

Calibrating camera-based biased mark-recapture sampling designs to survey leopard populations

Nakedi Maputla
Sam Ferreira

Singita

LEBOMBO & SWENI LODGES
Kruger National Park • South Africa



AFRICAN WILDLIFE FOUNDATION®



South African
NATIONAL PARKS

How many carnivores are there?

- Population growth rates summarise
 - Responses to the environment
 - Responses to other species
 - Responses to other individuals
- Establish population estimates
- How these are changing
- Challenges
 - Logistical
 - Operational
 - Cost
 - Statistical



Secretive Species

- Natural markings
- Mark-recapture techniques
- Camera traps in random to systematic designs
- For cats researchers favour biased-sampling
 - Cats are animals of habit
- Unknown relationship between sampling effort and precision



Aims

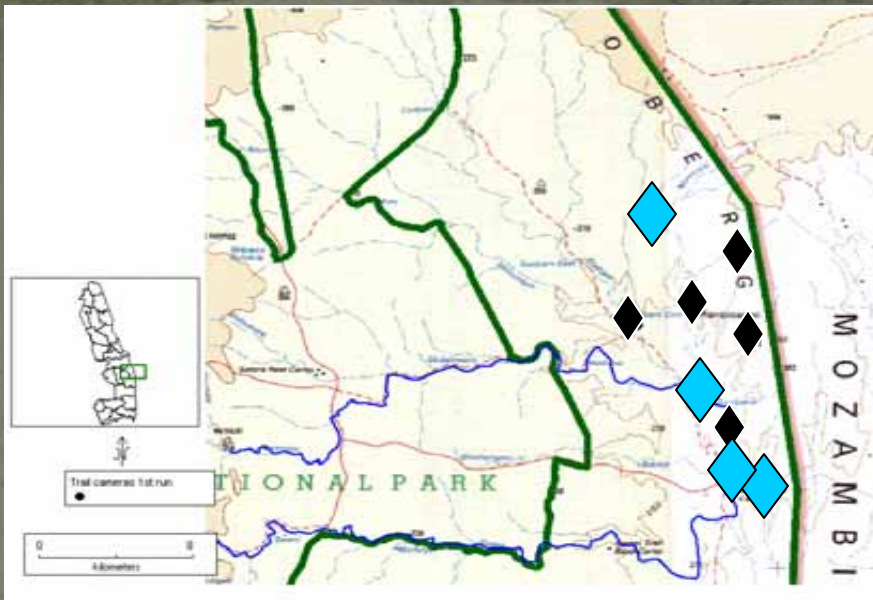
- Assess the effect of biased camera-trap sampling on estimating leopard abundance
 - Sampling effort to achieve an asymptote of new individuals
 - Sampling effort to stabilize precision of estimate
- Provide recommendations to survey Kruger



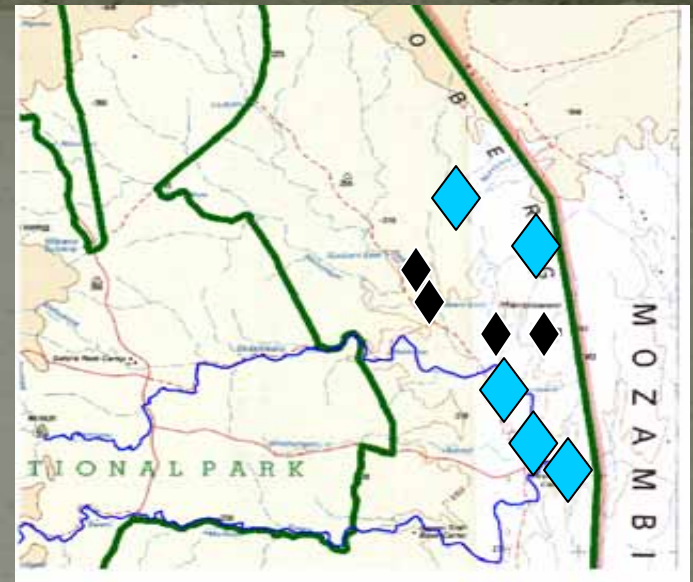
Sampling

- Nw'anetsi Section
- Four sessions:
 - 17 April – 8 May 2008
 - 21 May – 11 June 2008
 - 20 June – 21 July 2008
 - 9 August – 30 August 2008
- 10 Camera traps

