Landcare Research
Manaaki Whenua

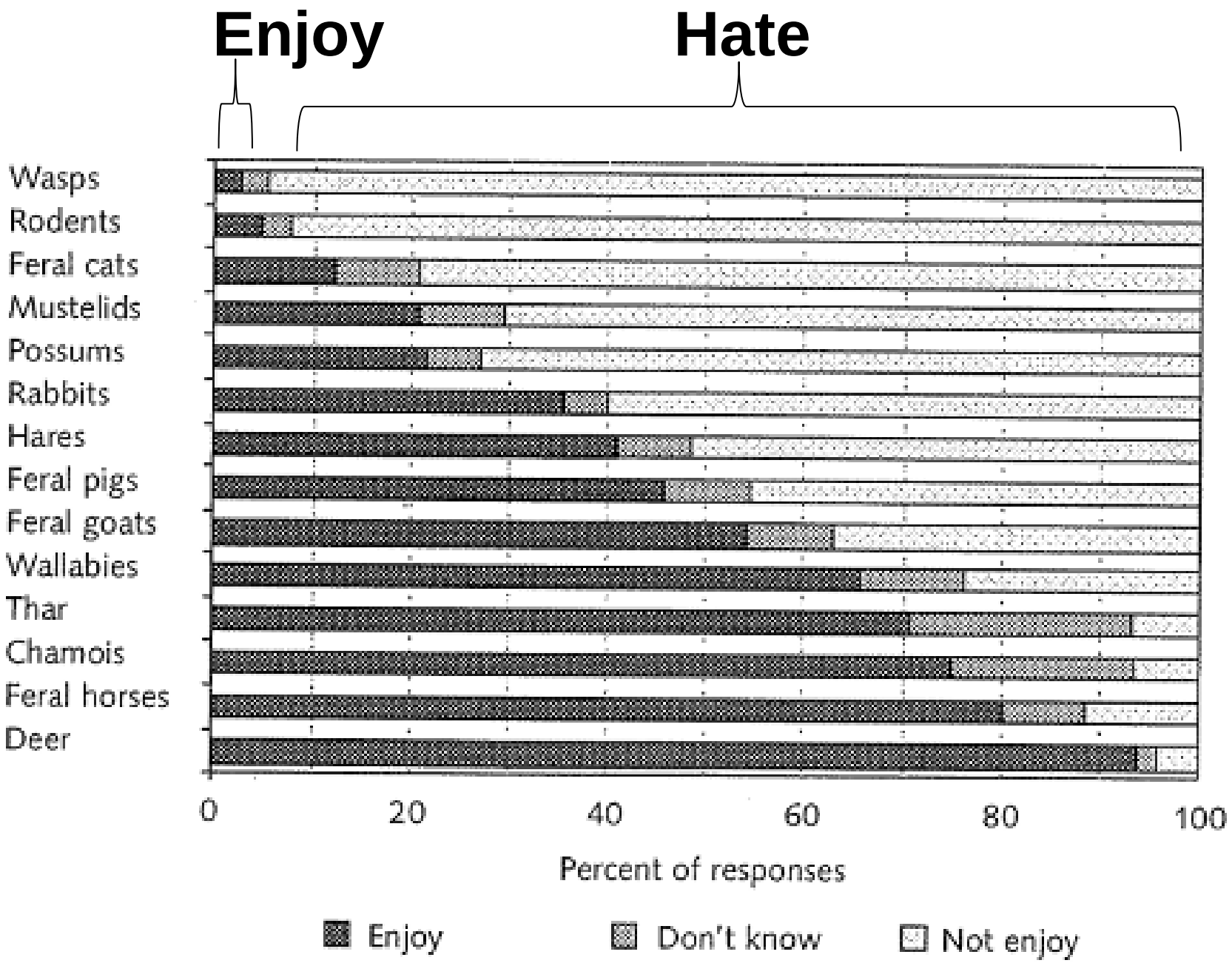
Update on Control Options for Wasps

Darren Ward

Biosecurity Bonanza :19 May 2014

German wasp
1945

Common wasp
1978



Source: Fraser 2001. Public views on introduced wildlife in NZ. LR Science Series 23.

