



Don't be shy: Understanding and targeting survivors of pest control

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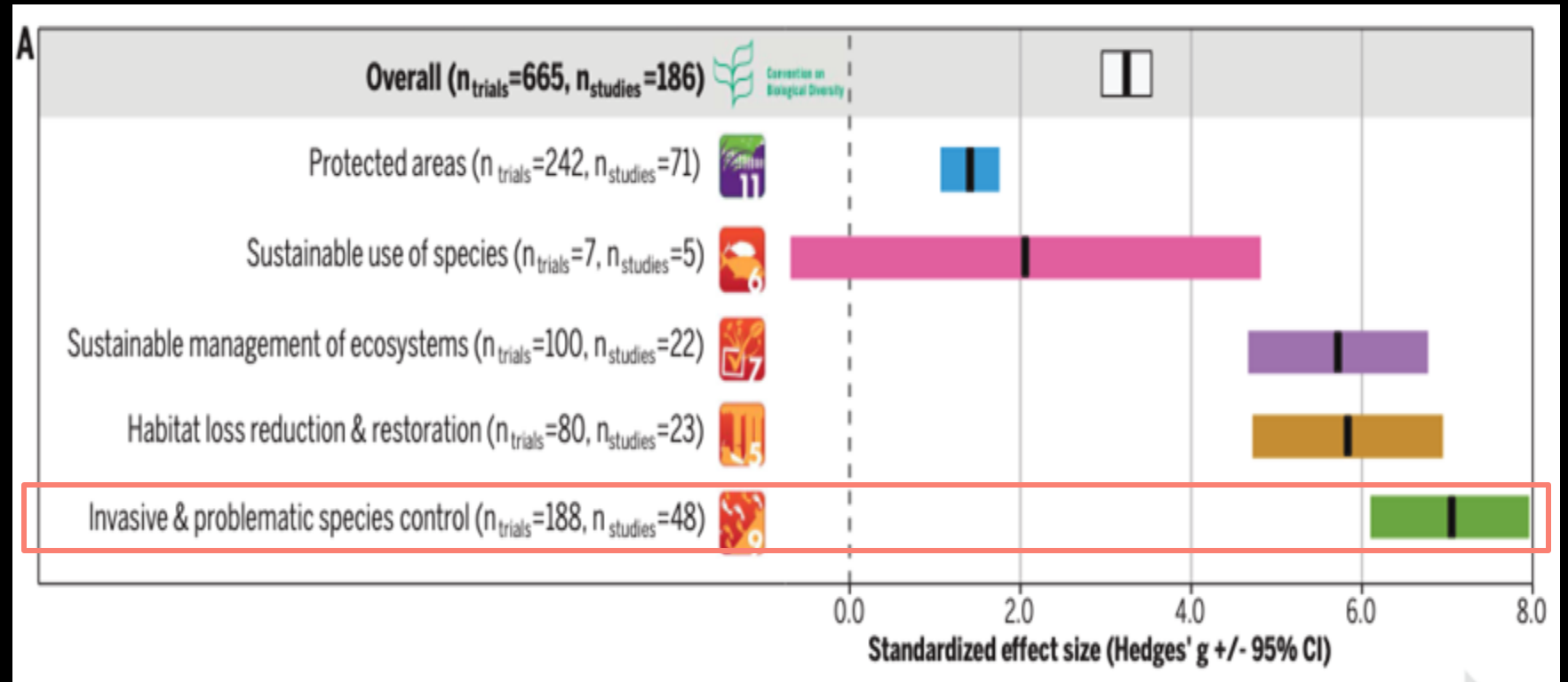
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Invasive predators and management



Invasive predators have dramatic effects on native biodiversity¹

Invasive predator control most effective conservation interventions²

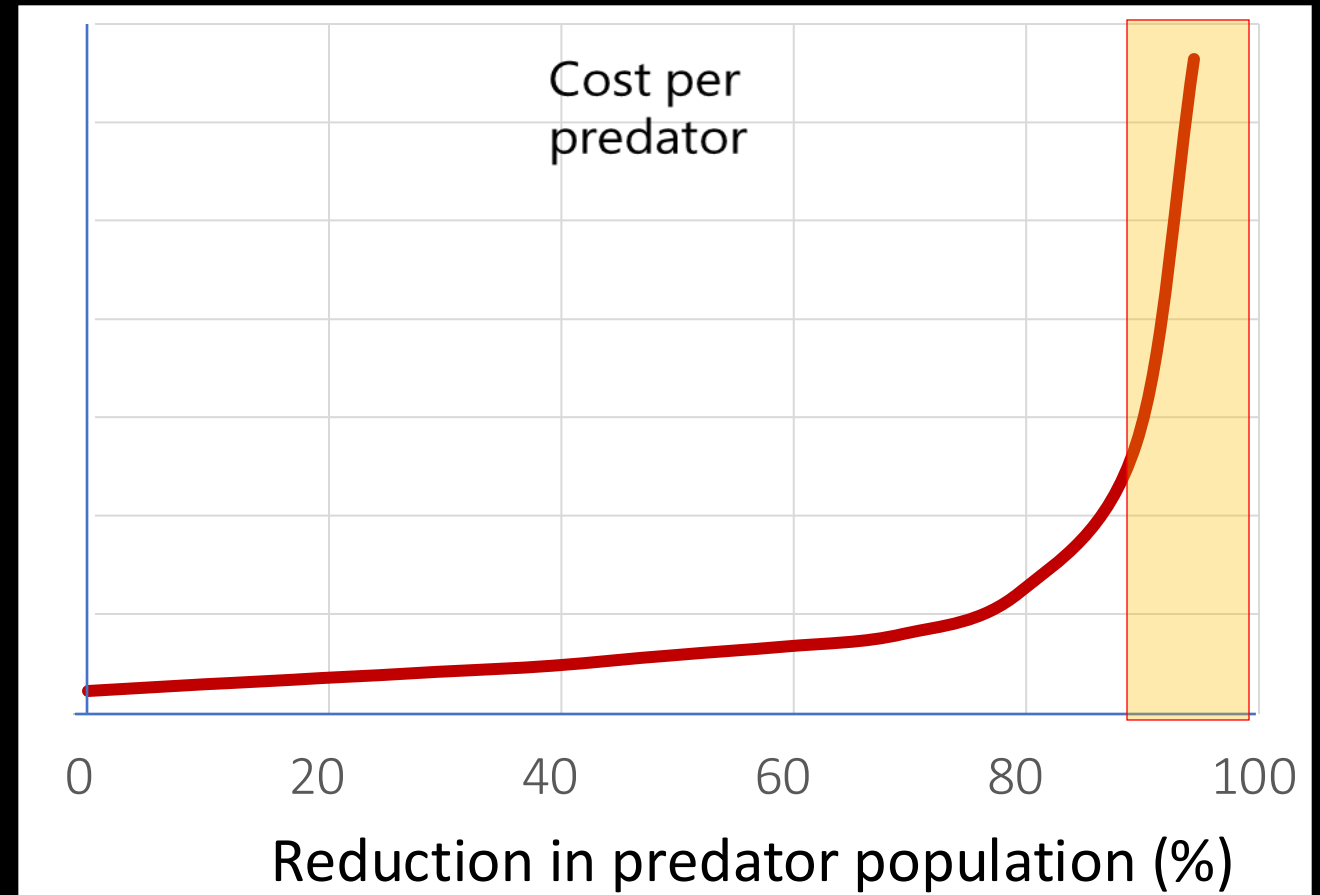


¹Doherty et al. 2016. *PNAS*; ²Langhammer et al. 2024. *Science*

Survivors of pest control



1. Facilitate recovery
2. Maintain pressure
3. Difficult to remove
4. Expensive to remove



Talk outline



Individual variation

- Survivors *versus* “average” individual
- Behavioral responses towards traps and baits
- Personality and perception of risk



Novel lures

- 4F motivations
- Sensory cues - Sound, visual, scent
- Overcoming survivor behaviors



Targeting survivors

- Collaborating with control programmes and hapu partners
- 4F lures combination
- Field trials of most promising lures





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Understanding survivor behaviour

