Snow Leopard Population Monitoring

How well are conservation efforts working?

Are snow leopards increasing? Stable?

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How many snow leopards are there?

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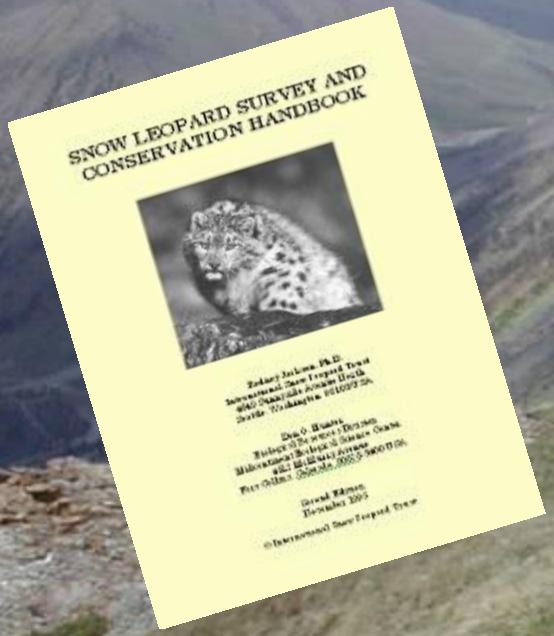
Monitoring snow leopard population status & trends



Sign - an indicator of cat numbers

Relationship between sign and cat numbers is unclear

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Better Science:

Novel tools
to monitor leopards

Genetics

Camera Traps

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Nice pictures…
wrong animals.

Quickly deplete film
and batteries.

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2008: Digital **camera traps**
Black and white
2 pictures per second
25,000+ picture capacity
Long battery life (6+ months)