Major Research Programs against Wasps

Biological Control

Insecticide Baits

Pathogens

Pheromones

DSIR late 1970s-1992
Landcare Research + AgResearch
1992-2004

Landcare Research + AgResearch
2005-2008

Plant & Food Research
2007-2011

- Despite these programs and research (>150 articles, reports)
- **Effective control is lacking**
- Central govt $ is gone; concern that issue is ‘in the past’

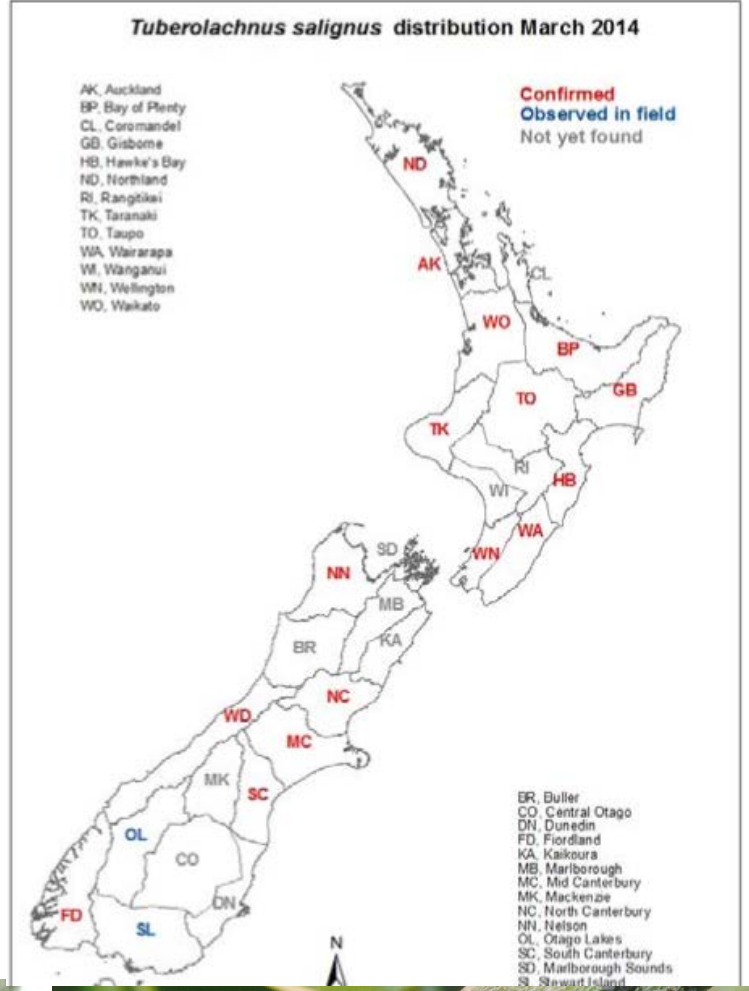
..but i) ongoing impacts; ii) new threat

New threat

Giant Willow Aphid
First found Dec 2013

Very abundant on willows
Providing wasps with more food (honeydew)

Expect increase in wasp numbers
Esp. on farmland, picnic areas etc



Reducing the Pain of Pest Wasps in NZ

A STRATEGY WORKSHOP

The impacts of pest wasps on biodiversity, recreation and industry in NZ is far reaching. Mitigation options and solutions need to take into account a range of technologies and approaches, explore innovative opportunities and stay connected with the needs of those in industries and occupations that experience the pain first hand. **What are the priorities for wasp management and research?**

Workshop Goal

Improved "big-picture" understanding of the ecological, economic and social pain caused by wasps and agreement on the value of solving / reducing the problem. Develop a collective research approach to a range of potential control solutions.

Draft Programme

- Stakeholder presentations on the "pain" – impacts, costs, solutions and gaps
- Workshop session to discover common ground and types of solutions that meet needs
- Research presentations on current knowledge and solutions
- Mapping needs and likely solutions in a comprehensive and effective programme of research

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management and research?

Outcomes

1. NZ-wide $$costs
2. Research directions

d social pain caused by

. Develop a collective

Draft Programme

- Stakeholder presentations on the "pain" – impacts, costs, solutions and gaps
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1. Improved NZ-wide $$costs

