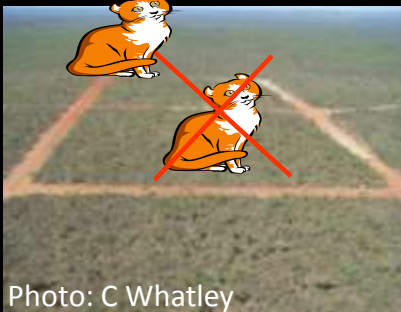
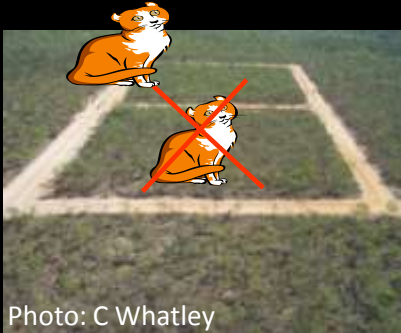


# The role of feral cats in small mammal declines in northern Australia: experimental evidence



Anke Frank, Chris Johnson, Sarah Legge, Alaric Fisher,

Michael Lawes, Ian Radford, Chris Pavey, and John Woinarski



# Australia

= worst mammal extinction record in the world

24 species extinct

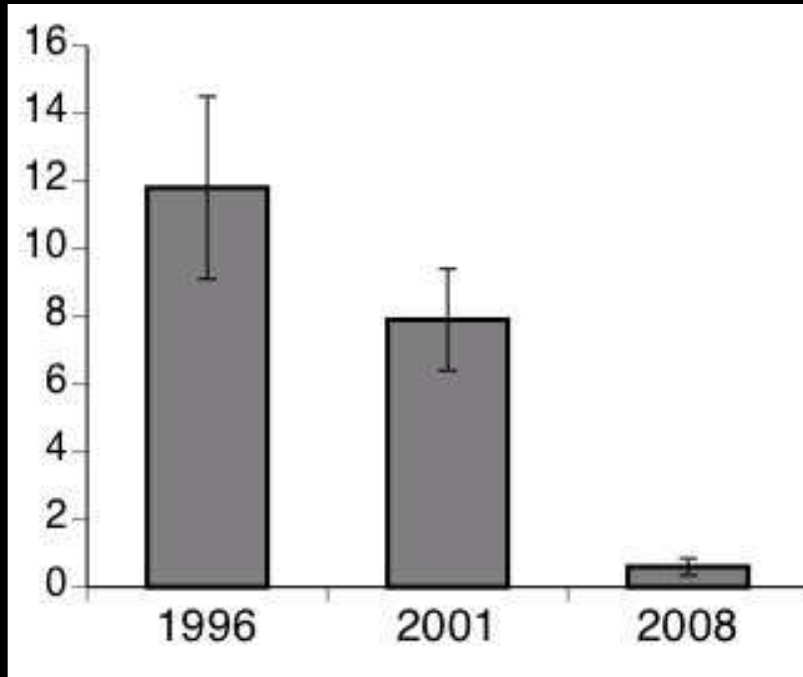
-> 1/3 of global mammal extinctions

25% range reduction for 1/3 of species



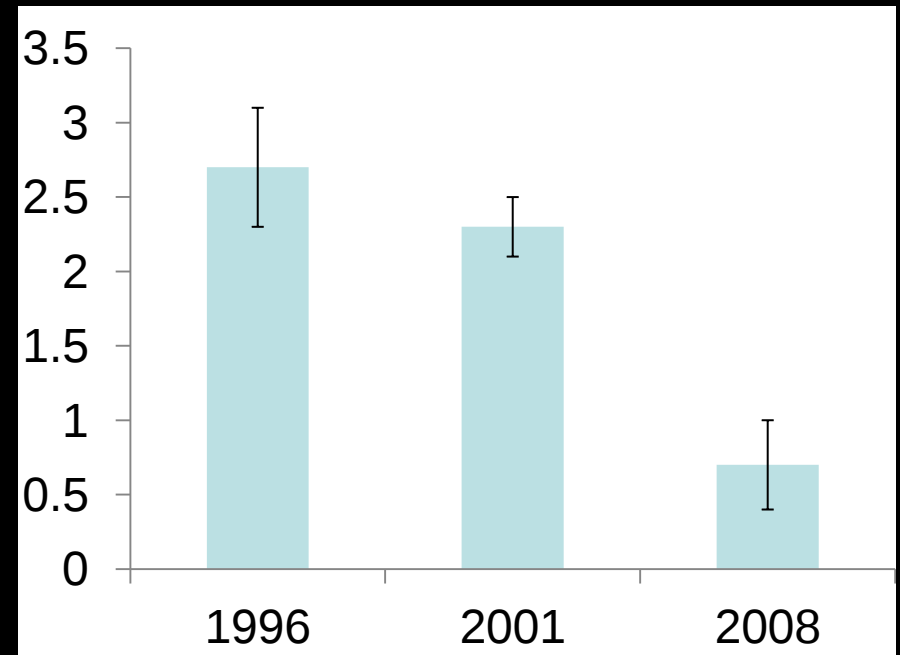
# Small mammal declines in northern Australia

Number of individuals/ plot +/- SE



Source: John Woinarski

Number of species/plot +/- SE



After Fitzsimons et al. 2010

# Trends for N-Australian mammals

| Status         | Number of species affected |
|----------------|----------------------------|
| Marked decline | 9                          |
| Some decline   | 12                         |
| Uncertain      | 13                         |

Fitzsimons et al. 2010. The Nature Conservancy, Melbourne.

# Mammal declines in the past

→ in southern, mainly arid Australia

- land use change



- introduced predators



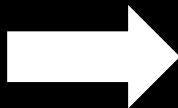
# Mammal declines in the present

→ in northern, tropical savanna Australia

- land use change



- introduced predators



# Indirect evidence for cats:

- smaller mammals affected (“cat prey range”)
- no small mammal declines on Islands without cats and
- declines on islands where cats were recently introduced

# Problem: finding direct evidence

Cats =

cryptic



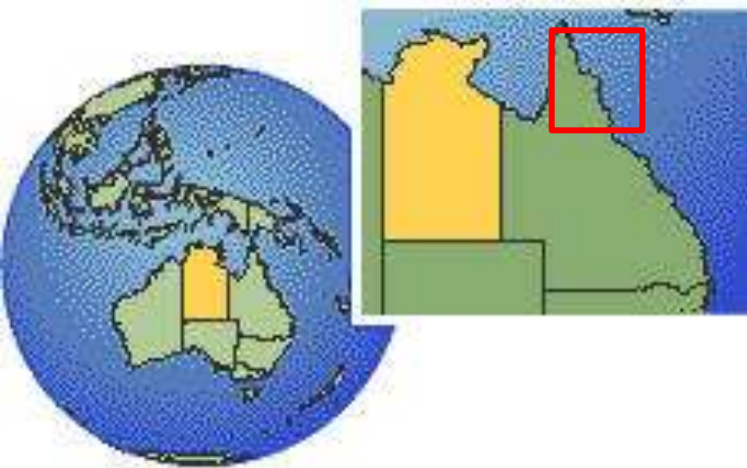
smart



→ experimental, manipulative study required

# Aim

Test cat impact on  
population growth  
of a declining mammal  
using cat-free and cat-accessible  
enclosures  
in a natural setting.