Impressive results

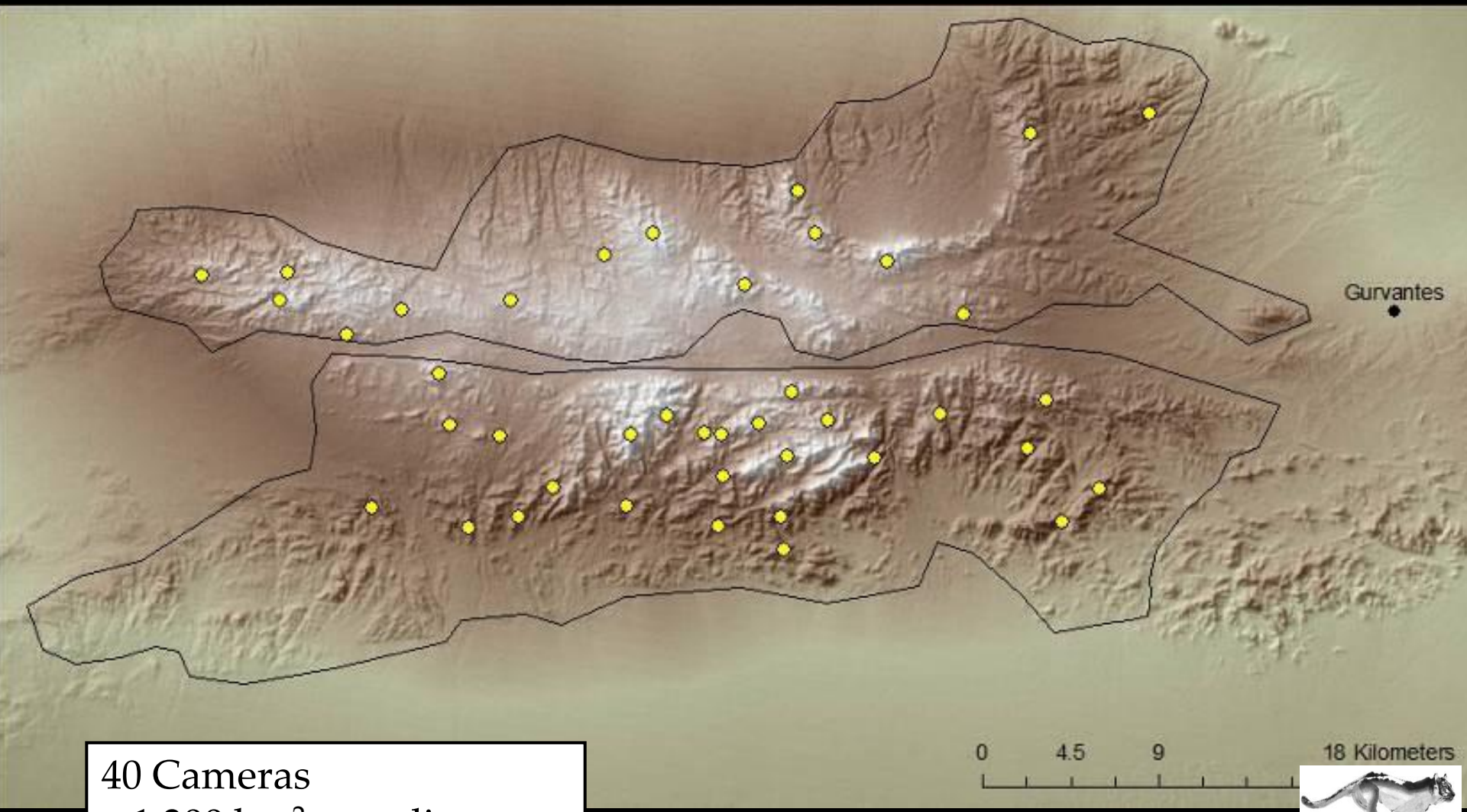
High “capture” rate

Many images per encounter

Image quality excellent

Summer 2010:

4-week mark-recapture camera-based population assessment



40 Cameras
~ 1,300 km^2 sampling area

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Results:

- 18,253 total photos
- 645 snow leopard photos
- 34 snow leopard encounters
- SL photos per encounter: 5 min - 85 max
- Identified 16 individual adults (plus 6 cubs)
- Mark-Recapture analyses = 22 adults (95% CI: 16 – 26)

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Using fecal DNA to monitor snow leopards

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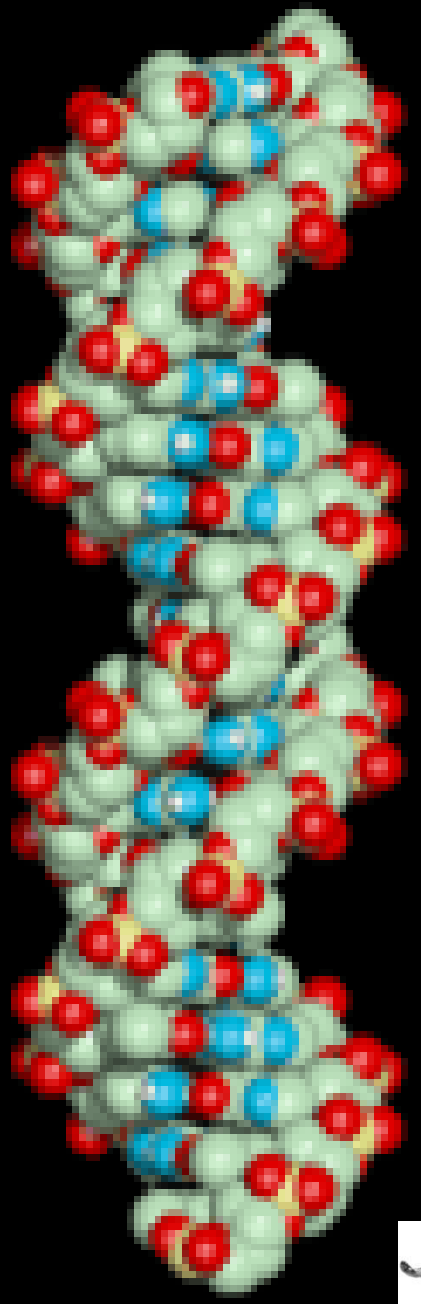
Identify individuals & sex