Characteristics of survivors

Personality

Intrinsic differences

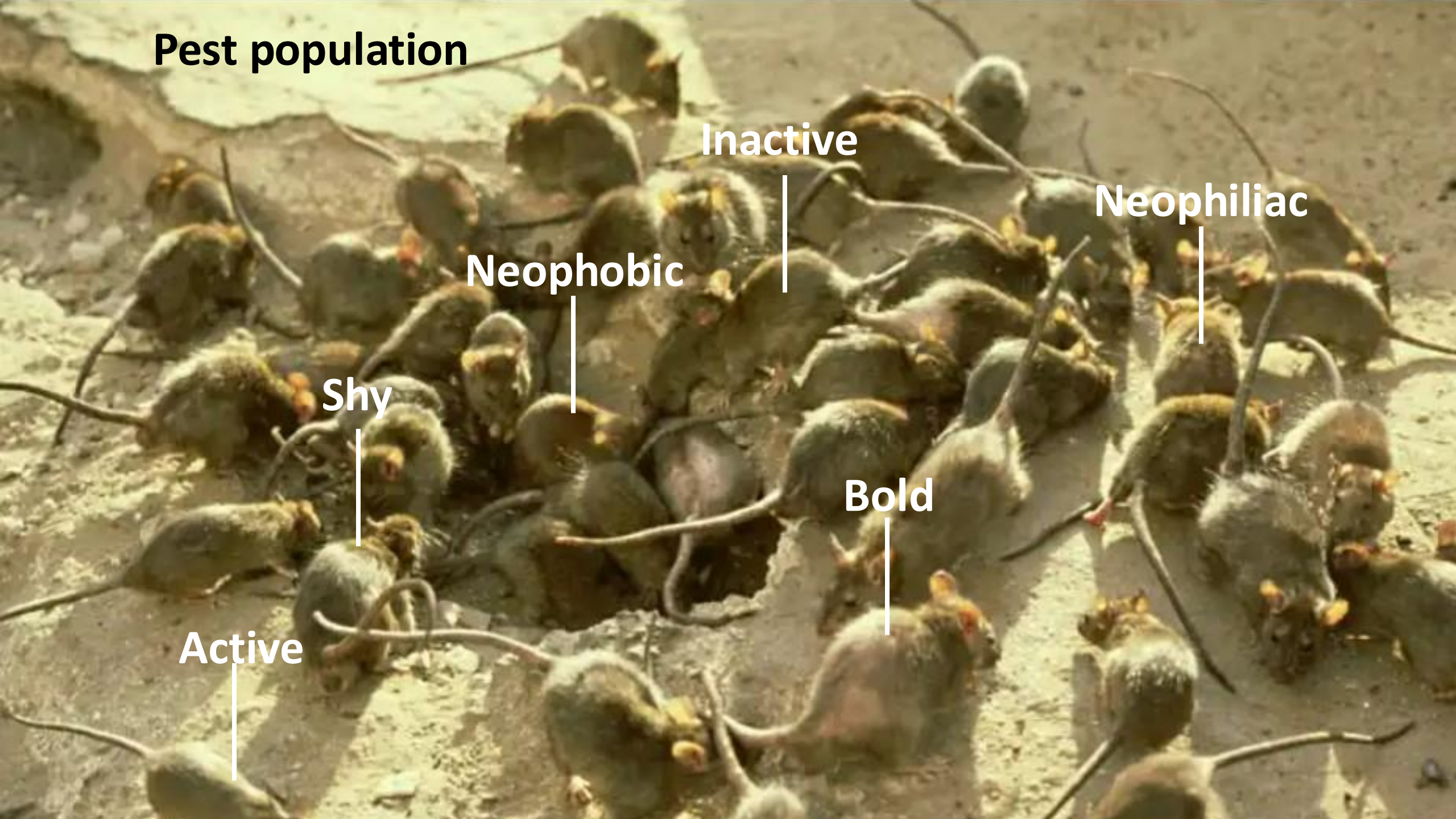
Learned/conditioned behaviours

Microbiome and diet

Random subset (null)



Pest population



Inactive

Neophilic

Neophobic

Shy

Bold

Active



Why animal personality matters

Behavioral differences between individuals that are consistent through time and across contexts



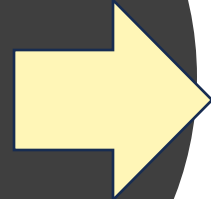
Boldness

Exploration

Activity

Aggression

Sociability



- Survival and reproduction
- Home range and range expansion
- Dispersal
- Diet
- Risk-taking