“...natural setting.”

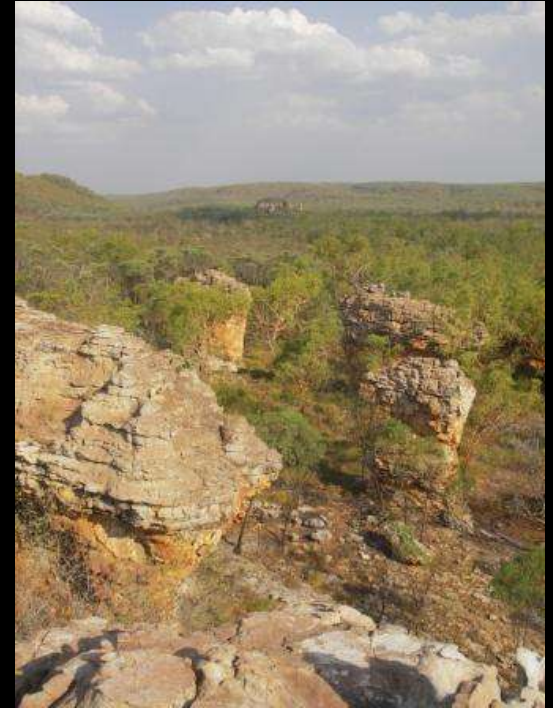


# Wongalara Sanctuary

~ rugged country (190.000 ha)

~ fairly low fire history

~ still grazed (cattle, buffalo,  
donkeys, horses)



# Choosing a declining mammal

Caught once  
(October 2011)

**Delicate mouse**  
*Pseudomys delicatulus*

Caught once  
(October 2012)

**Western chestnut mouse**  
*P. nanus*

Not caught  
in the wild  
since 2008

**Pale field rat**  
*Rattus tunneyi*

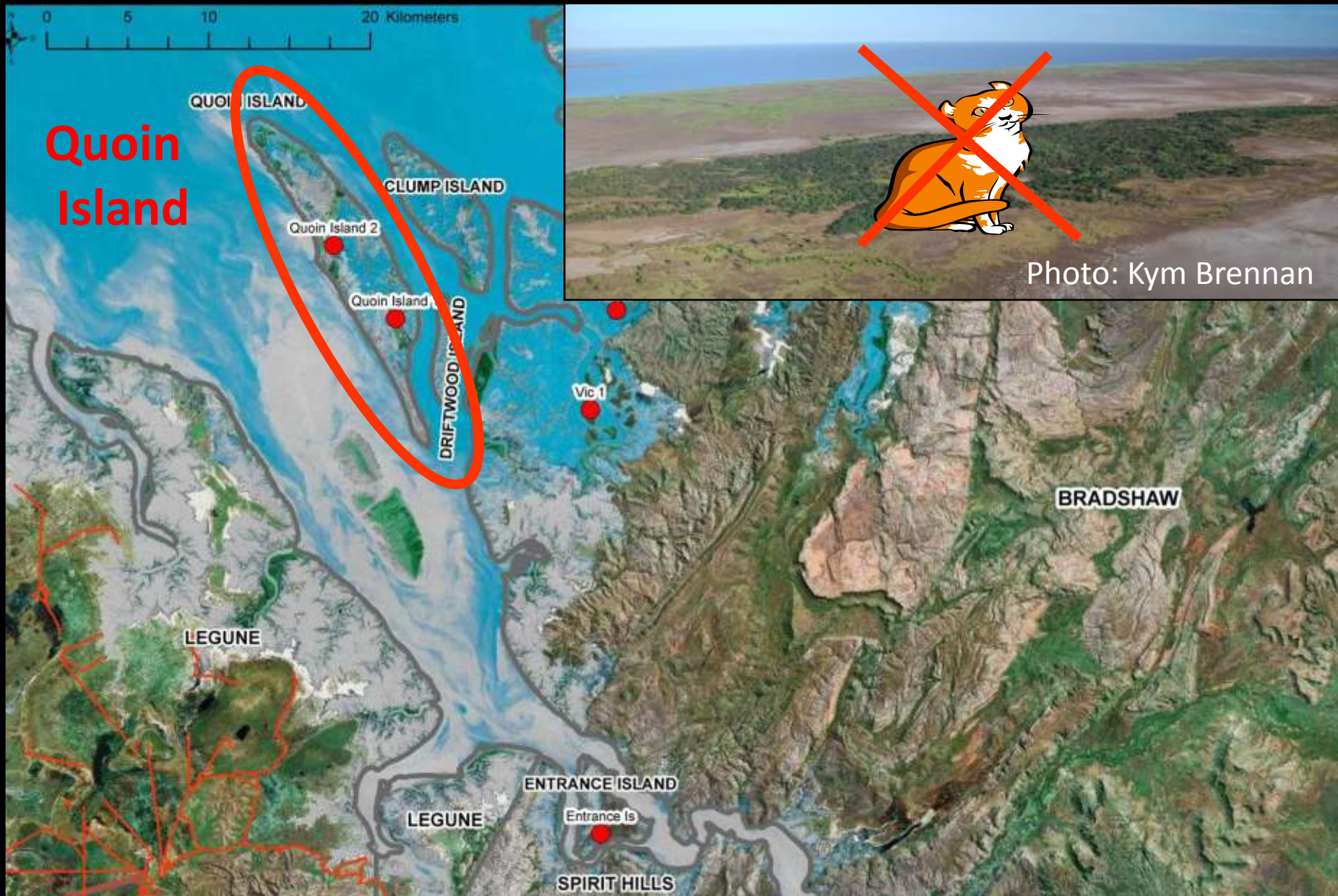


Photo: Damien Starbuck



Photo: Dende Steinberg

# Where to find a declining mammal?



# Captive breeding and fence design tests at the Territory Wildlife Park



# Cat-free and -accessible enclosure design

4 rat **enclosures**  
including  
2 cat **ex**closures



# Cat proofing the cat-exclosures



Photo : Damien Stanioch

Electric “floppy top” fence

Cat detection dog “Sally”

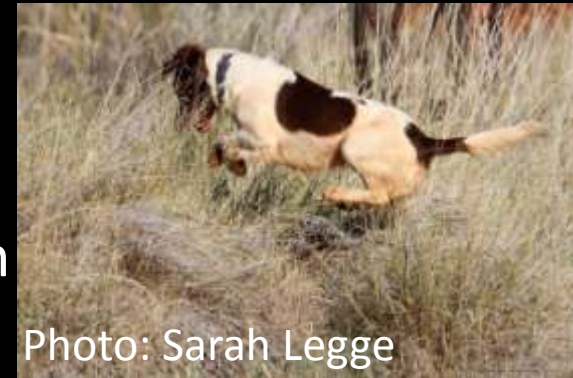


Photo: Sarah Legge



Photo : D Stanioch

~ 8 cameras/ treatment  
+  
4 cameras on fence  
pointing outside





Photos : Damien Stanioch

## 1<sup>st</sup> rat release (Oct 2011):

Enclosure #1: each half: 15 rats ( $\text{♂}:\text{♀} = 47:53$ ), 10 radio-collared (5  $\text{♂}$ )