Estimate cat numbers

Detect changes over time



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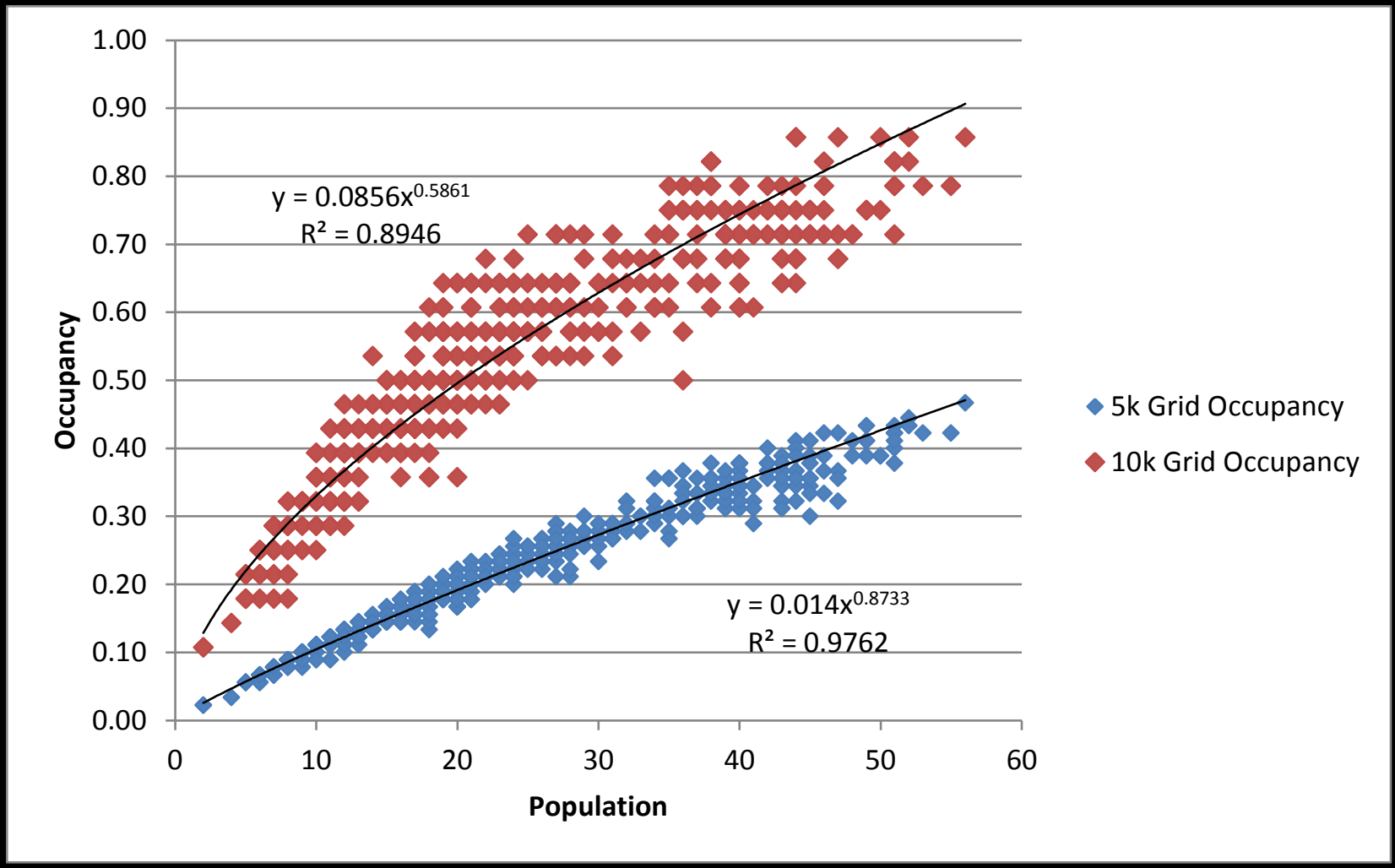
Challenges:

