The potential effectiveness of aerially sown 1080 baits for controlling low density possum populations

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Abstract

To protect conservation values that are vulnerable to possums it may be necessary in some instances to maintain possums at low density after initial "knock down" operations. The most cost-effective methods for achieving such maintenance control are unknown. This project examines the potential of aerial 1080 operations for controlling low-density possum populations by assessing acceptance of aerially-sown non-toxic baits by such populations. Two trials were carried out in Northland; Herekino Forest as a pre-peak population, and Waipoua Forest Sanctuary as an area in which possum numbers had been reduced to low levels by an aerial 1080 operation. Non-toxic RS5 cereal pellets were dyed with rhodamine B dye and sown at 5 kg/ha on 11 December in both areas, and after 2 nights possums were trapped and checked for dye. Of 94 possums captured in Herikino Forest, 88 (93.6% t 4.8%; 95% C.L.) were marked with rhodamine. Of 73 possums captured in Waipoua Forest, 67 (91.8% ± 6.2%) were marked with rhodamine. These results show that most possums will accept at least some bait material even though they are at sufficiently low densities for natural foods not to be limiting. The trial was conducted in summer when abundant new foliage, flowers and fruits were available and an even higher acceptance may have been achieved had the trial been carried out during winter. These results indicate that a sufficiently large proportion of possums at low to medium density will accept baits and therefore successful kills should be attainable providing the quantity of bait eaten (possibly only one or two baits) contains a lethal quantity of toxin.

1. Introduction

Recently, the Department of Conservation (DoC) has emphasised the need for maintaining possums at low density after initial "knock down" operations to ensure conservation values are protected. The most cost-effective methods for such maintenance control are unknown. This project examines the potential of aerial 1080 operations for controlling low-density possum populations by assessing acceptance of aerially-sown non-toxic baits by such populations. The work was carried out by Manaaki Whenua - Landcare Research during December 1993, and was funded by the Department of Conservation.

2. Background

Australian brushtail possums (*Trichosurus vulpecula*) are the major pest on New Zealand's conservation estate. Historically, possum control has been

limited to obtaining one-off population reductions of more than 70%. Recently, DoC has placed more emphasis on protecting specific conservation values, which has often necessitated the maintenance of possum populations at low levels (close to, or less than 1 possum/ha). This goal could theoretically be achieved by several different control strategies (e.g., repeat aerial operations or annual ground operations). However, none of these options have been fully evaluated.

Warburton *et al.* (1992, unpubl. FRI contract report) suggested that the most cost-effective strategy to maintain possum numbers below a defined threshold level is to repeat aerial 1080 operations at about 6-yearly intervals. However, the success of such a strategy would depend on a high proportion of the population eating a lethal quantity of bait.

It has been suggested that percent kill and possum condition are significantly correlated (Bamford & Martin 1971), i.e., only low kills could be expected for possum populations in good condition. However, Morgan (1982) reported a significantly higher acceptance (i.e., percentage of possums eating one or more baits) of non-toxic pellets by possums in winter than in summer, even though the possums in winter were in better condition than those in the summer sample. These conflicting data suggest that physical condition may not be a good indicator of the level of success of an aerial operation and that seasonal influences on, food availability, for example, may be more important.

With the increased funding being spent on possum control ($6 million for 1993-94) and the increased emphasis on maintenance control, the influence of possum density and condition, and season on the success of aerial operations needs to be assessed. This project examines the extent to which density and condition affect possum acceptance of non-toxic cereal pellet baits.

3. Objectives

- To assess the percent acceptance of non-toxic baits by a low-density, pre-peak possum population in good-condition.
- To assess the percent acceptance of non-toxic baits by possums at low density after a 1080 operation.

4. Methods

Two areas were selected in Northland by DoC field staff: Herekino Forest as a pre-peak population and Waipoua Forest Sanctuary as an area in which possum numbers had been significantly reduced by an aerial 1080 operation and then maintained at low levels by ground hunters. The vegetation in the Herekino Forest trial area had an abundance of palatable species such as pate *(Schefflera*

digitata) and fivefinger *(Pseudopanax arboreum),* with fuchsia *(Fuchsia excorticata)* still present in many sites. The Waipoua area had a lower diversity of forest species, dominated by kamahi *(Weimannia racemosa),* and possums had access to improved pasture adjacent to the forest.