Personality: Behavioural assays

Hole-in-wall arena



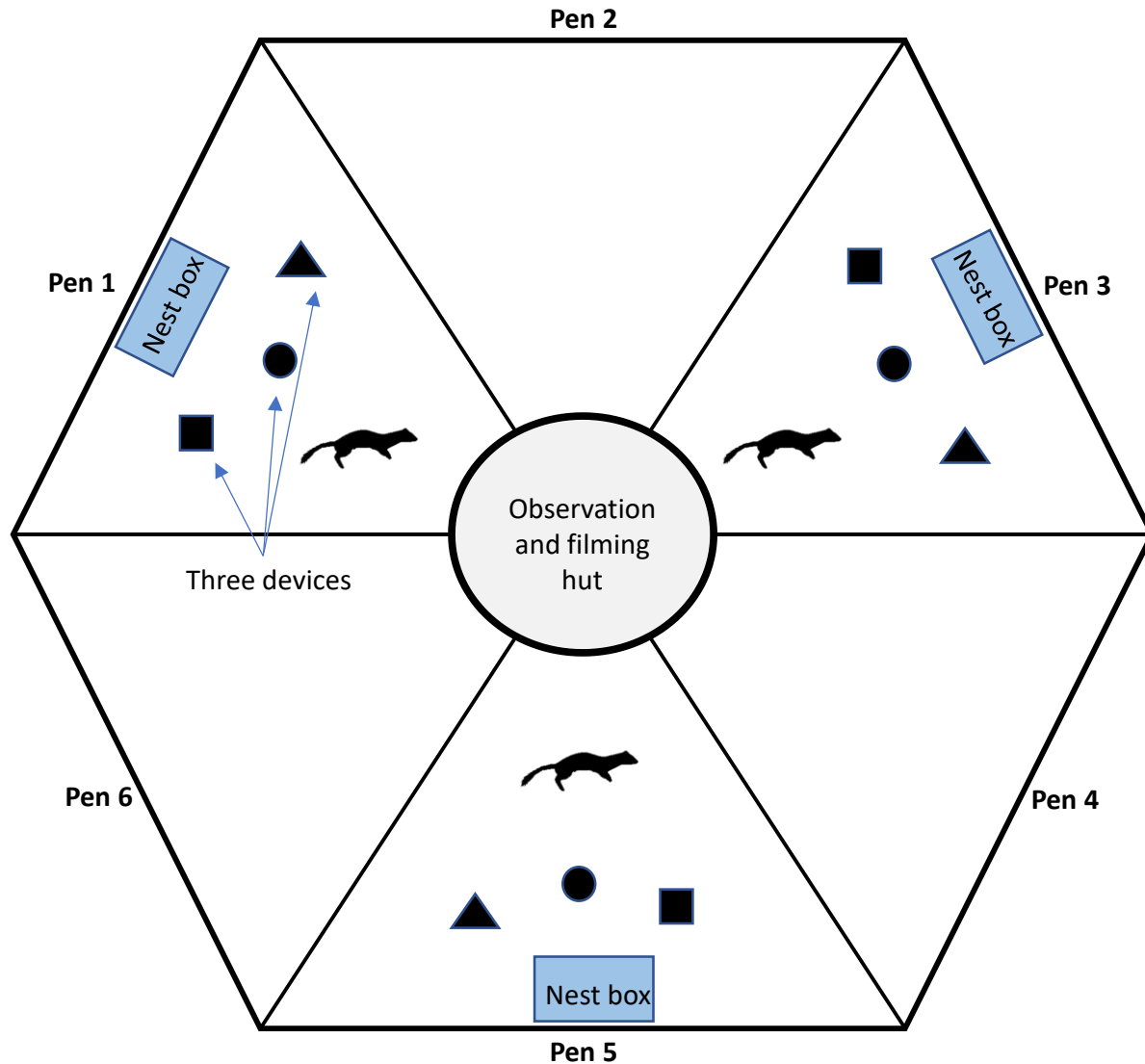
Novel object



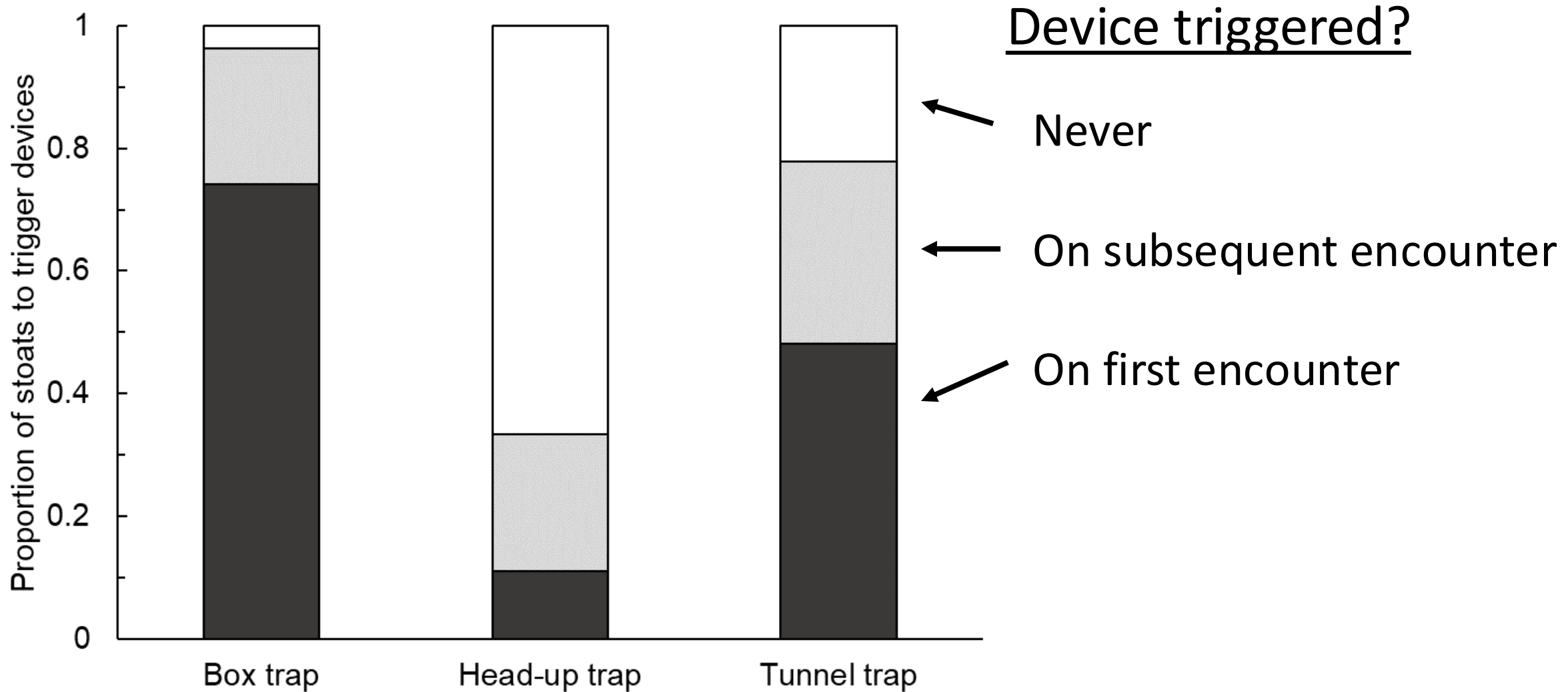
Startle test



Do stoat personalities influence trap interactions?