Camera placement can be ‘interesting.’

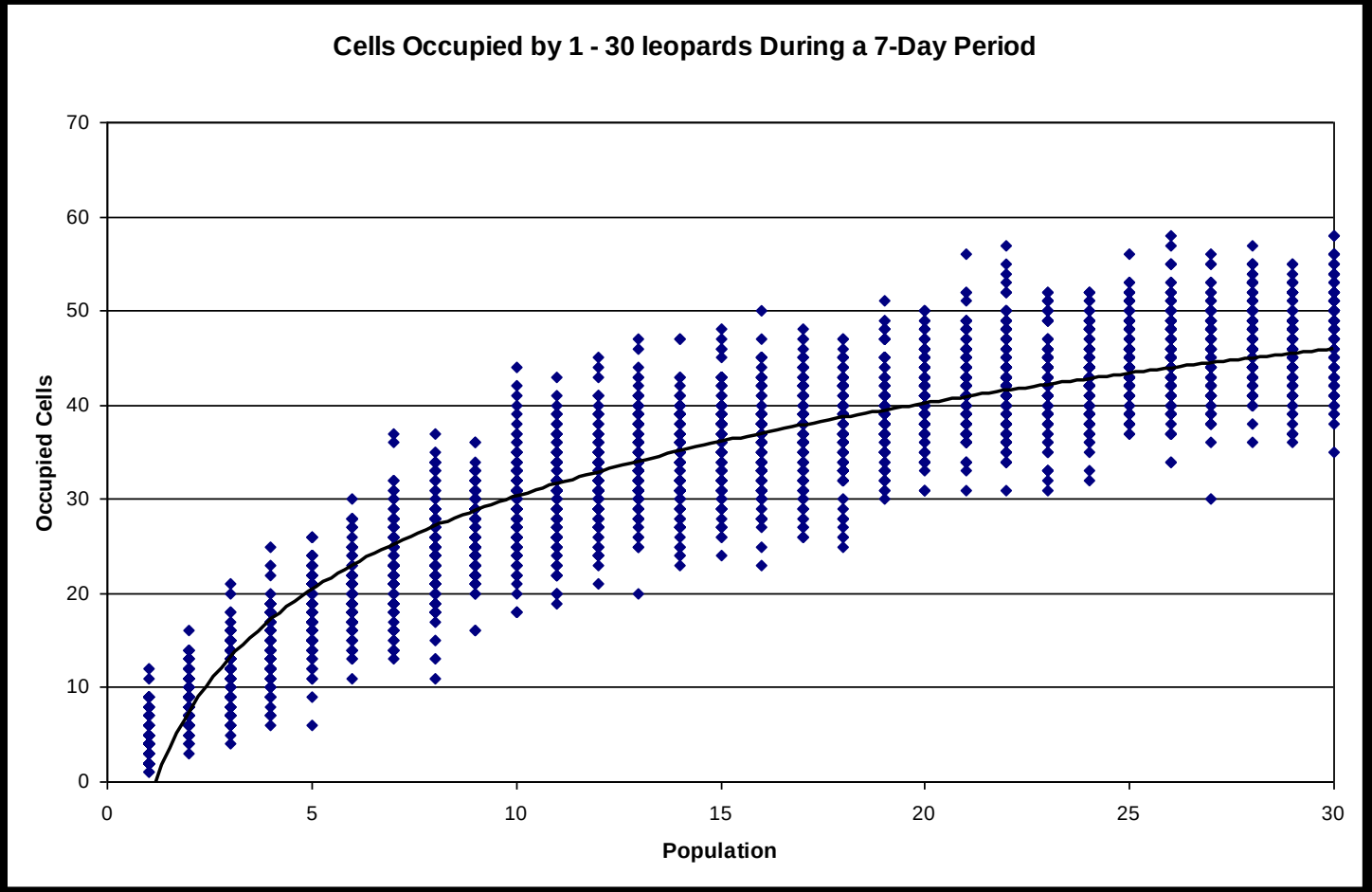
It’s a huge area to search and not just snow leopards are using it

