

Multispecies 1080 poisoning: Killing more pests with fewer baits

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Research contracted by
FRST (Multispecies Pest Control Project)
and AHB (Local Elimination Project)

Core premise

- We should strive to use no more 1080 than is needed to kill all targeted pests
 - because doing so will:
 - reduce the amount of toxin used
 - possibly reduce costs
 - reduce the risk of environmental contamination
 - reduce the risk of non target kills of valued species
 - make 1080 less controversial

How little 1080 is really needed?

Consider Whirinaki tawa forest (a high-end example?)

- 30% RTCI for possums = 5-6 possums/ha.
 - on average 5mg of 1080 needed per possum, 30 mg in total
- 90% 1-night track rate for rats (10 rats/ha)
 - 2.5 mg of 1080 needed per rat, 25 mg in total
- 50% 1-night track rate for mice (5-6 mice/ha)
 - 0.5 mg of 1080 needed per mouse, 3mg in total

=> Only need about 60 mg of 1080/ha

- at 0.15% conc this is only ~0.04 kg/ha of 1080 bait
- or, alternatively, one bait per animal = **26** baits/ha

What do we actually sow?

- Standard operational practice
 - 2.00-5.00 kg/ha of 1080 bait
 - 5-10 g per bait
 - ⇒ **200-1000 baits/ha**
 - ⇒ this is what works – using less risks failure
- Possible reasons why excess sowing is needed
 - bait loss into inaccessible areas – not quantified but low?
 - overconsumption by target species (>1 bait per pest)
 - consumption by non targets (esp. pigs, rats in possum ops)
 - baits need to be found quickly before rain falls
 - possums need multiple bait encounters within 40 minutes

Multispecies Pest Control: Evolution of hypotheses and research

- Initial trials (2006): Aimed to improve aerial poisoning by optimising (not necessarily minimising) pre-feeding, sowing rate and sowing pattern
- Repeat trials (2007): Investigate emerging suspicion that a key role of pre-feeding and sowing rate is to minimise sublethal poisoning

⇒ Underlying key question:

**How do pests survive
despite apparently massive overbaiting?**

How do pests survive aerial 1080?

Three reasons:

1. Do not encounter any bait at all

- No bait in home range
 - *coverage (GPS, swath spacing, broadcasting etc)*
- No bait in parts of home range used (up trees)
 - *prefeeding role?*
- Bait all consumed by other animals (pigs, rats)
 - *higher sow rates*
- Bait loss into inaccessible areas
 - *higher sow rates*
 - *more detectable baits (lures)*

NB: Italics = solutions (Blue = accepted wisdom, Orange = other possibilities)

How do pests survive aerial 1080?

2. Only encounter sublethal amount of bait

- Bait fragmentation during sowing
 - *make baits bigger, harder, and/or screen out fragments*
 - *excess baiting /prefeeding to incr. encounter rate*
- Bait fragmentation after sowing (partial consumption by previous pests)
 - *same as above*
- Low toxicity (variable 1080 conc - carrot, 1080 degradation)
 - *same as above*
 - *make baits more durable*

How do pests survive aerial 1080?

3. Encounter but don't eat lethal amount of bait

- Cautious feeding (neophobia or learned aversion)
 - *prefeed to increase acceptance*
 - *use familiar foods?*
- Low absolute or relative palatability
 - *high bait attractiveness and quality*
 - *target seasons when food is scarce (winter)*
- Disturbance (subordinate animals displaced from part eaten bait)
 - *excess baiting and prefeeding so displaced animal can quickly find another bait?*

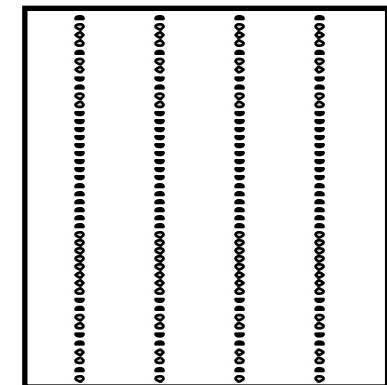
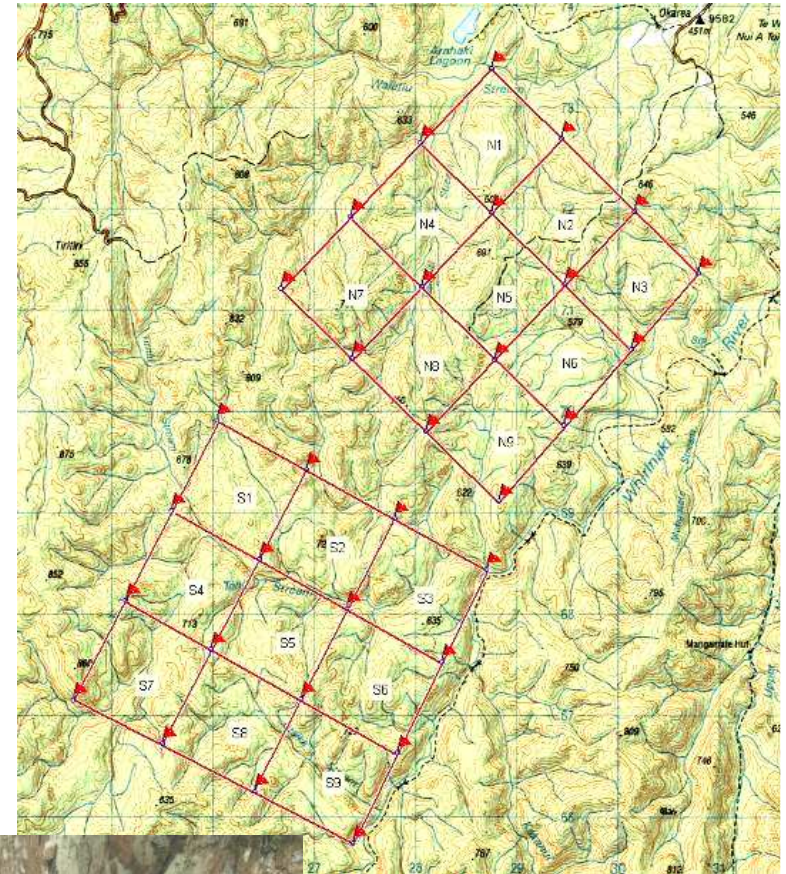
Whirinaki (Urewera) study area – 18 100-ha blocks