---

## 2<sup>nd</sup> rat release (Apr 2012):

Enclosure #2: each half: 23 rats ( $\text{♂}:\text{♀} = 43:57$ ), 7 radio-collared (5  $\text{♂}$ )



Photos: Eridani Mulder

# Rat trapping

72 Elliott traps/enclosure, 4-6x/year, 2-4 nights



Photo: A Porter



Photo: D Stanioch



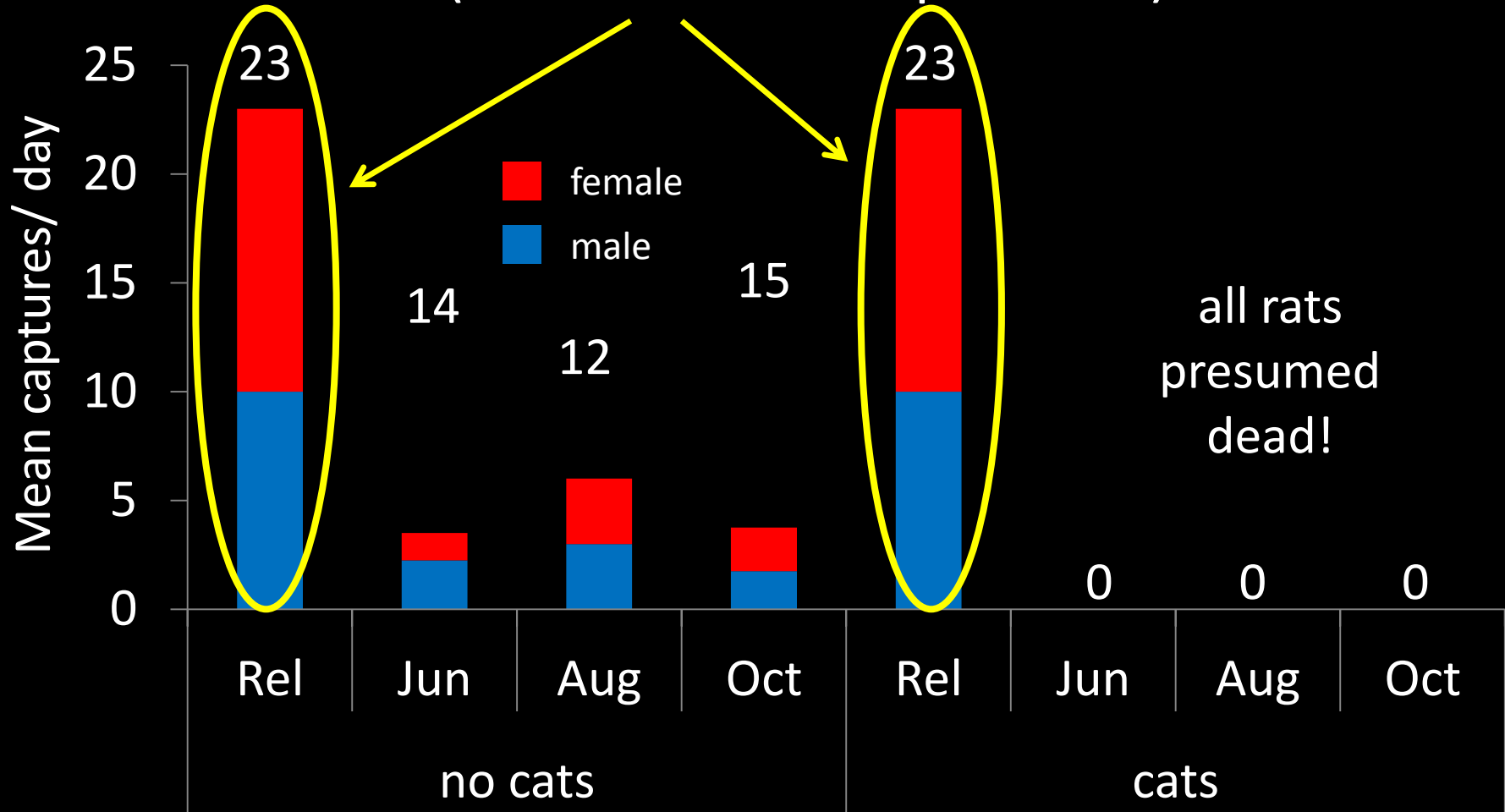
Photo: D Stanioch



Photo: A Porter

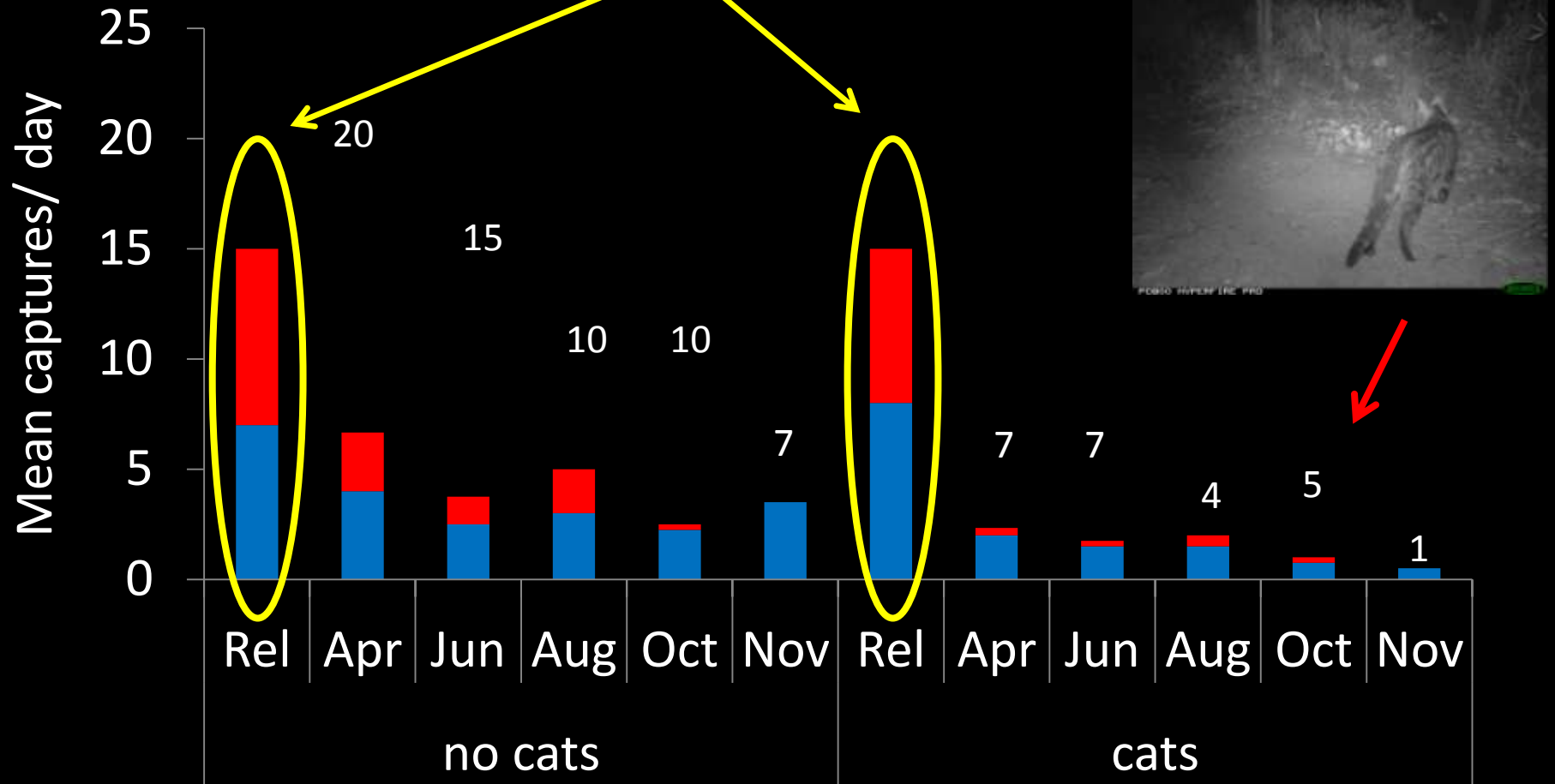
# 2<sup>nd</sup> enclosure trapping results