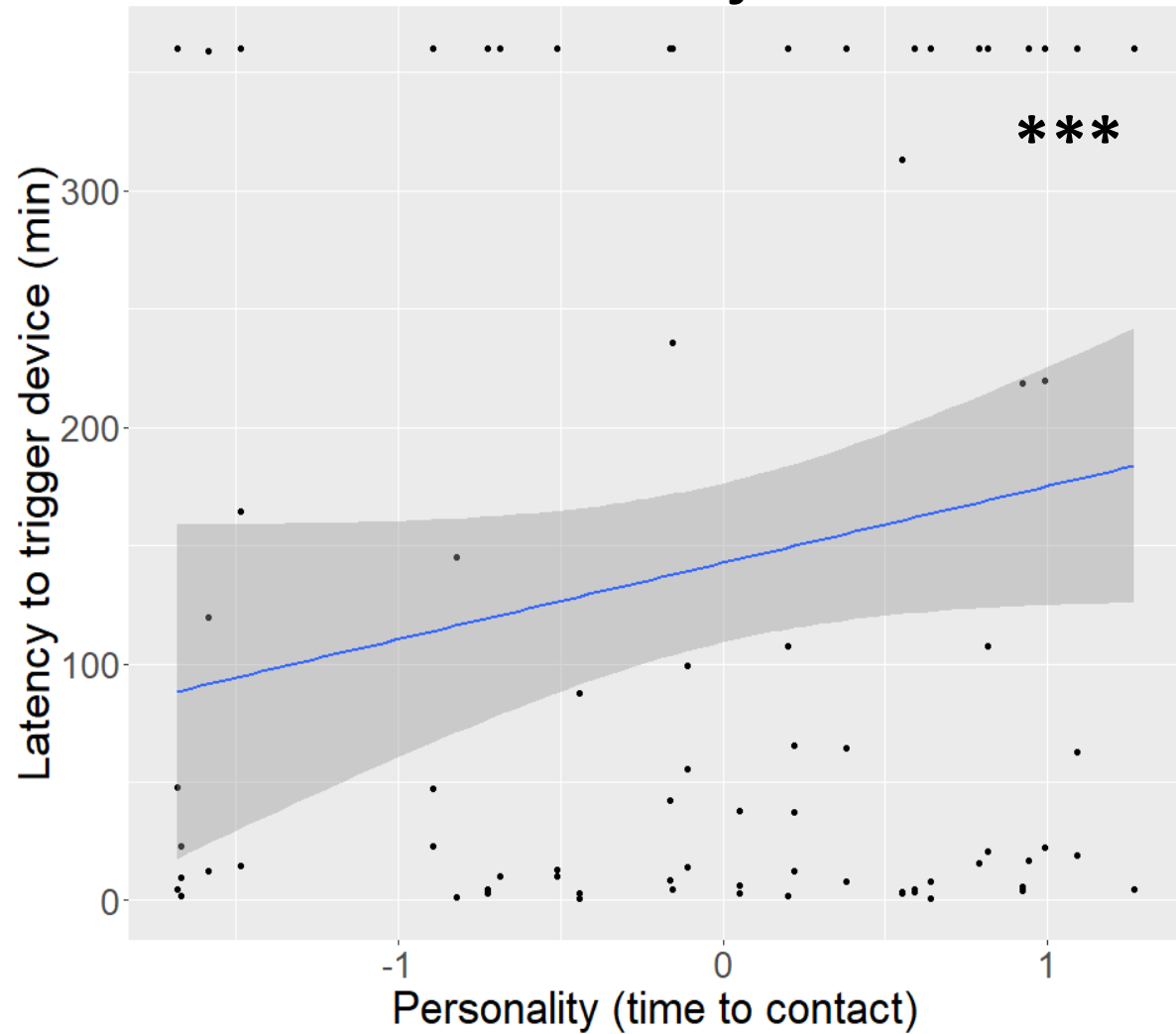


Results: No device 'captured' all 28 stoats

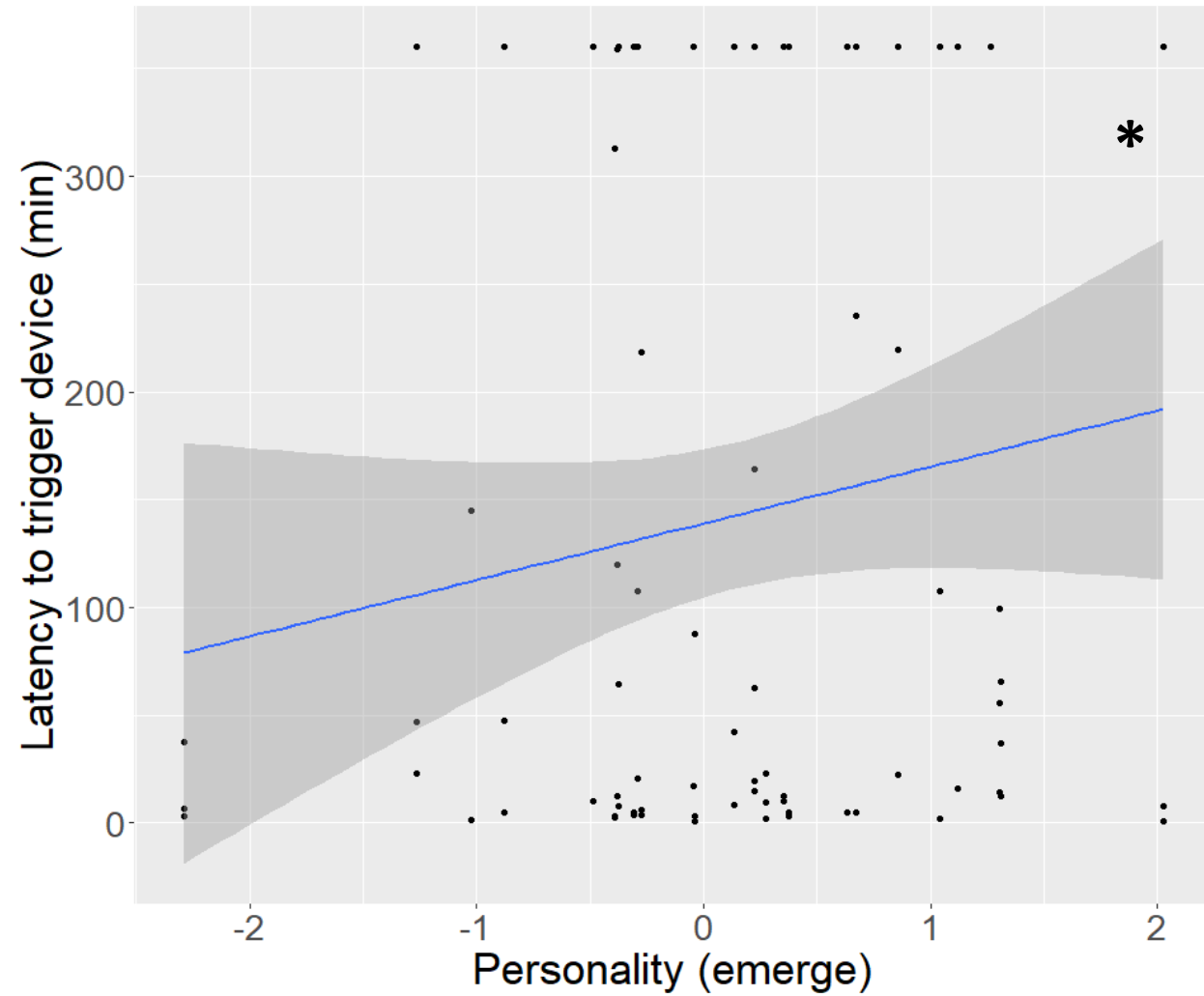


Personality influenced device interactions

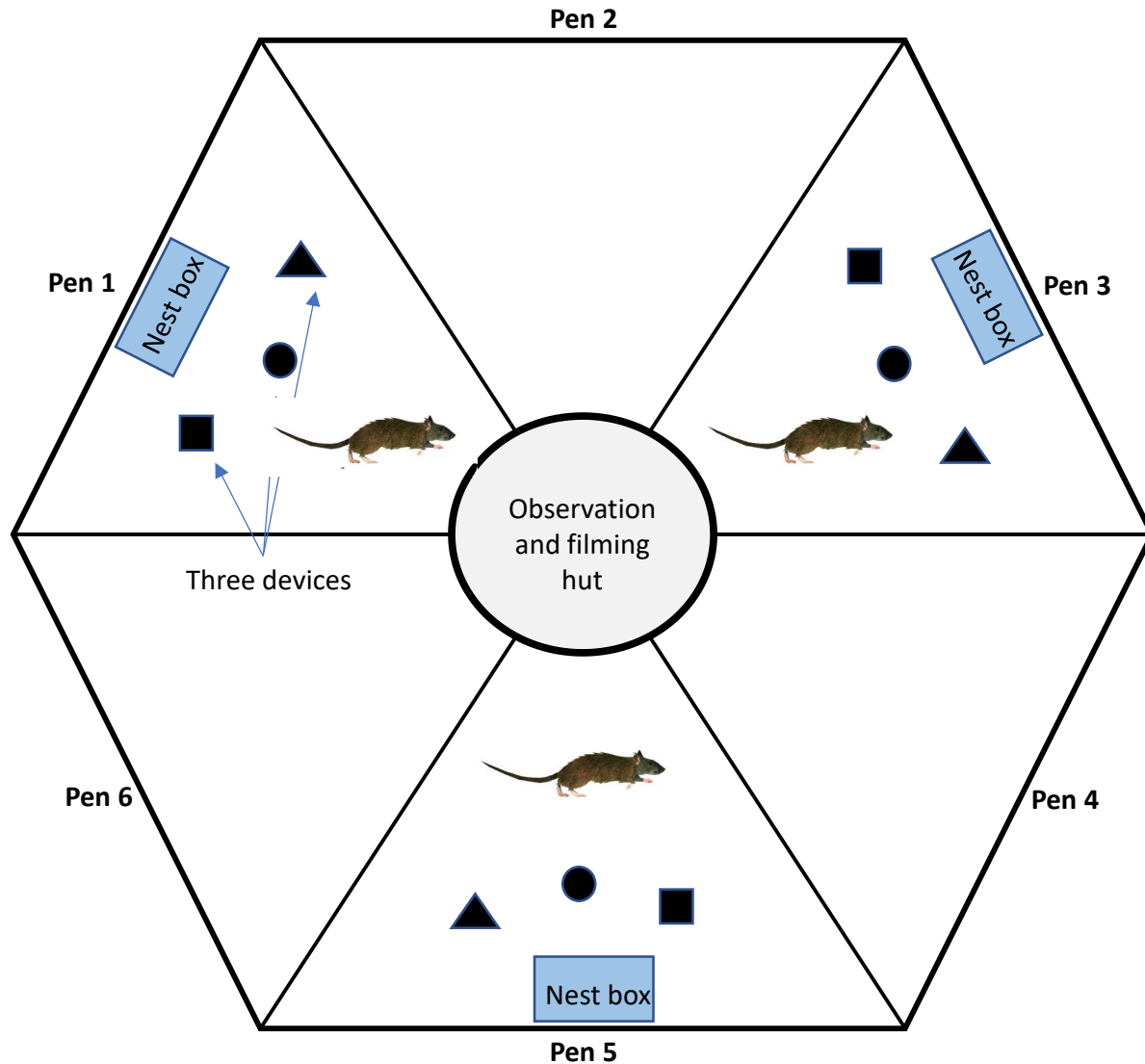
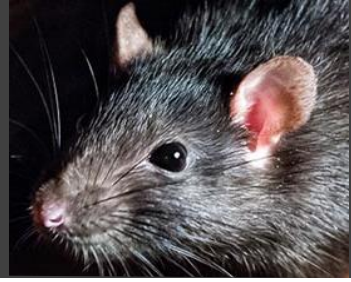
Novel object