Initial trials 2006

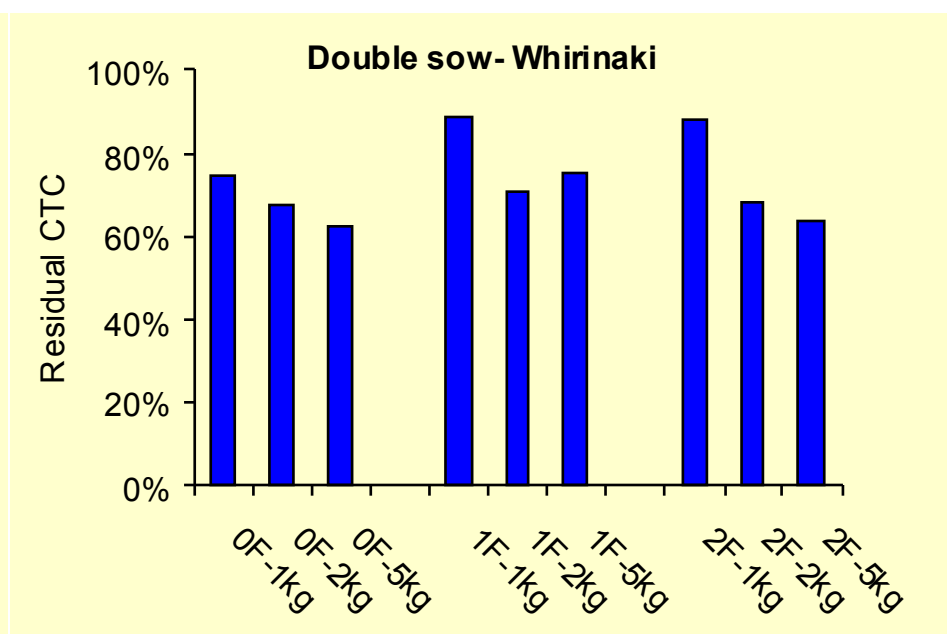
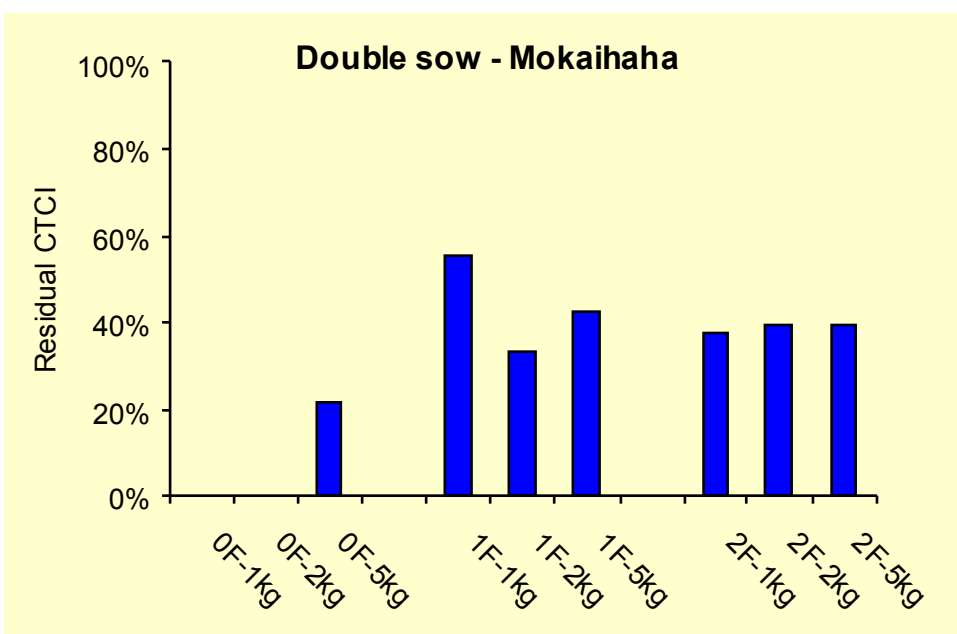
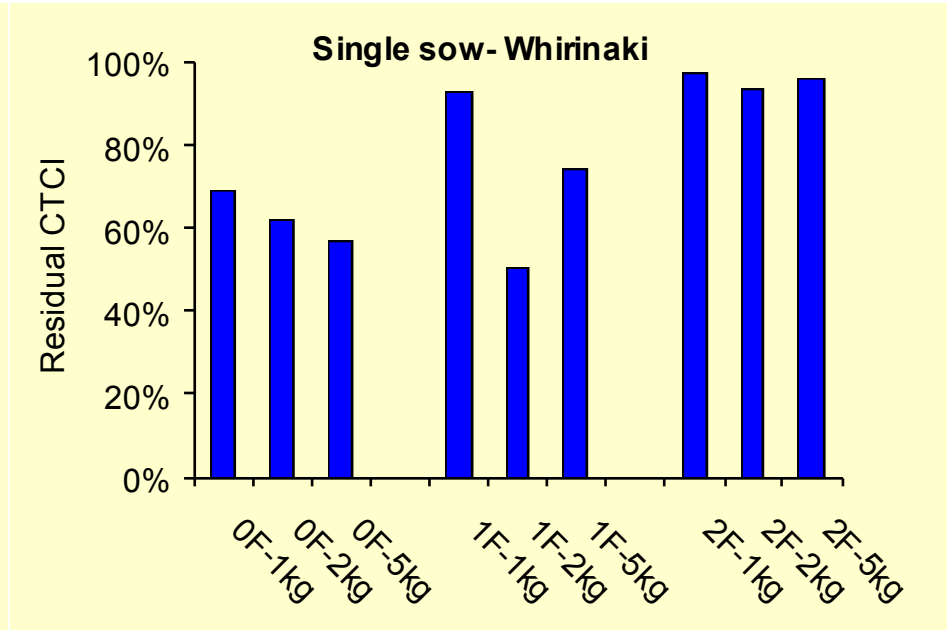
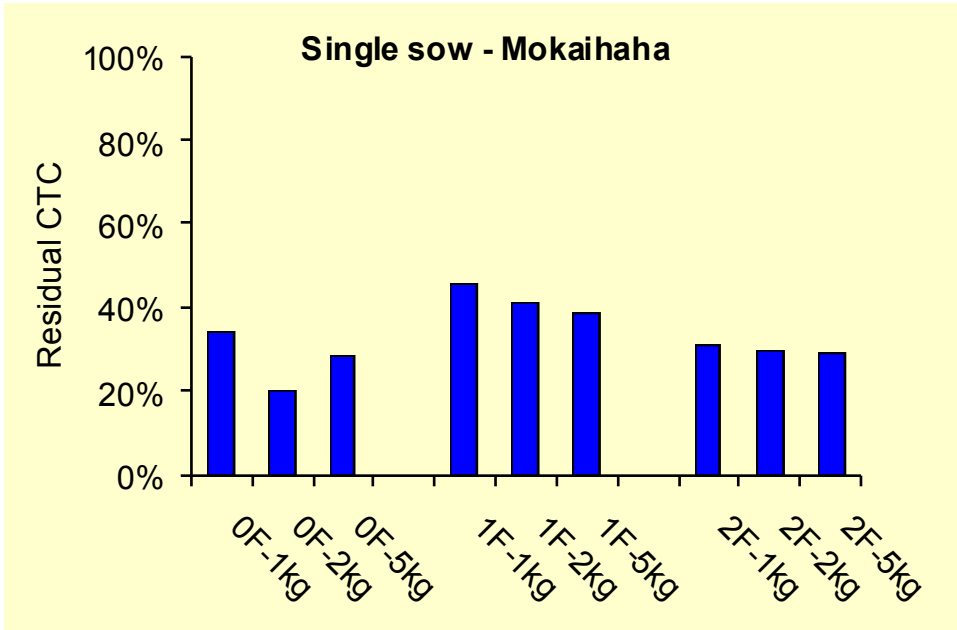
In each of two NI tawa forests (Whirinaki and Mokaihaha) compared 18 combinations of three factors:

- Sowing rate
 - 1, 2, and 5 kg/ha – toxin and pre feed
- Number of non toxic pre-feeds
 - none, one and two
- Sowing pattern
 - parallel or crosshatch

