Animal pests: snap trap indices of rodent abundance

Version 1.0

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Inventory and monitoring toolbox: animal pests

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Department of Conservation
Te Papa Atawhai

Synopsis

There is an overview of the best practice protocol for DOC staff to follow when using snap traps to measure relative rodent abundance (see 'DOC snap trap guide v1.3'—docdm-292004). The technique uses 'break back' snap traps, set over 3 nights, to catch rats and mice. An index of relative abundance is calculated from the number of animals trapped. The traps are baited with a mixture of peanut butter and rolled oats mixed together. They are set on randomly orientated lines and results are recorded as the number of rats or mice caught per 100 corrected trap nights (Nelson & Clark 1973). The number of trap lines that are needed depends on the size of the study site; between 3 and 20 trap lines are usually required, but consult table 1 in the best practice guide ('DOC snap trap guide v1.3'—docdm-292004) for more details. This technique only provides a coarse index of relative abundance of rodents; it is not a direct measure of population density and can be influenced by variation in activity. The technique is best suited for monitoring the effects of one-off or infrequent poison operations on rodent populations, or for determining what rodent species are present in an area.

Assumptions

- The trap catch index is related to relative abundance.
- The relationship between the index and abundance or density is linear.
- Given standardised survey conditions, a constant fraction of individuals are counted between areas at the same time, between areas over time, or within an area over time.
- The population remains demographically closed (no births, deaths, immigration or emigration) throughout the survey period.
- If snap trap indices are used for long-term monitoring it is also assumed that not enough rodents are killed during each sampling event to impact on the overall population size.
- Staff setting up the snap trapping survey lines have ensured that traps are placed in sites that are representative of the habitat within the study area, and that randomisation rules have been followed when deciding line direction and/or starting points.

Advantages

- Snap trap indices are inexpensive and easy to conduct (compared to tracking tunnels for monitoring the results of 'one-off' pest control operations).
- Their main advantage over tracking tunnels is that each individual is accounted for (because they are killed), therefore they cannot inflate the index by visiting more than one station (e.g. trap or tracking tunnel).
- They may be useful for comparative inference if assumptions about equal detection rates are met.
- They may be sufficient to describe basic biological patterns.
- They can be used to determine which rodent species are present.

- Rodents killed in the traps can be examined to provide additional information on the rodent population (e.g. age structure, reproductive condition or diet).

Disadvantages

- At best the technique only provides a coarse index of relative abundance for rodents (e.g. not detected, low abundance, normal abundance, high abundance).
- The method does not account for variation in the ability of traps to detect animals over time or space (i.e. probability of capture).
- Many factors may affect the probability of capture, and some of these can be controlled for by standardisation of methods and designs (e.g. seasons, species or effort). However, some other factors cannot be controlled (breeding status, density, etc.).
- Great care is required when interpreting trends derived from indices, particularly for small populations.
- Results may be spurious if assumptions are violated.
- The technique can become saturated at high rodent densities.
- The technique kills rodents. In small reserves or areas where rodents are normally present in low abundance this could confound attempts to relate any effects of rodent control operations (e.g. poisoning) to conservation outcomes.
- Snap trapping can kill non-target species (e.g. North Island robin).
- The method is labour intensive, and depending on the size of the area requiring coverage, can be expensive.
- Snap trapping surveys can be affected by heavy rain, so should only be done when a period of fine weather can reasonably be expected.
- A frequent problem is that sites are not surveyed adequately—either because too few trap lines are used, or available habitats are not sampled in a stratified and representative manner.

Suitability for inventory

Provided adequate survey effort is employed (both spatially and temporally) and appropriate lures are used, snap traps are useful to inventory the rodent species present in an area. If it is critical that each rodent species present in an area is identified, then snap traps should be used.

Suitability for monitoring

Snap trap surveys can be used as a management tool for determining the results of rodent control operations using toxins, especially when compared with data collected simultaneously from a suitable non-treatment comparison site. Snap trap surveys can be used to indicate population trends at a site over time at a coarse level, provided that: adequate survey effort (both spatially and temporally) is employed, appropriate lures are used, and the trap lines are set in different locations for each survey.

