



Small Mammal Control Research Priorities

NEW ZEALAND'S
BIOLOGICAL
HERITAGE

Ngā Kōhira
Tuku Iho

National
SCIENCE
Challenges



Manaaki Whenua
Landcare Research



New Zealand's specialist land-based university

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Executive Summary

This report presents the results of a survey assessing the research topics that are most important to improve currently available tools for small mammal pest control. The survey, and the review of the gaps in current knowledge that preceded it, was commissioned by the Biological Heritage National Science Challenge.

Key findings from the survey included:

- All respondents believed that more research is needed into how to improve current and close-to-market small mammal control tools
- Most of the proposed research topics were considered “essential” or “important”
- 96% of respondents thought it would be useful to create a collective funding and decision-making body specifically focused on improving NZ's ability to control small mammal pests
- More than 75% of respondents would likely support such a collective and would help initiate it

Research prioritisation results

The survey results can be analysed in several ways and the details in this report should be read in full for a complete picture. However, the top 10 research topics that were labelled “essential” or “important” were:

Research topic	# out of 26; and %
Conduct comparative trials comparing the accuracy and precision of monitoring techniques, particularly camera traps, in direct relation to abundance and conservation thresholds	24 (92%)
Gain a better understanding of encounter and interaction rates for all three target species with monitoring and control devices	24
Progress diphacinone + cholecalciferol (D+C) as an effective alternative to brodifacoum	22
Develop kill traps with improved capture efficiencies	22
Investigate a combination approach to lures and determine the best mix of sensory attractants (e.g. sound and scent)	22

Test wireless network reliability and cost-effectiveness across a range of trap network scenarios, including live and kill traps	22
Determine how to cost-effectively detect survivors of control	22
Conduct comparative trials using aerial 1080 with mixtures of sowing rates, new multi-species baits and prefeeding regimes to enable consistent high kills for all target species	22
Develop new formulations of d-pulegone (to slow its decay) or new products that are effective at repelling kea	21
Test the capture efficiency and selectivity of the top five most popular kill traps for each target species, using both commonly used lures and baits and novel lures and sets, and then develop product information to enable purchasers of traps to make informed choices	20 (77%)

Introduction

The BioHeritage Challenge is researching new, high-tech solutions for pest management in New Zealand. However, stakeholders have also asked for improvements to the tools they will depend on for the foreseeable future. In response, the Science Challenge commissioned a review of the gaps in current knowledge associated with these tools and identification of the key research required to support their improvement.

The report (Warburton, Ross, McFarlane 2017) identified 34 priority areas needing further research. The report is available online at: <https://tinyurl.com/mammal-control>

The report narrowed the 34 areas to 15 specific research priorities. This final selection was based on current knowledge gaps, how close to market a tool is, the probability of success and the likely benefits to PF2050 of the new tool becoming available.

The survey also tested support for the possible creation of a "Small Mammal Pest Collective." The BioHeritage National Science Challenge believes that a collective approach might provide a mechanism for supporting "close-to-market" research on small mammal pests. This approach has generally worked well to advance the biological control of pest plants.

The survey was emailed to 29 people, some of who will have forwarded it to others. Ultimately, there were 26 responses to the survey¹:

- 13 local or regional councils
- 3 Government agencies
- 3 community pest control groups
- 3 NGOs
- 1 each from a research organisation and a company.

Many questions included an open-ended “comments” section that provide useful insights into why people answered questions the way they did. Sample comments are included in the results below.

Survey Results

Q 1: Awareness of the report?

The survey asked: **Have you read the report “Applied research to progress and support close-to-market pest control tools and their strategic application”?**

Eighteen respondents (69%) had not read the report; eight had. There was one comment, that the report was “very comprehensive.”

Q 2: Is more research needed?

The survey asked: **Do you agree that more research is needed into how to improve current and close-to-market small mammal control tools?**

All 26 respondents agreed more research is needed.

Sample Comments

“Particularly where there is not a commercial market for a product but there may well be a current need from public conservation lands.”