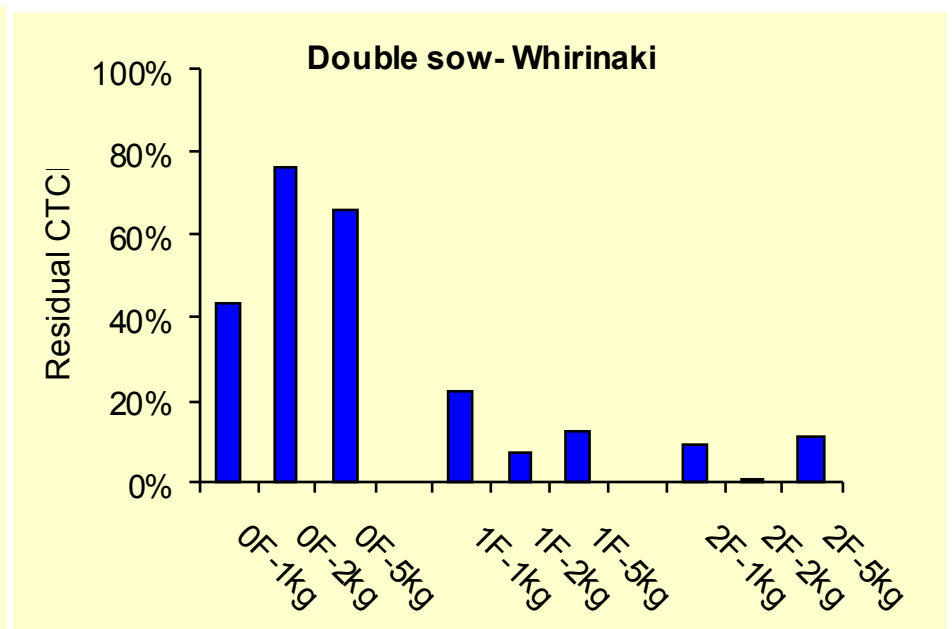
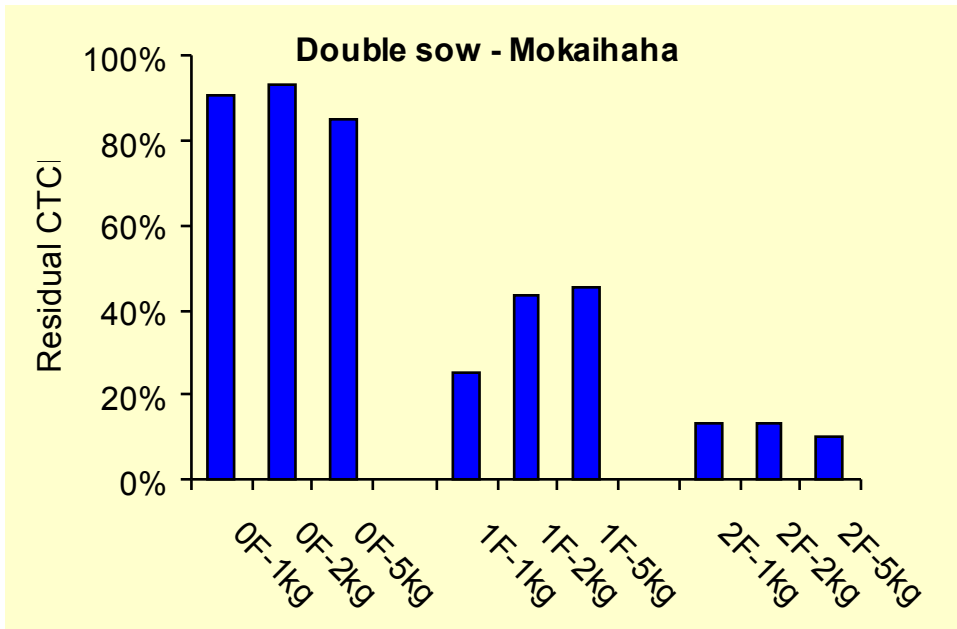
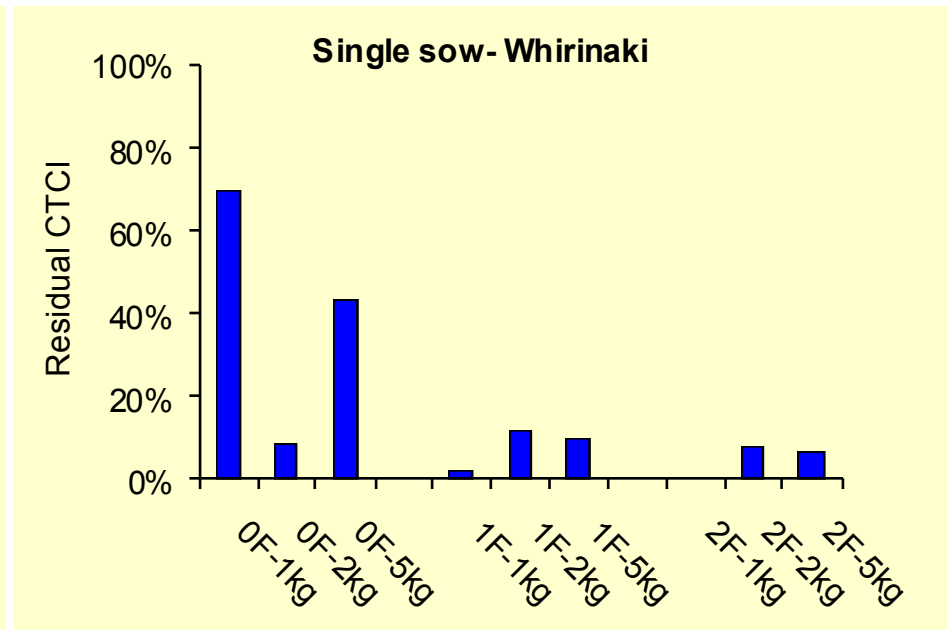
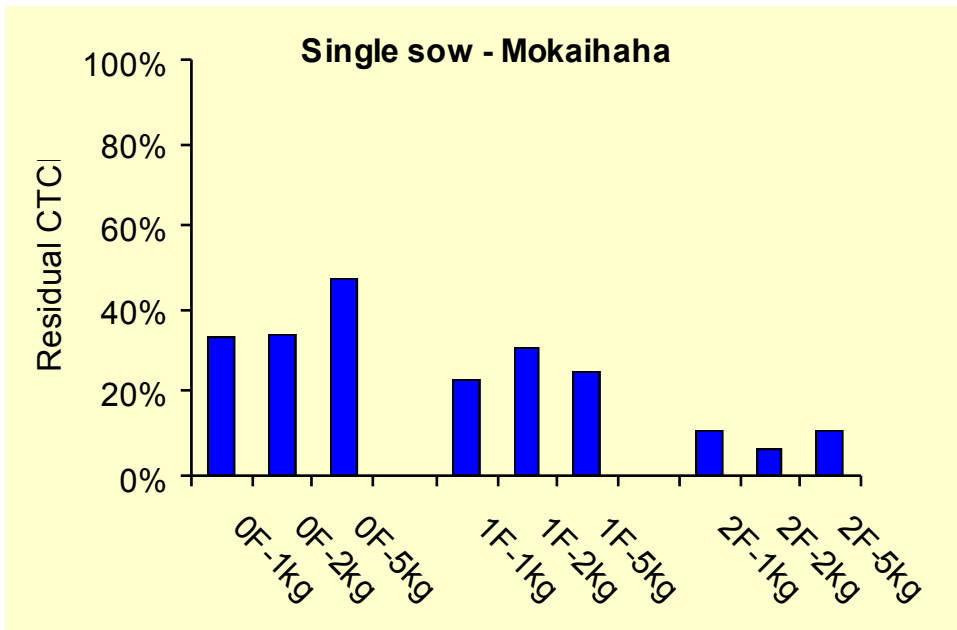
Pre and post monitoring based on ChewTrack Card interference rate



