Landcare Research
Manaaki Whenua

Closed Cell Foam Covers for Forest Lizards

A novel technique for monitoring highly cryptic lizard species in forests

TRENT BELL

Landcare Research

First things first

- I am profoundly deaf
- I have a “Deaf Accent”
- Some of you may struggle to understand me

- That’s OK
- Just follow the text in this slideshow

- Approach me in a free moment this week, or
- Email me with questions and comments
  - bellt@landcareresearch.co.nz

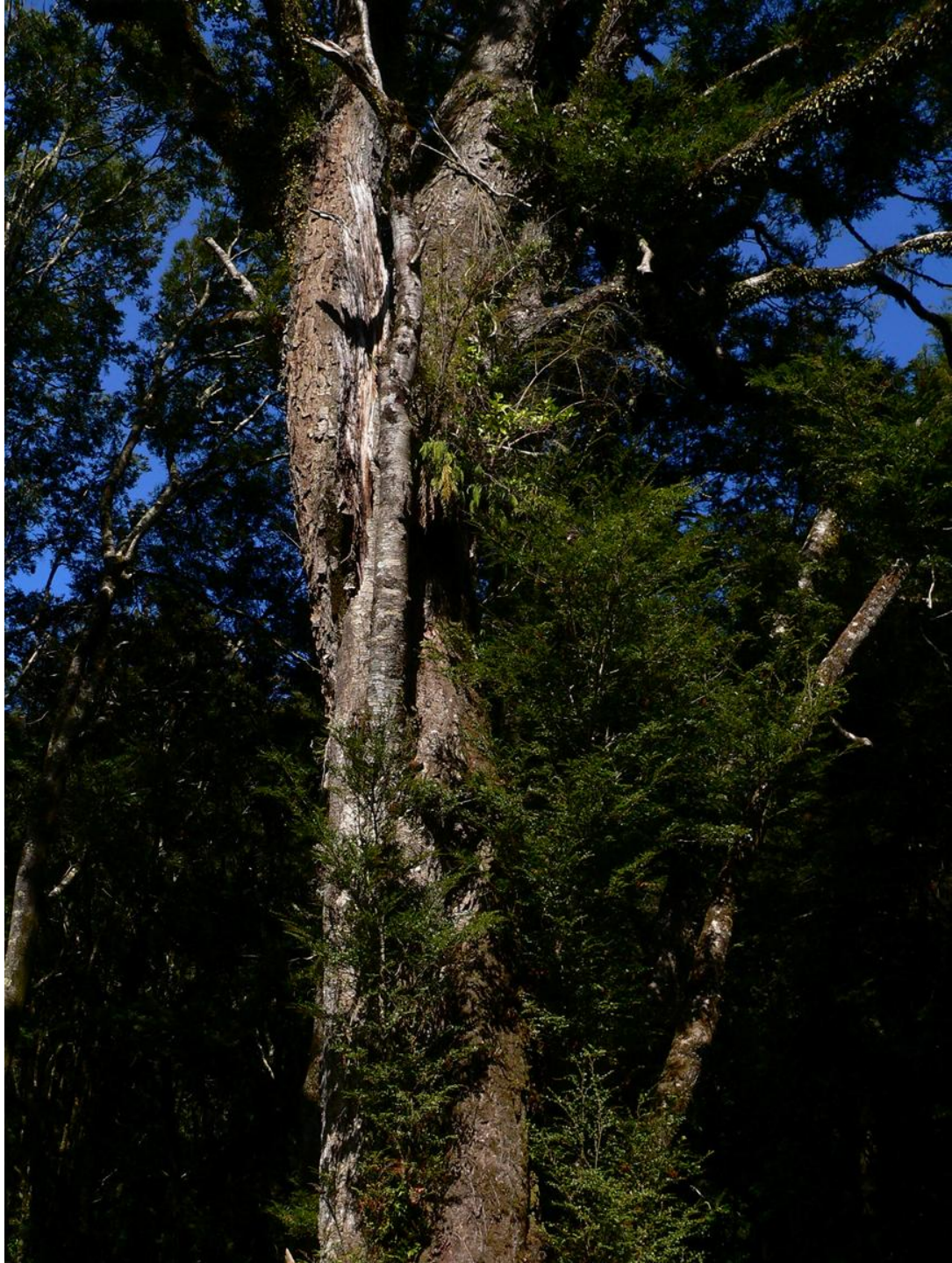
Forest Lizard Monitoring

- Currently one of the most difficult tasks in conservation management and research in New Zealand because of:
  - The complex three-dimensional structure of forests
  - An unnatural low abundance of many species
  - The reduced diversity of lizard species at sites
  - The crypticness and limited activity of lizards

- Few effective, efficient and less-baised methods for monitoring lizards in forests
  - But monitoring is a high priority for conservation agencies and sanctuaries

- Try spotlighting through this…

- Or try climbing this…



…to find these (30 arboreal spp)

Why Monitor Lizards?

