

**Effectiveness of the DOC 150, 200, and 250 traps for killing  
stoats, ferrets, Norway rats, ship rats, and hedgehogs**

Extension to  
INVESTIGATION 3655

Nick Poutu and Bruce Warburton

Landcare Research  
PO Box 69, Lincoln 8152  
New Zealand  
poutun@landcareresearch.co.nz

Landcare Research Contract Report: LC0405/109

PREPARED FOR:  
Chief Scientist  
Department of Conservation  
P.O. Box 10-420  
Wellington

DATE: May 2005



ISO 14001

---

Reviewed by:

Approved for release by:

Grant Morriss  
Scientist  
Landcare Research

Phil Cowan  
Science Manager  
Biosecurity and Pest Management

---

© **Department of Conservation 2005**

This report has been produced by Landcare Research New Zealand Ltd for the New Zealand Department of Conservation. All copyright in this report is the property of the Crown and any unauthorised publication, reproduction, or adaptation of this report is a breach of that copyright and illegal.

# Contents

|    |                              |    |
|----|------------------------------|----|
|    | Abstract.....                | 1  |
| 1. | Introduction.....            | 1  |
| 2. | Background.....              | 1  |
| 3. | Objectives .....             | 2  |
| 4. | Methods .....                | 2  |
|    | 4.1 Trap system set-up ..... | 2  |
|    | 4.2 Test animals.....        | 2  |
|    | 4.3 Procedures .....         | 3  |
| 5. | Results.....                 | 3  |
|    | 5.1 DOC 250 .....            | 3  |
|    | 5.2 DOC 150 .....            | 6  |
|    | 5.3 DOC 200 .....            | 9  |
| 6. | Conclusions.....             | 11 |
| 7. | Recommendations.....         | 11 |
| 8. | Acknowledgements.....        | 12 |
| 9. | References.....              | 12 |

## Abstract

The Animal Welfare Act (1999) enables traps that are considered to cause unacceptable pain or distress to be prohibited. The Department of Conservation has relied heavily on Fenn traps for predator control, but Landcare Research trials showed these traps failed to consistently capture and kill stoats quickly. Reports from trappers also indicate that Fenn traps are not effective at killing ferrets quickly. Landcare Research was commissioned by DOC to test three kill traps, the DOC 200 and DOC 150 for killing stoats, rats, and hedgehogs, and the DOC 250 for stoats, ferrets, Norway rats, ship rats, and hedgehogs. All three traps passed the National Animal Welfare Advisory Committee guidelines for kill trap performance.

### Keywords:

## 1. Introduction

The Department of Conservation (DOC) controls stoats (*Mustela ermina*) and ferrets (*M. furo*) primarily by using Fenn traps. Tests carried out by Landcare Research have shown that Fenn traps do not kill stoats quickly (Landcare Research, unpubl. data), and anecdotal field reports indicate they do not kill ferrets quickly either. Therefore, DOC has sought humane alternatives to Fenn traps, and Landcare Research tested two other kill traps, the Victor professional snapback and the Waddington backcracker, for their effectiveness in killing stoats quickly. However, both of these traps failed to meet the National Animal Welfare Advisory Committee (NAWAC) requirements for effective kill trap performance (Warburton et al. 2002; Poutu & Warburton 2003). Three traps, the DOC 150, DOC 200, and DOC 250, were developed in response to these test results by DOC, in collaboration with Phil Waddington.

The DOC 150 and DOC 200 traps were found to render stoats, Norway rats (*Rattus norvegicus*), and hedgehogs (*Erinaceus europaeus*) irreversibly unconscious within the NAWAC 3-minute threshold. Subsequently DOC developed a larger version of the trap (DOC 250) for capturing ferrets and this trap was also tested successfully in pen trials with ferrets (Poutu & Warburton 2004).

In November 2004 DOC commissioned Landcare Research to further test the DOC 250 to determine if the trap met the NAWAC kill-trap-performance requirements for stoats, Norway rats, ship rats (*Rattus rattus*), and hedgehogs. This report includes results from these latest trials and also from the earlier trials of the DOC 150 and 200 traps for stoats, Norway rats, and hedgehogs and the DOC 250 trap for ferrets.

## 2. Background

To assess the performance of a kill trap, the time to loss of brainstem reflex is measured to determine whether the trap can render the captured animals irreversibly unconscious within 3 minutes. When testing a trap, it is the trap-system (including the trap, any boxes or covers used, and the way the trap is set) that is tested, not the trap per se. The International Organisation for Standardisation (ISO) developed a draft standard for testing traps (Jotham & Phillips 1994; Warburton 1995) and this has now been developed as a NAWAC guideline for testing traps. For kill traps to be acceptable either 10 of 10 or 13 of 15 target animals must be

rendered irreversibly unconscious within 3 minutes of capture. Consciousness is determined by using the palpebral (blinking) reflex, which stops when the animal has lost consciousness (RowSELL et al. 1981).