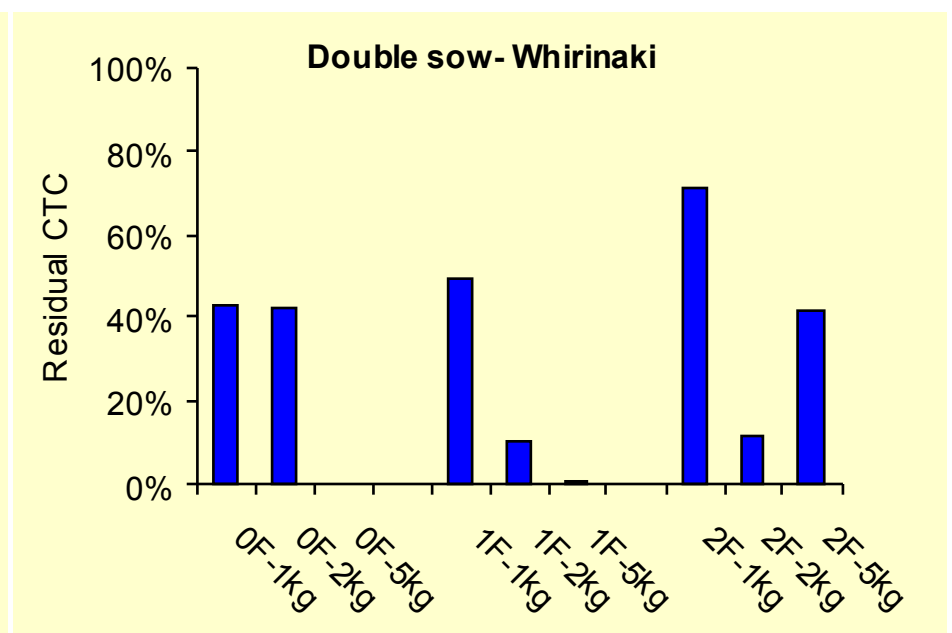
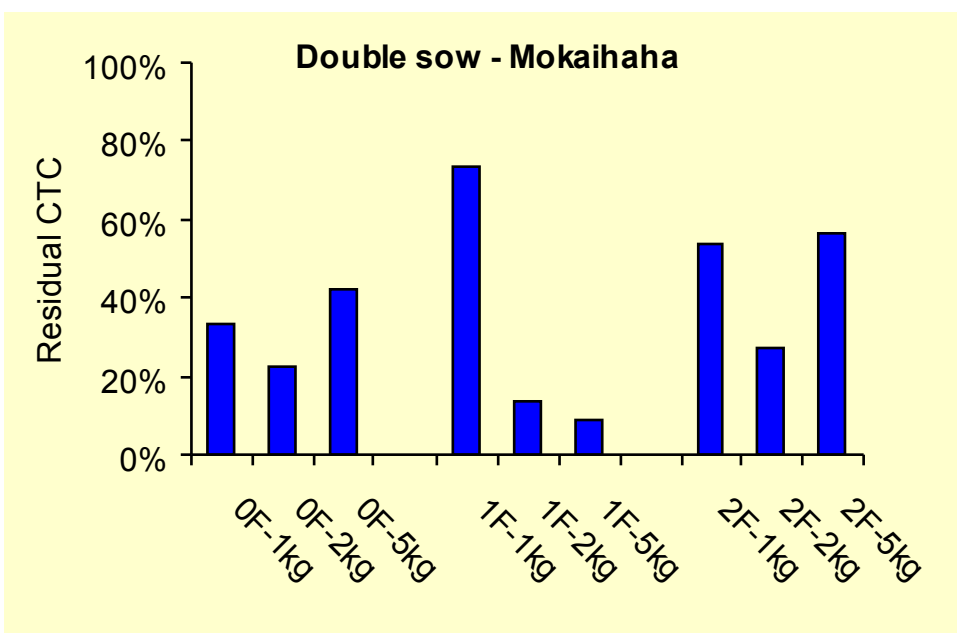
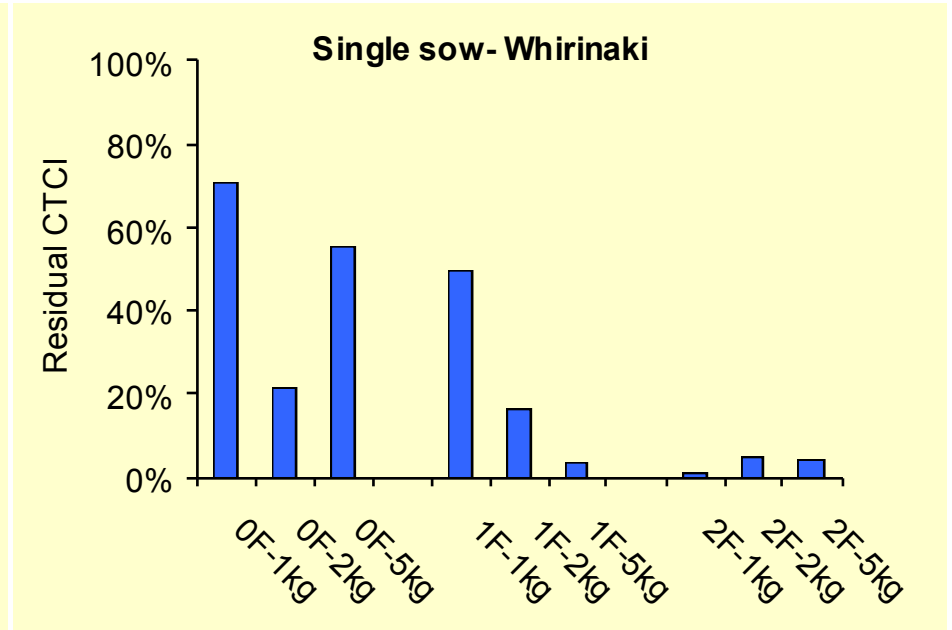
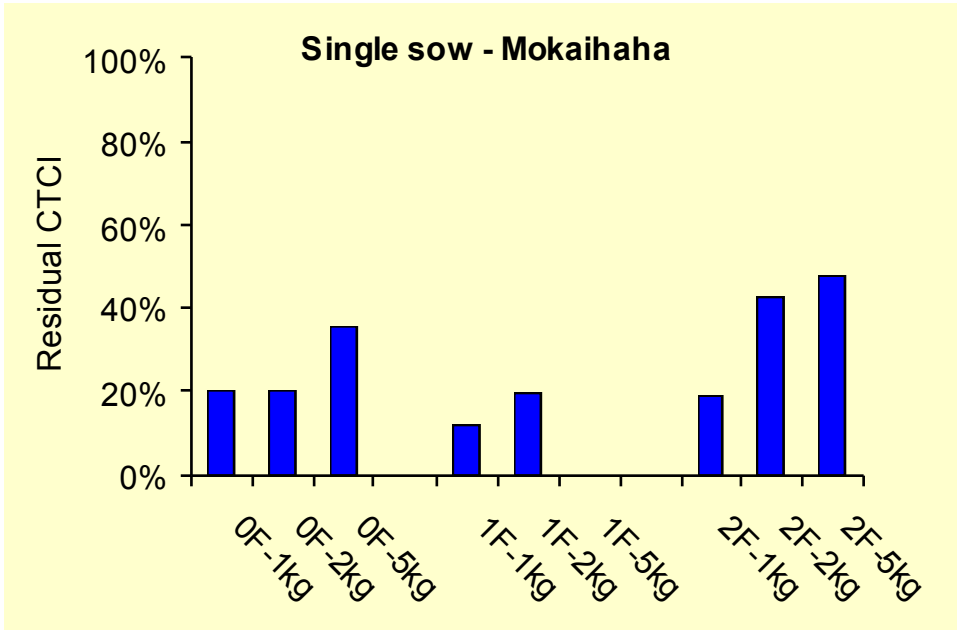
2006 results: Mice