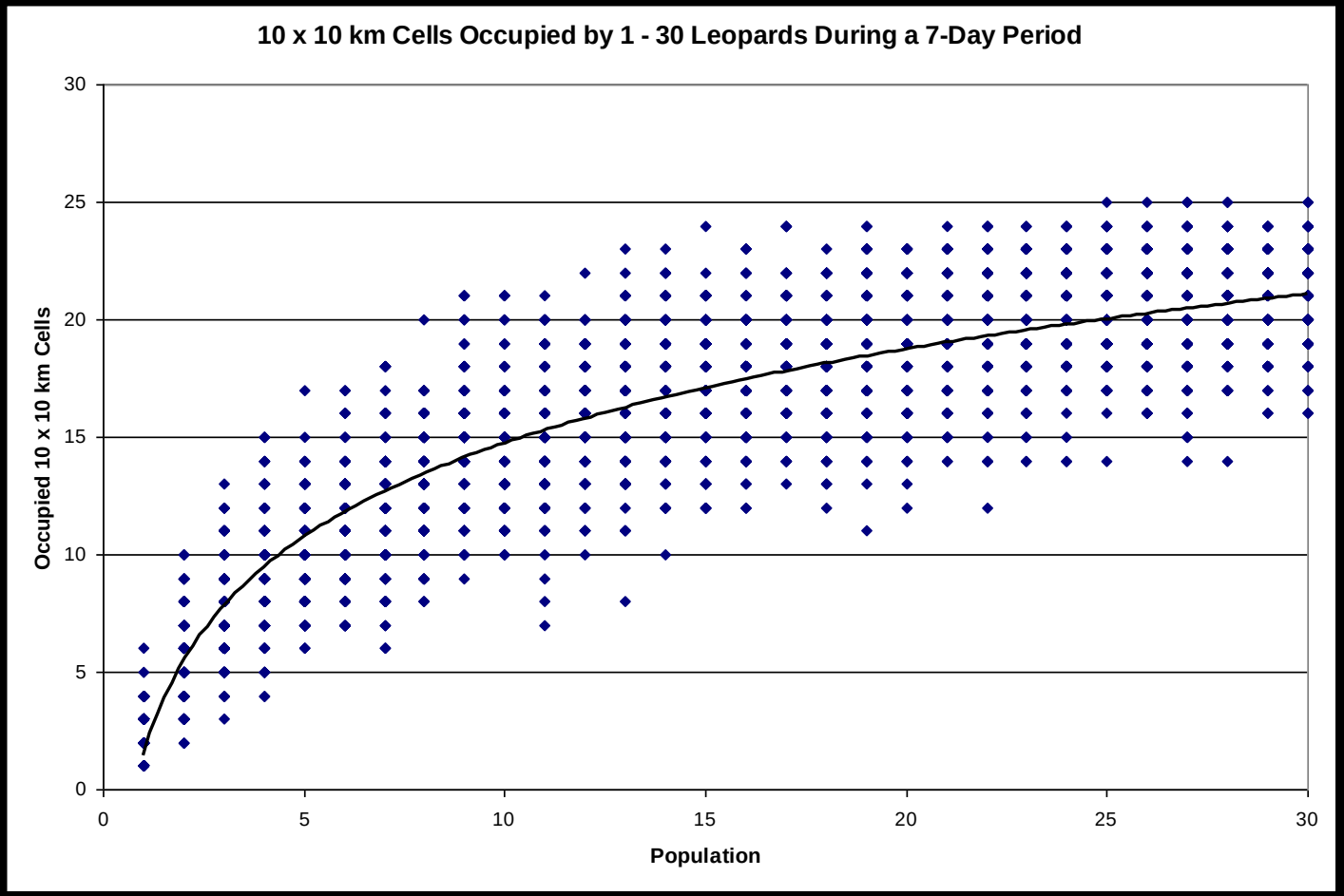
Site occupancy as a surrogate variable for monitoring snow leopards