The DOC 150, 200, and 250 traps have six parallel strike bars, powered by two coil springs. When set, the strike bars are in a vertical position, and when the trap is triggered the strike bars rotate down through 90° to close on and strike the animal across the dorsal surface. The DOC 150 and DOC 200 have treadle plates of 120 × 90 mm and the DOC 250 has a treadle plate of 160 × 140 mm.

### **3. Objectives**

To evaluate the killing performance of the DOC 150, 200, and 250 traps in pen trials to:

- determine how effectively DOC 250 traps capture and kill stoats, ferrets, Norway rats, ship rats, and hedgehogs.
- determine how effectively DOC 150 and DOC 200 traps capture and kill stoats, Norway rats, and hedgehogs.

### **4. Methods**

#### **4.1 Trap system set-up**

The trap system consisted of the trap (DOC 150, 200, or 250) set in a single-ended wooden tunnel with double mesh restrictors at the opening. Holes were cut into the mesh in order to align the target animal with the trap treadle. When used in the field the mesh restrictors prevent large non-target animals (especially ground birds) entering the trap. The back of the tunnel was fully covered with mesh to allow animals to see through or into the tunnel, but not access it from that end. Bait (see below) was placed behind the trap so that the animal had to walk over the trap treadle to reach it. A wide-angle infrared video camera was positioned at the blind (fully mesh covered) end so that each animal's approach into the tunnel and over the trap could be monitored and later evaluated.

#### **4.2 Test animals**

A sample size of ten of each species was selected, which required, under the NAWAC guidelines, all ten of these animals to be rendered unconscious within 3 minutes for the trap to pass the test.

*Stoats:* For the DOC 250 trial and the first seven captures of the DOC 200 trial, stoats were placed in outdoor observation pens. Each pen contained a trap system, baited with an egg and/or a freshly killed rat. For the last three DOC 200 captures and the DOC 150 trial the trap entrance was placed against the nest box opening. This was done to minimise the time taken for animals to enter a trap. Stoats used included both acclimatised wild-caught and captive-bred animals.

*Ferrets:* This trial was conducted in an outdoor observation pen. The trap system was baited with meat, and a ferret was placed in the pen. Ferrets used were both acclimatised wild-caught and captive-bred animals.

*Norway rats:* All three trap types (DOC 150, 200, and 250) were tested with Norway rats. These trials were conducted in an indoor enclosure with two chambers. Individual rats were

placed while in their nest box into one chamber, which had an opening to the second chamber that contained the trap system. Rats used were acclimatised wild-caught Norway rats.

*Ship rats:* The DOC 250 was tested with ship rats. These trials were conducted in an indoor enclosure. The nest box containing an individual rat was placed with its opening against the trap entrance. Ship rats used in the trial were wild-caught over four nights immediately before to testing.

*Hedgehogs:* The DOC 150 and DOC 200 trials were conducted in an indoor enclosure. The DOC 250 trial was conducted in an outdoor enclosure. Individual hedgehogs were placed in the enclosure with a trap system. The bait (cat biscuits) was placed at the back of the tunnel behind the trap and a trail of biscuits was also placed in front of the entrance to lure the animal into the trap. Hedgehogs used were all wild-caught animals.

### **4.3 Procedures**

For all captures the time to loss of palpebral reflex was measured by blowing on and/or touching the corner of the eye. Cessation of the heartbeat was determined using a stethoscope. Captures were monitored and recorded on video and the strike location of the trap on the animal was recorded. Surviving animals were euthanased using an intracardiac injection of 2 mL of pentobarbitone if they were still conscious after 3 minutes.

The work was carried out with approval from the Landcare Research Animal Ethics Committee (AEC 03/01/02).

## **5. Results**

### **5.1 DOC 250**

*Stoats:* The DOC 250 trap rendered all ten stoats tested unconscious within the time it took an observer to enter the pen and monitor the animal (20 s; Table 1). All stoats tested received head strikes that caused significant skull fractures.

*Ferrets:* All ferrets tested with the DOC 250 were unconscious at the time they were first monitored by the observer (10–30 s after capture) having all received head strikes (Table 2).