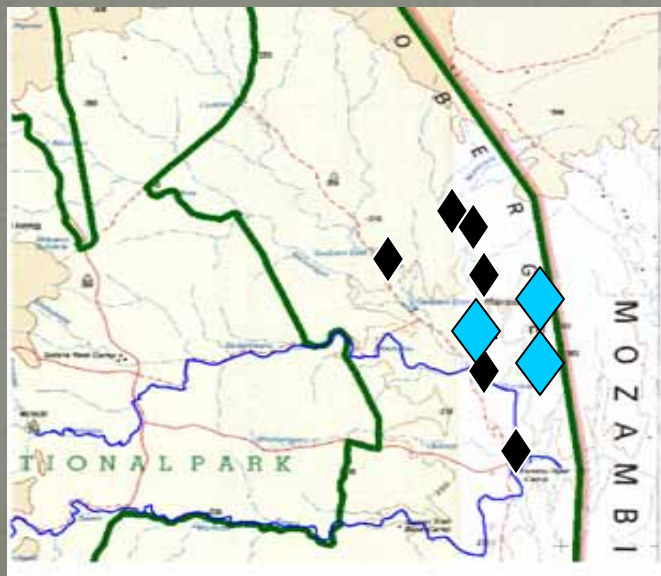




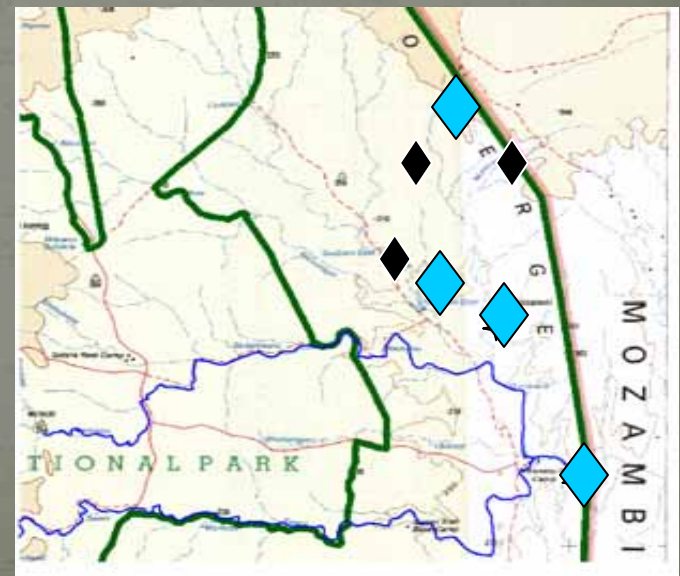
17 April – 8 May



21 May – 11 June



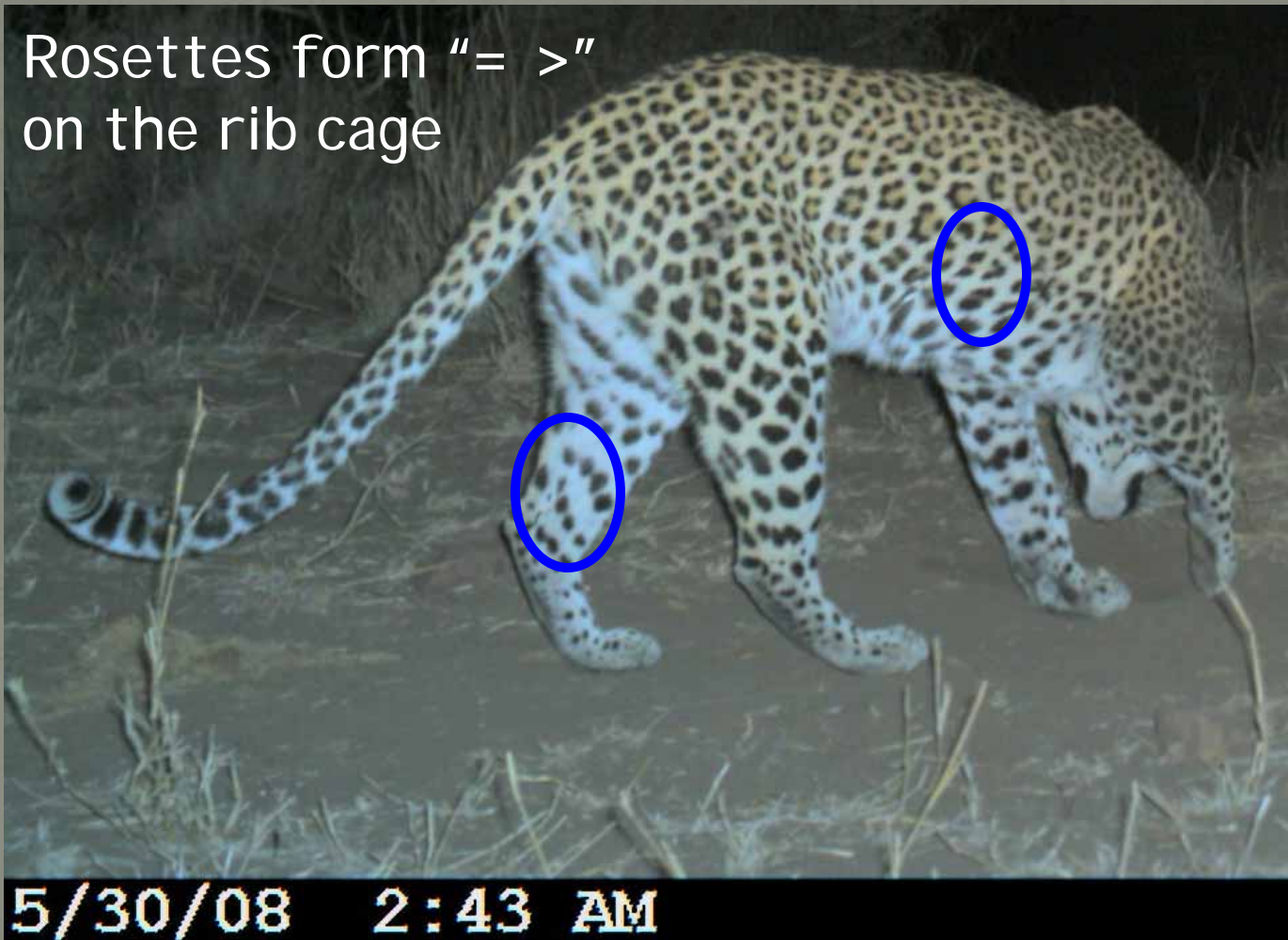
20 June – 21 July



9 August – 30 August

Identifying individuals