The trial areas were each 200 ha and were selected so that boundaries could be easily located from the air and the ground. Although it was intended to sow both areas with bait by a helicopter equipped with a Global Positioning System (GPS) for precise sowing, technical problems with the GPS meant both areas were sown by fixed-wing aircraft, and only one with GPS.

Non-toxic baits (RS5 cereal pellets) were dyed with rhodamine B (Morgan 1981), and sown at 5 kg/ha on 11 December. Baits were left for 2 nights to allow possums sufficient time to find them. Victor 11½ leg-hold traps were then set for 2-3 nights to obtain a minimum catch of 80 possums from each trial area. Traps were set only where bait was seen on the ground to avoid the possibility of captured possums being sampled from non-treated areas.

Possums were checked externally and internally for visual traces of rhodamine dye and those with no obvious dye were further inspected with a UV light that reveals traces of rhodamine as an orange fluorescence. The quantity of bait eaten was subjectively classified as high (pellets more than 75% of stomach volume when full), medium (pellets 30-75% of stomach volume when full) or low (pellets less than 30% of the stomach volume when full). Because possums were trapped up to four nights after application of the dyed pellets, possums with a low volume of pellets in the stomach may not have had a low acceptance of the pellets, but may have only eaten baits on the first or second night so that most pellets had been digested. When dyed pellets contributed a high proportion to the stomach volume it could be confidentally assumed that those possums had consumed several pellet baits.

All possums were weighed, and total length, body length, and mesenteric fat weight were recorded.

An indication of relative possum density for each trial area was obtained from the capture rate per 100 traps. Because the sample of possums had to be maximised, traps were set on best sign and not randomly distributed along a line as for population monitoring programmes. It was accepted that the percent catches obtained would therefore over-estimate density.

Weight-to-length ratios of possums (an index of condition, Bamford 1970), and capture rates from both trial sites were compared to those from a survey of possums from Waipoua in 1981 and 1990. The 1981 sample represented a pre-peak population (M. Thomas pers. comm.), substantiated by comparing the weight-to-length ratios of this sample with those from a 1990 sample when the population was close to peak and causing significant damage to the vegetation.

The statistical precision of the measurement of acceptance was determined using a binomial estimate of variance.

5. Results

5.1 BAIT ACCEPTANCE

Herekino Forest

Of 94 possums captured, 88 (93.6% ± 4.8%; 95% C.L.) were marked with rhodamine, usually in the stomach. Of the marked possums, 61% were classified as having eaten large quantities of pellets, 18% medium quantities, and 21% low quantities.

Waipoua Forest Sanctuary

Of 73 possums captured, 67 (91.8% ± 6.2%) were marked with rhodamine. Only 26% of these possums were classified as having eaten high quantities of bait, 30% medium quantities, and 44% low quantities.

5.2 POSSUM DENSITIES

Herekino Forest

Although DoC field staff had identified this trial area as a pre-peak population with low density, a 2-night trap-catch of 26.9% indicated the density was low to medium. Capture rates on the first and second nights were 35.7% and 17.1%, respectively, confirming that densities were not high.

Waipoua Forest Sanctuary

Capture rates in this area indicated similar densities to those found in Herekino with a three-night capture rate of 24.3% (30% for first 2 nights). Capture rate dropped from 38% for the first night to 18.9% and 8.9% for the second and third nights, respectively.

5.3 POSSUM CONDITION

The three condition indices used (body weight, mesenteric fat weight, and the ratio of body weight-to-length of adult possums) all declined significantly at Waipoua from 1981 to 1990 (Table 1).

Possums sampled from Herekino in this trial had condition indices similar to those of possums from the pre-peak Waipoua 1981 sample (Table 2), suggesting they were in relatively good condition and not stressed by shortage of food. As the possums sampled from Waipoua in this trial had significantly lower condition indices than the 1981 Waipoua sample (Table 2), they probably did not represent the population in prime condition as expected in low-density areas with an abundance of food.