*Norway rats:* The first Norway rat received a nose-and-foot strike only, and had to be euthanased (Table 3). This strike resulted from the trigger pressure of the sample trap being set incorrectly, with the trap being triggered before the animal had fully stepped onto the trigger plate. The trap was replaced and the trial was restarted. The next ten rats tested were rendered unconscious within 30 seconds. One of these animals received a nose-and-foot strike only, but still died after being rapidly rendered unconscious (<30 s).

*Ship rats:* The first six ship rats tested were killed successfully, but the seventh received a strike on its front foot only and had to be euthanased. The trap system was adjusted by shifting the trap as close as possible to the baffle (mesh at entrance to the trap). This ensured the rats would be far enough onto the plate to receive strikes in vital positions. The trial was restarted and the next ten rats received strikes in vital positions and were rendered unconscious rapidly (<10 s) (Table 4).

*Hedgehogs:* All ten hedgehogs tested received strikes on the head and were rendered unconscious rapidly (<30 s) (Table 5).

**Table 1** Capture performance of DOC 250 trap with stoats. Strike locations refer to trap strike bar impact on up to four locations on the animal, anterior to posterior.

| Weight (g) | Sex    | Strike location       |                          |                   |                    | Loss of palpebral reflex (min:s) | Heart stop (min:s) |
|------------|--------|-----------------------|--------------------------|-------------------|--------------------|----------------------------------|--------------------|
|            |        | 1                     | 2                        | 3                 | 4                  |                                  |                    |
| 400        | Male   | Forward of eyes       | Across ears              | Neck              | Longitudinal head* | <0:20                            | 3:20               |
| 273        | Female | Across eyes           | Rear skull               |                   |                    | <0:20                            | <0:40              |
| 208        | Female | Nose                  | Across ears              | Neck              |                    | <0:20                            | 2:39               |
| 395        | Male   | Between eyes and ears |                          |                   |                    | <0:20                            | 3:28               |
| 365        | Male   | Between eyes and ears | Neck                     | Longitudinal head |                    | <0:20                            | 3:50               |
| 340        | Male   | Between eyes and ears | Neck                     | Base of neck      | Longitudinal head* | <0:20                            | <0:50              |
| 350        | Male   | Across ears           | Neck, 1 mm. behind skull |                   |                    | <0:20                            | 1:50               |
| 205        | Female | 1 mm forward of eyes  | Rear skull               |                   |                    | <0:20                            | 3:05               |
| 240        | Female | Between eyes and ears | Neck                     |                   |                    | <0:20                            | <0:50              |
| 310        | Male   | Across eyes           | Behind ears              | Neck              | Longitudinal head* | <0:20                            | 3:46               |

\* Struck by front edge of strike bars.

**Table 2** Capture performance of DOC 250 trap with ferrets. Strike locations refer to trap strike bar impact on up to three locations on the animal, anterior to posterior.

| Weight (kg) | Sex    | Strike location        |                              |               | Loss of palp. reflex (min:s) | Heart stop (min:s) |
|-------------|--------|------------------------|------------------------------|---------------|------------------------------|--------------------|
|             |        | 1                      | 2                            | 3             |                              |                    |
| 0.95        | Male   | Top of eyes            | Between ears                 | Rear skull    | <0:30                        | 5:40               |
| 1.05        | Male   | Above eyes             | Behind ears                  | Rear of skull | <0:30                        | 5:40               |
| 0.75        | Female | Nose                   | Above ears                   | Neck; neck    | <0:23                        | 3:38               |
| 1.02        | Male   | Between ears and eyes  | Behind ears                  | Neck          | <0:16                        | 5:54               |
| 0.96        | Male   | Nose                   | Across ears                  |               | <0:26                        | 6:23               |
| 0.91        | Male   | Nose                   | Between ears                 | Rear of skull | <0:30                        | 5:20               |
| 0.8         | Female | Across one ear and eye | Rear skull                   |               | <0:10                        | 5:10               |
| 0.91        | Male   | Across brow and nose   | Across ear to rear skull     | Neck          | <0:15                        | 5:17               |
| 0.92        | Male   | Top of eyes            | Between ears                 | Between ears  | <0:20                        | 7:09               |
| 0.77        | Male   | Above eye and ear      | Across ear and rear of skull |               | <0:20                        | 5:18               |

**Table 3** Capture performance of DOC 250 trap with Norway rats. Strike locations refer to trap strike bar impact on up to three locations on the animal, anterior to posterior. The trial was restarted with a new trap after the first animal.