Rosettes form " $= >$ "
on the rib cage





6/20/08 5:49 PM

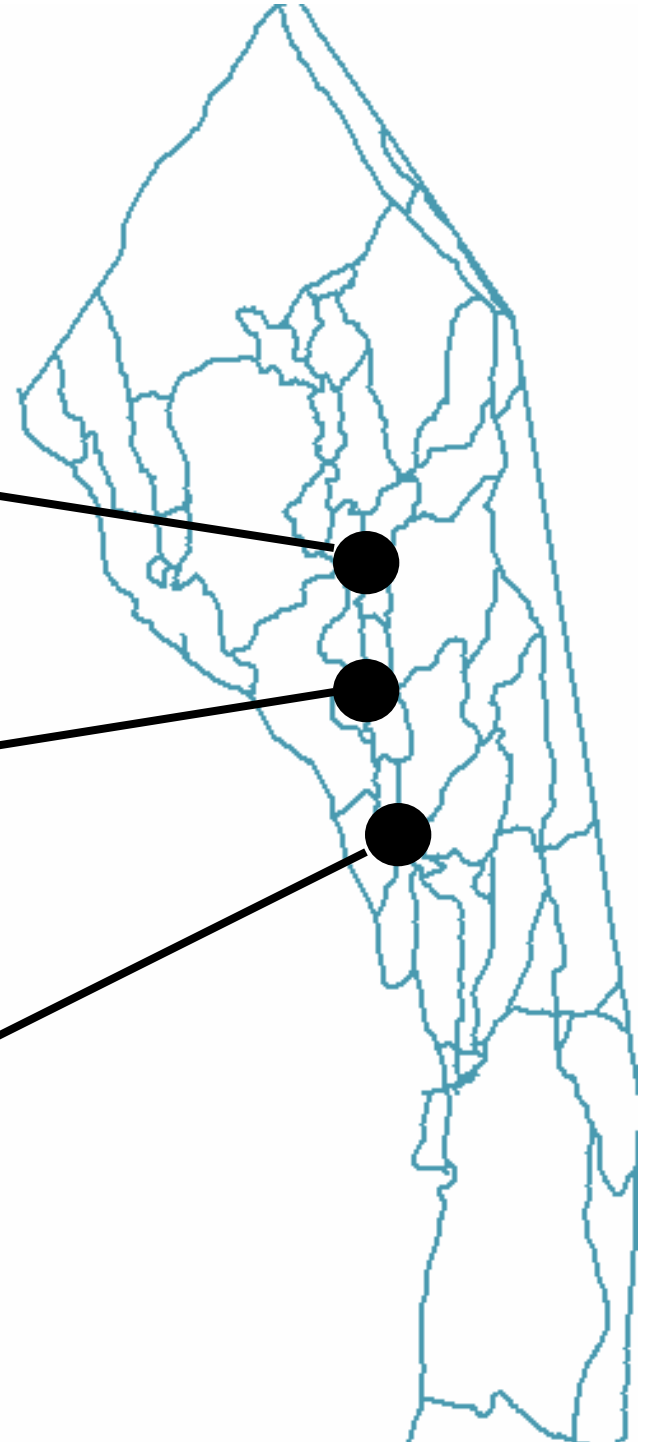




7/06/08 8:24 AM

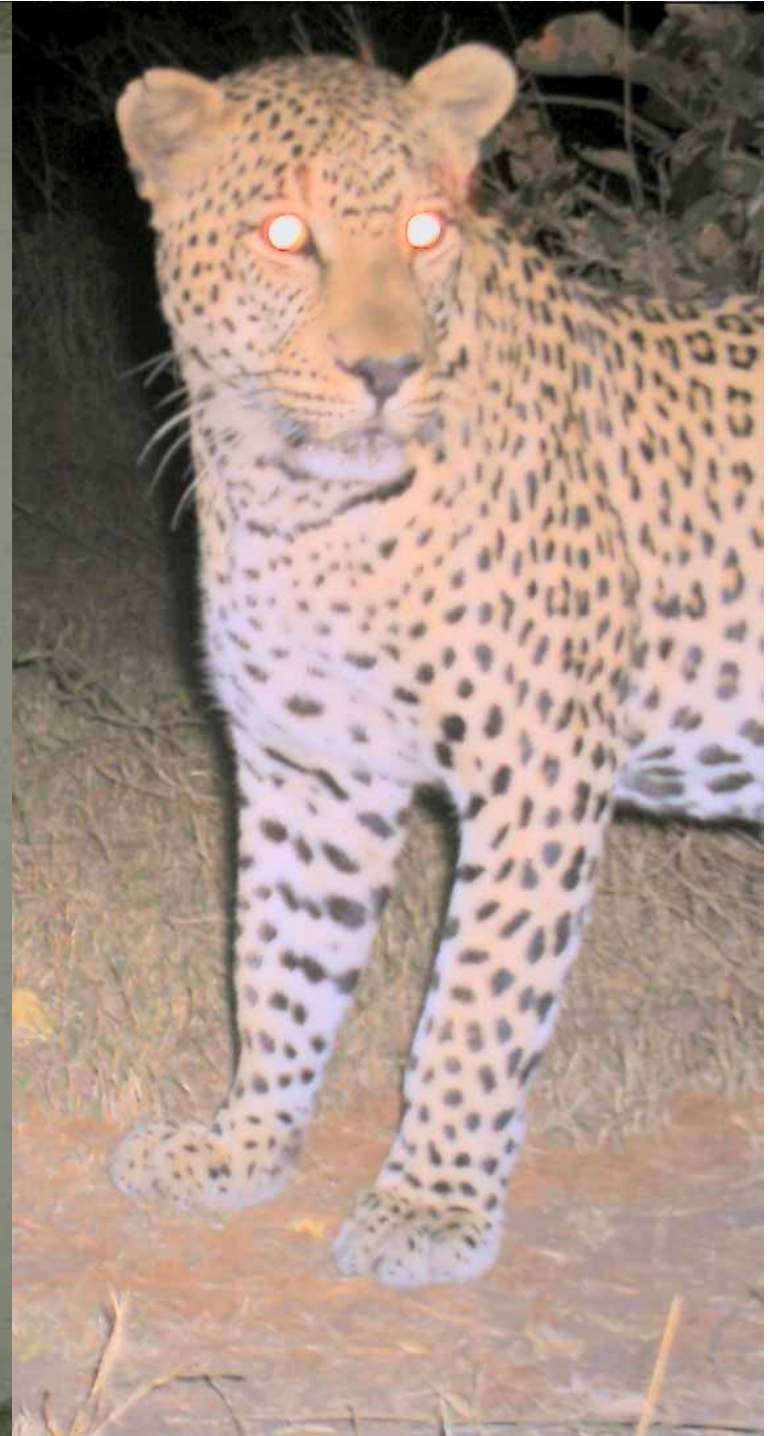


Capture history



Analysis

- Programme CAPTURE