¹ Responses were anonymous, but most respondents identified themselves as willing to participate in a working group.

"Many of these prototypes are likely to provide valuable new tools if they can be taken to proof of concept and commercialization."

"They are clearly very inadequate for all target species. Even if there is one ok tool, more research is needed because it is a poor strategy to just use one tool. We need multiple excellent tools for each species."

Q 3: Ranking research priorities

The survey asked: **Please categorise the importance of the following research areas.**

1. Progress diphacinone + cholecalciferol (D+C) as an effective alternative to brodifacoum
2. Develop kill traps with improved capture efficiencies
3. Conduct comparative trials comparing the accuracy and precision of monitoring techniques, particularly camera traps, in direct relation to abundance and conservation thresholds
4. Advance our understanding of the need to include fat, protein and other additives in rat, possum, and (especially) stoat baits with the aim of developing standardised baits suitable for ground and aerial control
5. Investigate a combination approach to lures and determine the best mix of sensory attractants (e.g. sound and scent)
6. Test wireless network reliability and cost-effectiveness across a range of trap network scenarios, including live and kill traps
7. Develop simulation tools for comparing the cost-effectiveness of competing scenarios for rolling out large-scale eradication programmes
8. Develop an attractive, long-life and standardised lure for the three target species to increase detection sensitivity
9. Develop new formulations of d-pulegone (to slow its decay) or new products that are effective at repelling kea
10. Conduct ground-based field trials comparing the efficacy and cost-effectiveness of all newly registered vertebrate toxic agents (VTAs) against current industry standards
11. Gain a better understanding of encounter and interaction rates for all three target species with monitoring and control devices
12. Test the capture efficiency and selectivity of the top five most popular kill traps for each target species, using both commonly used lures and baits and novel lures and sets, and then develop product information to enable purchasers of traps to make informed choices

13. Determine how to cost-effectively detect survivors of control
14. Conduct comparative trials using aerial 1080 with mixtures of sowing rates, new multi-species baits and prefeeding regimes to enable consistent high kills for all target species
15. Ascertain which prototype multi-kill poison devices have potential for field evaluation and then run comparative field trials

Summary results

Two thirds of the research topics were seen as “essential” or “important” (Fig 1). Of the 15 topics, 10 had a combined essential/important score above 75%. That is, 20 or more respondents scored the topic as essential or important.

Conversely, very few of the topics were strongly identified as “nice to have.” The only double-digit response in this category was “develop simulation tools for comparing the cost-effectiveness of competing scenarios for rolling out large-scale eradication programmes,” which was listed as “nice to have” by 10 respondents. One person also listed simulation tools as “not needed,” the only topic put into that category by any respondent.

Figure 1 below shows the scores for each of the 15 research priorities.

The top “essential” research topics were:

Conduct comparative trials comparing the accuracy and precision of monitoring techniques, particularly camera traps, in direct relation to abundance and conservation thresholds	16 responses
Determine how to cost-effectively detect survivors of control	15
Progress diphacinone + cholecalciferol (D+C) as an effective alternative to brodifacoum	14
Gain a better understanding of encounter and interaction rates for all three target species with monitoring and control devices	14
Conduct comparative trials using aerial 1080 with mixtures of sowing rates, new multi-species baits and prefeeding regimes to enable consistent high kills for all target species	13
Develop kill traps with improved capture efficiencies	12
Ascertain which prototype multi-kill poison devices have potential for field evaluation and then run comparative field trials	12

The top “important” research topics were:

Test wireless network reliability and cost-effectiveness across a range of trap network scenarios, including live and kill traps	15
Develop new formulations of d-pulegone (to slow its decay) or new products that are effective at repelling kea	15
Test the capture efficiency and selectivity of the top five most popular kill traps for each target species, using both commonly used lures and baits and novel lures and sets, and then develop product information to enable purchasers of traps to make informed choices	15
Investigate a combination approach to lures and determine the best mix of sensory attractants (e.g. sound and scent)	13
Advance our understanding of the need to include fat, protein and other additives in rat, possum, and (especially) stoat baits with the aim of developing standardised baits suitable for ground and aerial control	12
Gain a better understanding of encounter and interaction rates for all three target species with monitoring and control devices	10
Develop kill traps with improved capture efficiencies	10