Skills

Anyone with a reasonable level of physical fitness can run snap trap surveys with minimal training. Workers need to:

- Be able to navigate in the bush
- Be comfortable negotiating difficult terrain
- Be comfortable killing injured rodents (or other small mammals) that may be found alive in the traps

Identifying rodents caught in traps and calculating the trapping index requires a small amount of training. Workers need to:

- Be able to identify the rodent species likely to be caught in the traps. Usually this skill does not take very long to acquire. There are several useful publications that illustrate and describe the four rodent species present in New Zealand (Cunningham & Moors 1996; Aplin et al. 2003; King 2005).
- Have a basic understanding of statistical concepts such as ‘mean’ and ‘standard error of the mean’.
- Be able to operate appropriate computer software (usually Microsoft Excel).

Resources

Resources required for running a snap trap survey include:

- Rodent traps, covers and wire pegs
- Lure—1:1 mixture of peanut butter and rolled oats
- Set of pliers or ‘multi-tool’ to adjust traps
- Map and/or GPS detailing where to locate trap lines
- Compass
- Hip chain
- Flagging tape for marking trap sites
- Indelible ink marker for numbering trap markers
- Pencil and notebook
- Other equipment appropriate for the field conditions

For calculating trapping index:

- Access to a computer or calculator

Minimum attributes

These attributes are critical for the implementation of the method. Other attributes may be optional depending on your objective. For more information refer to ‘Full details of technique and best practice’.

DOC staff must complete a 'Standard inventory and monitoring project plan' (docdm-146272).

Minimum attributes to record:

- Observer name, survey location and dates traps were set
- Overnight weather conditions
- Trap status (e.g. 'still set', 'caught a rodent', 'sprung without catching anything', 'still set but with the bait missing or trap missing entirely')
- Species and sex of any rodents caught, plus any additional morphological information required (e.g. colour, reproductive condition and approximate age class)

Data storage

Forward copies of completed survey sheets to the survey administrator, or enter data into an appropriate spreadsheet as soon as possible. Collate, consolidate and store survey information securely—also as soon as possible, and preferably immediately on return from the field. The key steps here are data entry, storage and maintenance for later analysis, followed by copying and data backup for security.

Summarise the results in a spreadsheet or equivalent. Arrange data as 'column variables', i.e. arrange data from each field on the data sheet (enter date, time, location, plot designation, number seen, identity, etc.) in columns, with each row representing the occasion on which a given survey plot was sampled.

If data storage is designed well at the outset, it will make the job of analysis and interpretation much easier. Before storing data, check for missing information and errors, and ensure metadata are recorded.

Storage tools can be either manual or electronic systems (or both, preferably). They will usually be summary sheets, other physical filing systems, or electronic spreadsheets and databases. Use appropriate file formats such as .xls, .txt, .dbf or specific analysis software formats. Copy and/or backup all data whether electronic, data sheets, metadata or site access descriptions, and preferably offline if the primary storage location is part of a networked system. Store the copy at a separate location for security purposes.

DOC staff at sites with DME access can use a copy of 'DOC snap trap C100TN calculator' (docdm-292725) to store rodent snap trapping data. However, please note that this sheet was primarily designed to calculate the trapping index for a single survey (see 'Analysis, interpretation and reporting') so any morphological data collected on the rodents caught (see 'Minimum attributes') will need to be entered as cell comments in the appropriate cell, or in separate columns created for that purpose.

Analysis, interpretation and reporting

Seek statistical advice from a biometrician or suitably skilled person prior to undertaking any analysis.

Calculating the trapping index

Calculation of the trapping rate and data entry should happen concurrently at base or in the office. The trapping rate is calculated by tallying up the captures per 100 trap-nights (C100TN) on each line, then averaging this figure over all survey lines; to do this, DOC staff at sites with DME access can use a copy of 'DOC snap trap C100TN calculator' (docdm-292725).

Results are best summarised in a spreadsheet (e.g. Microsoft Excel), and the columns in the spreadsheet should include all data recorded as traps were inspected.

Results can be presented in a number of ways:

- The average C100TN of rats or mice per line
- The overall C100TN of rats or mice for the survey
- The proportion of trap lines that detected rats or mice
- Distribution maps plotting rodent detections

Simple statistical comparisons can be made between standardised surveys of rodent abundance at the same site. However, because this technique impacts the target population, the results should be treated with caution if the same trap sites are used for surveys done less than a year apart (i.e. before rodents have had ample opportunity to move back into the areas close to the traps).

Simple statistical comparisons can also be made between standardised surveys of rodent abundance conducted simultaneously at different sites. However, these should be treated with caution—especially if weather conditions at the time of the surveys were different at each site, but also because of any unknown differences in the detection rates of these small mammals in different habitats.