| Weight (kg) | Sex    | Strike location       |                       |            |                       | Loss of palp. reflex (min:s) | Heart stop (min:s) |
|-------------|--------|-----------------------|-----------------------|------------|-----------------------|------------------------------|--------------------|
|             |        | 1                     | 2                     | 3          | 4 & 5                 |                              |                    |
| 270         | Female | Nose, foot            |                       |            |                       | >3:00                        | Euthanased         |
| 260         | Female | 1 mm behind eyes      | Rear skull            | Shoulders  |                       | <0:30                        | 3:12               |
| 340         | Female | Across eye            | Neck                  | Shoulders  | Chest                 | <0:30                        | 1:40               |
| 90          | Female | Nose                  | Between eyes and ears | Shoulders  | Abdomen; hindquarters | <0:30                        | <0:40              |
| 350         | Female | Nose                  | Between eyes and ears | Neck       | Shoulders             | <0:30                        | <0:40              |
| 430         | Female | Between ears and eyes | Shoulders             | Shoulders  |                       | <0:30                        | 1:20               |
| 270         | Female | Foot                  | Nose                  |            |                       | <0:30                        | 3:40               |
| 94          | Female | Head, longitudinal    | Rear skull            | Nose       |                       | <0:30                        | 2:20               |
| 330         | Female | Nose                  | Between eyes and ears | Rear skull |                       | <0:30                        | 3:50               |
| 320         | Female | Across eyes           | Neck                  |            |                       | <0:30                        | 3:20               |
| 360         | Female | Across eyes           | Across ears           | Shoulders  |                       | <0:30                        | 3:26               |

**Table 4** Capture performance of DOC 250 trap with ship rats. Strike locations refer to trap strike bar impact on up to five locations on the animal, anterior to posterior. The trial was restarted with the trap position adjusted after the seventh animal. (ND = Not determined)

| Weight (g) | Sex    | Strike location |                           |              |                       | Loss of palp. reflex (min:s) | Heart stop (min:s) |
|------------|--------|-----------------|---------------------------|--------------|-----------------------|------------------------------|--------------------|
|            |        | 1               | 2                         | 3            | 4 & 5                 |                              |                    |
| 140        | Male   | Across eyes     | Neck                      | Chest        |                       | <0:10                        | None detected      |
| 128        | Female | Across eye      | Neck                      | Shoulder     |                       | <0:10                        | 2:20               |
| 149        | Male   | Behind eyes     | Across shoulders          |              |                       | <0:10                        | 0:50               |
| 138        | Female | Nose            | Neck                      | Chest        | Abdomen               | <0:10                        | None detected      |
| 110        | Male   | Nose            | Rear skull                | Chest        | Abdomen; hindquarters | <0:10                        | None detected      |
| 125        | Female | Across eyes     | Neck                      | Shoulders    | Chest                 | <0:10                        | None detected      |
| 138        | Male   | Front foot      |                           |              |                       | >3:00                        | Euthanased         |
| 28         | ND     | Nose            | Shoulders                 | Hindquarters |                       | <0:10                        | Not detected       |
| 28         | ND     | Forward of eyes | Chest                     | Hindquarters |                       | <0:10                        | Not detected       |
| 28         | ND     | Nose            | Neck                      | Abdomen      |                       | <0:10                        | Not detected       |
| 140        | Female | Forward of eyes | Rear skull                | Chest        | Abdomen               | <0:10                        | Not detected       |
| 115        | Female | Across eye      | Shoulder-neck             |              |                       | <0:10                        | 0:56               |
| 135        | Male   | Nose            | Rear skull and front foot | Chest        | Abdomen.              | <0:10                        | Not detected       |
| 144        | Female | Across eyes     | Rear skull                | Chest        |                       | <0:10                        | Not detected       |
| 170        | Male   | Nose            | Rear skull                | Shoulders    |                       | <0:10                        | 2:04               |
| 140        | Female | Across eyes     | Rear skull                | Chest        | Abdomen               | <0:10                        | Not detected       |
| 125        | Male   | Nose            | Neck                      | Chest        | Abdomen.              | <0:10                        | Not detected       |



**Table 5** Capture performance of DOC 250 trap with hedgehogs. Strike locations refer to trap strike bar impact on up to three locations on the animal, anterior to posterior.