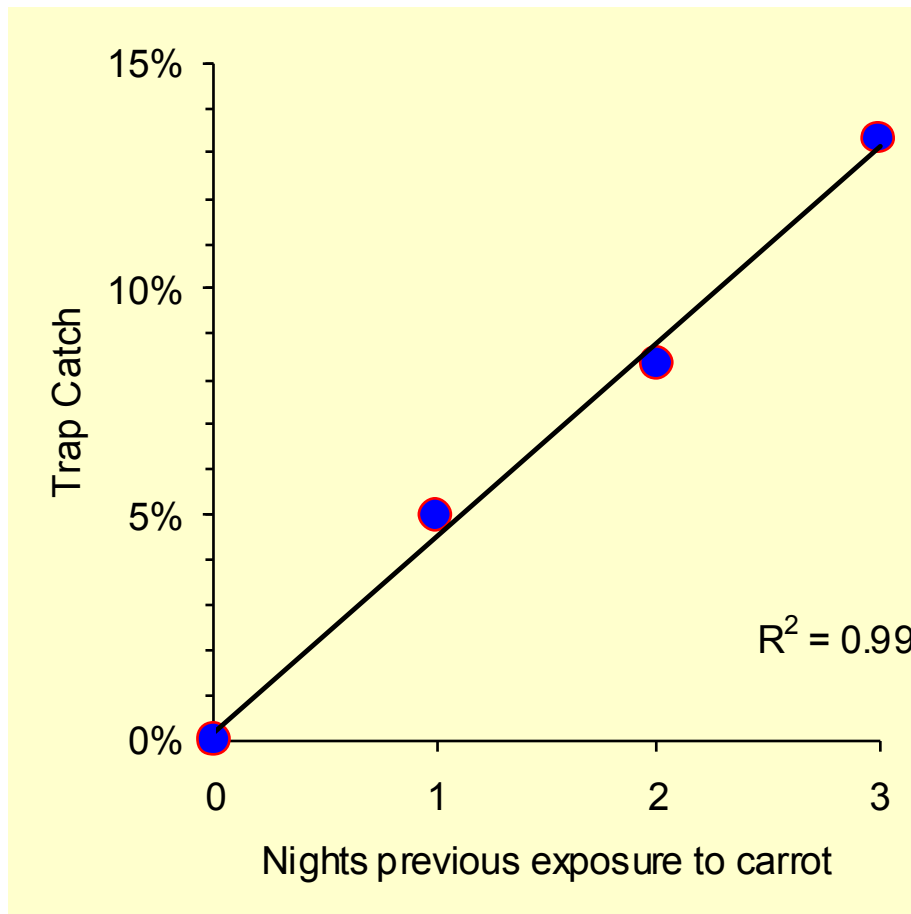
2006 results: Rats



2006 results: Possums



Effect of pre-feed on possum trap catch



Mokaihaha: 60 traps set for the first time on the day that non-toxic pre-feed was sown in two 100-ha blocks.

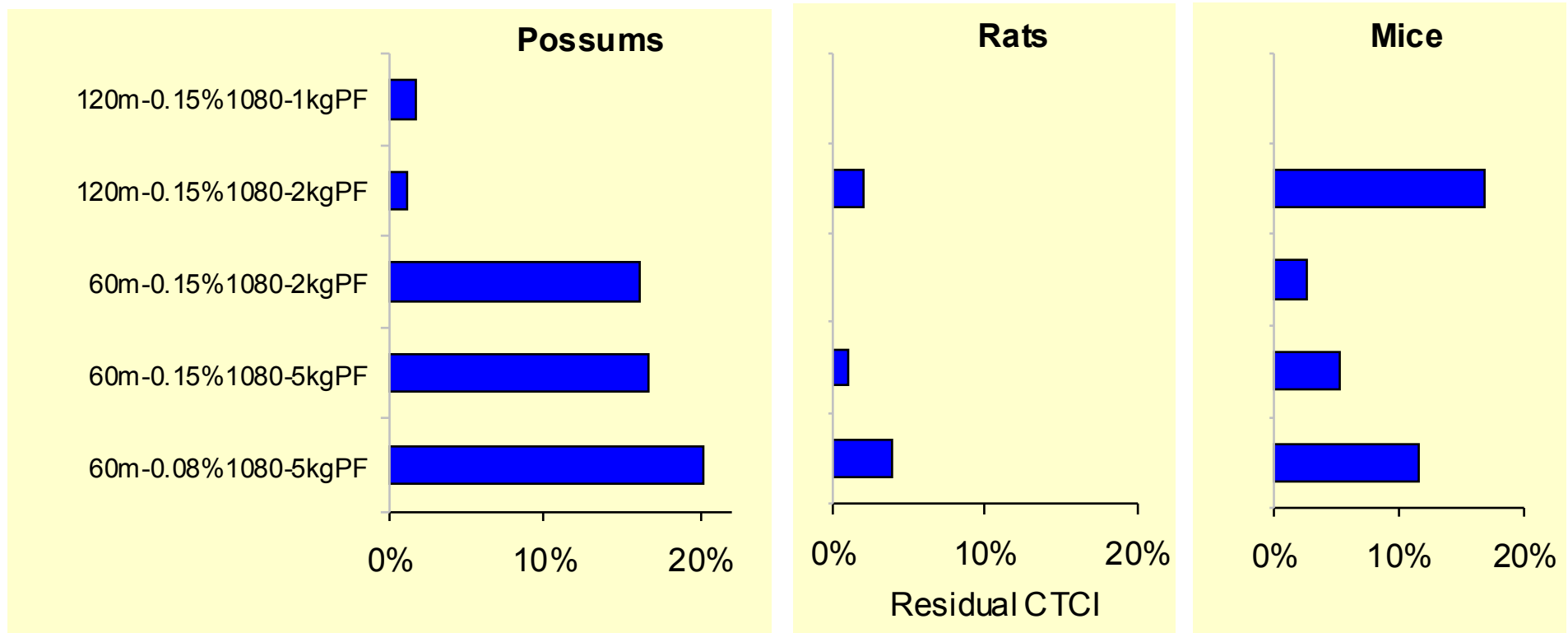
=> before pre-feeding possums were making limited use of ground?

