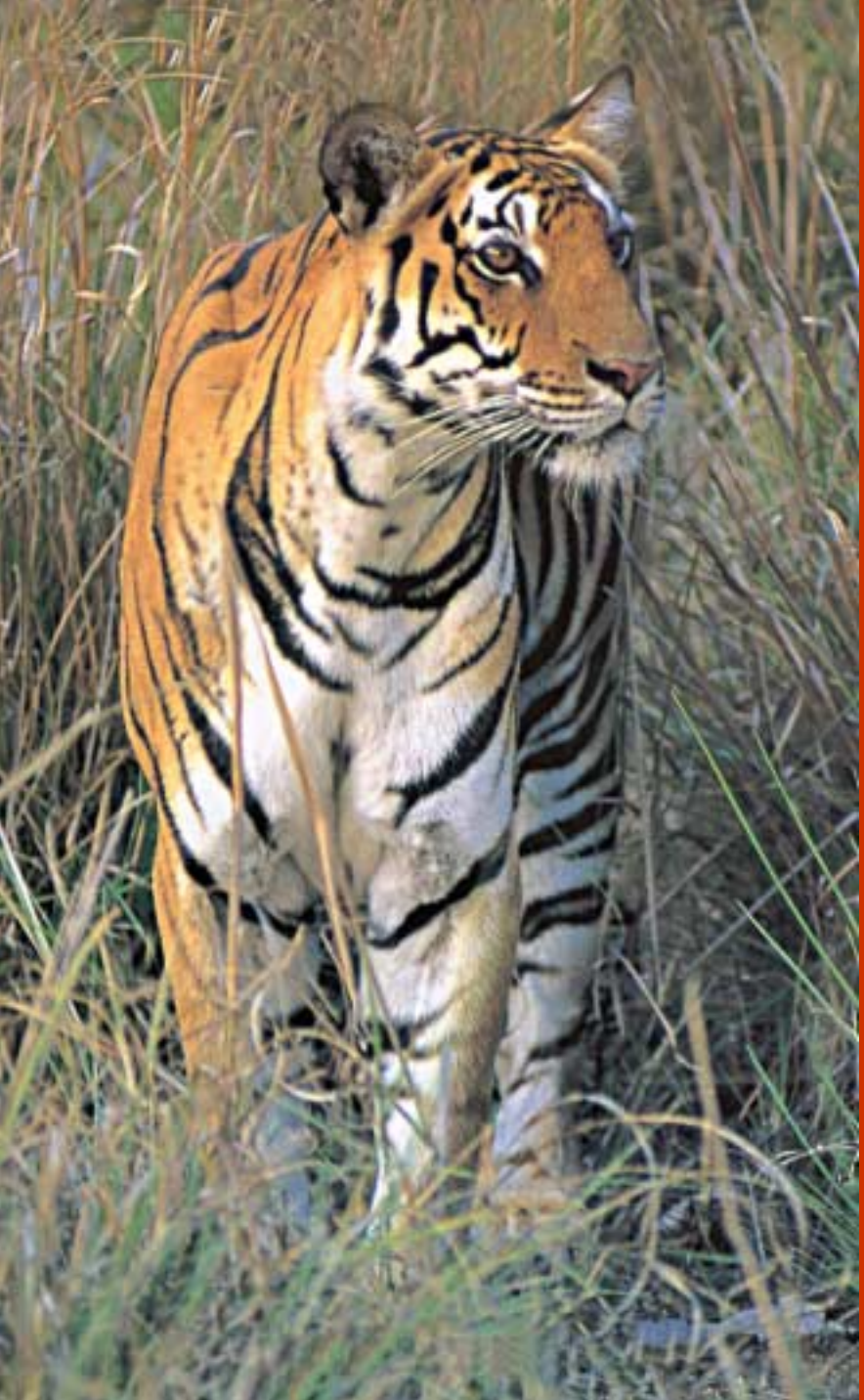

# Strengthening The Monitoring System for Tigers


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&

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Landscape Planning & Management