| Weight (g) | Sex    | Strike location    |                 |                   | Loss of palp. reflex (min:s) | Heart stop (min:s) |
|------------|--------|--------------------|-----------------|-------------------|------------------------------|--------------------|
|            |        | 1                  | 2               | 3                 |                              |                    |
| 563        | Male   | Head behind eyes   | Neck            |                   | <0:30                        | 8:20               |
| 841        | Female | Nose               | Rear skull      |                   | <0:30                        | 5:20               |
| 525        | Female | Nose               | Rear skull      |                   | <0:30                        | 2:30               |
| 797        | Female | Behind eyes        | Neck            | Longitudinal head | <0:30                        | 6:00               |
| 717        | Female | Across eyes        | Rear skull      |                   | <0:30                        | 8:17               |
| 695        | Female | Across eyes        | Rear skull      |                   | <0:30                        | 7:00               |
| 713        | Male   | Nose               | Eyes            | Neck              | <0:30                        | 8:25               |
| 689        | Male   | Nose               | Eyes            | Neck              | <0:30                        | 7:50               |
| 152        | Female | Nose               | Rear skull      | Chest             | <0:30                        | <0:50              |
| 798        | Female | Longitudinal skull | Forward of ears | Neck              | <0:30                        | 6:30               |

## 5.2 DOC 150

*Stoats:* The DOC 150 trap rendered the first nine stoats tested unconscious within 40 seconds. Eight of these animals received head strikes and skull fractures (Table 6). The first stoat tested was not struck on the head or neck, but was still rendered unconscious within 3 minutes. The tenth stoat tested was struck on the abdomen and hindquarters only and was not rendered unconscious within 3 minutes. Analysis of video footage showed that this animal was aware and very nervous of the scent of previously caught stoats on the trap treadle, and as a result attempted to jump over the treadle, triggering the trap with its hind feet. Because the trap plate had excessive scent on the treadle and because the stoat's behaviour was atypical, this animal was removed from the sample. Once the trap was cleaned a further stoat was tested.

*Norway rats:* The rat trial was stopped after the second rat tested received only an ineffective nose strike and had to be euthanased. Analysis of video footage showed that the animal had been restricted from entering the trap box freely as the opening of the testing pen chamber was misaligned with the trap entrance. The testing pen was modified and the trial restarted. The trap then rendered each of the next ten rats unconscious within 10 seconds with all animals receiving head strikes and skull fractures (Table 7).

*Hedgehogs:* The hedgehog trial was stopped after the second animal tested remained conscious beyond 3 minutes and had to be euthanased. Analysis of video footage revealed that the opening in the mesh was too large and had allowed the animal to enter too far into the trap before triggering the trap. As a result, the mesh entrance was modified and the trial restarted. The DOC 150 then rendered each of the next ten hedgehogs unconscious within 30 seconds, with all animals receiving head strikes and skull fractures (Table 8).

**Table 6** Capture performance of DOC 150 trap with stoats. Strike locations refer to trap strike bar impact on up to six locations on the animal, anterior to posterior.

| Weight (g) | Sex    | Strike location       |                       |                      |                                     | Loss of Palp. reflex (min:s) | Heart stop (min:s)      |
|------------|--------|-----------------------|-----------------------|----------------------|-------------------------------------|------------------------------|-------------------------|
|            |        | 1                     | 2                     | 3                    | 4, 5 & 6                            |                              |                         |
| 335        | Male   | Shoulders             | Shoulder              | Chest                | Ribcage; abdomen; abdomen           | 0:40                         | 0:40                    |
| 300        | Male   | Across eyes           | Between eyes and ears | Neck                 |                                     | <0:09                        | 4:04                    |
| 385        | Male   | Across eyes           | Rear skull            | Neck                 | Neck                                | <0:10                        | 1:52                    |
| 300        | Male   | Between ears and eyes | Neck                  | Neck                 | Shoulders                           | <0:10                        | 2:38                    |
| 190        | Female | Between eyes and ears | Neck                  | Shoulders;           | Rear shoulders                      | <0:10                        | 2:30                    |
| 200        | Female | Nose                  | Between eyes and ears | Rear skull           |                                     | <0:10                        | 1:56                    |
| 180        | Female | Between ears and eyes | Neck                  | Forward of shoulders | Rear of shoulders; ribcage; ribcage | <0:10                        | 2:50                    |
| 340        | Male   | Between eyes and ears | Neck                  | Neck                 | Shoulders                           | <0:10                        | 3:09                    |
| 240        | Male   | Across eyes           | Ears                  | Neck                 | Shoulders; shoulders                | <0:10                        | 2:42                    |
| 400        | Male   | Abdomen               | Abdomen               | Hind-quarters        |                                     | >3:00                        | Euthanased <sup>1</sup> |
| 210        | Female | Between eyes and ears | Rear skull            | Neck                 |                                     | <0:10                        | 2:50                    |

<sup>1</sup>Excluded from sample (see text)

**Table 7** Capture performance of DOC 150 trap with Norway rats. Strike locations refer to trap strike bar impact on up to four locations on the animal, anterior to posterior. The trial was stopped after the second animal and restarted with the pen chamber correctly aligned with the trap entrance.