(after release in April 2012)



# 1<sup>st</sup> enclosure trapping results

(after release in Oct 2011)

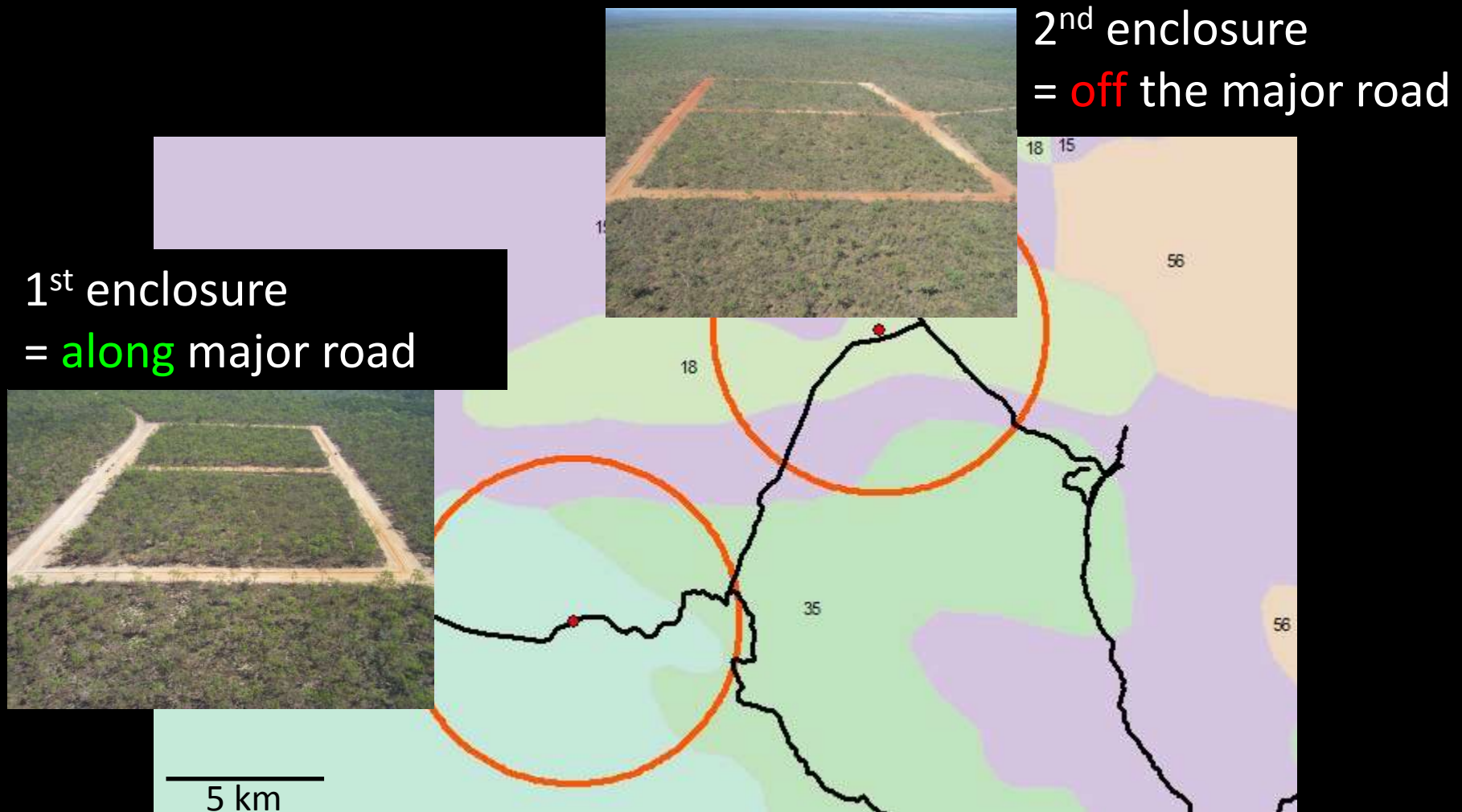


# Cat sniffing out rat

first cat evidence > 12 months after rat release

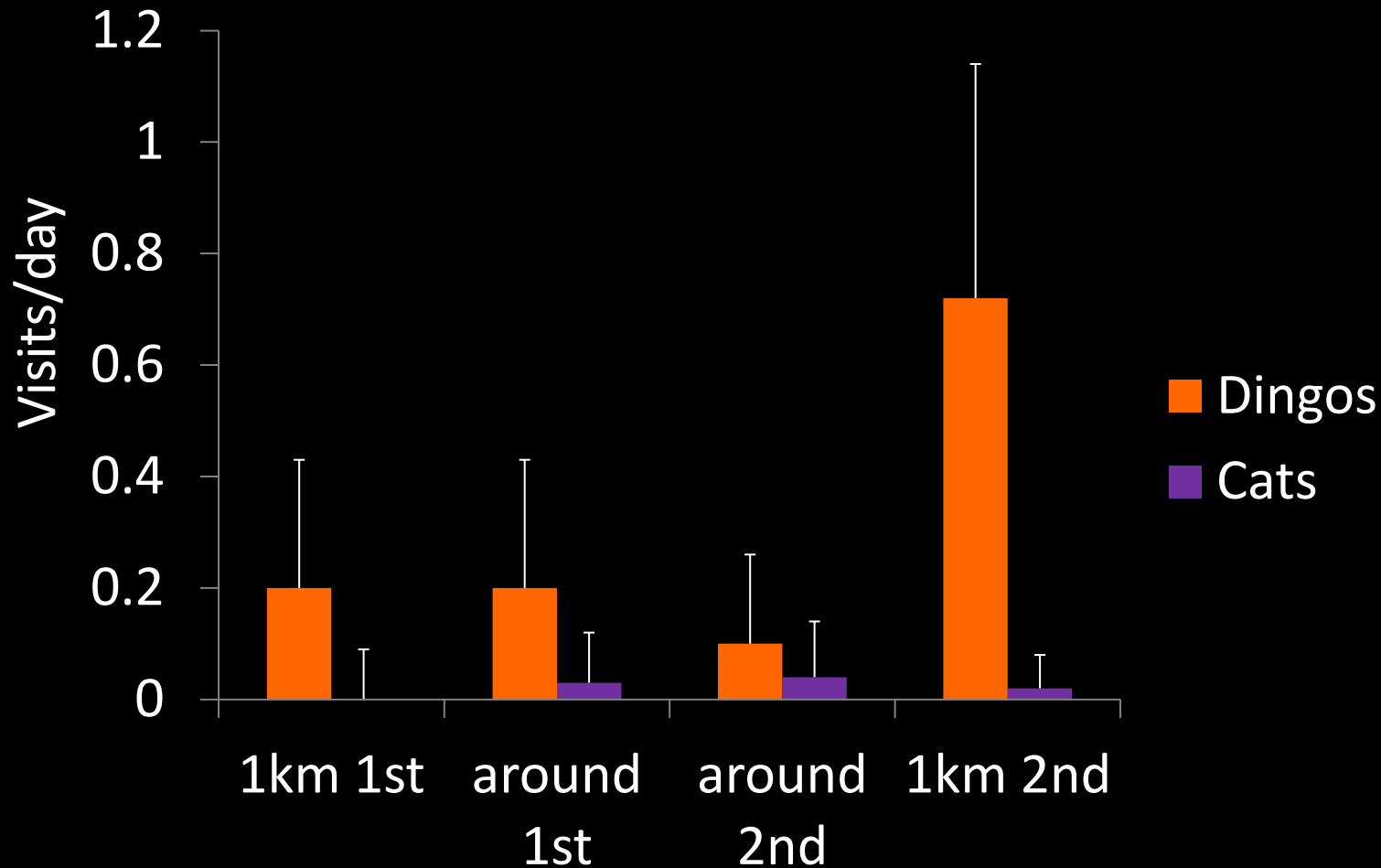


# Do dingos affect cat activity?



Apr – Jul 2012: camera trapping at 0, 1, 3 and 5 km around enclosures

# Camera trapping results



# Key results

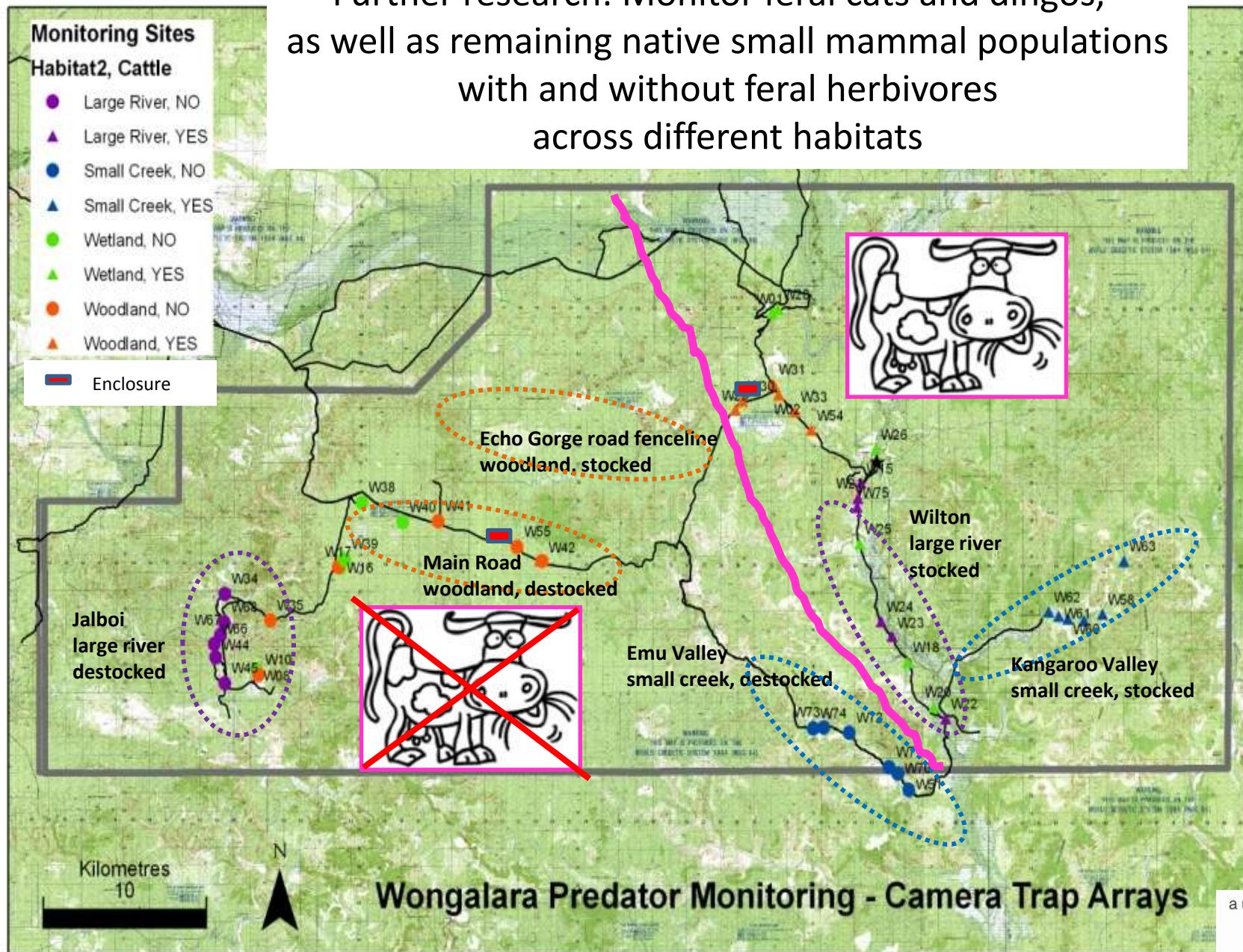
## Cats

- can deplete a whole population of small mammals ( $n > 20$ ) in a relatively short amount of time ( $< 10$  days).
- keep checking an area of a previously depleted small mammal population on a regular basis ( $\sim 2 - 4$  x/month) .

## Further research:

Do dingos, vegetation and/or feral herbivores affect cats and hence survival of small mammals?

Further research: Monitor feral cats and dingos,  
as well as remaining native small mammal populations  
with and without feral herbivores  
across different habitats



Modified after Katherine Tuft, AWC

# Acknowledgements



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Damien Stanioch

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Emma Tait,



**Australian Government**  
**Australian Research Council**





# Indirect evidence of predation pressure:

- 1) Do rats eat more in the open or under cover?
- 2) Does “cat access” have an effect on their feeding rates?