Wildlife Institute of India

A Report on the

# Project Tiger Directorate Initiative

## "Tiger Habitat & Population Evaluation System"

in collaboration with

## Wildlife Institute of India
&
## Forest Department of Madhya Pradesh

# Importance of Tiger Conservation

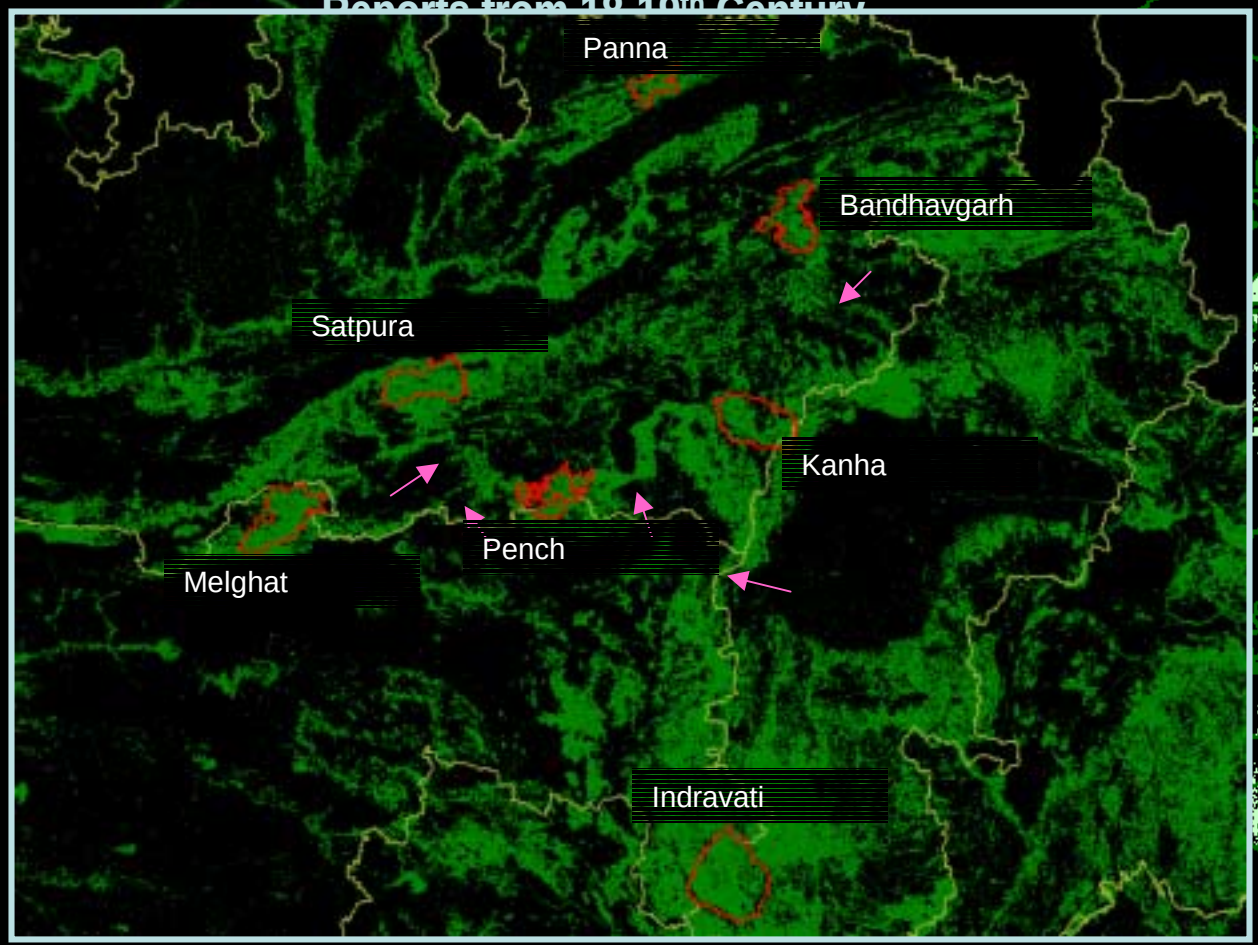
- **Charismatic Large Carnivore at the Apex of the Food Chain**
- **Acts as an umbrella species for conserving the biodiversity of forested ecosystems**