| Weight (g) | Sex    | Strike location       |                 |                    |       | Loss of palp. reflex (min:s) | Heart stop (min:s)          |
|------------|--------|-----------------------|-----------------|--------------------|-------|------------------------------|-----------------------------|
|            |        | 1                     | 2               | 3                  | 4     |                              |                             |
| 255        | Female | Between eyes and ears | Rear skull      | Longitudinal skull |       | <0:08                        | 1:12                        |
| 510        | Male   | Nose                  |                 |                    |       | >3:00                        | Euthanased, trial restarted |
| 485        | Female | Nose                  | Eyes            | Rear skull         |       | <0:09                        | 1:18                        |
| 350        | Male   | Eyes                  | Ears            | Neck               |       | <0:10                        | 1:50                        |
| 120        | Female | Nose                  | Rear skull      | Shoulders          | Chest | <0:10                        | <0:10                       |
| 185        | Female | Behind eyes           | Behind ears     | Shoulders          |       | <0:10                        | 3:51                        |
| 195        | Female | Between nose and eyes | Forward of ears | Neck               |       | <0:10                        | 2:44                        |
| 190        | Male   | Across one eye        | Across one ear  | Shoulder and foot  |       | <0:10                        | 3:50                        |
| 115        | Female | Nose                  | Rear skull      | Shoulder           | Chest | <0:10                        | <0:10                       |
| 225        | Female | Between eyes and ears | Chest           | Chest              | Chest | <0:10                        | 2:09                        |
| 140        | Female | Between ears and eyes | Neck            | Shoulders          |       | <0:10                        | 1:00                        |
| 320        | Female | Nose                  | Behind eyes     | Behind ears        |       | <0:10                        | 3:10                        |

**Table 8** Capture performance of DOC 150 trap with hedgehogs. Strike locations refer to trap strike bar impact on up to three locations on the animal, anterior to posterior. The trial was stopped after the second capture and restarted with the entrance modified.

| Weight (g) | Sex    | Strike location       |                       |            | Loss of palp. reflex (min:s) | Heart stop (min:s)          |
|------------|--------|-----------------------|-----------------------|------------|------------------------------|-----------------------------|
|            |        | 1                     | 2                     | 3          |                              |                             |
| 175        | Female | Forward of eyes       | Between ears and eyes |            | <0:30                        | 1:57                        |
| 771        | Male   | Shoulders             |                       |            | >3:00                        | Euthanased, trial restarted |
| 330        | Male   | Behind eyes           | Ears                  | Neck       | <0:30                        | 4:20                        |
| 590        | Female | Forward of eyes       | Between ears and eyes | Neck       | <0:30                        | 7:35                        |
| 871        | Male   | Forward of eyes       | Across ears           |            | <0:30                        | 6:00                        |
| 380        | Female | Eyes                  | Ears                  | Neck       | <0:30                        | 6:10                        |
| 495        | Female | Forward of eyes       | Between ears and eyes | Rear skull | <0:30                        | 4:46                        |
| 265        | Female | Nose                  | Eyes                  | Rear skull | <0:30                        | 6:07                        |
| 525        | Female | Forward of eyes       | Between ears and eyes | Rear skull | <0:30                        | 6:19                        |
| 780        | Male   | Forward of eyes       | Behind eyes           | Neck       | <0:30                        | 6:30                        |
| 685        | Male   | Forward of eyes       | Rear skull            |            | <0:30                        | 7:43                        |
| 420        | Male   | Between eyes and nose | Between ears and eyes | Neck       | <0:30                        | 6:40                        |

### 5.3 DOC 200

*Stoats:* The DOC 200 trap successfully rendered all stoats unconscious within 48 seconds (Table 9). All stoats tested received head strikes that caused significant skull fractures.

*Norway rats:* All Norway rats tested received head and/or neck strikes and were rendered unconscious within 20 seconds (Table 10).

*Hedgehogs:* All hedgehogs tested received strikes on the head and were rendered unconscious rapidly (<30 s) (Table 11).