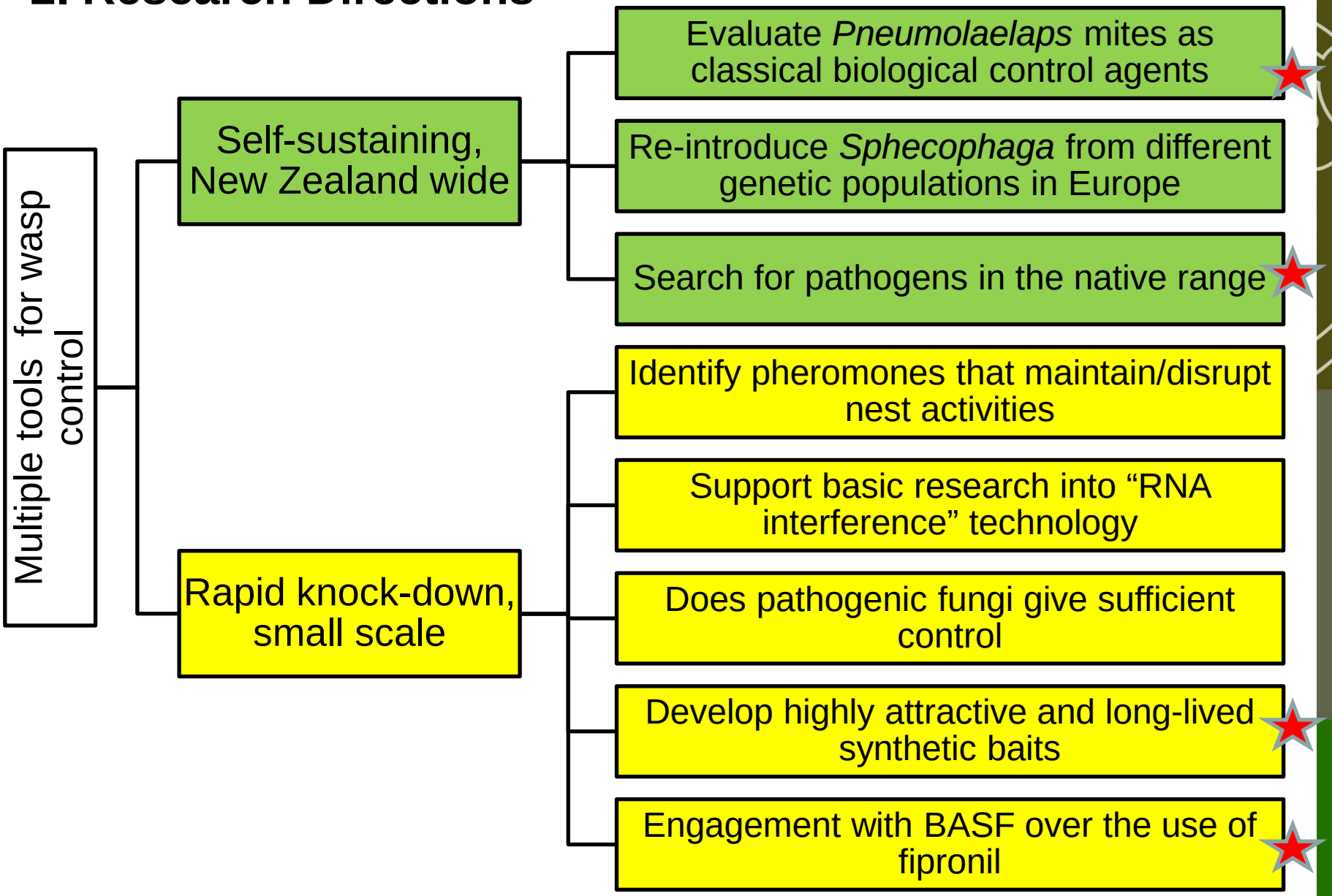
DOC & MPI

Q: what are the costs of wasps for NZ?

economic (horticulture; beekeepers etc); health; recreation; conservation

Project ends July 2014

2. Research Directions



Self-sustaining, New Zealand wide control

- Previous biocontrol releases of parasitoid *Sphecophaga*
- Effectively failed

- **Should we give up?**
- No

  - Biocontrol *only option* for wide suppression of wasps numbers across NZ (never be able to bait/trap wasps at this scale)

  - >attempts needed (e.g. weed biocontrol programs)

Self-sustaining, New Zealand wide control

- Likely that *Sphecophaga* failed because …
    - Importations of agent (late 1970s)
        - from small number of sites in central Europe
        - small number of colonies imported
        - some were hosts of different wasp species