Hypothetical relationship between population and cell occupancy

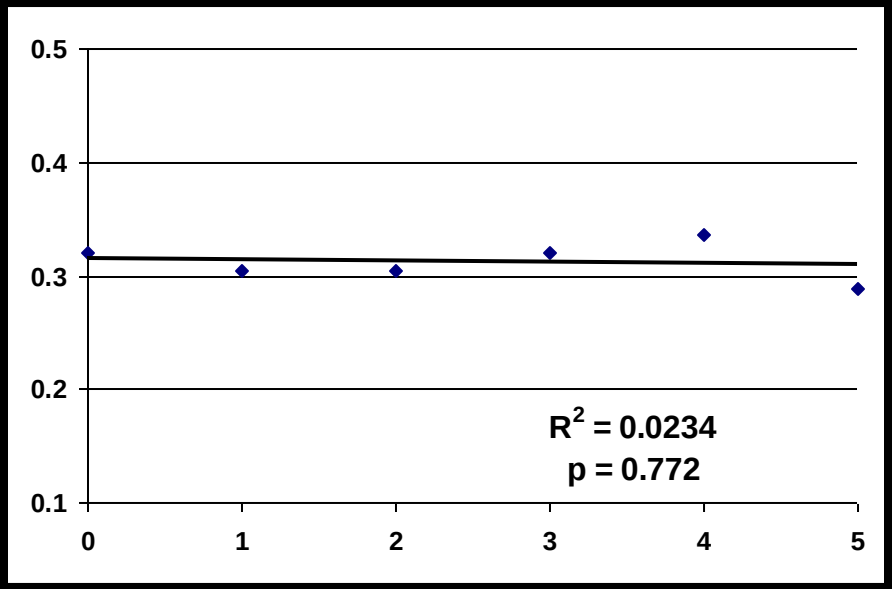


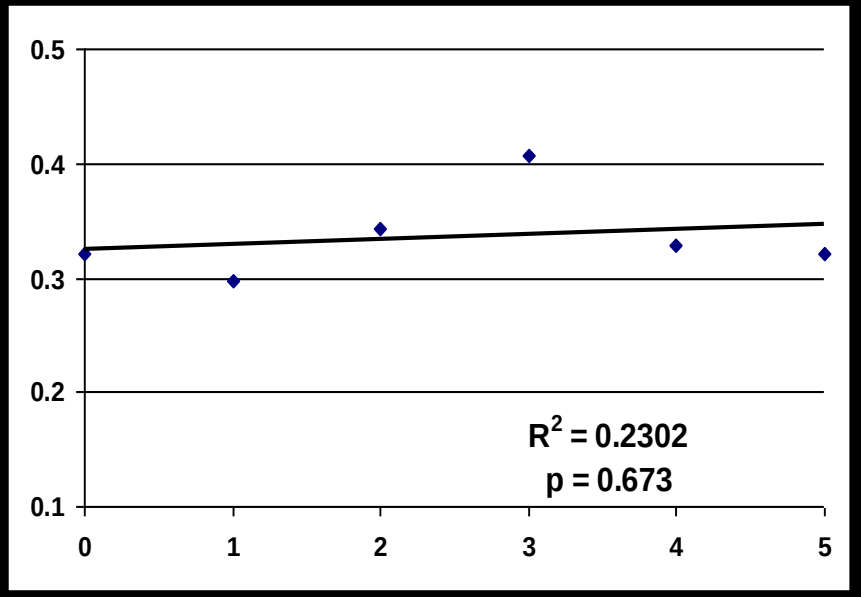
Grid cells for occupancy surveys

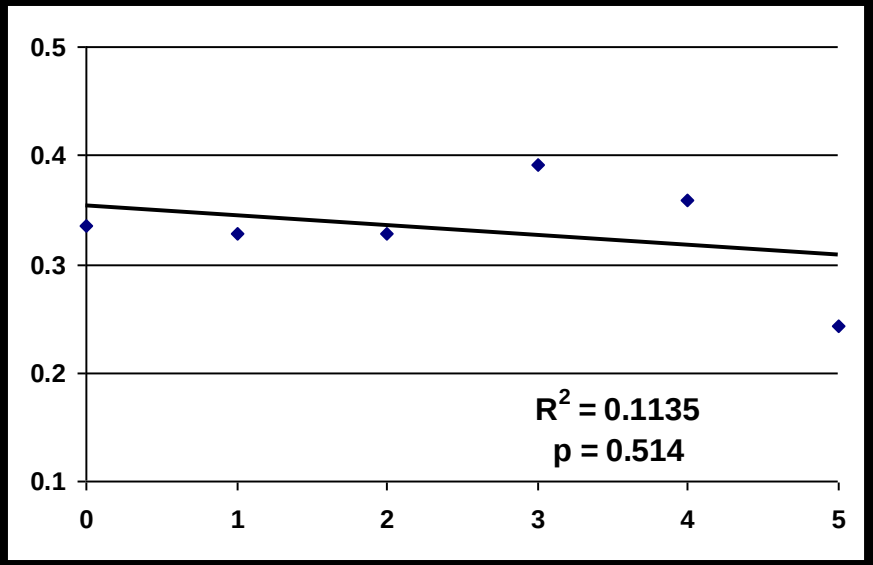

Cells Occupied by 1 - 30 leopards During a 7-Day Period
Occupied Cells
Population
0
10
20
30
40
50
60
70
0
5
10
15
20
25
30

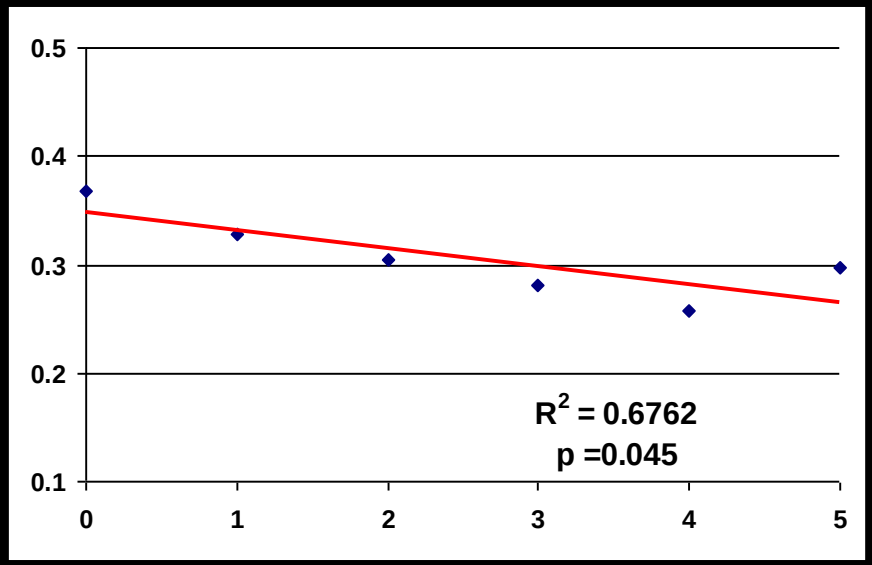

10 x 10 km Cells Occupied by 1 - 30 Leopards During a 7-Day Period
Occupied 10 x 10 km Cells
Population
0
5
10
15
20
25
30

Failure of occupancy methods to detect substantial declines (-20%, 5 yrs, start pop = 25)