Highest combined scores “essential and important”

After combining the “essential” and “important” scores, the top 10 research topics were:

Conduct comparative trials comparing the accuracy and precision of monitoring techniques, particularly camera traps, in direct relation to abundance and conservation thresholds	24 (92%)
Gain a better understanding of encounter and interaction rates for all three target species with monitoring and control devices	24
Progress diphacinone + cholecalciferol (D+C) as an effective alternative to brodifacoum	22
Develop kill traps with improved capture efficiencies	22
Investigate a combination approach to lures and determine the best mix of sensory attractants (e.g. sound and scent)	22
Test wireless network reliability and cost-effectiveness across a range of trap network scenarios, including live and kill traps	22

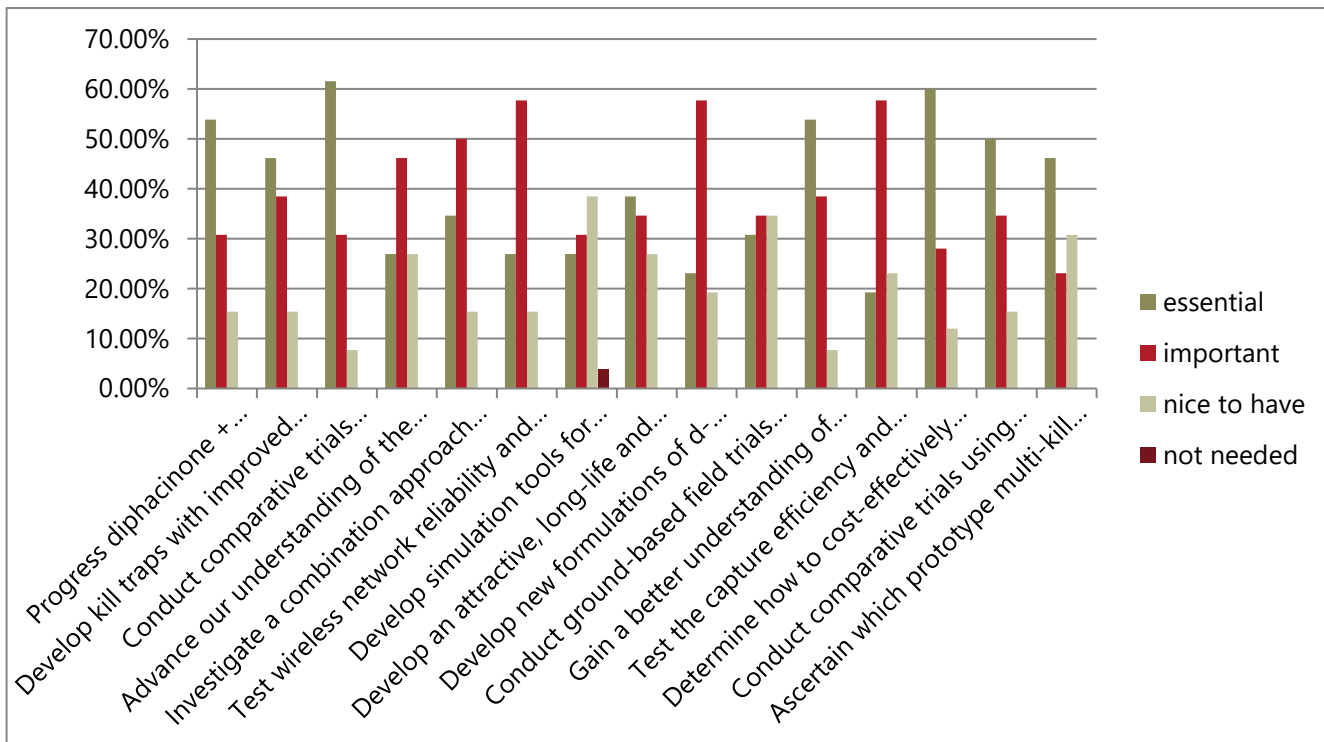
Determine how to cost-effectively detect survivors of control	22
Conduct comparative trials using aerial 1080 with mixtures of sowing rates, new multi-species baits and prefeeding regimes to enable consistent high kills for all target species	22
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Lowest combined "essential and important" scores