= releases in NZ from ONE colony = low genetic diversity

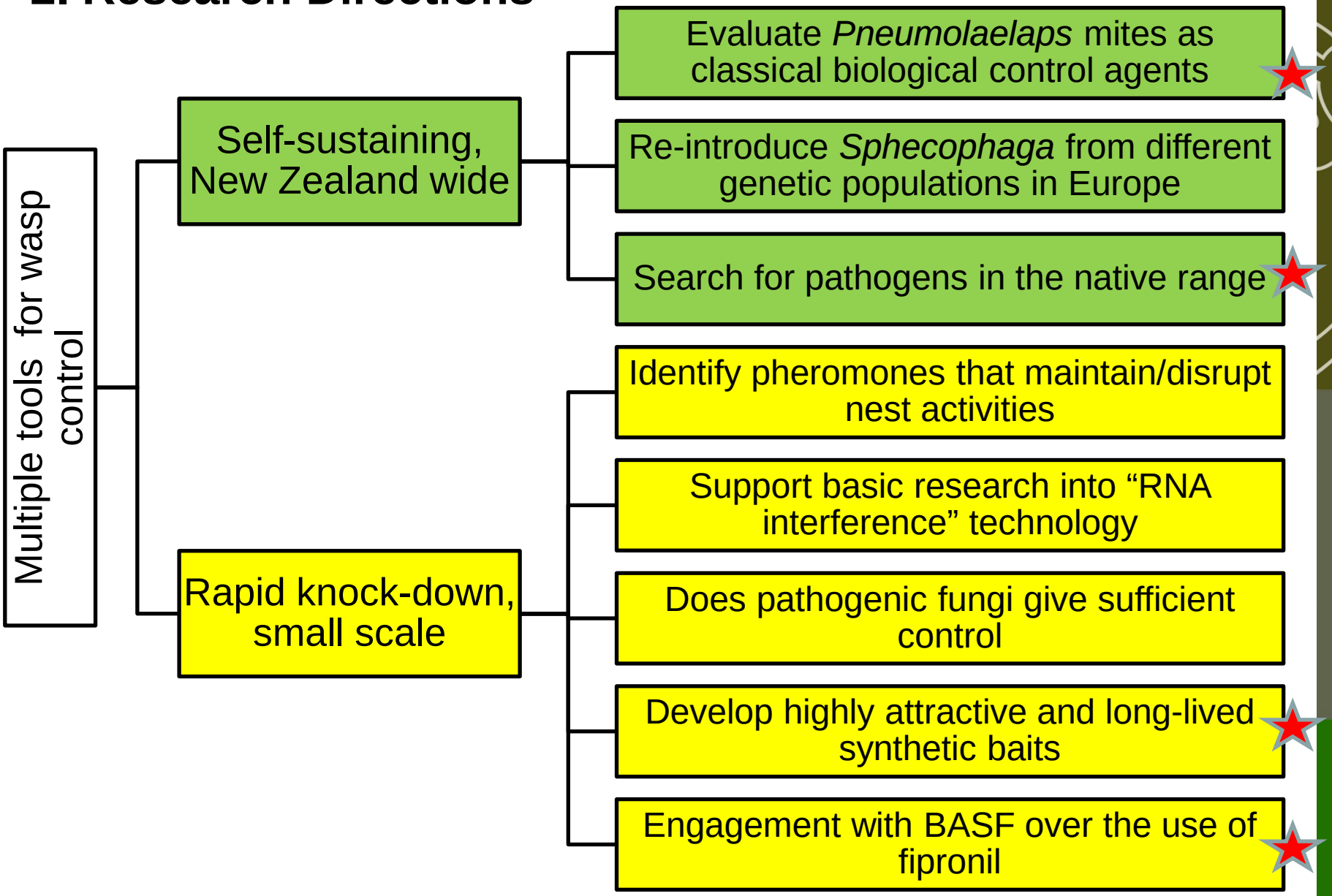
Self-sustaining, New Zealand wide control

Options for Biocontrol

- Further releases of *Sphecophaga* from a wider source of populations in Europe

- New agents
  - Pathogens — Marsden$ (Vic. Univ.)
  - Mite — **SFF$ 3yr project begins v. soon!**
  - Hoverfly

2. Research Directions



Rapid knock-down, small scale

Resources needed to place out “stations”

So useful: residential, orchard, few ha – 1000ha

AIM - <u>Get wasp numbers down FAST</u>

via different techniques

1. Baits

2. Mass trapping; Lure & Kill (attractants, pheromones)

Rapid knock-down, small scale ➔ Baits

Baiting has been the *only* effective method for wasps for many decades

Fipronil

- new level of control (late 1990s)
- 1st poison to reduce wasps to below damage threshold levels