# Questions Relevant for Tiger Conservation

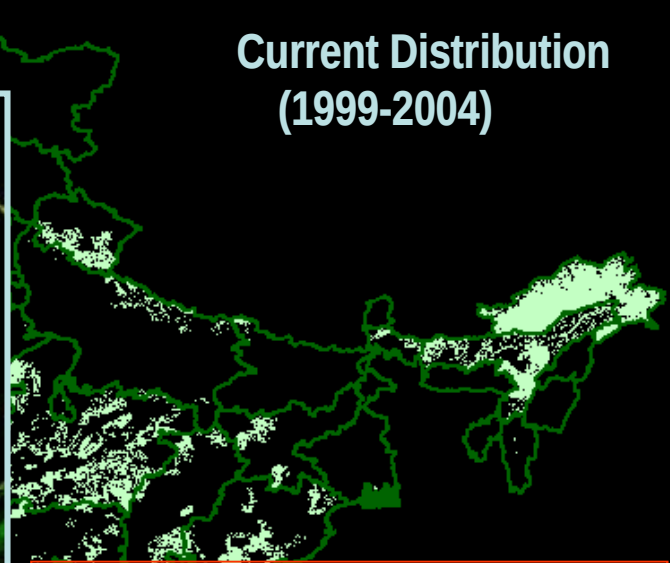
- State of tiger habitat?
- Population Trend of Tigers?
- Areas where Tigers are decreasing & why ?
- What is the status of tiger's wild prey?
- Where are the Source Populations (breeding units) ?
- Spacing & connectivity of Populations?
- How many tigers ?

# Change in Tiger Distribution

**Historical Distribution**
**Reports from 18-19th Century**




**Current Distribution (1999-2004)**

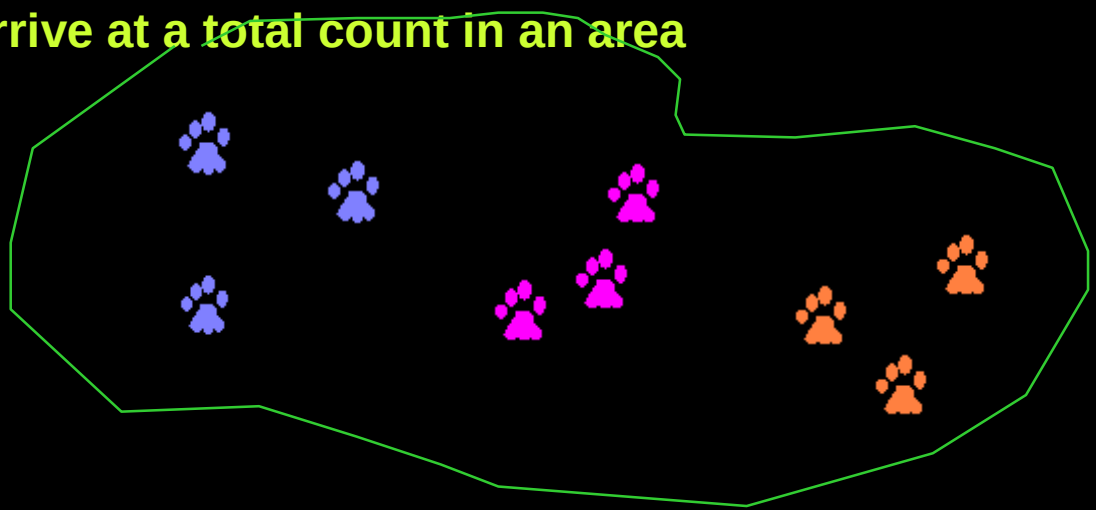


- ✓Fragmentation
- ✓Forest Patch Size
- ✓Core Areas- Breeding Units
- ✓Connectivity for Demography and Genetic viability

