Pest Surveillance and Detection Workshop : September 10th / 11th 2013

Freedom from the Threat of Predators (possums, rats, mustelids, mice) by 2050 (2040?)

Theme 1: Eradication and Suppression

1. **Low cost detection and control** – understand across landscape –

- Current tools limitation – why failing to deliver and how to overcome?
- More selective tools (eg rats in presence of mice)
- Biological detection tools should be considered
- Difficulty vs cost

2. **Strategic thinking - Decision-making and defining goals / outcomes** (agriculture and biodiversity)

- How much is enough? – eradicate or supress
- Priorities – better definition of goals – where, when, why, how to prioritise
- Trade-off – optimisation between eradication compared with detection
- How to reallocate resources between species
- Cost / long term commitment
- Dealing with whole systems rather than single species – when do you have a game stopper and how do you know?
- Disassembly Rules – site integrated pest management across weeds, vertebrates and invertebrates

3. **Detection sensitivity**

- Differences between survivors and immigrants (behaviour – therefore different detection needed / density)
- Change in detection with density – better techniques for low density
- Spatial and temporal – population reservoirs
- Encounter vs interaction

4. **Low cost detection for monitoring vs for Absence**

- Cost benefit analysis (rather than hi tech vs low tech)
- Why spend $ on monitoring?
- Sustained control index – compare index to damage thresholds
- Different affordabilities – border surveillance vs whole patch

5. **Trophic cascades** – consequences of single pest or sequential control

- Where are gaps in research on this – ecological impacts of control of one species
- Vertical integration / whole system approach
- Ordering of control

6. **Re-invasion pathways**

- Technical tools such as genetics, genotypes, stable isotopes
- Human assisted dispersal
- Epidemiological models / social research (human)
- Landscape features
- Understanding founder populations and allee effects
- Are dispersers predicatable – explorers vs inventors – affects what devices you employ to detect

7. **Role of people** in operations / politics / support

- Education and communication with the public about large scale operations – acceptability / political backing
- Social science research
- Citizen science / reporting / interpreting information
- Urban surveillance tools
- PFNZ rollout

8. **Re-invasion Biology / Management** (part 2)

- Habitat changes with time after eradication (post control) – eg more birds might change stoat behaviour
- Distinguish survivors vs invaders – what makes them survive (and others die?)
- Long term selection for difficult to catch animals
- Understand pattern of re-invasion in terms of time and space and rates
- Barriers to re-invasion – buffer / overlap scales – role of natural barriers (rivers)
- Buffers – how much do we know?
- Are fenced areas really just like islands?
- Creating effective barriers between treated and untreated areas in rolling front eradications
- Sources and sinks - rates crucial in determining control frequency.

9. **Control levels / targets** – eg. link between possum TCI and desired outcomes

- Ok for possum – not good for other pests – operational limitation at present
- Needed to help prioritisation and strategic choice (eradication vs suppression)
- Detection devices for outcomes – eg aidio recorders for bird-song
- Develop strategic decision support framework (Paul Meek – decision matrix – DNA / detection measures / where its feasible to use) - strategic approach to how you tackle these issues. Strategy rather than tools – trying to decide what you are going to do. (see also 2.)

10. **Determining why some survive and others don't**

From the flip-charts – other ideas / expressions added in green (hopefully in the right places)

<u>Theme 2: Detection Theory</u>

1. **Better empirical estimates of sensitivity and specificity**

- Leads to being able to estimate cost effectiveness – use of multiple g0 and 0 for different devices
- Variability between species, density, habitats and seasons – worth doing?
- Dogs
- Level of interaction required, compared with population density
- Identify which sources of variation are most important
- Detection of impact rather than pest

2. **Link between empirical data and theory**.

- Need for collection of empirical data to drive the models – use existing operations / data to provide feedback
- validation of predictions in multiple control operations
- updating theory from data – an on-going activity
- models for possums good – but need modelling for more species using empirical data

- models not being adopted in operations

3. Standard protocols for multiple species and devices "ready to use"

- Provision of information to non-specialists – eg rules of how to deploy / standard protocols
- Optimising where you put detection devices
- Search strategies, mapping prior probabilities, habitat suitability probabilities

4. Stratifying effort

- Understanding sources (sustained by breeding) and sinks (sustained by immigration) – identify sources for target
- What is the purpose of surveillance – can you do detection and control all in one?
- Stratifying search effort (linked to pathway analysis) - optimising using multiple methods

5. Improving encounter and interaction rates using technology

- Rate of new detections / actually detect undetectable / important for cost-benefit
- Zone of detection – increase- attract and hold
- Stop false positives with more specific devices, monoclonal antibodies?

6. Species that hide

- Active vs passive sensors

7. Calibration of detection probabilities for different devices

- importance of multiple detection systems / streams of info
- Trade-off between fine-scale detection and cost (bio-economics)

8. Proving presence vs absence

- How many and extent of population / avoidance and non-detection

<u>Theme 3: High Tech Detection Technologies</u>

1. Defining the problem to be solved

- Problem drives technology ,not vice-versa

2. Application of e-noses in the field

- Complex odours, reference odours, wind etc
- "dog" standard
- reliability of electronics in the field
- need library of smells that are ecologically informative – can they be linked to the genome that is informing?
- modelling non-detections etc
- Do we have enough information about scenting behaviour of target animals?