**Table 9** Capture performance of DOC 200 trap with stoats. Strike locations refer to trap strike bar impact on up to six locations on the animal, anterior to posterior.

| Weight (g) | Sex  | Strike location |                                  |                          |                               | Loss of palp. reflex (min:s) | Heart stop (min:s) |
|------------|------|-----------------|----------------------------------|--------------------------|-------------------------------|------------------------------|--------------------|
|            |      | 1               | 2                                | 3                        | 4, 5 & 6                      |                              |                    |
| 335        | Male | Nose            | Top of skull                     | Behind skull             | Neck; shoulders               | <0:29                        | 3:23               |
| 340        | Male | Across eyes     | Behind ears                      | Neck                     | Neck                          | <0:24                        | 2:57               |
| 255        | Male | Nose            | Skull, between ears and eyes     |                          |                               | <0:25                        | 3:07               |
| 280        | Male | Nose            | Forward of ears                  | Behind ears              | Neck                          | <0:26                        | 2:49               |
| 290        | Male | Above eyes      | Behind ears                      | Immediately behind skull | Shoulders; shoulders; ribcage | <0:30                        | 2:55               |
| 345        | Male | Forward of ears | Rear skull                       |                          |                               | 0:48                         | 3:15               |
| 290        | Male | Nose            | Across ears                      | Rear skull               | Neck                          | <0:24                        | 3:05               |
| 310        | Male | Nose/face       | Across one ear, forward of other |                          |                               | <0:30                        | 3:12               |
| 300        | Male | Nose            | Between ears and eyes            | Immediately behind skull | Base of neck; shoulder        | <0:23                        | 1:40               |
| 270        | Male | Nose            | Behind eyes                      | Rear of skull            | Neck; shoulders; shoulders    | <0:20                        | 2:58               |

**Table 10** Capture performance of DOC 200 trap with Norway rats. Strike locations refer to trap strike bar impact on up to four locations on the animal, anterior to posterior.

| Weight (g) | Sex    | Strike location             |                   |                  |                 | Loss of Palp. reflex (min:s) | Heart stop (min:s) |
|------------|--------|-----------------------------|-------------------|------------------|-----------------|------------------------------|--------------------|
|            |        | 1                           | 2                 | 3                | 4               |                              |                    |
| 190        | Male   | Head, between ears and eyes | Shoulders         |                  |                 | <0:07                        | 0:30               |
| 266        | Male   | Head, forward of eyes       | Head, behind ears | Chest            | Abdomen         | <0:14                        | <0:14              |
| 195        | Male   | Nose                        | Head, across ears | Behind shoulders | Rear of ribcage | <0:20                        | <0:20              |
| 207        | Female | Head, between eyes and ears | Across shoulders  | Behind ribcage   |                 | <0:08                        | 4:00               |
| 92         | Female | Head, between ears and eyes | Behind ribcage    | Hindquarters     |                 | <0:10                        | <1:30              |
| 175        | Male   | Neck                        |                   |                  |                 | <0:15                        | <1:30              |
| 231        | Male   | Between ears and eyes       | Across shoulders  | Abdomen          | Hindquarters    | <0:12                        | <1:00              |
| 288        | Female | Nose                        | Neck              | Chest            |                 | <0:10                        | <0:30              |
| 218        | Female | Nose                        | Neck              | Behind shoulders |                 | <0:10                        | <0:50              |
| 125        | Male   | Head, eyes and ears         | Across shoulders  | Rear abdomen     |                 | <0:13                        | <0:40              |

**Table 11** Capture performance of DOC 200 trap with hedgehogs. Strike locations refer to trap strike bar impact on up to three locations on the animal, anterior to posterior.

| Weight (g) | Sex    | Strike location |                       |      | Loss of palp. reflex (min:s) | Heart stop (min:s) |
|------------|--------|-----------------|-----------------------|------|------------------------------|--------------------|
|            |        | 1               | 2                     | 3    |                              |                    |
| 610        | Male   | Above eyes      | Rear skull            | Neck | <0:30                        | 6:03               |
| 620        | Female | Nose            | Behind eyes           | Neck | <0:30                        | 6:13               |
| 660        | Female | Above eyes      | Rear skull            | Neck | <0:30                        | 5:42               |
| 750        | Male   | Nose            | Behind eyes           | Neck | <0:20                        | 6:50               |
| 504        | Female | Forward of eyes | Between eyes and ears | Neck | <0:20                        | 6:50               |
| 895        | Male   | Forward of eyes | Between eyes and ears | Neck | <0:30                        | 5:40               |
| 750        | Male   | Nose            | Behind eyes           | Neck | <0:20                        | 6:50               |
| 754        | Female | Forward of eyes | Between eyes and ears | Neck | <0:20                        | 5:57               |
| 704        | Female | Forward of eyes | Between eyes and ears | Neck | <0:20                        | 8:40               |
| 566        | Male   | Forward of eyes | Between eyes and ears |      | <0:20                        | 7:59               |

## **6. Conclusions**

The DOC 250 proved effective in meeting the NAWAC guideline requirements for kill-trap performance for ferrets, stoats, Norway rats, ship rats, and hedgehogs. The DOC 150 and 200 traps effectively killed stoats, Norway rats, and hedgehogs, and with most captures being rendered unconscious in less than 30 seconds. Because all three trap types generally caused significant trauma to the skull, it is likely that most captured animals were rendered unconscious within a few seconds if not instantaneously. Unfortunately, in most instances, the logistical constraints of getting to a trapped animal and monitoring its palpebral reflex prevented exact determination of the time to unconsciousness.