# Current Methodology:

# The Pugmark Census

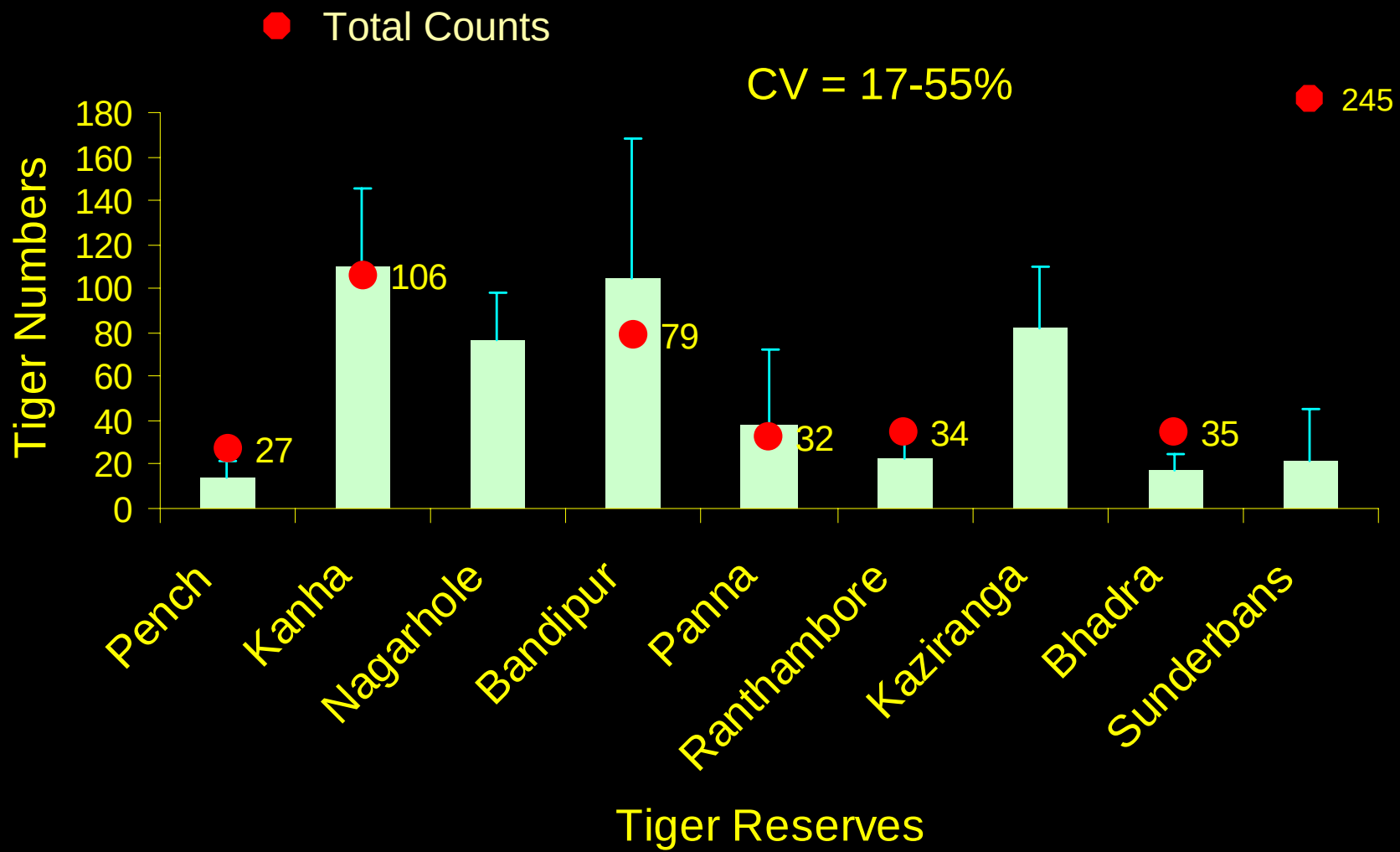
- Followed since 1970, All India Census every 4 years, PT Areas every year.
- Obtain Pugmark Tracings, Plaster Casts and Gait measurements
- Ancillary information on location, date, and substrate
- Identify individual tigers on the above information
- Continuously monitor individual tigers over time
- Arrive at a total count in an area