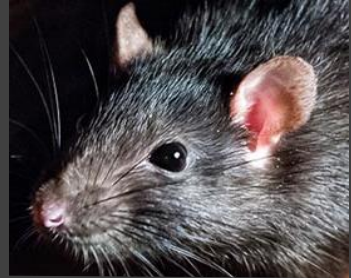
Startle test



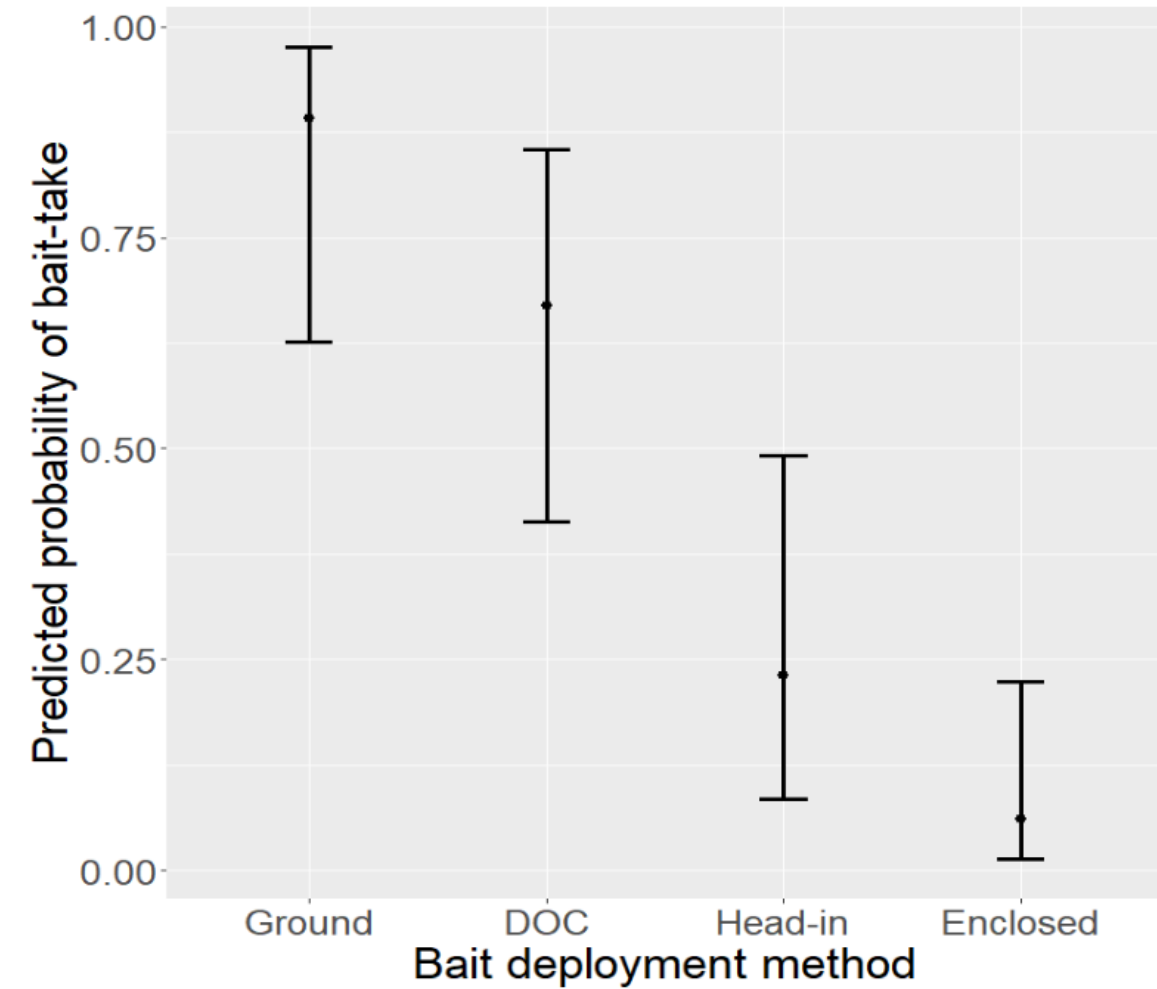
Does rat personalities influence device interactions?



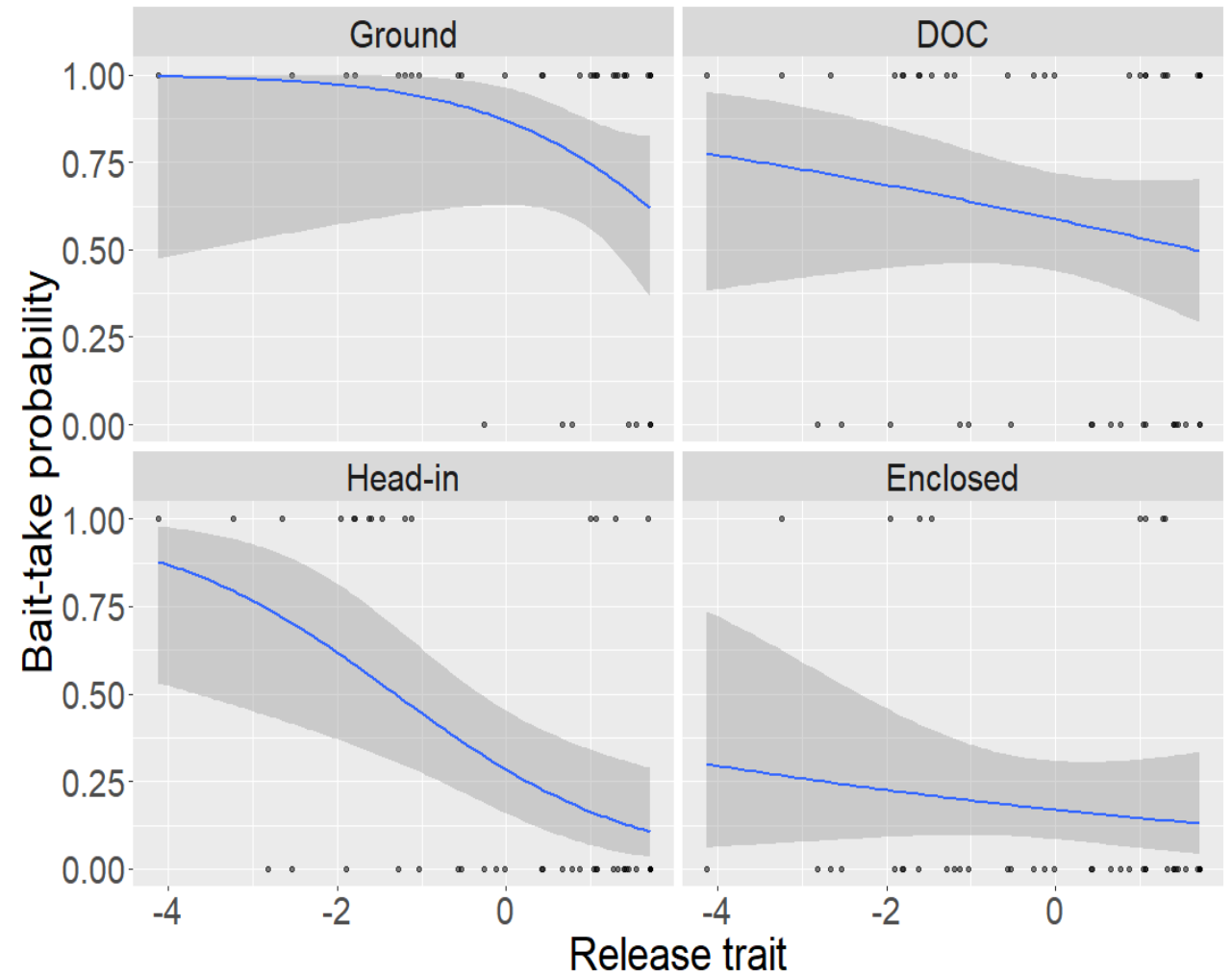
Does personality influence device interactions?