3. **Diversify** – no silver bullet, need old and new, high tech and low-tech

4. Applicability of high-tech technologies at large scale

5. Long life lures for self- reporting traps

- Developed in parallel with detection technology

6. Scoping available technologies and their application

- Watching brief of possibilities – potential technologies from other fields – eg UAU's and drones
- Develop a wildlife camera trap (rather than focus on pests) – automated biodiversity outcome devices?
- Low density and highly mobile pest detection
- Review what we've currently got

7. **Large scale demonstration studies** (independent testing and validation) -
- fast track benefits
- demonstrate uptake and cost benefit
- integration of tools with current practices
- focus on tools which reduce labour component
8. **Decision framework** – which approach to use?
- Cost benefit – being realistic as to whether technology will be affordable
- Match device to purpose
- Collaboration and sharing information
- Education – that arsenal of tools is required
- Centralise technical expertise and resources into a conservation development group
- Engage specialists early in process
- Spatial strategy for use of expensive devices
9. **Automate Image / sound analyses and data management** (open source)
10. **Integrate control with detection**
- Detect to kill – cost reduction
11. Develop **standard protocols for sampling** - such as use of dogs and other technologies
12. **Funding of development and commercialisation** – beyond proof of concept
- Callaghan Institute / central agency to drive developments that show promise? CRC model
- Commercialisation pathways / process – and investment (perhaps from Angel investors)
- Give the technologists the problem early rather than the solution!
- Custom-made technology
- Optimise current tools and continue to support all tools in the market
13. **DNA techniques**
- build libraries of information
- Reduce costs
- gene chips for rats and mice.
14. **Soil / water sampling as a method for broad-scale monitoring?**
15. **Tools to de-limit pest ranges /edges** – particularly in suppression context

Theme 4: Citizen Science and Stakeholder Needs

1. **Perception and value of biodiversity in the community** (cf freshwater values)
- Drives significant change in politics and resources towards biodiversity
- Goal 80% of NZ understanding the value of biodiversity

2. **Citizen information and data portals**
- How to extract information that citizens have / know?
- How to get better quality data – GPS – and alignment with formal science data
- Getting information returns – low strike rate! Websites, games, smartphones, prizes
- Build human behaviour into strategy – bursts of publicity / change
- Who do we want information from – farmers, conservationists, trampers?
- Set clear objectives for citizen activities – eg new incursions/ forecasting outbreaks / population monitoring (rather than relative abundance - where modelling might be more helpful)
- Need for association with something that people can relate to
- Central data / information repository?

- What is the data needed for in citizen science – appropriate / “horses for courses”
- Reliability and validation
- Passive and active - gives different data
- Education / Generational change – engage the schools with science tools and processes
- NZ’s equivalent of Feral-Scan or UK’s BirdWatch? – strange sightings, urban bird counts, biosecurity risks
- Naturewatch public monitoring – can this be refined? Can the public drive refinement?
- Strategies to get communities involved – schools / rural
- Under what conditions can citizen science work? Common vs Rare species / incentives?

3. **Framework for citizen science / involvement**

- Under what circumstances can citizen science contribute
- Mechanisms to keep people enthused
- Realistic expectations
- Alignment of tools / services as to how they can be used – integration of recording systems to strategic priorities
- Guides and techniques for citizen keys
- Citizen-based involvement / management – but not research
- Citizens make wider contributions than just science – take on management
- Google searches and website hits – information used to help predict upcoming issues? (like flu)
- Institutional inertia – need a central umbrella project (similar to fishing app?)
- Resourcing – DoC partnership / Biodiversity Hub / Royal Society – how to get science advice to community groups?

4. **Linking Maori cultural values into the science**

- better understanding - spiritual mandate / opportunity to influence end result

5. **Community indicators** to look at thresholds for different pests for reporting etc
6. **Stakeholder Needs**

- Connecting end-users to researchers – keen to know about research relevant to current work and timelines
- Protocols – optimal set-up for different needs (monitor vs preserve) / cheap vs expensive
- Long term support for tools and processes
- Connecting with industries – Federated Farmers, rural-based providers, source industries?

7. **Social science and citizen science - should this be a separate workshop?**

- How are species valued?
-

Camera traps

1. **Protocols** – for different species, how to use, position, monitor

- Industry standards (NPCA option) – for camera traps and other products
- Information source / decision matrix / on-line forum / user group?
- Reasons for using camera traps / building a case to purchase equipment
- Could public be used to beta-test new products

2. Make information in the **DoC toolbox** available – on web

- MPI Biosecurity Toolbox – WIP for pest management group.

- Where to get information from DoC and LCR who are researching cameras

3. Not just focus on cameras – don't overlook **other detection techniques** already working
4. **Privacy and legal issues**

- Use of signs
- Public use of photos?

5. **Security Issues**

- Better locking, memory, website "top 10"

6. **How to deal with photos generated?**

- Company / image recognition / issues with independence, baiting of traps

7. **Long-term cost of different surveillance options**

- Funding sources for cameras
- Generic camera case / reconditioned parts. Bulk purchase

Invasive Animals' CRC: http://www.invasiveanimals.com/

Camera trap manual is at http://www.feral.org.au/camera-trapping-for-wildlife-surveys

Facebook is Wildlife Camera Trapping – Paul Meek is the moderator

Listerver - http://uk.groups.yahoo.com/group/cameratraps

Camera trap registry is to Paul Meek: paul.meek@invasiveanimals.com

Wrap-up

Enthusiam to repeat the workshop in 5,3,2,1 (?) years' time.

Agreement that the format was successful