NB:

pre CTCIs = 0%, 7%

post CTCIs = 35%, 43%.

Swath spacing trial (J. Kemp)



Moeraki/Whakapohai: Five different treatments over ~1000-ha blocks, toxic sowing all 2kg/ha 1080 Wanganui #7cereal baits.

Unexpectedly: Best possum kill with wider spacing and low amounts of pre-feed => **suggested peak bait density was important, and that it was possible to overprefeed rats and mice**

How much toxic bait does it take to kill a possum?

IF peak bait density is important for high possum kill:

⇒ some possums must need to encounter two or more baits to be killed.

1080 LD95 for largish (3kg) possum is up to 7.5 mg - at 0.15% concentration, this translates to 5g of bait.

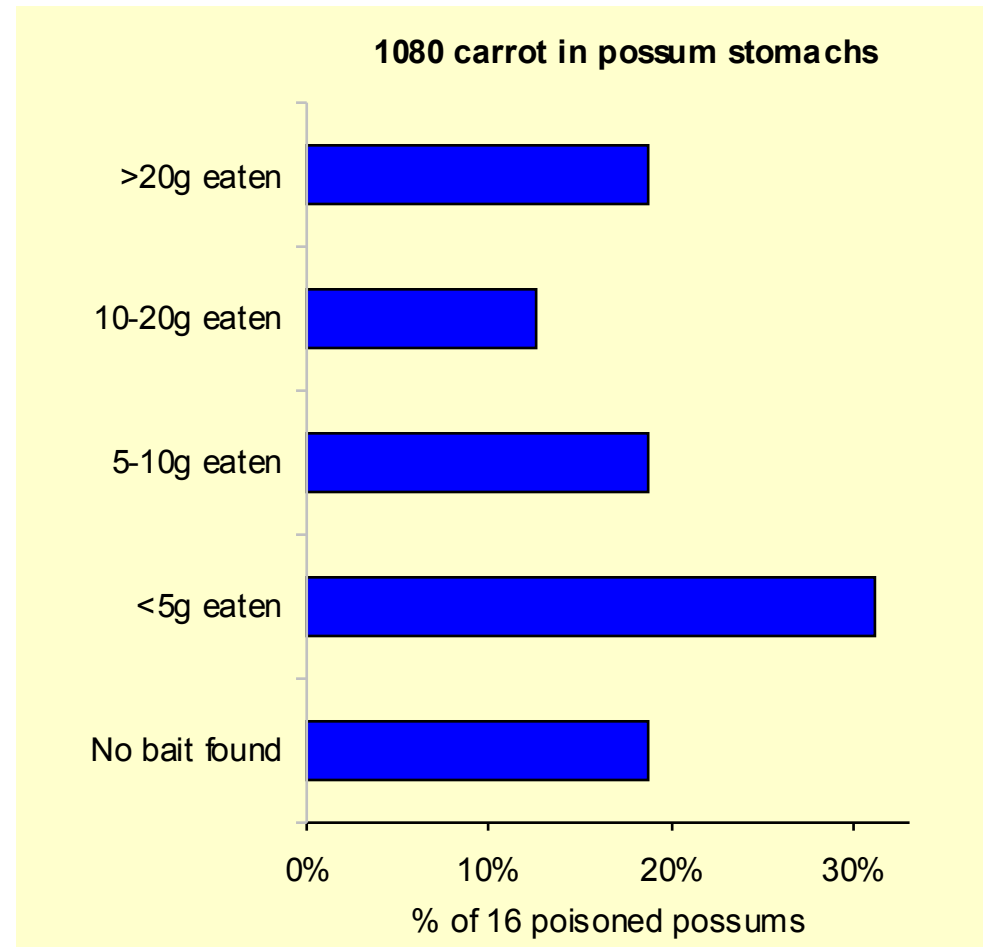
⇒ some possums need to eat more than **5g of 1080 bait.**

Well-fed pre-fed captive possums usually eat at least twice this amount

How much toxic bait do possums actually eat?

At Mokaihaha, 8 of 16 possums found dead after aerial poisoning had less than 5g of bait in their stomachs

=> poor kills resulted from encounters with or eating sublethal amounts of bait, not from not encountering bait



NB: after the 1080 carrot trial at Whirinaki, possums ate 50% of 100 non toxic cereal baits but just 4% of 100 non-toxic carrot baits => **most surviving possums** had encountered enough 1080 carrot to become carrot shy

2006 inferences

Pre feeding works for possums and rats, but not for mice

two pre-feeds better than one, at least for possums

Increased sowing rate gives a modest increase in kills

at least for possums

Too much prefeed can be counter productive?

especially if still present when toxic sown?

Cross hatch sowing did not help in any consistent way

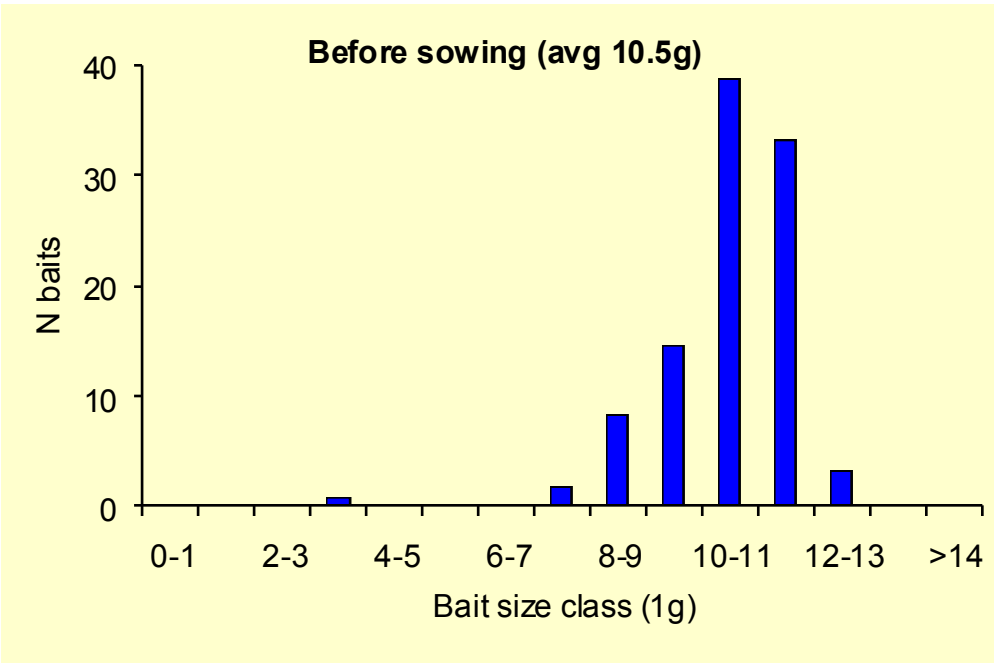
but strongly indicated some spatial effect

Minimum peak bait density needed for possums?

because of bait fragmentation?