## Giving up density (GUD) studies

Brown, Joel S (1988): *Patch use = indicator of habitat preference, predation risk, and competition.*

*Metabolic Cost*

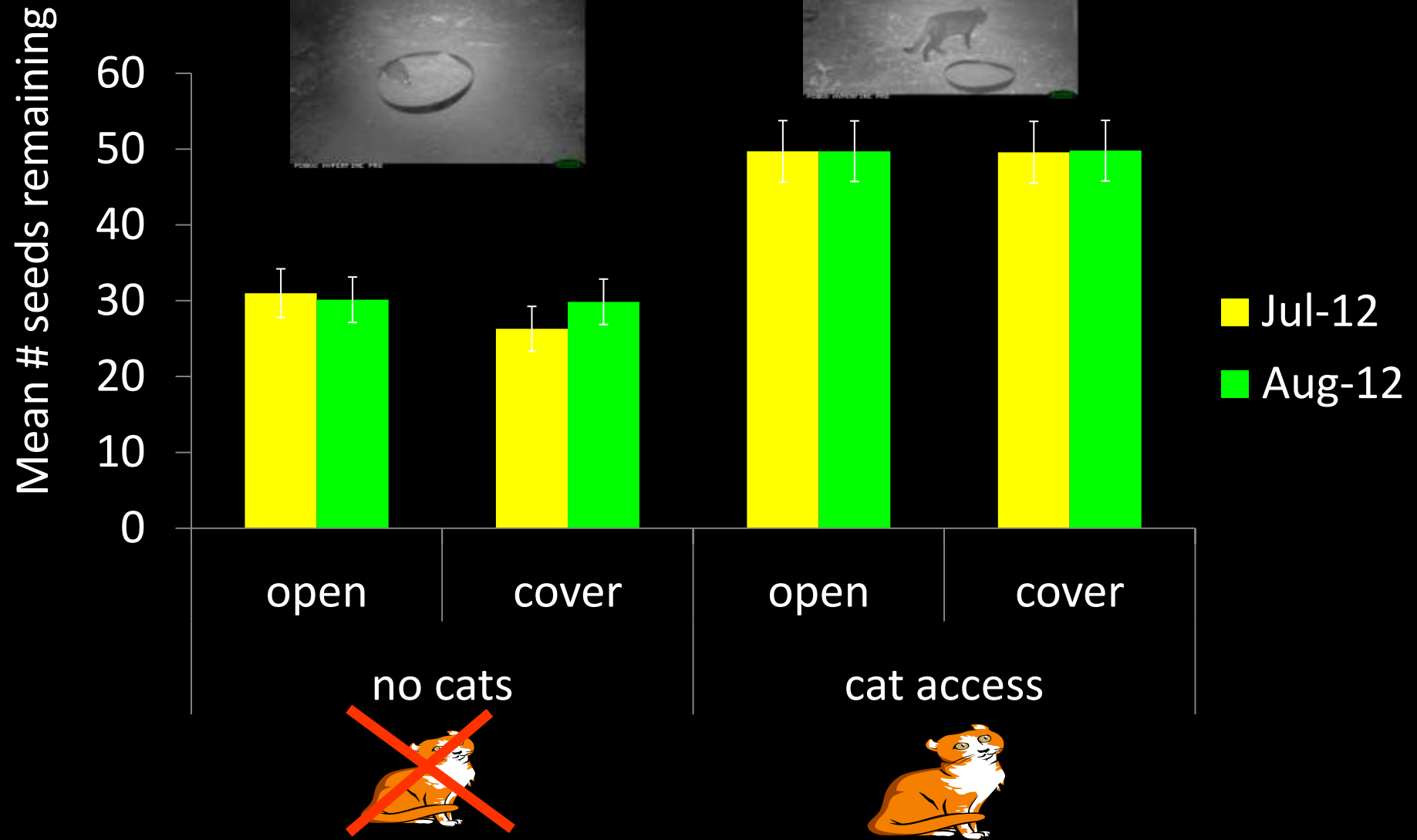
*Missed Opportunity Cost*

$$H \approx C + P + MOC$$

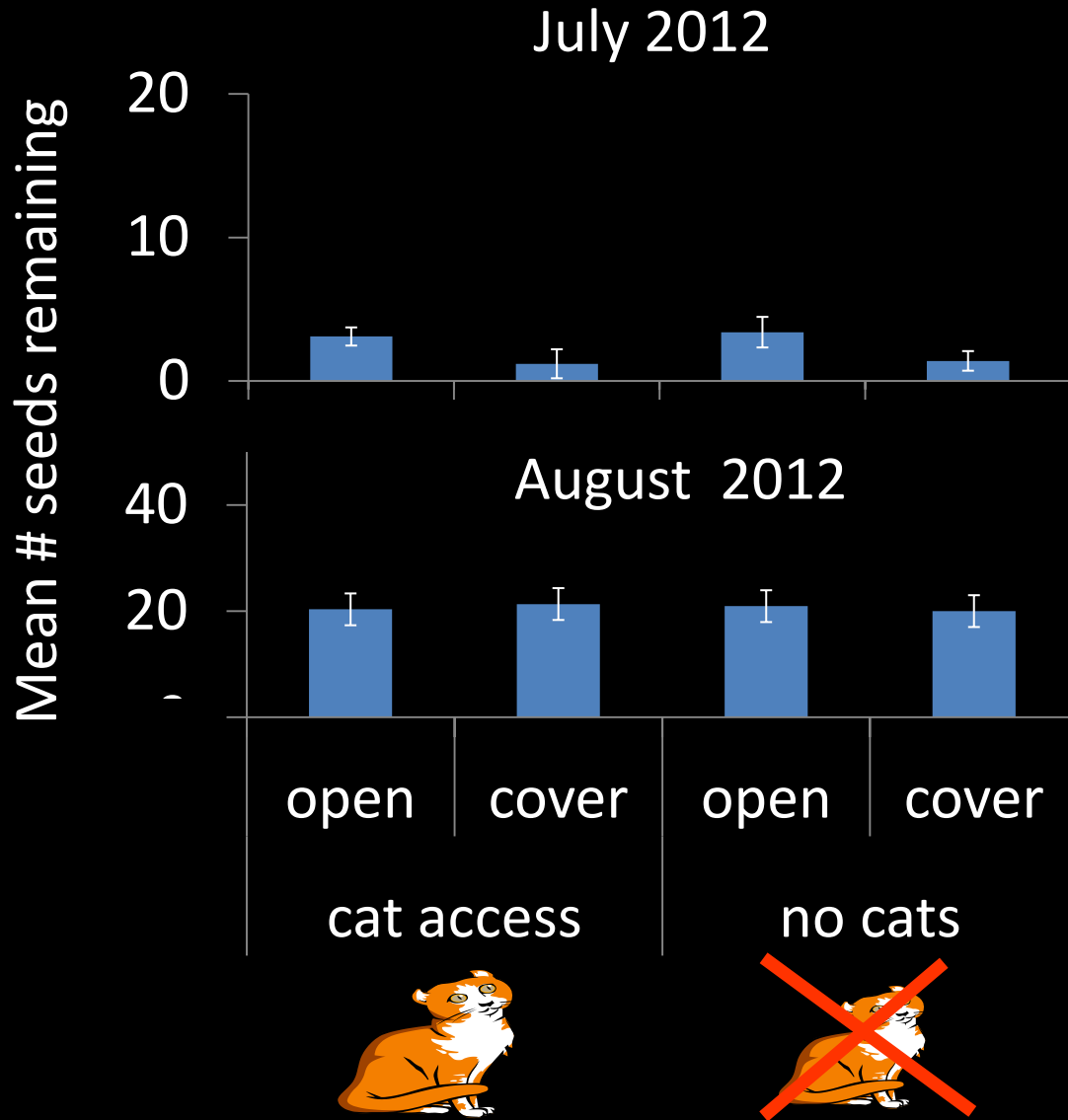
*Harvest rate*

*Predation risk*

# 2<sup>nd</sup> enclosure GUDs (rat release Apr-12)



# 1<sup>st</sup> enclosure GUDs (rat release Oct-11)



# Radio-tracking rats – where do they live?

Photo : Dene Steinberg



Photo : Damien Stanioch