- 2004-2006 commercialise a bait product ==> patent issues

Oct 2013 strategy workshop
= recommended that DOC and MPI negotiate with BASF on behalf of NZ govt

Watch this space…

Rapid knock-down, small scale

- **Baits** √

Rapid knock-down, small scale

Other techniques

- Mass trapping; Lure & Kill
  (attractant, pheromones)

Conceptually simple and appealing

Trapping is also self-fulfilling because ‘dead wasps’ are seen in traps

Rapid knock-down, small scale

- mass trapping
- lure (attractant, e.g. pheromones)

… they don’t work

Rapid knock-down, small scale

Potential of Mass Trapping for Long-Term Pest Management and Eradication of Invasive Species

A. M. EL-SAYED,[1, 2] D. M. SUCKLING,[1] C. H. WEARING,[3] AND J. A. BYERS[4]

J. Econ. Entomol. 99(5): 1550–1564 (2006)

Potential of "Lure and Kill" in Long-Term Pest Management and Eradication of Invasive Species

A. M. EL-SAYED,[1,2] D. M. SUCKLING,[1] J. A. BYERS,[3] E. B. JANG,[4] AND C. H. WEARING[5]

J. Econ. Entomol. 102(3): 815–835 (2009)

methods. Several case studies in which lure and kill has been used with the aims of long-term pest management (e.g., pink bollworm, Egyptian cotton leafworm, codling moth, apple maggot, biting flies, and bark beetles) or the eradication of invasive species (e.g., tephritid fruit flies and boll weevils) are provided. Subsequently, we identify essential knowledge required for successful lure and kill programs that include lure competitiveness with natural odor source; lure density; lure formulation and release rate; pest population density and risk of immigration; and biology and ecology of the target species. The risks associated with lure and kill, especially when used in the eradication programs, are highlighted. We comment on the cost-effectiveness of this technology and its strengths and weaknesses, and list key reasons for success and failure. We conclude that lure and kill can be highly effective in controlling small, low-density, isolated populations, and thus it has the potential to add value to long-term pest management. In the eradication of invasive species, lure and kill offers a major advantage in effectiveness by its being inverse density dependent and it provides some improvements in efficacy over related control methods. However, the inclusion of insecticides or sterilants in lure and kill formulations presents a major obstacle to public acceptance.

ABSTRACT Semiochemical-based pest management programs comprise three major approaches that are being used to provide environmentally friendly control methods of insect pests: mass trapping, "lure and kill," and mating disruption. In this article, we review the potential of mass trapping in long-term pest management as well as in the eradication of invasive species. We discuss similarities and differences between mass trapping and other two main approaches of semiochemical-based pest management programs. We highlight several study cases where mass trapping has been used either in long-term pest management [e.g., codling moth, *Cydia pomonella* (L.); pink bollworm, *Pectinophora gossypiella* (Saunders); bark beetles, palm weevils, corn rootworms (*Diabrotica* spp.); and fruit flies] or in eradication of invasive species [e.g., gypsy moth, *Lymantria dispar* (L.); and boll weevil, *Anthonomus grandis grandis* Boheman). We list the critical issues that affect the efficacy of mass trapping and compare these with previously published models developed to investigate mass trapping efficacy in pest control. We conclude that mass trapping has good potential to suppress or eradicate low-density, isolated pest populations; however, its full potential in pest management has not been adequately realized and therefore encourages further research and development of this technology.

Successful criteria trapping

Small
Low-density
Isolated populations

Rapid knock-down, small scale

Small
Low-density
Isolated populations

These situations <u>do not</u> apply for wasps in NZ!!