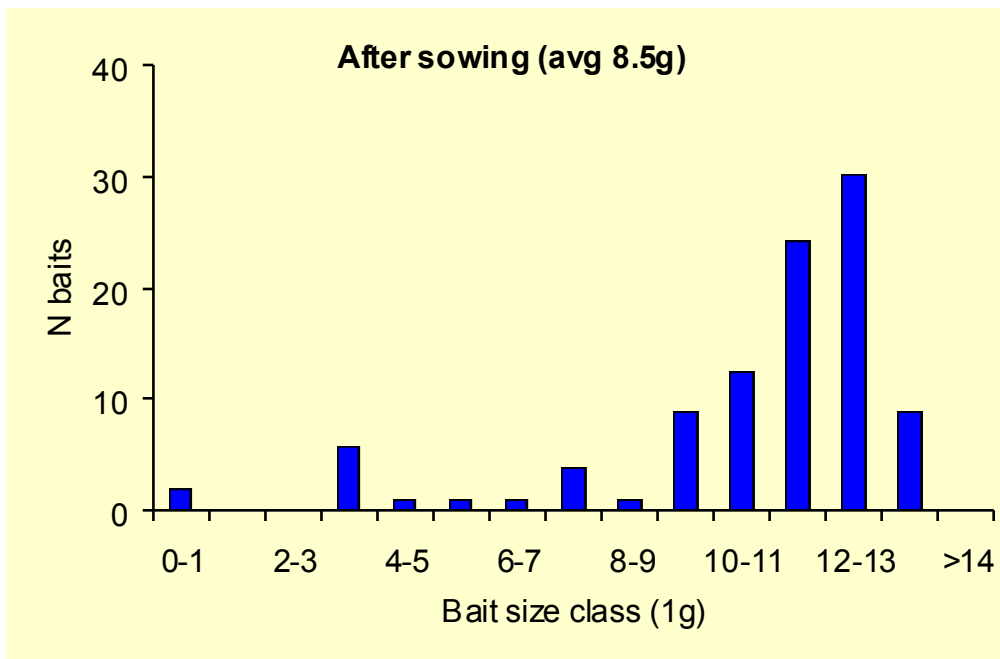
2007 results: Bait fragmentation

Size distribution of “12g” cereal 1080 baits measured before sowing, and immediately after (along roadways and in forest)



⇒ almost all baits >7g before sowing, but 10% <7g after

⇒ some sublethal fragments inevitable? - even before partial consumption by other animals.



2007 Whirinaki repeat: Possums

Pre feed /ha	0	1 kg	1 kg	1 kg	0
1080 cereal/ha method	2 kg Broadcast	2 kg Broadcast	2 kg Trickle	0.4kg Ground	0.4 kg Ground

Possum reduction

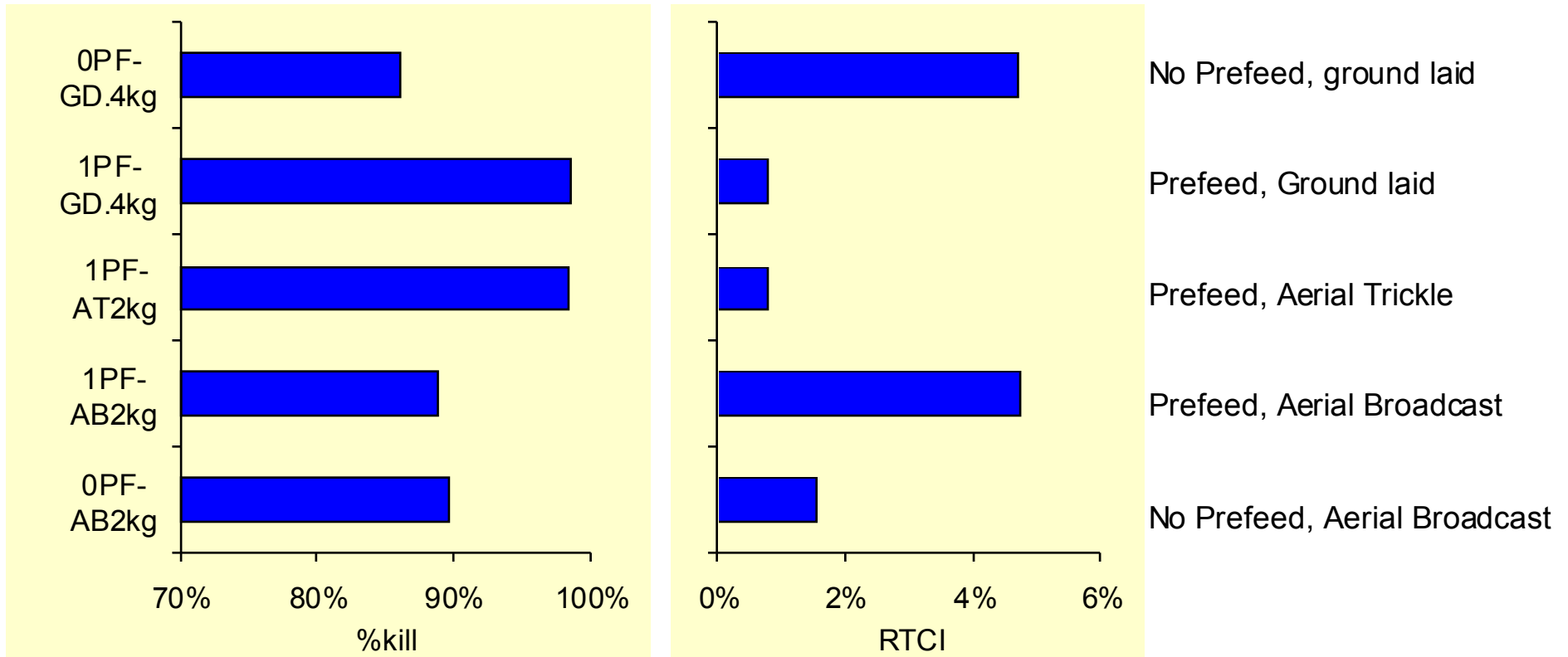
Rep1	89.4%	90.8%	93.1%	89.9%	75.7%
Rep2	36.6%	84.3%	90.8%	84.5%	52.0%

Radio possums

%kill	90%	100%	100%	91-100%	86%
Sample size	(n=20)	(n=18)	(n=14)	(n=11)	(n=21)