TABLE 1. CONDITION INDICES FROM ADULT POSSUMS SAMPLED FROM WAIPOUA IN 1981 AND 1990. MESENTERIC FAT WEIGHTS AND WEIGHT-TO-LENGTH RATIOS WERE COMPARED USING T-TESTS WITH « = 0.05.

CONDITION INDEX	WAIPOUA 1981	WAIPOUA 1990	PROBABILITY
Body weight (kg)	2.5	2.2	p < 0.001
Mesenteric fat weight (g)	10.4	5.1	p < 0.001
Body weight/length	3.3	2.9	p < 0.001

TABLE 2. INDICES OF CONDITION FOR POSSUMS FROM POPULATIONS ASSUMED TO HAVE DIFFERENT STATUS (DENSITY & CONDITION), MESENTERIC FAT WEIGHTS AND WEIGHT-TO-LENGTH RATIOS WERE COMPARED USING T-TESTS WITH u = 0.05.

CONDITION l NDEX	HEREKINO n=53	WAIPOUA n=48	WAIPOUA 1981 n= 178	HEREKINO cf WAIPOUA 1981	WAIPOUA cf WAIPOUA 1981
Body wt (kg)	2.61	2.38	2.53	NS	p = .003
Mesenteric fat weight (g)	8.1	5.2	10.4	NS	p = .02
Body weight/length	3.35	3.04	3.3	NS	p = <.001

6. Conclusions

Most possums will accept at least some bait material even when they are at sufficiently low densities for natural foods not to be limiting. The trial was conducted in summer when abundant new foliage, flowers and fruits were available (Best & Bellingham 1991, unpubl. DoC report), and an even higher acceptance may have been achieved had the trial been carried out during winter. The percentage acceptances obtained (93.6% and 91.8%) are lower than those obtained for cereal bait acceptance by Morgan (1982) from a range of possum populations sampled in native forest in winter (96 - 100%), but not as low as that obtained for a summer trial in Kaingaroa Forest (80 - 84%). The result indicates that a sufficiently large proportion of possums at low to medium density will accept baits to give a successful kill (>70%), providing the quantity of bait eaten contains a lethal quantity of toxin. However, if possum populations are to be maintained at very low densities (i.e., less that 1/ha) bait acceptance by possums held at these levels should be assessed.

The relative abundance of rhodamine pellets found in the possum stomachs (assuming loss through digestion was insignificant) suggests that a high proportion of possums, particularly in the Waipoua sample, were eating only small quantities of bait, for example, 44% of the possums sampled from

Waipoua. Although the rhodamine dye technique does not allow the number of baits eaten to be determined, it is likely that such possums had eaten only one or two baits. If baits contained the usual 0.08% 1080 concentration, most possums at Herekino and Waipoua are heavy enough that the overall kill would be poor. Therefore, in these situations it is important that the higher 0.15% 1080 loading is used.

The high proportion of the Herekino and Waipoua samples that ate small amounts of bait suggests these possums were not eager to eat cereal pellets. As seasonal factors such as fruit production probably affect bait acceptance more than body condition (Morgan 1982), it appears that condition may not be an important factor in influencing bait consumption. To ensure bait consumption is maximised, control operations should be restricted to late winter months when natural food abundance is likely to be limited.

The results from the Waipoua sample indicate that possum populations previously poisoned by aerial 1080 operations still have a high acceptance of non-toxic baits. Thus, operational success should not be dependent on overcoming any learned aversion to the bait material. However, results from one series of 1080 operations 12 months apart at Mapara (Waikato, K. Broome pers. comm.), indicate that although possums may accept non-toxic pellets, they reject the pellets when 1080 is present. For repeat control operations, therefore, a more effective mask than cinnamon for 1080 or an alternative toxin may be required.

7. Recommendations

- To ensure consumption of bait material is maximised, control operations should be restricted to winter months.
- A further trial should be conducted to substantiate these results using populations at very low densities (i.e., trap-catch frequencies of less than 10%).
- Aerial control operations should be considered a viable control option even when possum condition is high and density low.

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