# Critique of the Pugmark Census Method

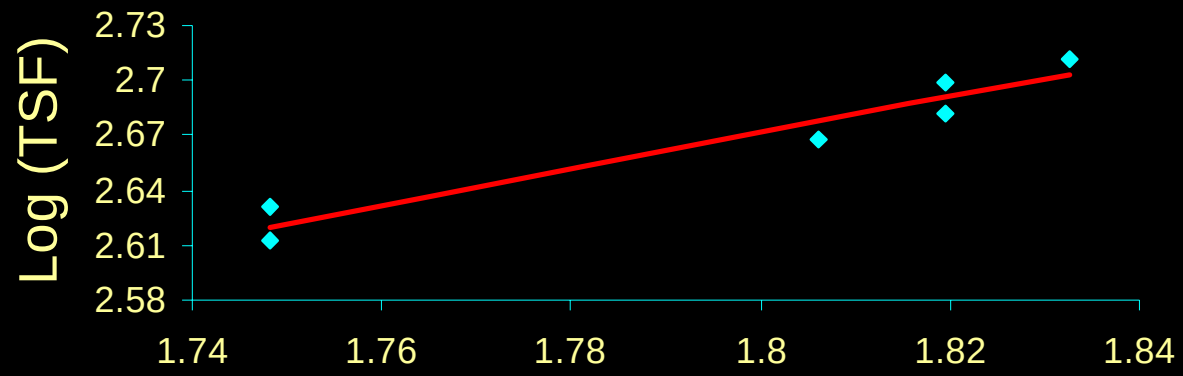
- Attempts total count of Tigers.
- Based on Enumerators Subjective Ability to Identify Individual Tigers from Pugmarks.
- Variation in Pugmarks with substratum, gait, and observers recording skills.
- Not possible to obtain Pugmarks from all Tiger Occupied Landscapes.