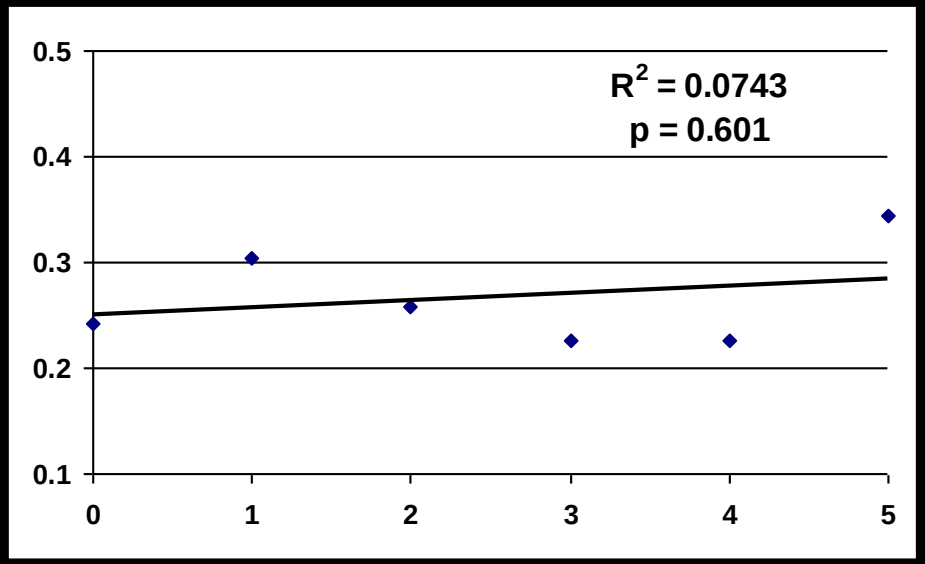


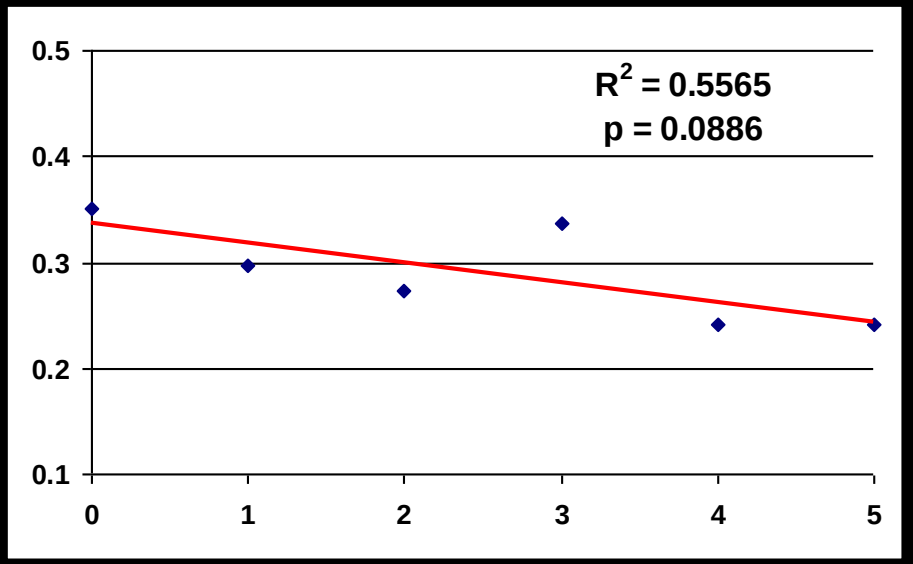


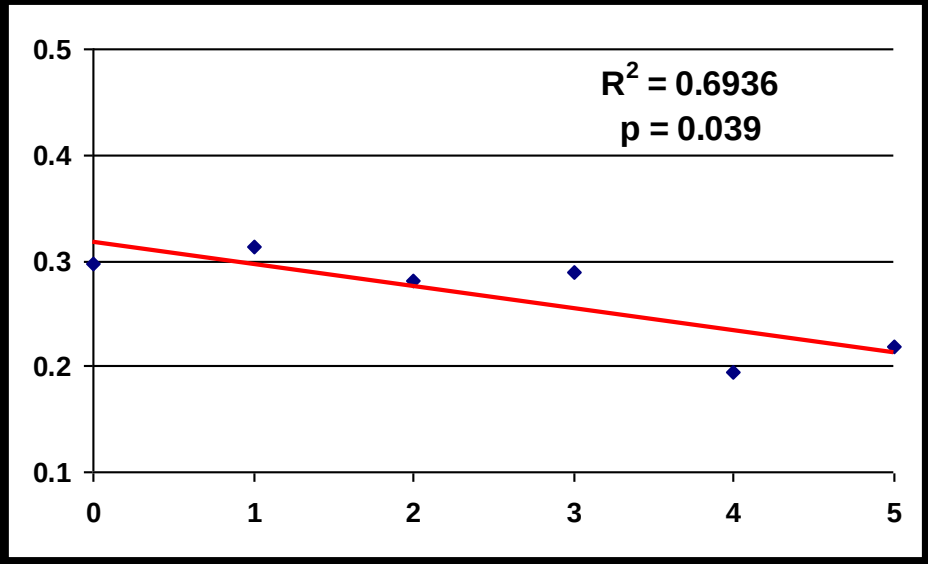


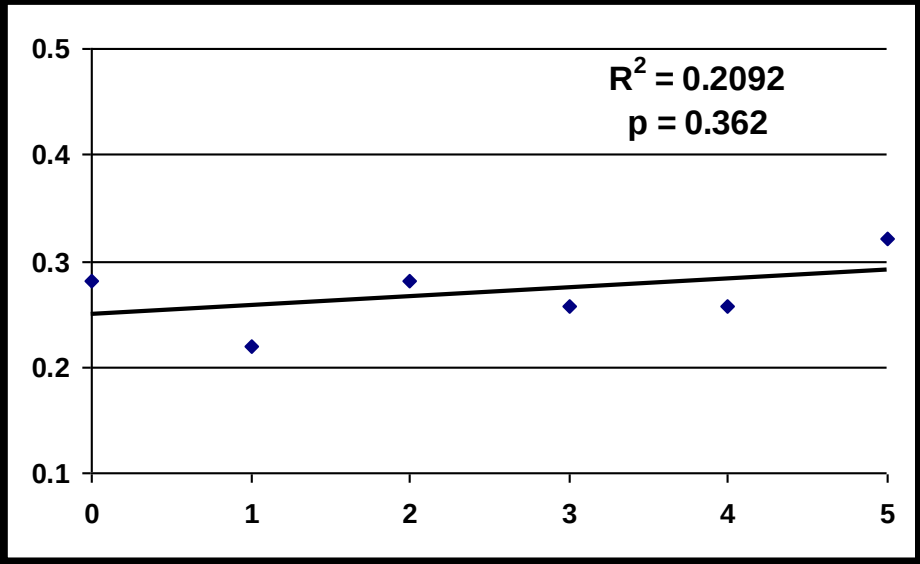


Failure of occupancy with small populations (-53%, 5 yrs, start pop = 15)









A failed experiment?

Perhaps not…..

Diet analyses via DNA barcoding

Diet analyses via DNA barcoding

Fecal DNA amplification with universal primers

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High throughout Solexa sequencers