- Lizards are critical for ecosystem processes and function
  - offer ecological ‘services’ such as pollination, frugivory and associated seed dispersal
  - are key predators and prey
  - can be exceptionally abundant when released from invasive predator pressure
- Some forest species are classified as Data Deficient in Threat Classification Lists
  - Need to study them somehow

Biodiversity Sanctuaries

- In New Zealand
  - 9 spp. invasive mammalian predators present
- Biodiversity Sanctuaries are:
  - Offshore or “mainland” islands where these predators have been controlled or eradicated
  - Translocations of lizards are occurring as part of ecological restoration of these sites
  - Resident lizards are an indicator species for forest ecosystem health

Invasive mammalian-proof fences in biodiversity sanctuaries on the New Zealand mainland. Lizards are an indicator species for “Treatment” effects against a “Control” site

Current monitoring methods

- Lizard houses/boxes
- Traps – pitfall traps, G-minnow traps
- Onduline Artifical Retreats
- Tracking tunnels
- Direct Searching (day and spotlighting)

- Ineffective, uneconomical or potentially biased in forests

Characteristics of Ideal Refugia for Lizards

- Dry
- Narrow entrances
- Rapidly-heated surface
- Positioned in warm locations

Schlesinger & Shine 1994
Webb & Shine 2000

Closed Cell Foam Covers

- Polyurethane
- Waterproof
- Insulative
- Economical
- Extremely light
- Can fit contour of trees
- Light on tools


D11


D2
D3

Bark and Hollow Mimic

- Lizards have been recorded utilising bark and hollows on trees as refugia
- Covers mimics this natural choice of refugia

Pilot Trial

➔Trials in 2008 were to establish proof-of-concept

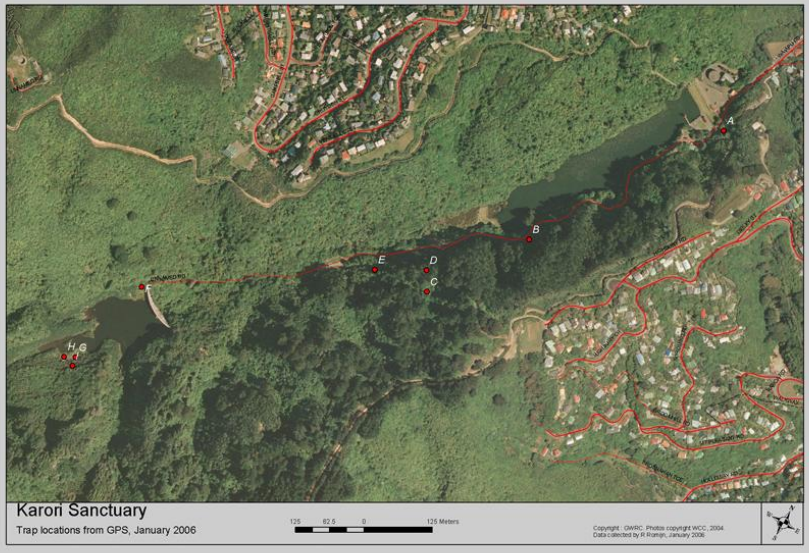
Therefore,

- Limited data available at present
- Limited checks (replication)
- Limited comparision with other techniques
- Not a population study of lizards
- Seasonal or animal effects not considered

Trial Sites

- Fanal Island, Mokohinaus (mammal-free offshore island)
  - 80 covers placed October 2007, checked March 2008
  - An area representative of “high lizard abundance” (Duvaucel’s gecko)
  - Necessary to establish whether possible poor results in other sites weren’t an artifact of low lizard densities

- Windy Hill, Great Barrier Island (biodiversity sanctuary)
  - 200 covers placed April 2007, checked March 2008



- Karori Sanctuary, Wellington (biodiversity sanctuary)
  - 96 covers placed April 2007, checked March 2008
  - Another grid of 130 small covers in Tui Glen

Sizes of covers

- Two designs used in Transects
  - 1m x 40cm either horizontal or vertical
  - 50cm x 40cm, 360 degree wrap-around

Where possible, other techniques used to compare results

- Spotlighting, Onduline ACO's, pitfall traps, g-minnow traps, lizard houses
- Limited by logistics, time or opportunities

Species recorded so far


Forest gecko, n=4 + 3 sign, 96 covers

Pacific gecko, n=7 + 1 sign, 196 covers

Common skink, n=1, 96 covers

An aberration? (typically a terrestrial spp.)