Rat bait take

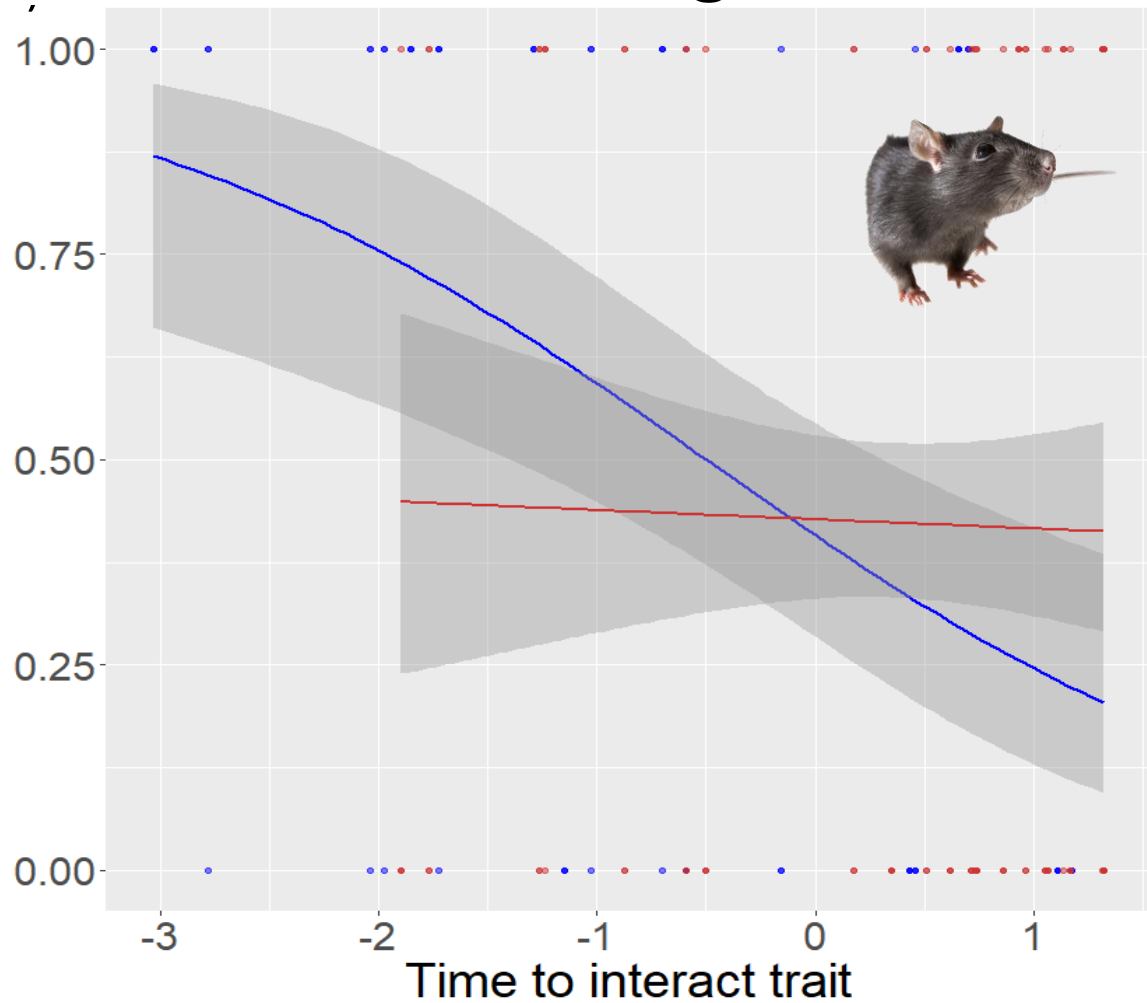


Device interaction with personality

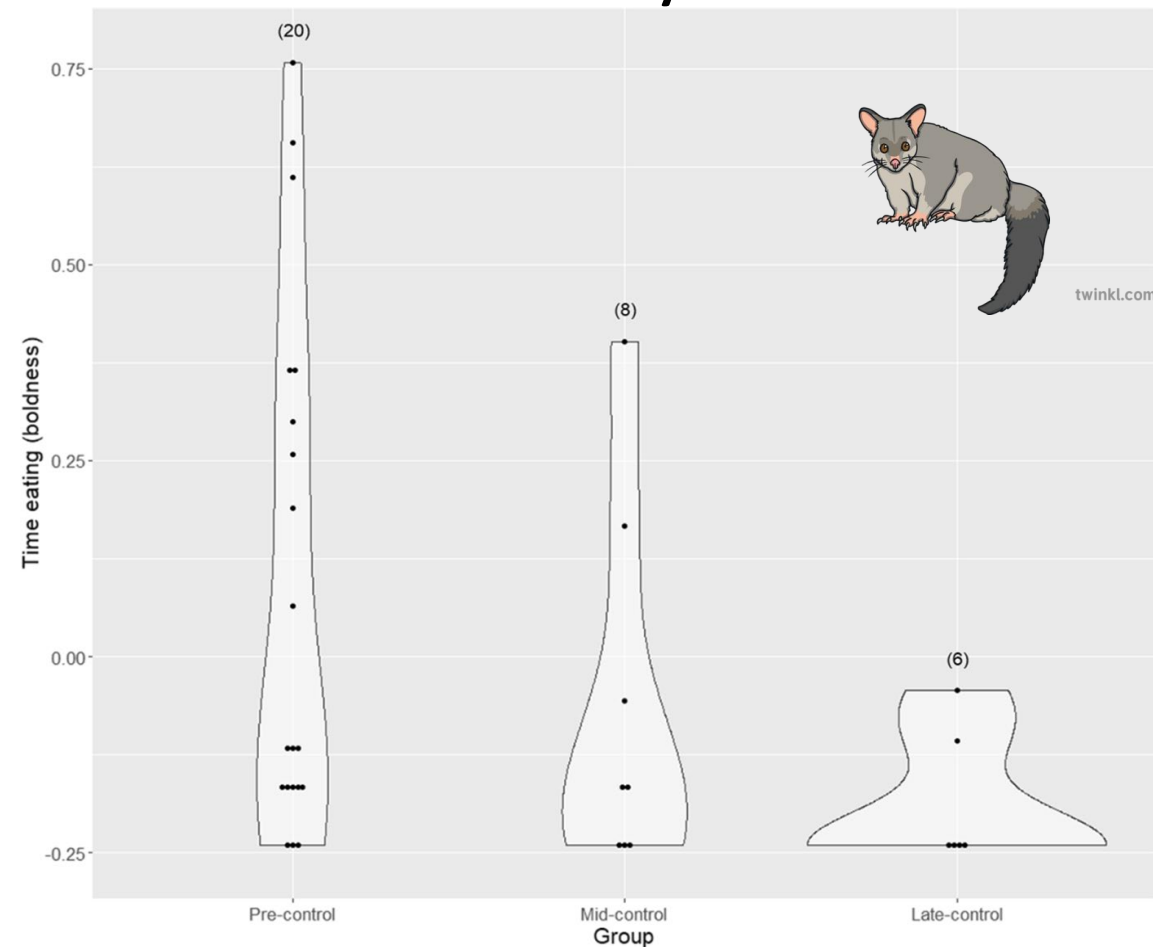


Survivors of control operations

Josef Langer



Lottery Bush



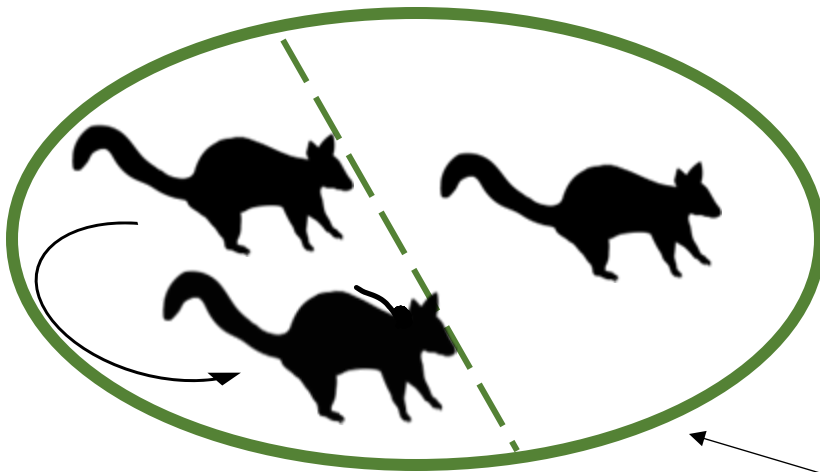
Why do pests survive baiting operations?



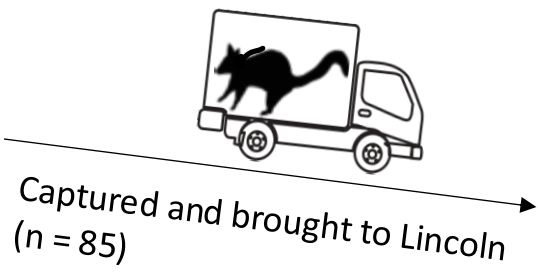
Franz Josef

Photo: Bruce Warburton

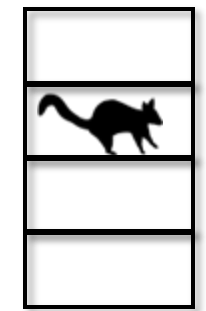
**Live-trap before toxin drop
(Possums = 128)**



Capture & released (n=43)
• Collared (n = 24)



Collared and returned to site pre-toxin drop (n = 85)



Bookcase test



Feeding trial

1080 toxin drop



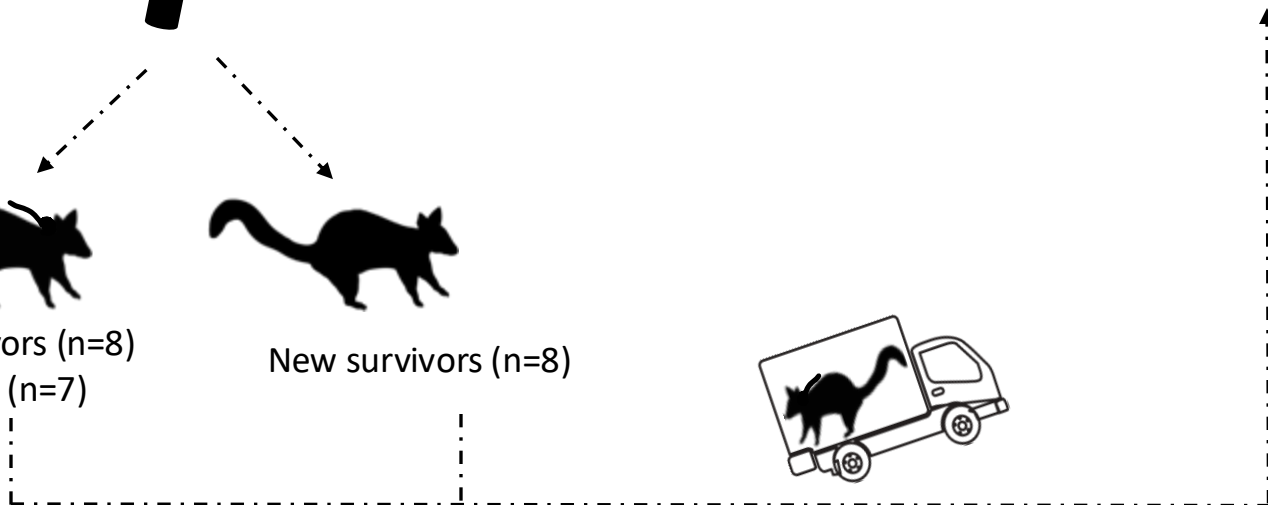
Survivors after toxin drop



Collared survivors (n=8)
• Recaptured (n=7)



New survivors (n=8)



Why do pests survive aerial baiting operations?