- Assumptions
 - the population is closed
 - all animals have equal opportunity of being captured
- Discriminant function model selection
 - Heterogeneity (Mh)
 - Behavioural (Mb)
 - Time (Mt)
 - Combinations
- Simulated effort
 - Randomly redistributed capture occasions



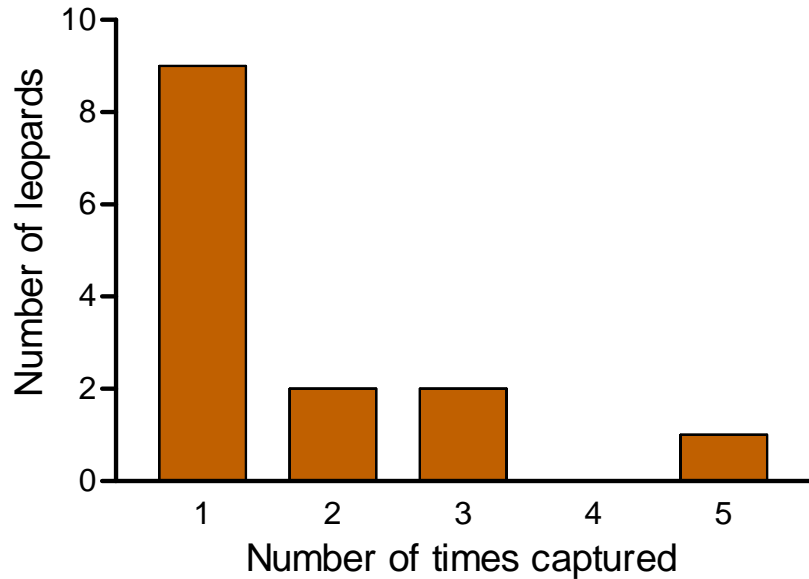
Captures

- 586 trap days
- Photographs taken $n = 24$
- Number of leopards $n = 14$
- Males $n = 11$
- Recaptures $n = 5$