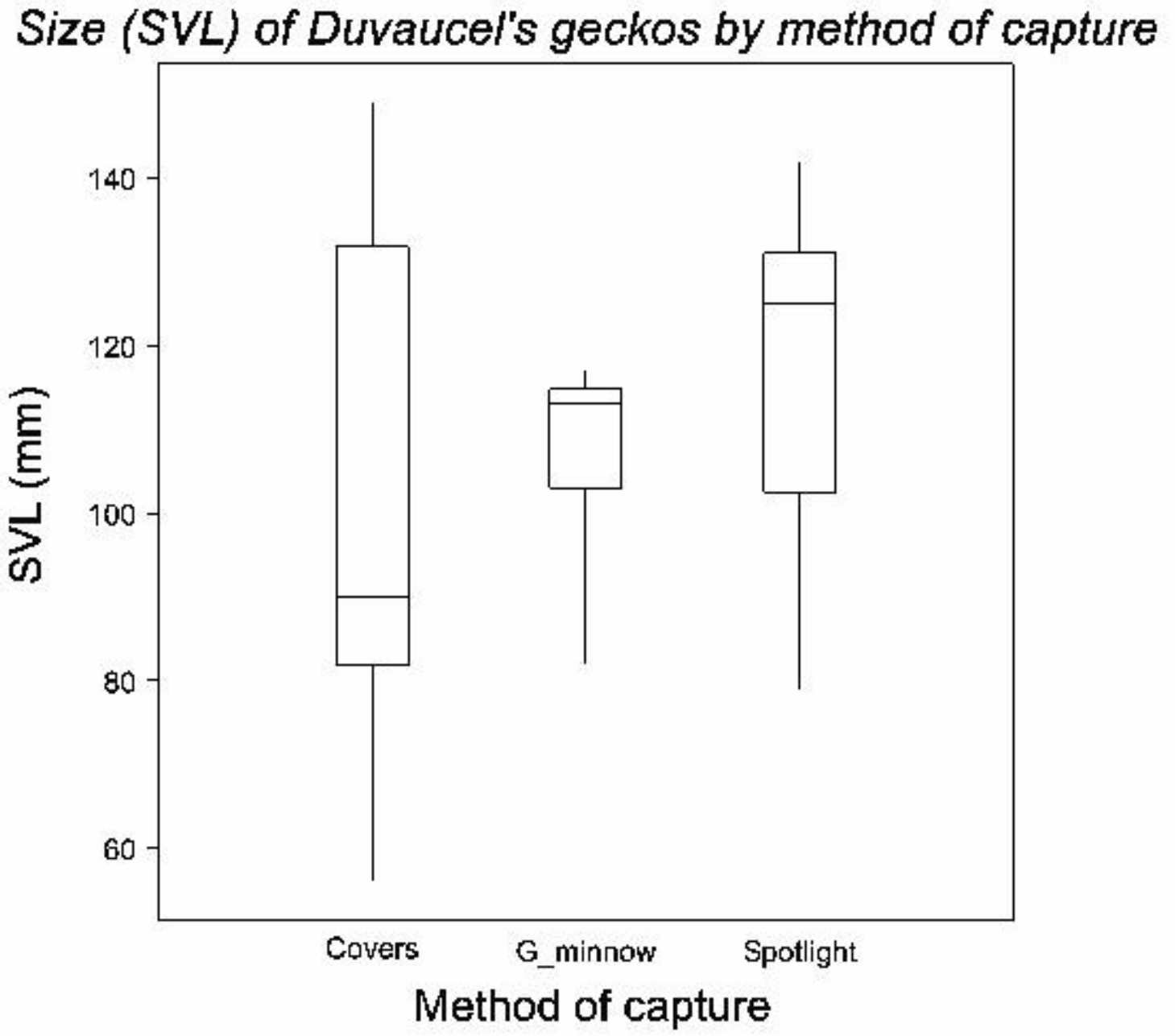
Duvaucel's gecko, Fanal Island

- The "abundant species" study site
- 31 geckos out of 80 covers (39% catch rate)
  - The life stage of animals was significantly different in terms of representation
  - 10 adults vs 21 non-adults, $p < 0.001$
  - also had adults, at near equal sex ratio proportions.
- Non-adults very difficult to detect or capture using other methods
- Indicates covers offer improved population sampling compared to other methods