At the other end of the ranking scale, the lowest combined "essential and important" scores were:

- Develop simulation tools for comparing the cost-effectiveness of competing scenarios for rolling out large-scale eradication programmes – 57%
- Conduct ground-based field trials comparing the efficacy and cost-effectiveness of all newly registered vertebrate toxic agents (VTAs) against current industry standards – 65%
- Ascertain which prototype multi-kill poison devices have potential for field evaluation and then run comparative field trials – 69%

Figure 1: Ranking all 15 research topics



Sample Comments

I'd be wary of developing and relying on one super long-life lure. I think we should aim to ensure we have a variety of high performing lures so that we can move between these as needed.

Work needs to include efficacy and efficiency of implementation and scaling.

There is a definite need for improved monitoring and detection tools. Perhaps not necessarily cameras.

Q 4: Top three "essential" research topics

The survey asked: **Please rank (1-3) ONLY your TOP THREE "essential" research topics chosen in Q 3. Please choose only three topics.**

This was always going to be a challenging question to answer because it asked respondents to make a very fine distinction (rank 1-3) among topics that they had already labelled “essential.” Ultimately, the difficulty of the question was reflected in answers that were not overly helpful in refining priorities.

The results showed about half of respondents agreed on the first priority, but considerably less agreement about the second and third priorities.

Of the 26 respondents, 14 listed their top priority as “progress diphacinone + cholecalciferol (D+C) as an effective alternative to brodifacoum.”

Seven of 26 respondents (just 27%) agreed that the second priority was to “conduct comparative trials comparing the accuracy and precision of monitoring techniques, particularly camera traps, in direct relation to abundance and conservation thresholds.”

Views on the third priority varied widely and showed no useful consensus.

There were no comments for Q 4.

Q 5: National Biocontrol Collective

The survey asked: **Are you familiar with the National Biocontrol Collective (NBC)?**

The Biocontrol Collective was well known among respondents – 42% said they were very familiar with it and 42% said somewhat familiar. Four respondents (15%) said they were unfamiliar with the collective.

Sample Comments

Great collective but there is no National Strategy. There is provider capture by LCR which directs programmes according to its own capabilities. There are too many insect agents being trialled and not enough pathogens. There also needs to be more provider players.

Note, Regional Councils are looking at reviewing this system.

This has worked well.

Q 6: Value of a collective approach to small mammal research?

The survey asked: **In general, do you think it would be useful to create a collective funding and decision-making body specifically focused on improving NZ's ability to control small mammal pests?**

Eighty-four percent (21 respondents) said a small mammal research collective would be very useful; another 12% said somewhat useful. Only one respondent said it would not be useful.

Sample comments

But as with all of these things we need to be very clear on focus and scope.

Can't comment on the usefulness without more detail on what this body would focus on and how it would operate.

So long as it is fast and effective at getting tools to field.

Without doubt. Funding is disparate, providers are competing unnecessarily and there are no nationally agreed research areas. This is not sustainable in a small country.

Need to get things moving fast.