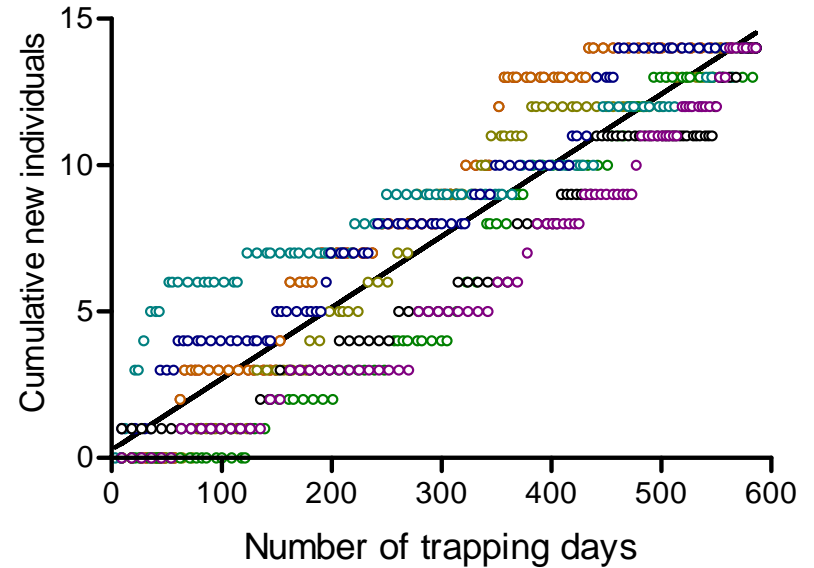


Captures of Individuals

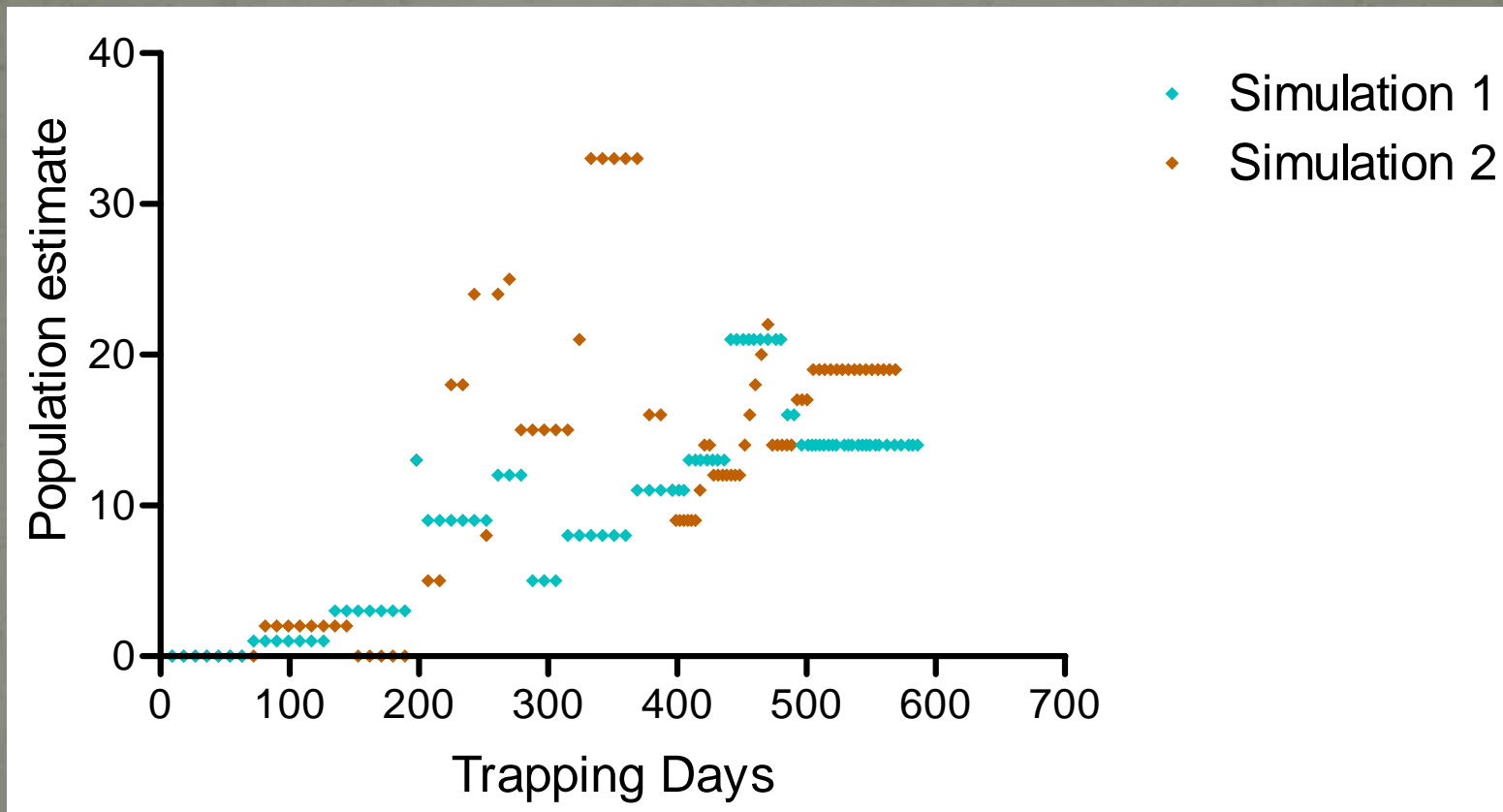
Capture frequency of individuals



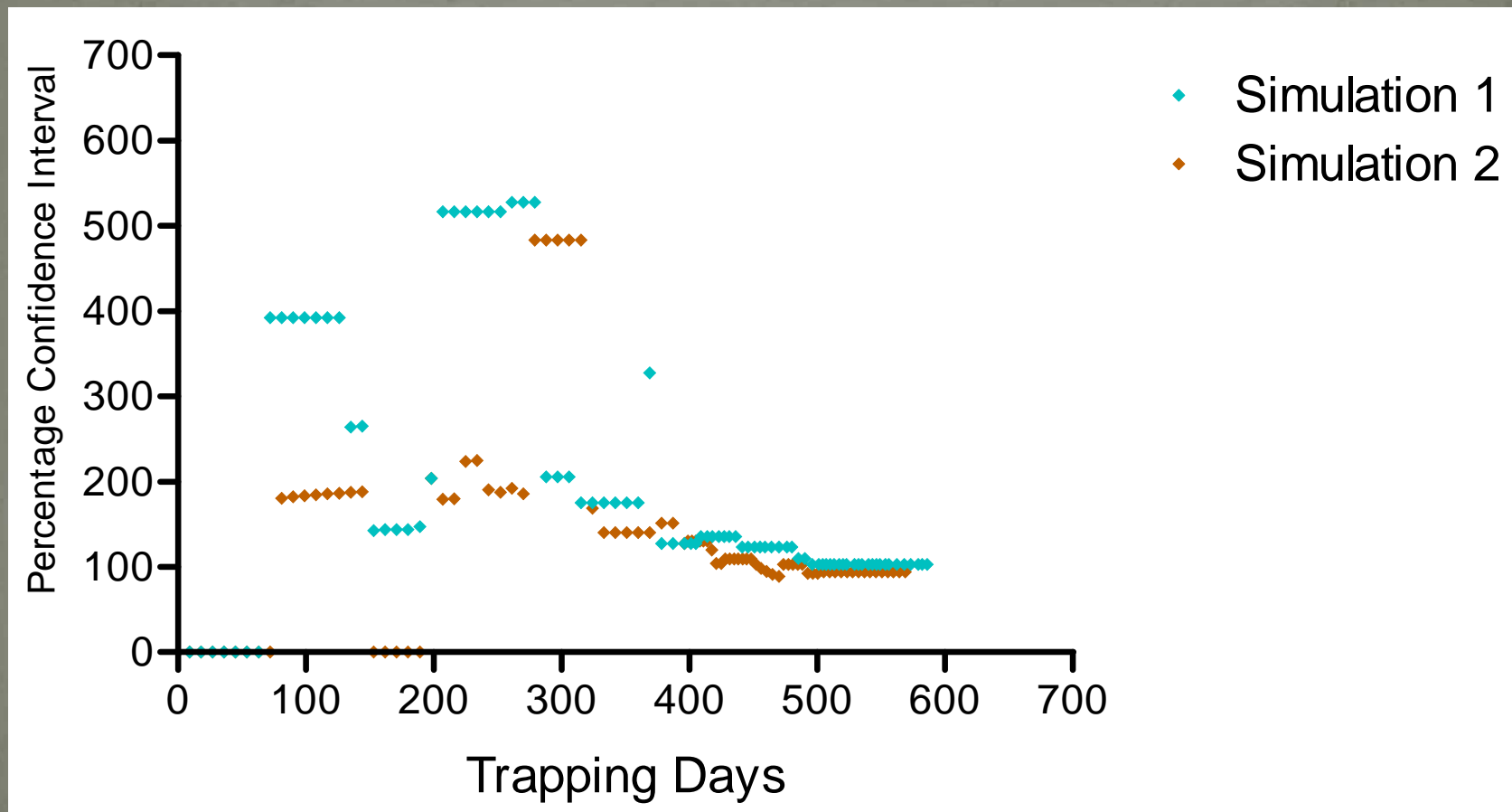
Cumulative captures



Population estimates