Covers
n=31
39/100 rate

G-minnow
n=5
25/100 rate

Spotlight
n=18
0.6-1.6pphr CPUE



More efficient than spotlighting

- ~10 hrs to check 80 covers on Fanal Island = 31 Duvaucel's gecko
  - 3.1 per person hour
- Transect spotlighting, n=5
  - 0.6 per person hour
- Opportunistic spotlighting, n=13
  - 1.6 pphr
  - Could not control overly enthusiastic volunteers

Sites with low densities had only a handful of animals but…

- Windy Hill
  - 7 Pacific geckos + one skin
  - occupancy rate 0.04 or 4%
- Karori
  - 4 forest geckos + 3 skins
  - Occupancy rate 0.041 or 4.1%
  - One common skink
- As predicted, but…

Improved detectability of cryptic species at low densities

- Lizard houses
  - 0.00 Eglinton Valley (0 for 360 checks)
  - 0.003 Karori (1 for 290 checks)
  - 0.01 Boundary Stream (17 in c. 1235 checks)
- Other methods used during current trials (spotlighting, g-minnows, pitfalls, Onduline AR's)
  - No geckos captured

- Extrapolating this into 1000 'checks':
  - 0 - 10 geckos/1000 house checks
  - 40 geckos/1000 cover checks
- Biologically significant for management

Few geckos in biodiversity sanctuaries

- 9 spp. invasive mammalian predators
  - NZ fauna evolved 80my without predatory mammals

- Low abundance may be due to longer-lasting effects of invasive mammalian predation

  - Even after several years of predator control
  - Allee effects at low densities may also be contributing
  - Delayed lag in response to management

Because…

Because…

- New Zealand gecko life history strategies:
  - Low annual reproductive output (1-2 young/yr)
  - Slow to mature (3-4 years)
  - Longevity (7-17 years, up to 36 years in wild)
  - Slow annual population increase (5-9%)
- Contrasts with numbers of Pacific geckos on offshore islands (spotlighting, Whitaker 1970, 1973)
  - Zero Pacific geckos in 4 hours on seven islands with kiore (Pacific rat)
  - 6.70 p/hr and up to 25 p/hr on kiore-free islands
  - In this trial, only 7 Pacific geckos after 10 years of predator management (none seen by spotlight!)

Implications

- Geckos are important medium to long term monitoring indicator species in sanctuaries
- May affect timing of reintroductions of predatory native species (kiwi, weka, tuatara)
- Be **(very)** happy with what you get on NZ mainland!

Remember…

- All results represent only one check

- More lizards over time/more replications
  - As more and more lizards find the covers
- Lizard populations start to recover eventually
- Different numbers at different times of year?
  - Seasonal effects?
- New sites will have different abundances

Summary

- Covers offer:
  - Improved population sampling
  - Improved efficiency
  - Lower cost and maintenance
  - Ability to detect lizards at very low densities
  - Multi-species acceptance
  - The reduced sampling bias typical of artificial refugia

    (reduces observer skill, environmental biases)

Discussion

- Demonstration of arboreal lizard uptake of covers a first step towards a monitoring tool
- Covers are ideal as count-based indices to measure population change over time
- Caveats:
  - Relationship between index and true population size is not known (Anderson 2001, 2003)
  - At very low densities, substantial replications needed to detect differences in management effects (Wilson et al 2007)

New Directions

- Initiation of index monitoring trials (2008-2009) at three “biodiversity sanctuaries”
  - To assess Treatment (predator-free/trapped) vs Non-Treatment (control) outcomes over time

- Development of experimental design on Fanal Island - the “abundant lizard site”
    - Try to obtain data good enough for capture-mark-recapture
    - Using random cluster-radiuses 30-50m of c. 80 covers

Thanks to…

- Foundation for Research, Science and Technology (FRST)
  - Conservation Flagships IO (Bruce Burns)

- Judy Gilbert, Raewyn Empson, Halema Jamieson, Kerri Lukis, Rob Cross, Beth Wishart, Neil Anderson, Kelvin Parsons, Dylan Van Winkel, Ben Barr and Richard Romijn

- My e-mail: bellt@landcareresearch.co.nz