Both the Norway and ship rat trials with the DOC 250 had to be stopped and restarted. In one instance (Norway rat trial), the sample trap used had a trigger pressure that was too light, and in another (ship rat trial), there was a gap between the baffle and the trap. It is critical that the trap system is set up to ensure that trigger pressure is approximately 100 g and the trap is positioned in the tunnel with the trigger plate as close as possible to the inner baffle entrance to ensure that the trap will strike the animal in a vital position.

Two of the trials for the DOC 150 were stopped after a second animal was tested because of incorrect strike locations, resulting from the entrance hole being restricted by the testing pen (Norway rat) or the trap entrance being too large (hedgehog). Although the size of the entrance hole could be easily modified in these trials, such a result indicates the importance of the nature of the trap system being tested, and the importance that the same system is used in the field.

The trial of the DOC 150 on stoats also alerted the test personnel to the issue of trap maintenance between captures. In this trial the scent from captured stoats was allowed to accumulate on the trigger plate (treadle) and video footage indicated that such an accumulation changed the behaviour of the stoats, encouraging them to try and avoid contact with the treadle. Given the much lower frequency of stoat captures in an individual trap in the field, stoats are less likely to encounter a trap with this amount of accumulated scent on it. The anomaly of this capture is confirmed by field results with the DOC 200 (which has the same-sized trigger plate as the DOC 150) where all stoats caught in trials and in subsequent control operations have triggered the trap with their front legs (D. Peters, pers comm.). Nevertheless, this result indicates the importance of trap maintenance and the need to clean trigger plates between captures.

Because changes to variables such as trigger pressure, trap placement, and entrance size can influence the performance of each of the traps tested, trap users need to be made aware and understand the importance of setting the trap and maintaining it correctly and as recommended.

## **7. Recommendations**

- The DOC 250 system (trap, tunnel, baffles and the configuration of these used in this trial) should be regarded as an effective trap for killing stoats, ferrets, Norway rats, ship rats, and hedgehogs.
- The DOC 150 and 200 systems are regarded as acceptable kill traps for killing stoats, Norway rats, and hedgehogs.

- The effectiveness of DOC 150 and 200 traps should be tested for ship rats.
- Field staff who use these trap systems need to be made aware of the importance of setting and maintaining the systems correctly to ensure captured animals are killed quickly.

## **8. Acknowledgements**

We thank DOC for supplying video equipment for this trial; the footage obtained proved invaluable for reviewing animal captures. We also thank Phil Waddington and Darren Peters for capturing ship rats for use in the trial, Julie Turner for supplying and maintaining stoats, Norway rats, and hedgehogs for the trials, Penny Fisher and Grant Morriss for commenting on drafts of this report, Christine Bezar for editing and Wendy Weller for final word processing.

## **9. References**

- Jotham N, Phillips RL 1994. Developing international trap standards – a progress report. Pp. 308–310 in Proceedings, 16<sup>th</sup> Vertebrate Pest Conference, Santa Clara, California.
- Poutu N, Warburton B 2003. Evaluation of the effectiveness of the Waddington backcracker trap for killing stoats. DOC Science Internal Series 132. Department of Conservation, Wellington, New Zealand.
- Poutu N, Warburton B 2004. DOC (150, 200, 250) trap effectiveness for killing stoats, rats, hedgehogs, and ferrets. Landcare Research Contract Report LC0304/152 (unpublished). 13 p.
- Rowse HC, Tircey J, Cox F 1981. Assessment of effectiveness of trapping methods in production of a humane death. Pp. 1647–1670 in Chapman, J.A.; Pursley D. (Eds): Proceedings of the Worldwide Furbearer Conference, Frostburg, Maryland, USA.
- Warburton B 1995. Setting standards for trapping wildlife. Pp. 283–287 in Proceedings of the 10<sup>th</sup> Australian Vertebrate Pest Conference. Hobart, Tasmania.
- Warburton B, Poutu N, Domigan I 2002. Evaluation of the effectiveness of the Victor snapback for killing stoats. Landcare Research Contract Report LC0102/078 (unpublished). 8 p.