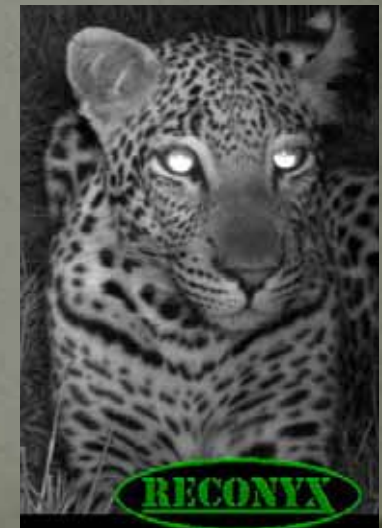
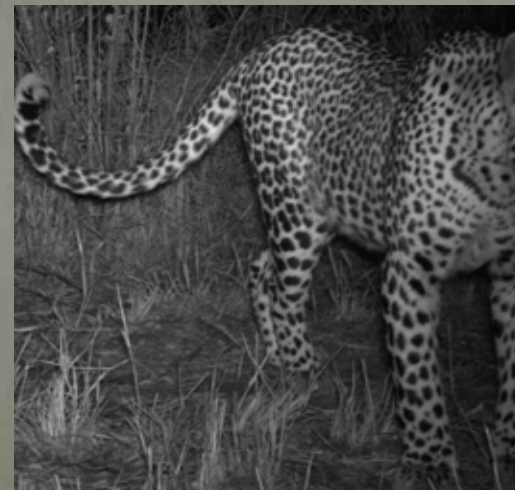


Precisions of population estimates



Conclusions

- Biased sampling may take a long time
 - To achieve an asymptote of new individuals captured
 - To obtain estimates of reasonable precision
- Biased sampling limited for small populations



The way forward

- Test a systematic trapping design
- Test a lured trapping design
- Comparing precision
- Recommend desired trapping approach