- Baits not perceived as “scary”
- Sub-lethal poisoning was the key mechanism
- Bait avoidance sustained through time
- Trend towards juvenile males and large survivors

The good news:

- All 85 possums willing to eat RS5
- No evidence survivors could detect 1080
- Encounter not an issue in single bait application
- Bait switching killed all but one survivor



Survivors - Know thy enemy



Trap survivors

Extremely shy, less active, neophobic
Traps and bait stations are “dangerous”
Control operations leave remnant shy population
Female stoats more risk averse

Bait survivors

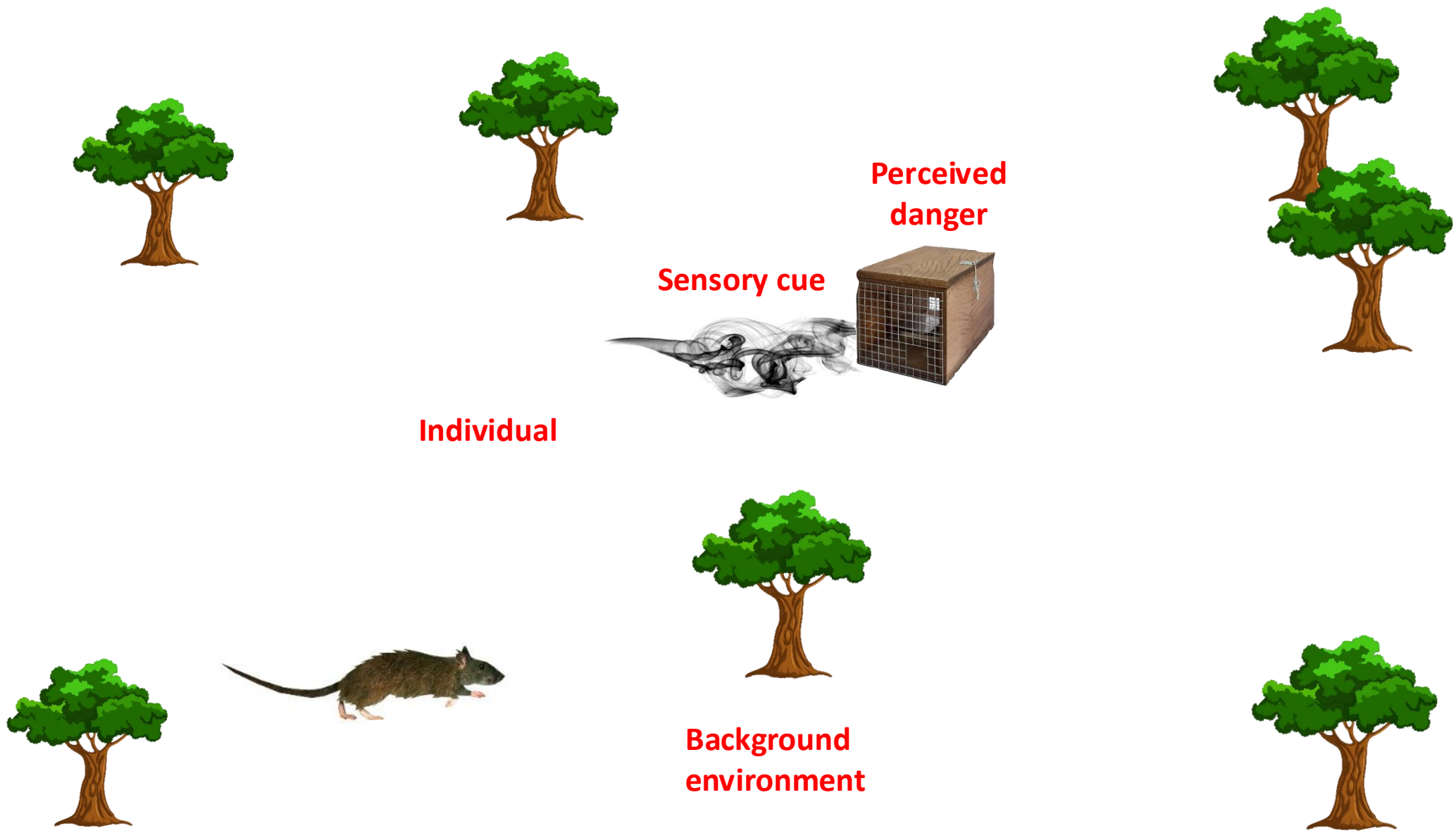
Less active, less exploratory, less dominant
Baits not perceived as “dangerous”
Trend towards juvenile males and large possums
Survivors failed to encounter a single lethal pellet
- Conditioned taste aversion





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Targeting survivors



Individual

Sensory cue

**Perceived
danger**

**Background
environment**

Background environment (MOC)



Background environment alters the perceived value of cues

- Baiting when food resources are low e.g., winter
- Bait matching to seasonal resources
- Pheromone lures during breeding season



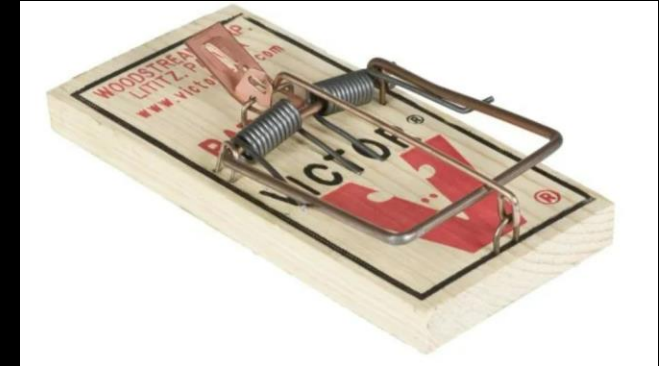
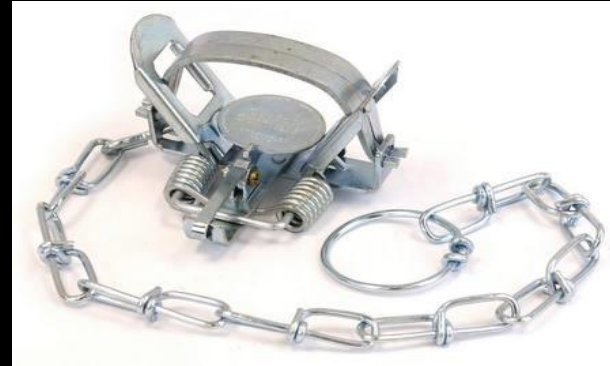
Perceived risk of devices



Pests under selection pressure to recognise and avoid devices

Overcoming risk aversion

- Pre-feeding
- High value baits
- Passive devices
- Natural traps
- Low-risk traps



Experiments

- Trap materials
- Trap switching and camouflage
- High interaction traps



Behavior-based lures for predator management

The **4 Fs** of animal motivations (Garvey et al, 2020)