Case study A

Case study A: using snap traps to monitor the effect of poison operations on the abundance of rodents in Trounson Kauri Park

Synopsis

This case study shows that snap trap surveys detected a decline in rodent abundance after a poison operation in Trounson Kauri Park, Northland. Rodent abundance was surveyed before and after the poison operation. Poison baits were put in bait stations set on a 100 × 100 m grid within

the (c. 450 ha) park. The 1080 operation took place in June 1996, and the follow-up brodifacoum operation began in July 1996. For full details of the operation see Gillies et al. (2003).

Objectives

- To measure the effectiveness of 1080 and brodifacoum poison baits at reducing rodent abundance in Trounson Kauri Park, Northland.

Sampling design and methods

- Five randomly placed trap lines were set within Trounson Kauri Park. Each trap line consisted of 20 trap sites (each with one rat and one mouse trap) spaced every 20 m along the line.
- The traps were baited with a 1:1 mixture of peanut butter and rolled oats, and were set for 3 consecutive nights of fine weather.
- Snap trap surveys were run in May 1996, before any poisons were laid. A post-1080 operation snap trapping survey was then run in July 1996, to assess the effects of the poison on rat abundance. Surveys were subsequently conducted to assess the effects of the ongoing brodifacoum operation on rodent abundance in August 1996, October 1996, January 1997, April 1997, November 1997 and June 1998.
- Results were presented as the overall number of captures of rats and mice in each survey (C100TN).

Results

The snap trap surveys revealed that the initial 1080 operation reduced rat abundance to non-detectable levels and mouse abundance to very low levels. The brodifacoum operation suppressed rat abundance to very low or non-detectable levels (Fig. 1), and further reduced the mouse population to non-detectable levels. However, it appears that the abundance of mice managed to increase over time despite the continued presence of brodifacoum baits in the stations.