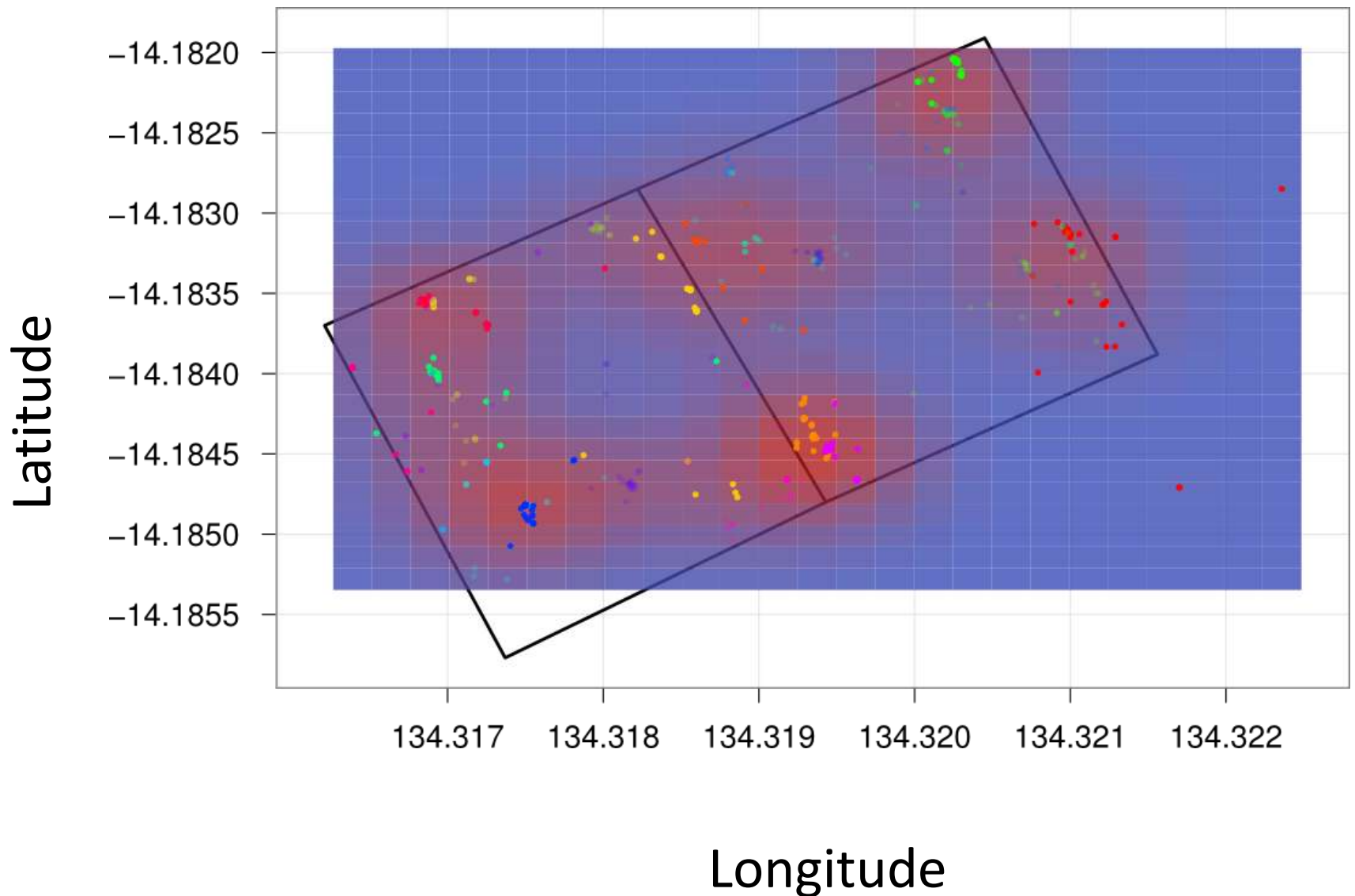


Photo : Alison Porter

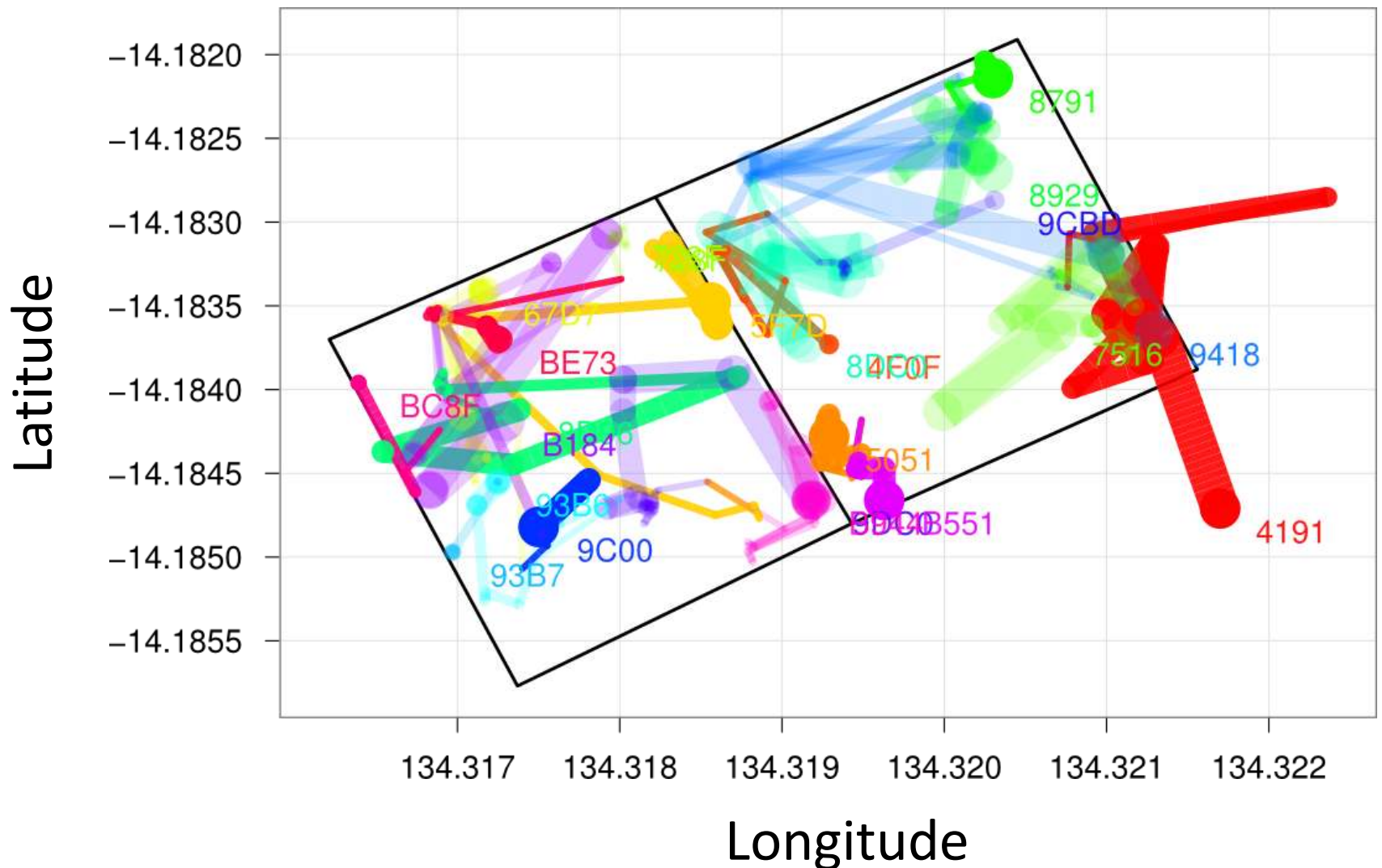


Photo : Damien Stanioch

# Radio-tracking results: Rat shelter usage



# “Rat movements” (usage of different shelter locations)





# 1<sup>st</sup> rat re-introduction (Oct 2011)

15 rats, 10 radio-collared

15 rats, 10 radio-collared

♀♂

♀♂

cat  
access

♀♀♂

♀♂♂

♀♂♂

♀♂

no cat  
access

♀♀

♀♂♂



## 2nd rat re-introduction (Apr 2012)

23 rats, 7 radio-collared

23 rats, 7 radio-collared



no cat  