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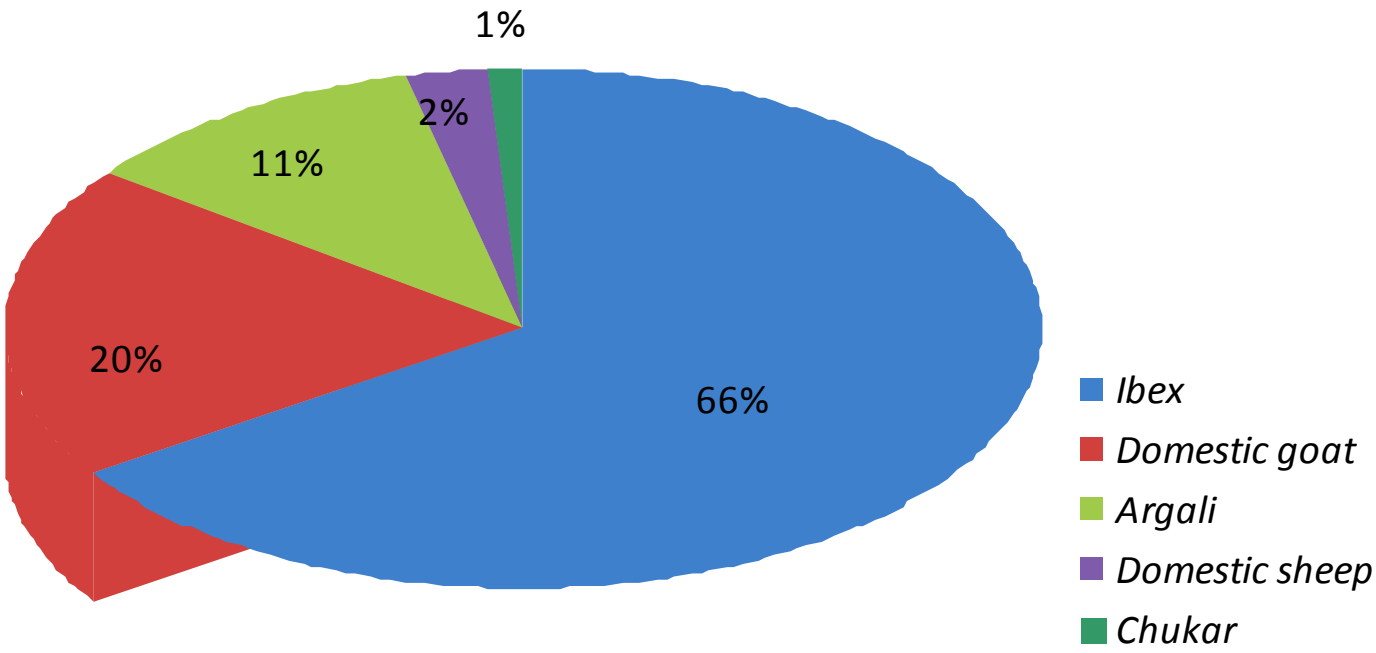
GenBank

Reference database → Species identification via DNA barcoding

↓

DIET

Diet composition at fine scale



Better Science:

Novel tools
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Camera Traps

Intensive camera study:
China & Kyrgyzstan, 2005

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