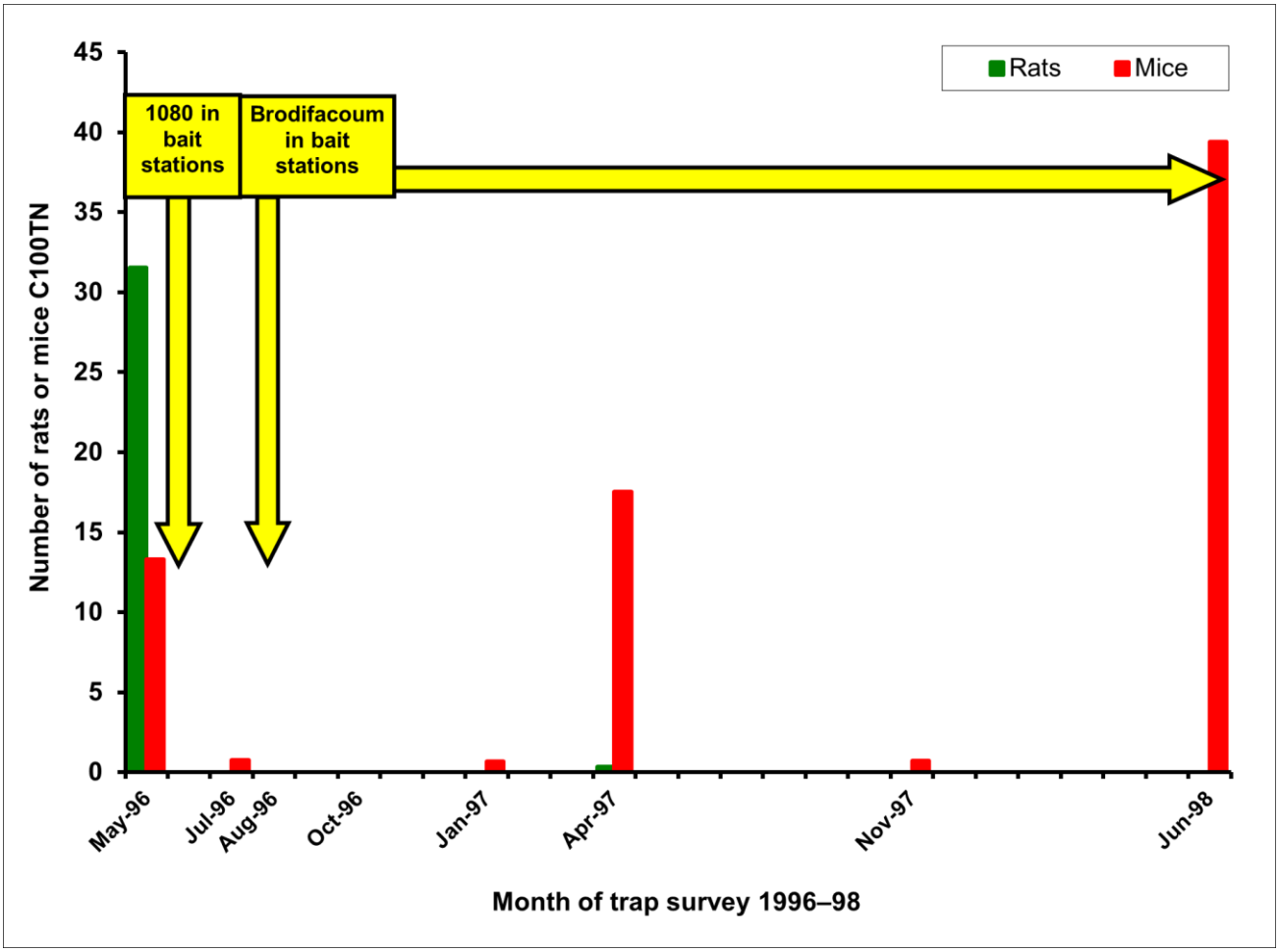

Figure 1. Snap trapping indices of rodent abundance at Trounson Kauri Park through 1080 and brodifacoum poison operations May 1996 to June 1998.

Limitations and points to consider

- These traps were set under natural cover (as opposed to core flute covers). This is not recommended best practice because of the risks to non-target species. This may also have had an effect on the capture rates of rodents.
- For a more comprehensive description of how these data were collected and the context in which they were interpreted see Gillies et al. (2003).

References for case study A

Gillies, C.A.; Leach, M.R.; Coad, N.B.; Theobald, S.W.; Campbell, J.; Herbert, T.; Graham, P.J.; Pierce, R.J. 2003: Six years of intensive pest mammal control at Trounson Kauri Park, a Department of Conservation 'mainland island', June 1996–July 2002. *New Zealand Journal of Zoology 30*: 399–420.

Full details of technique and best practice

There is a draft national standard for using snap traps to monitor rodents: 'DOC snap trap guide v1.3' (docdm-292004). Below is a brief summary of the key points:

- The number of lines that is required depends on the size of the study area. Refer to table 1 in 'DOC snap trap guide v1.3' (docdm-292004).
- Snap traps are set along randomly orientated lines in locations that have been selected to sample a representative range of habitats present in the area of interest.
- Each trap line consists of 20 trap sites spaced 20 m apart along the line.
- Each trap site consists of one rat trap and one mouse trap set under separate covers.
- The traps must be baited with a 1:1 mixture of peanut butter and rolled oats.
- Snap traps surveys are conducted over 3 nights.
- Surveys must only be undertaken when a period of fine weather can reasonably be expected.

References and further reading

Aplin, K.P.; Brown, P.E.; Jacob, J.; Krebs, C.J.; Singleton, G.R. 2003: Field methods for rodent studies in Asia and the Indo-Pacific. Australian Centre for International Agricultural Research, Canberra, Australia. 223 p.

Cunningham, D.M.; Moors, P.J. 1996: Guide to the identification and collection of New Zealand rodents (3rd edition). Department of Conservation, Wellington.

Gillies, C.A. 2008. Using snap traps to index rodent abundance. Version 1.3. Department of Conservation, Hamilton. docdm-292004.

Gillies, C.A.; Leach, M.R.; Coad, N.B.; Theobald, S.W.; Campbell, J.; Herbert, T.; Graham, P.J.; Pierce, R.J. 2003: Six years of intensive pest mammal control at Trounson Kauri Park, a Department of Conservation 'mainland island', June 1996–July 2002. *New Zealand Journal of Zoology 30*: 399–420.

King, C.M. (Editor) 2005: The handbook of New Zealand mammals. Oxford University Press, Melbourne, Australia.

Nelson, L.; Clark, F.W. 1973: Correction for sprung traps in catch/effort calculations of trapping results. *Journal of Mammalogy 54*: 295–298.

Appendix A

The following Department of Conservation documents are referred to in this method:

docdm-292004	DOC snap trap guide v1.3
docdm-292725	DOC snap trap C100TN calculator
docdm-146272	Standard inventory and monitoring project plan