Feeding

Locate food

Bait e.g., rabbit meat, peanut butter

Fighting

Defending territories or
challenging for mates

Conspecific pheromone or territorial call

Fleeing

Avoid predators

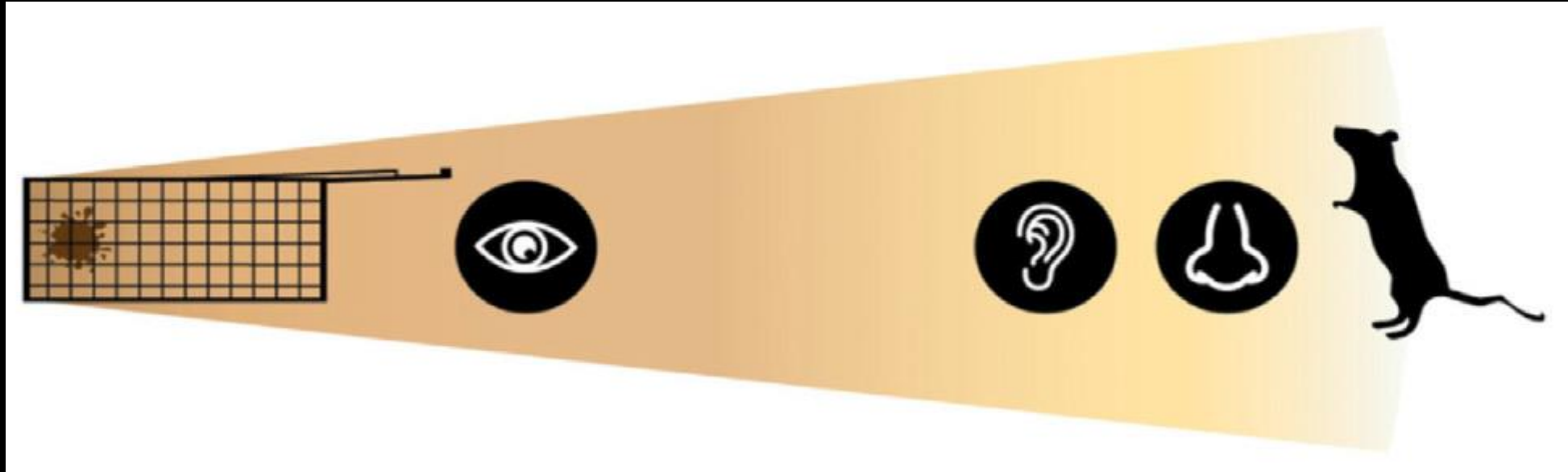
Predator odour or predator visual cue

Fornication

Finding mates

Stoat kit calls or oestrous female

4F lures to target survivors



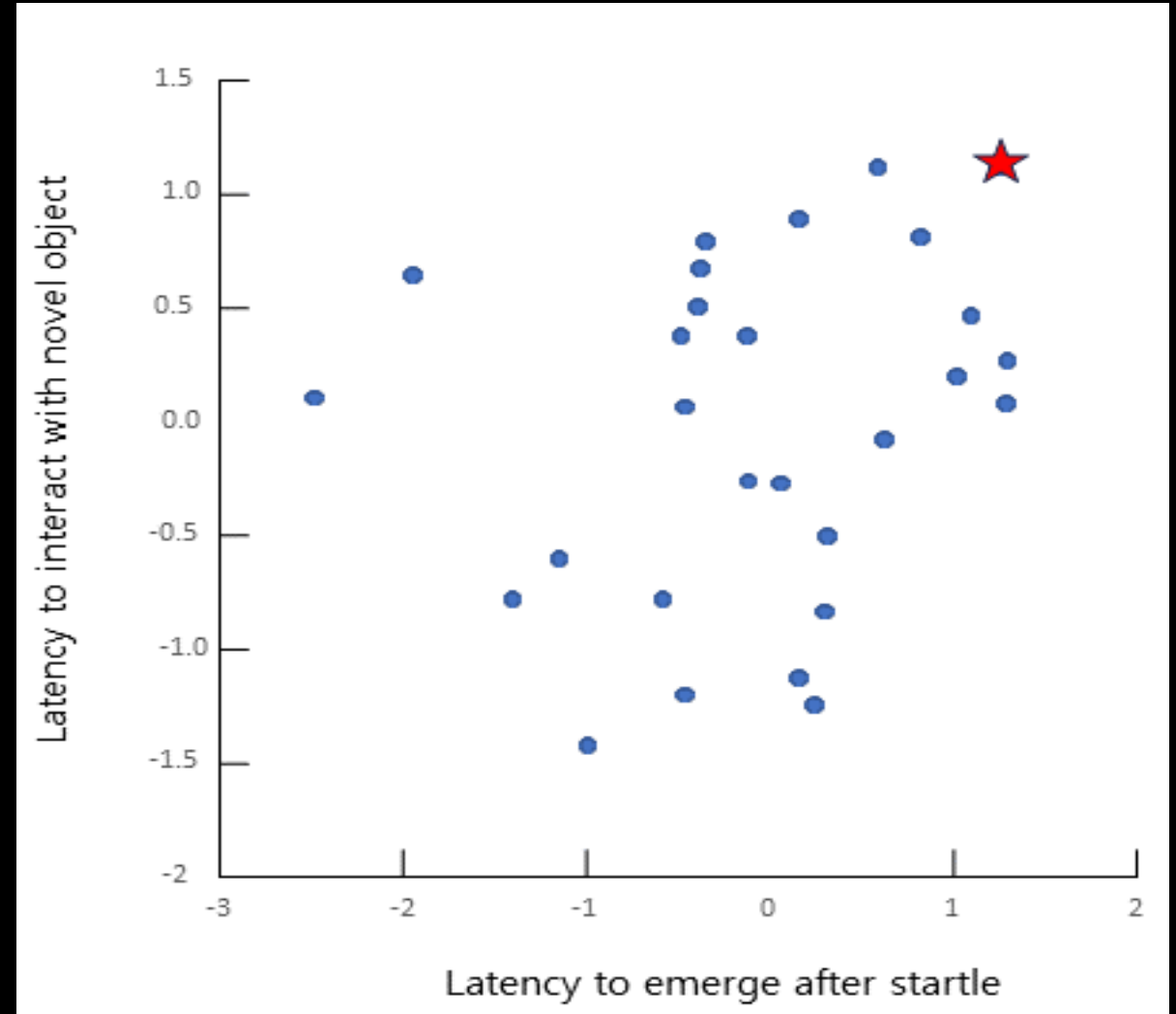
Sounds - fighting possum, male rat call, or baby stoats

Scent - m/f conspecifics, cat odour, or mouse odour

Visual - glow lures, faux mouse, fake eggs, or conspecific tail



Targeting survivors with sensory cues



Field trials underway

4F Lure trials

- Secretary Island (scent)
- Coal Island (scent and sound)
- Five Fingers Peninsula (sound)
- Te Korowai o Waiheke (scent and sound)
- Living Springs (scent, sound, visual)
- Otago Peninsula (scent, sound, visual)
- Summit road group (visual and scent)
- Project Janszoon (scent)

Student research

- Jess Wagner (Victoria University)
- Laura Grant (Sydney University)



(Image credit - Shinji Kameyama, DOC)

Conclusion



Baits

- Baits highly palatable and not “scary”
- Fast action toxins lead to survivors with CTA
- Bait avoidance sustained through time
- Bait switching targets **most** survivors



Traps

- Traps select for certain personality traits
- Survivors shy, neophobic, and less active
- Survivors targeted with range of devices, passive traps, and dogs



Lures

- 4F lures can overcome survivor behaviour
- Range of sensory cues (audio, visual, olfactory) target difficult pests
- Field trials underway to determine effectiveness



Eradication Science Programme



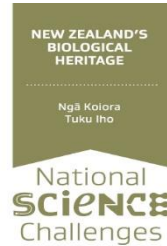
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MINISTRY OF BUSINESS,
INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI



Department of
Conservation
Te Papa Atawhai



National
SCIENCE
Challenges



PREDATOR FREE
2050
kia uru ora, return to life



Te Korowai o Waiheke
---VARDS PREDATOR FREE WAIHEKE



THE
Cacophony
PROJECT



HAWKE'S BAY
REGIONAL COUNCIL



PROJECT
JANSZOOM
Together restoring the Abel Tasman



Hapū research partners

- Ngāti Porou,
- Tūhoe Tuawhenua
- Northern Taranaki iwi
- Moriori imi



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Thank you

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Stoat sound lures



Lure	Type	4Fs behaviour
Stoat contact call	Social/eavesdropping	Fornication
Stoat threat call	Social/eavesdropping	Fighting
Stoat kitt call	Social	Fornication/Fighting
Weasel call	Social/eavesdropping	Fighting
Cat call	Social/eavesdropping	Fear
Rabbit distress call	Food	Feeding (prey)
Chick call	Food	Feeding (prey)
Mouse call	Food	Feeding (prey)
Sheep	Control	Control