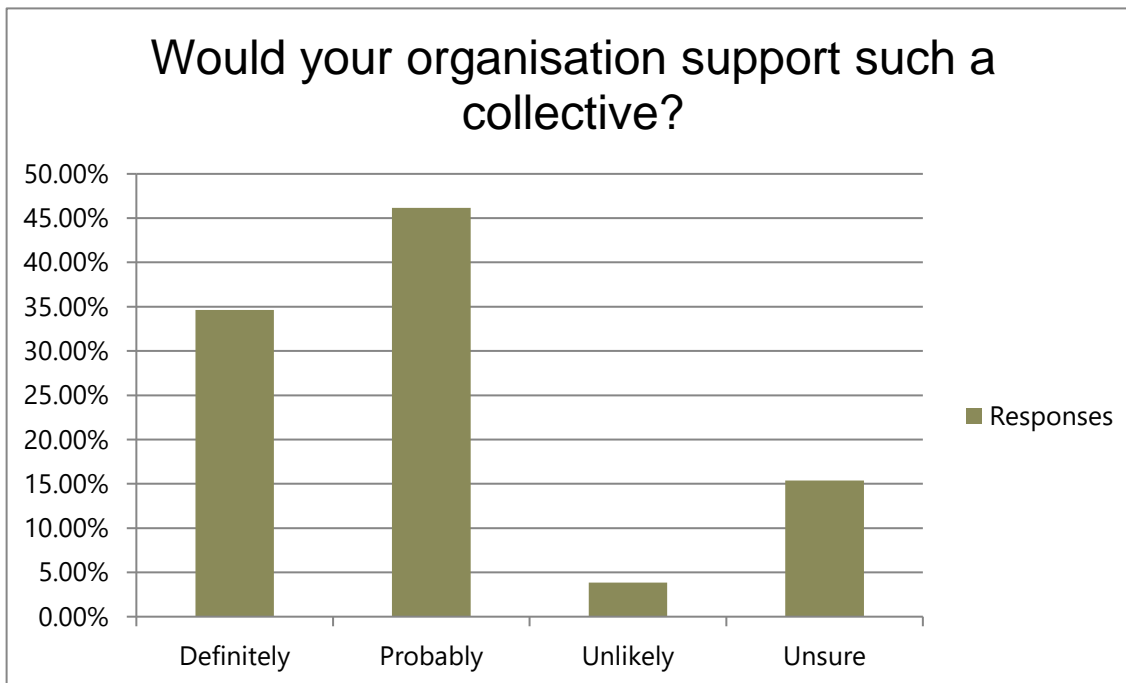
There is undoubtedly a current vacuum about leadership in the small mammal control area. Both best practice control and monitoring techniques exist in DOC and NPCA but there is little leadership and communication about these. In particular, they need endless updating, at suitable, practical intervals. This updating must be data-based. This was achieved effectively by Pestlink (DOC) but restructuring stopped Pestlink in its tracks. If there were to be a body, it must not focus on just one strand eg PFNZ, but must work to support the huge diversity of current NZ approaches.

Q 7: Is there support for a small mammal collective?

The survey asked: **Would your organisation support such a collective?**

As Fig 2 below shows, there was a very strong (80%) indication that organisations would support a collective.

Figure 2: Support for a collective



Sample Comments

I only represent small user groups, but we would support better targeted research, with some finance.

What is meant by support? Financial support or moral support?

