)	Kiwi + other forest birds	Tongariro / Taupo	214	2	1	300
Hunua	Kokako + other forest birds	Auckland	194	1	8	3 600
Landsborough Valley	Mohua + other forest birds	West Coast	186	2	2	300
Trounson Kauri Park Mainland Island	**Kiwi + other forest birds**	**Northland**	**180**	**1–2**	**6**	**500**
Clinton Valley	Blue duck / kiwi + other forest birds	Southland	180	2	2	6 000
Rowallan	Mohua	Southland	169	1	8	250
Whinray Scenic Reserve	Kiwi / weka	East Coast	152	2	3	650
Catlins River	Mohua + other forest birds	Otago	128	2	0	-
Papakanui	Fairy tern + other shore birds	Auckland	110	1–2	4	-
Flea Bay	White-flippered penguin	Canterbury	110	2	1	200
Ruataniwha—Project River Recovery	Black stilt + braided river birds	Canterbury	80	2	6	80
Caples Valley	Mohua + other forest birds	Otago	80	2	1	1 600
Motatau Northland Kiwi Sanctuary (DOC / Iwi)	Kiwi / kukupa + other forest birds	Northland	68	2	2	900
Bream Head Northland Kiwi Sanctuary	Kiwi	Northland	63	1	2	450
Forest Hill Reserve (DOC / Community)	Forest birds	Southland	60	2	0	-
Opoutere	NZ dotterel + other shore birds	Waikato	50	1–2	12	20

Mt Bruce Reserve	Kaka + other forest birds	Wellington	50	1	4	60
Routeburn Valley	Mohua + other forest birds	Otago	50	2	0	1 000
Maud Island Coastline	**Takahe + other threat'd species**	**Nelson / Marlborough**	**46**	**1–2**	**11**	**–**
Turihaua Station	?	East Coast	45	2	3	30
Curio Bay penguin reserve	Yellow-eyed penguin	Southland	44	2	5	5
Marlow Northland Kiwi Sanctuary (DOC/ Iwi)	Kiwi	Northland	31	2	1	327
Tairoa Head	Albatross	Otago	30	1–2	42	6
Omaha Spit (community)	NZ dotterel + other shore birds	Auckland	20	1–2	5	–
Purua Northland Kiwi Sanctuary	Kiwi	Northland	19	2	1	70
Rarewarewa Northland Kiwi Sanctuary	Kiwi	Northland	14	2	1	50
Riponui Northland Kiwi Sanctuary	Kiwi	Northland	12	2	1	44
Hodges Bush Northland Kiwi Sanctuary	Kiwi	Northland	10	2	1	40
Pakiri River (DOC / community)	? Shore birds	Auckland	8	2	4	6
Tuwatawata Ecological Area	?	Bay of Plenty	–	–	–	–
Macraes Flat	Giant skinks	Otago	–	1	4	700
Minginui Village	?	Bay of Plenty	–	–	3	–