access



cat  
access

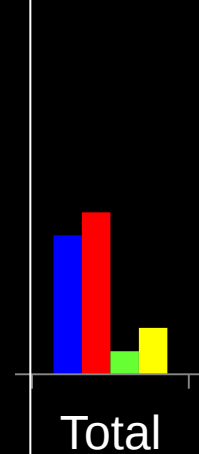
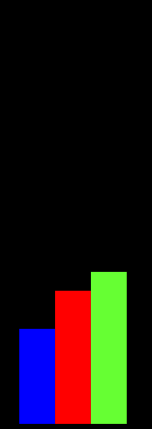
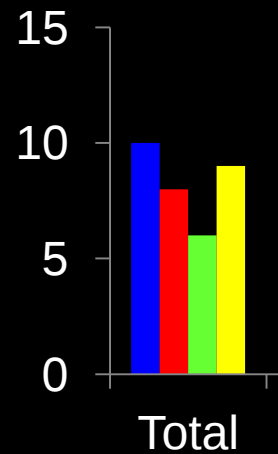
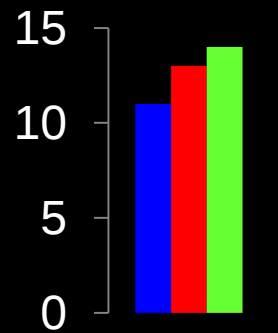


# Trapping results (after October release)

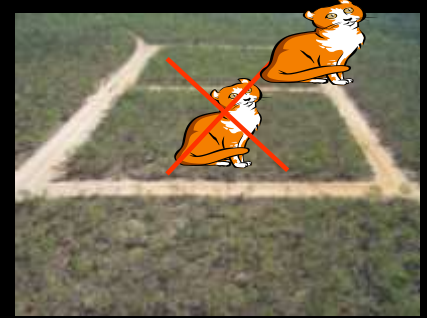
Apr-12



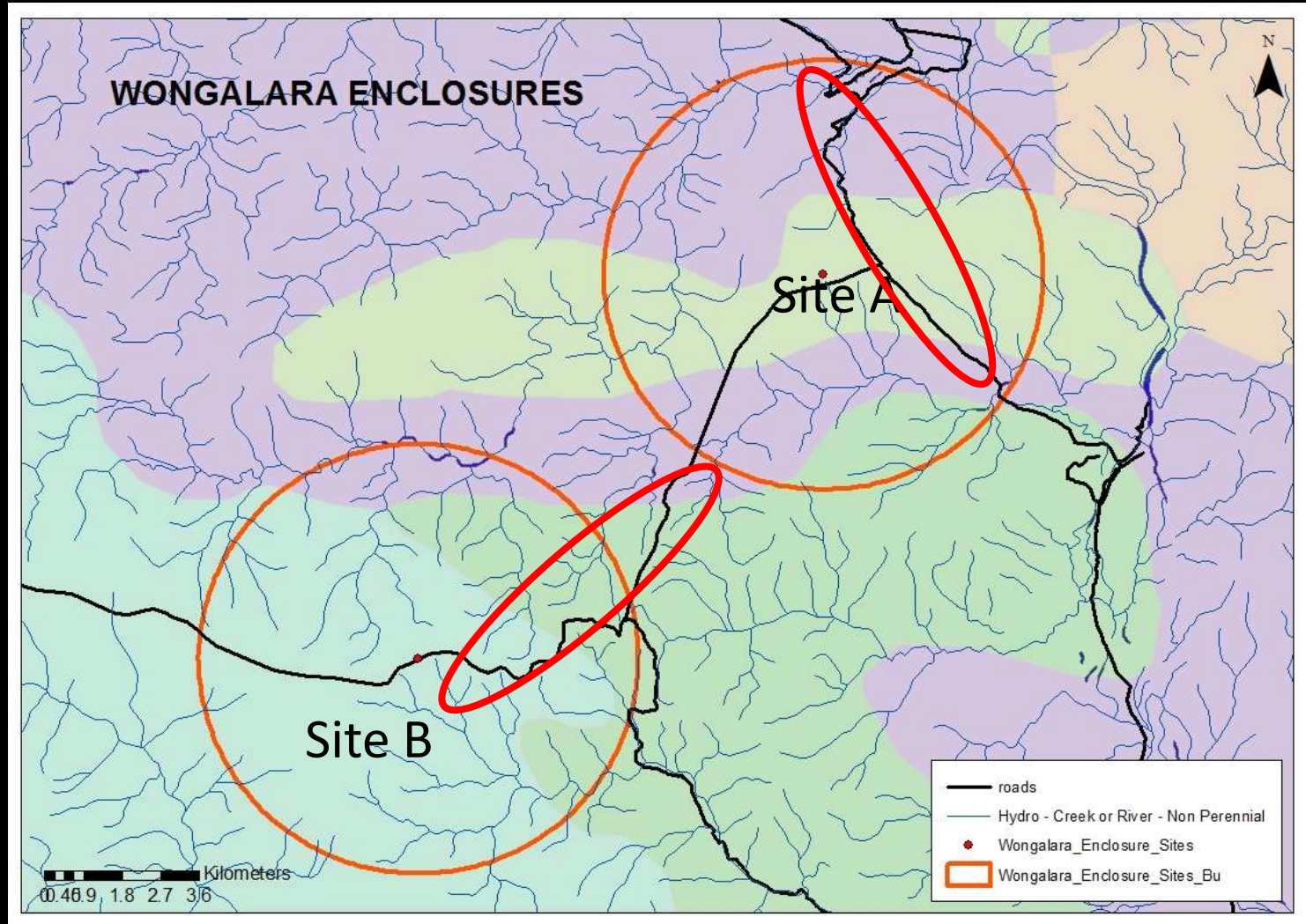
Jun-12



■ Day1  
■ Day2  
■ Day3  
■ Day4



# Natural corridors = focal points for cat activity?



Testing different lure types: audio, food, pongo  
and visual

# Stress



# Parasites & Disease