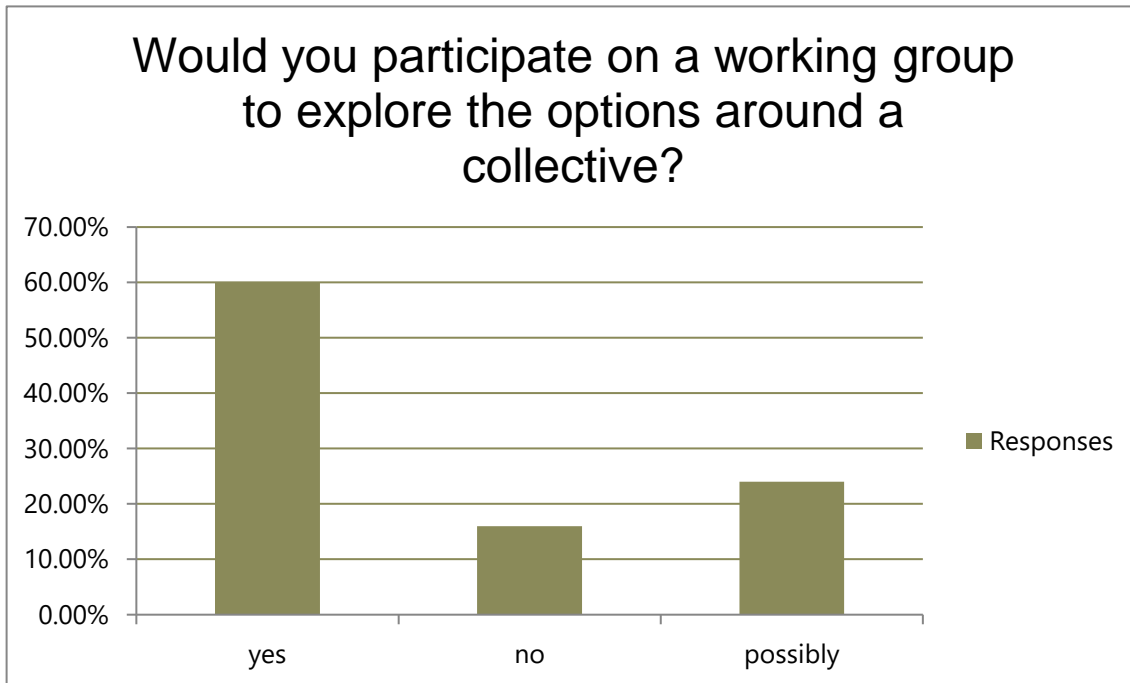
I have no influence in such decision making.

Q 8: Willingness to develop options for a collective approach?

The survey asked: **Would you participate on a working group to explore the options around a collective?**

Mirroring the responses in Q 7, 84% of respondents said they would or possibly would help develop a collective approach (Fig 3).

Figure 3: Help develop a collective



Sample Comments

As usual, depends on time required, and timing. This would be another unpaid time thing, but I would try to prioritise it.

Would link very strongly into the landscape scale predator control projects that PF2050 Ltd is just about to start funding.

I have extensive experience with the National Biocontrol Collective and know that it works.

Q 9: Working group participation

The survey asked for the names of people willing to be part of a working group.

Twenty of 26 people provided their names.

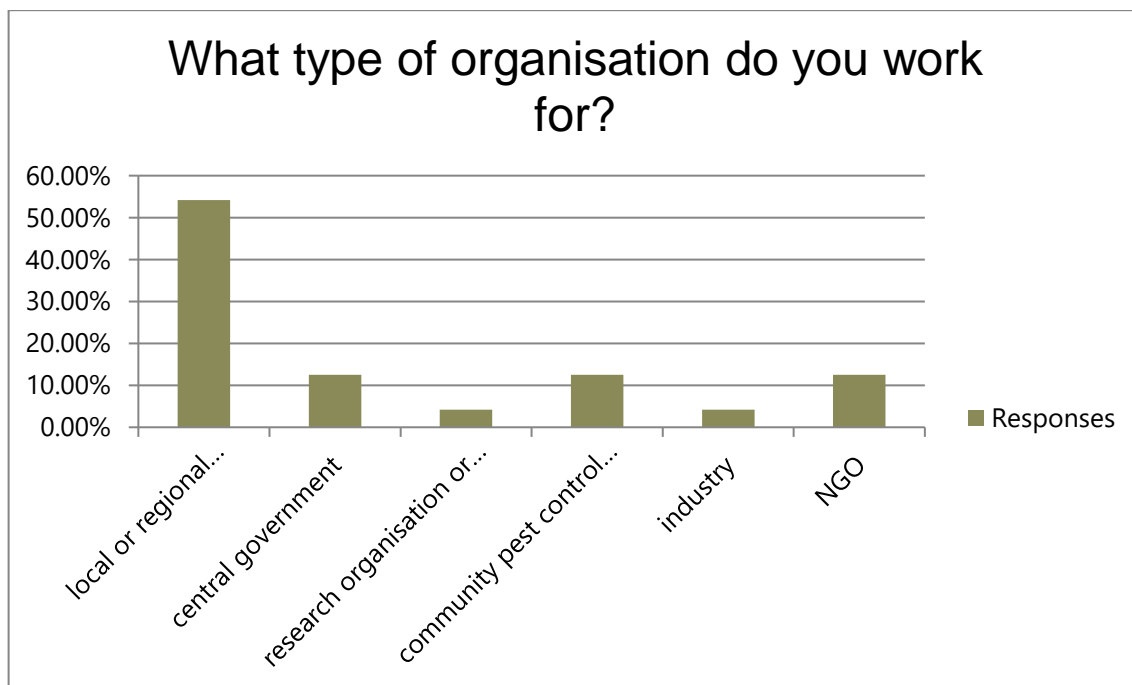
Q 10: Who responded?