1. Widespread
2. High density
3. Not isolated – therefore re-invasion easy

Rapid knock-down, small scale

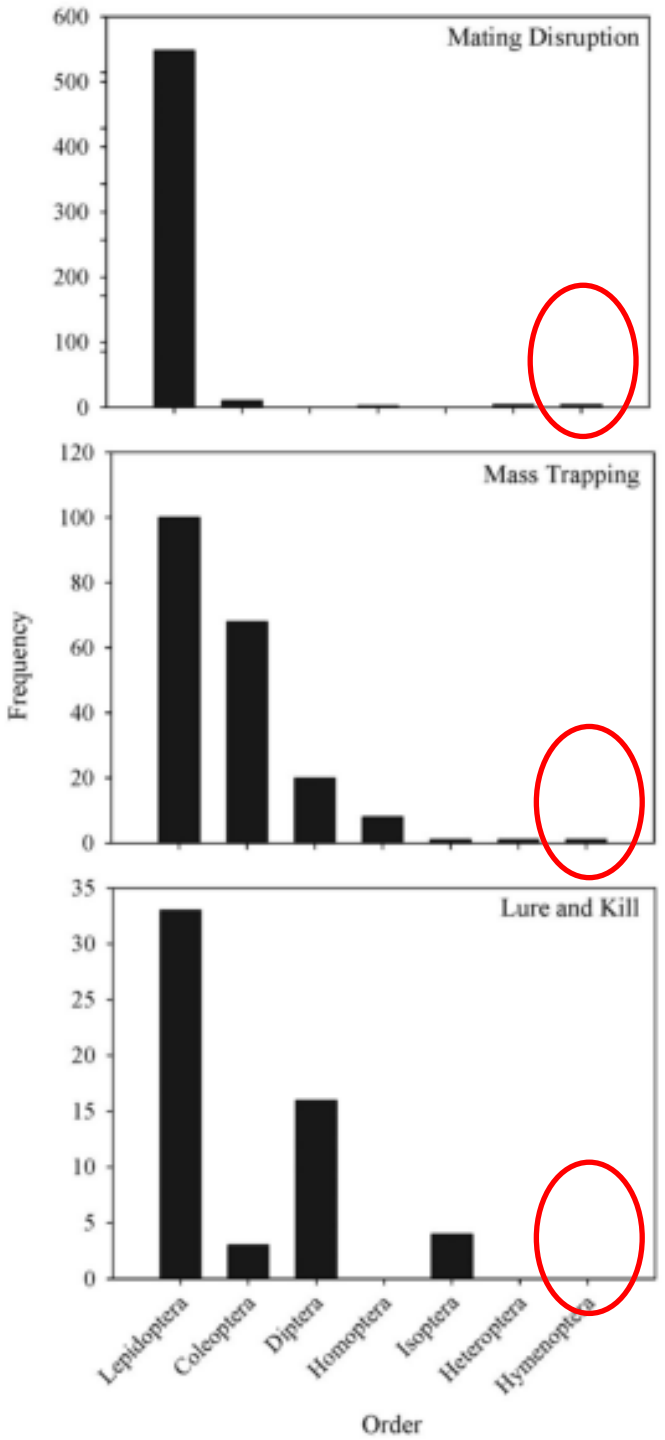
- **Baits** √
- Mass trapping X
- Lure & Kill X

Rapid knock-down, small scale

Success of

- mass trapping
- lure & kill

for <u>other</u> groups insects, <u>not</u> wasps



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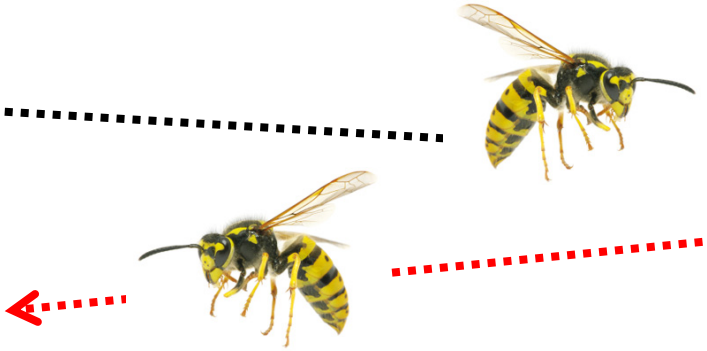
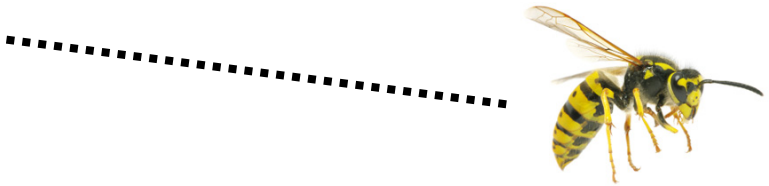


BAIT

Difference between “bait” and a “trap”



TRAP

Baits kill the nest

- **Fundamental importance to control social insects (ants, wasps)**
- **Trapping individuals (ie workers) barely affects nest**

reproductive output of a wasp nest is so high

that trapping cannot remove worker wasps fast enough

Key message

- Wasps have a big impact across NZ
- Still lots of opportunities to control wasps
  - Multiple methods will be needed

1. Self-sustaining; supress; over wide area
= Biological control agents

2. Fast-kill of nests in yrs of high numbers of wasps
=Toxic bait

Thanks