2007 Whirinaki repeat: Possums 2

NB: Innermost traps only



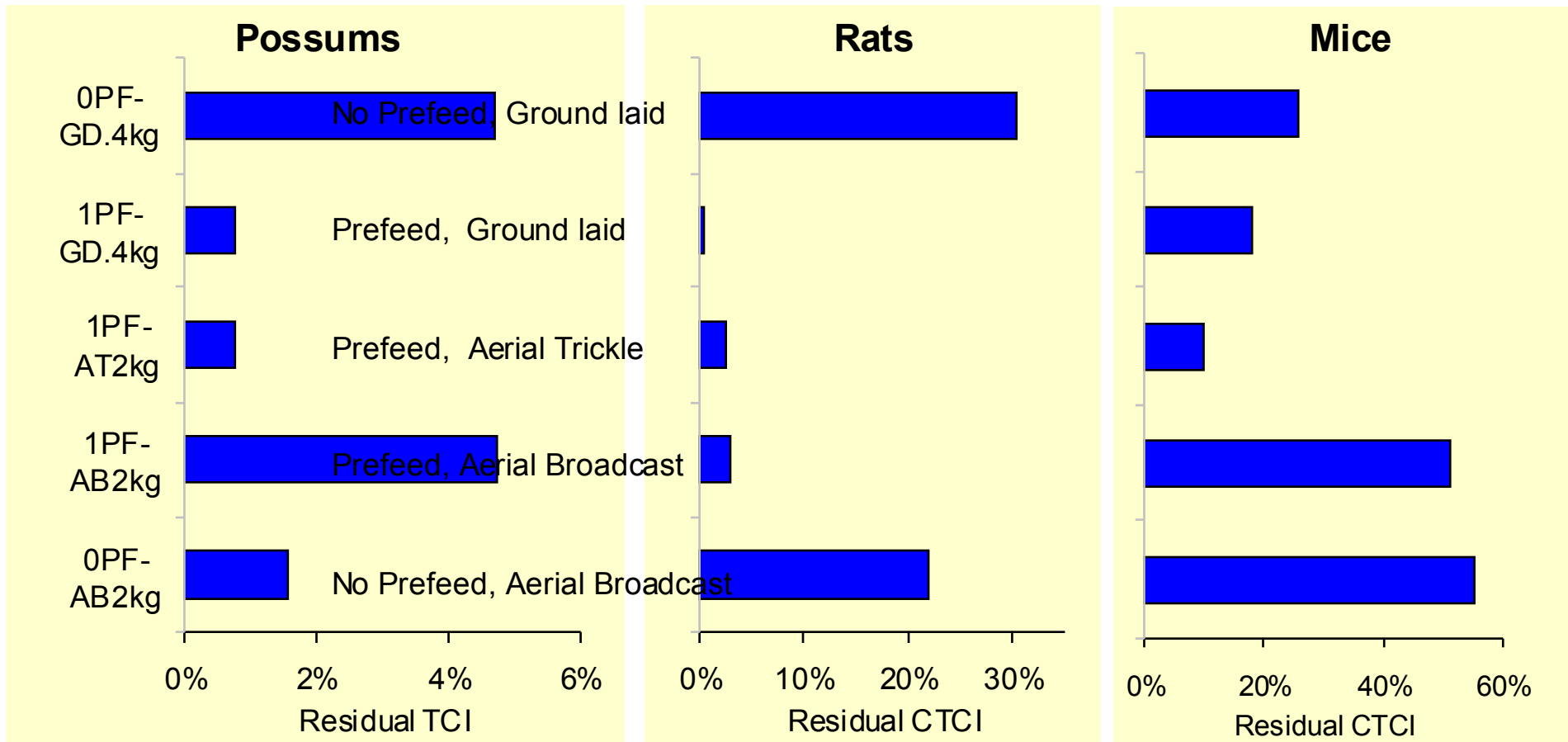
Ground and trickle at least as good as broadcast

⇒ Localised high density good?

2007 %kill: Rats and mice

Pre feed /ha	0 kg	1 kg	1 kg	1 kg	0 kg
1080 cereal/ha method	2 kg Broadcast	2 kg Broadcast	2 kg Trickle	0.4kg Ground	0.4 kg Ground
Rat reduction					
Rep1	87.7%	100%	98.9%	96.7%	60.0%
Rep2	74.3%	95.0%	84.8%	100.0%	60.2%
Mouse reduction					
Rep1	67.2%	52.9%	86.7%	64.7%	81.8%
Rep2	-39.8%	-56.6%	91.7%	98.1%	76.9%

Residual abundance

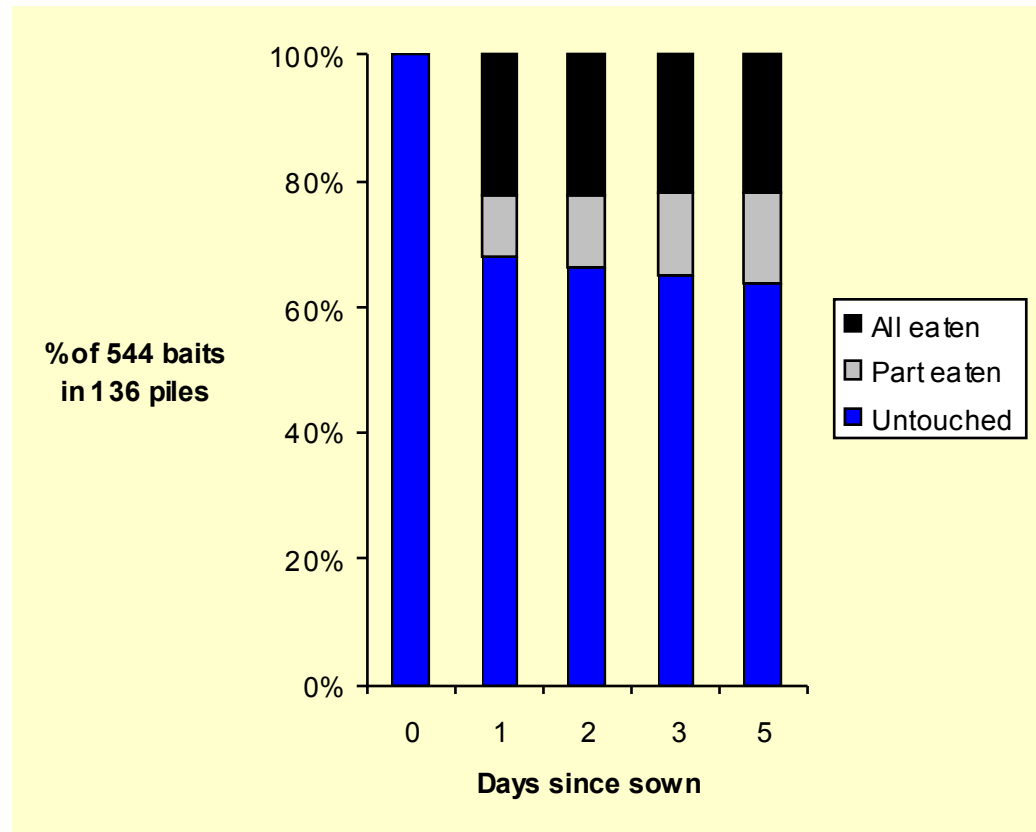


⇒ Prefeeding works well for rats and (usually) possums, but far less so for mice

⇒ Ground and trickle best? broadcast poor for mice

Bait consumption

In pre-fed block ground baited at 0.4kg/ha, most bait eaten (and all whole baits taken) was eaten on the first night.



- ⇒ most possums were killed on the first night, and only 0.1kg/ha of bait was eaten
- ⇒ we would have got similarly high kills with < 0.1kg bait/ha (i.e. <5% of current standard)?

2007 inferences

Prefeeding serves multiple functions

- sustained increase in bait acceptance
- sustained awareness of where to look for bait
- temporary increase in ground use

Overbaiting serves mainly to reduce sublethal poisoning of possums

- broadcasting improves coverage but reduces density immediately under the helicopter
- trickle and handsowing better, but presumably only if swath spacing < majority of home range diameters.

2007 inferences

Pre-feeding seems essential for high kills of rats

- one prefeed usually enough (unless numbers v high)
- may be possible to over pre-feed?
- sowing rate not crucial

Mice can be killed with 1080 bait but apparently only when rats are removed first?

- neophobia secondary – but probably still important?
- surprisingly most mice at Whirinaki were killed even with 100m spacing between bait lines

Summary

Good multi-species (possum and rodent) control was attained using 80% less 1080 bait than usual but with pre-feeding and with bait aggregated to reduce the risk of sublethal encounters by possums

There is potential to massively reduce the amount of 1080 used in New Zealand without risking low kills.