The survey asked: **What type of organisation do you work for?**

Distribution of the survey focused on organisations with a strong interest in small mammal control, some research capability and the resources to potentially support a research collective. The responses demonstrate very good coverage among regional or local councils (13) and relevant central government agencies (3) (Fig 4).

As expected, there were relatively few responses from other sectors. For example, the survey did not attempt to reach the large number of community groups doing pest control across New Zealand. There were only three responses from that sector.

Figure 4: Sectors responding



Sample Comments

Collective submission from MPI.

We are a small group.

Conclusions

The survey results showed unanimous agreement that more research is needed to improve currently available tools for small mammal pest control.

There was strong agreement on what those top research priorities should be. Ten research topics were considered essential or important by three-quarters of respondents. These are shown in the table below:

Conduct comparative trials comparing the accuracy and precision of monitoring techniques, particularly camera traps, in direct relation to abundance and conservation thresholds	24 (92%)
Gain a better understanding of encounter and interaction rates for all three target species with monitoring and control devices	24
Progress diphacinone + cholecalciferol (D+C) as an effective alternative to brodifacoum	22
Develop kill traps with improved capture efficiencies	22
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Develop new formulations of d-pulegone (to slow its decay) or new products that are effective at repelling kea	21
Test the capture efficiency and selectivity of the top five most popular kill traps for each target species, using both commonly used lures and baits and novel lures and sets, and then develop product information to enable purchasers of traps to make informed choices	20 (77%)

Respondents also agreed that it would be useful to create a collective funding and decision-making body specifically focused on improving NZ's ability to control small

mammal pests. More than 75% of respondents would likely support such a collective and would help initiate it.

Funding from the Biological Heritage National Science Challenge for pest control technologies has focused on high-tech solutions with potential future applications. However, end-users have expressed concern about the lack of funding support for incrementally improving many of the currently available tools, which they will depend on for the foreseeable future.

Indeed, there is very little market-based or Government funding available for applied, close-to-market research. As a result, the priorities identified in this report are extremely unlikely to be progressed without end-user funding support.

The focus of the BioHeritage Challenge is on “game changing” research to reverse the decline of New Zealand’s biological heritage. However, it also is committed to supporting the more effective control of vertebrate pests in the short term.

The Challenge will therefore facilitate a collaborative discussion of the options for achieving “joined up” action to improve the tools that we use right now. The Challenge will support those initial discussions; including how a collective approach might be structured, membership decided and how parties can best contribute and/or leverage funding. Although the bio-collective for weeds provides one possible template, the pest animal collective may need to have a wider stakeholder base. Any potential longer term role for the Challenge will be part of those discussions.

Recommendations

- That the BioHeritage Challenge facilitate a meeting in July to explore options for achieving “joined up” action to address the knowledge gaps that have been identified.
- That the discussion examine potential mechanisms for funding this research, including but not limited to the establishment of a collective.
- That as part of that discussion, key stakeholders confirm the priority research gaps in small mammal pest control.
- That the group prepare a report with recommendations for review by the key stakeholders.

References

Warburton B, Ross J, McFarlane L. 2018. Applied research to progress and support close-to-market pest control tools and their strategic application. Landcare Research contract report LC3051. 53pp.