# Comparing Pugmark Census Total Counts with Population Estimates from Camera Traps



# Correlating Tiger Population with Tiger Sighting Frequency by Forest Staff

## Bandhavgarh

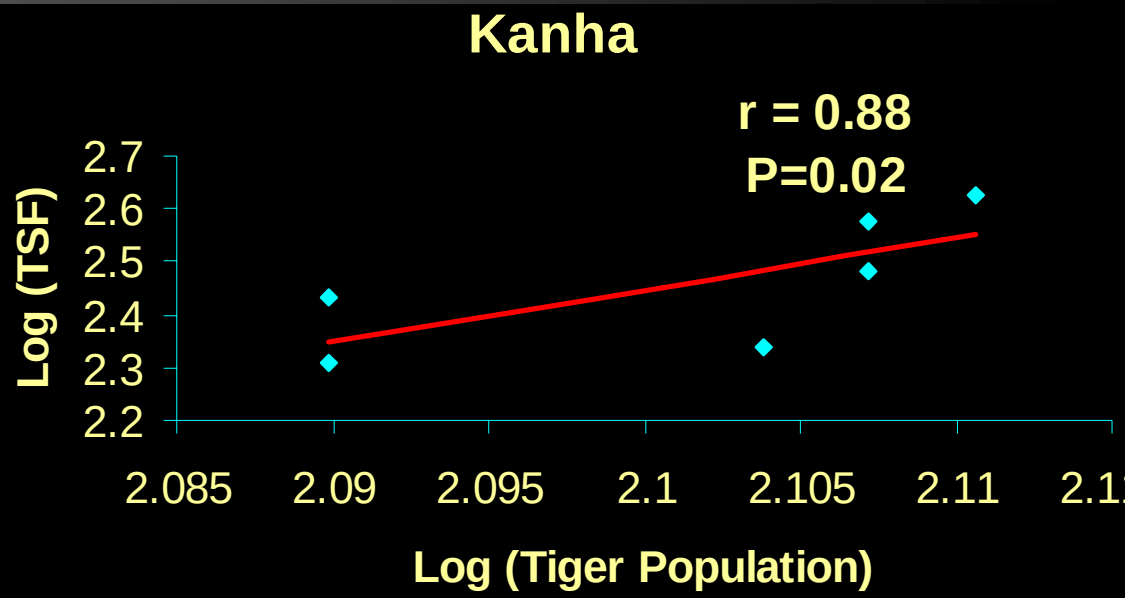


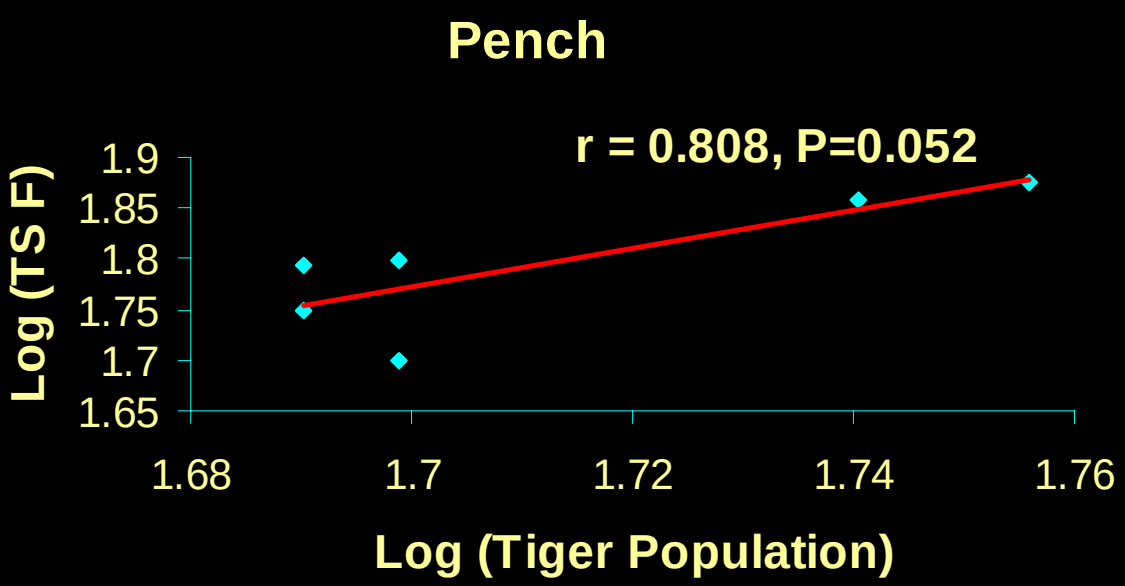

r = 0.967, P = 0.002

## Panna

r = 0.959, P = 0.002

# Correlating Tiger Population with Tiger Sighting Frequency by Forest Staff

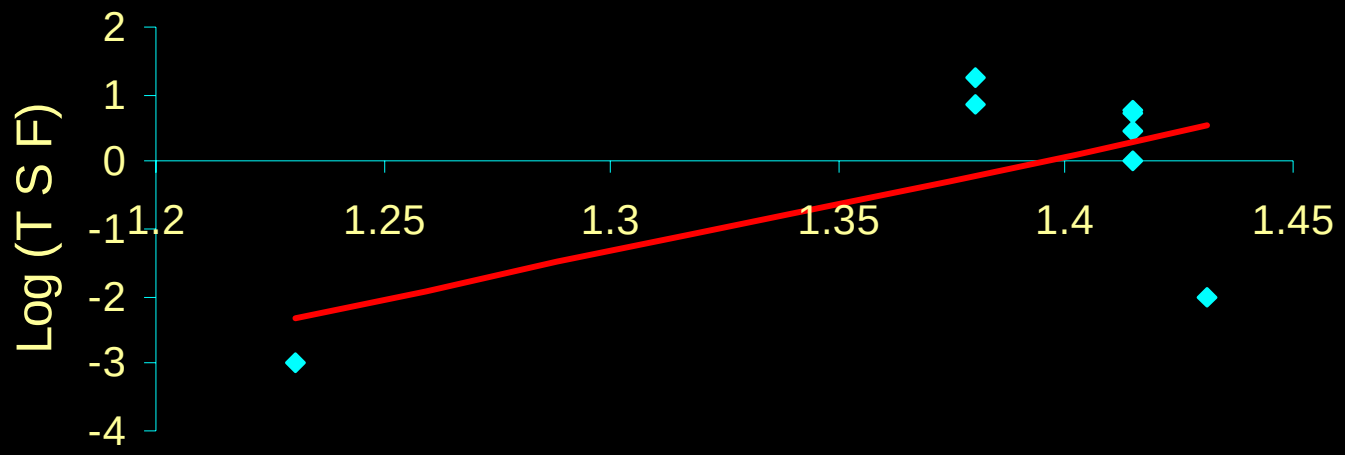


# Correlating Tiger Population with Tiger Sighting Frequency by Forest Staff

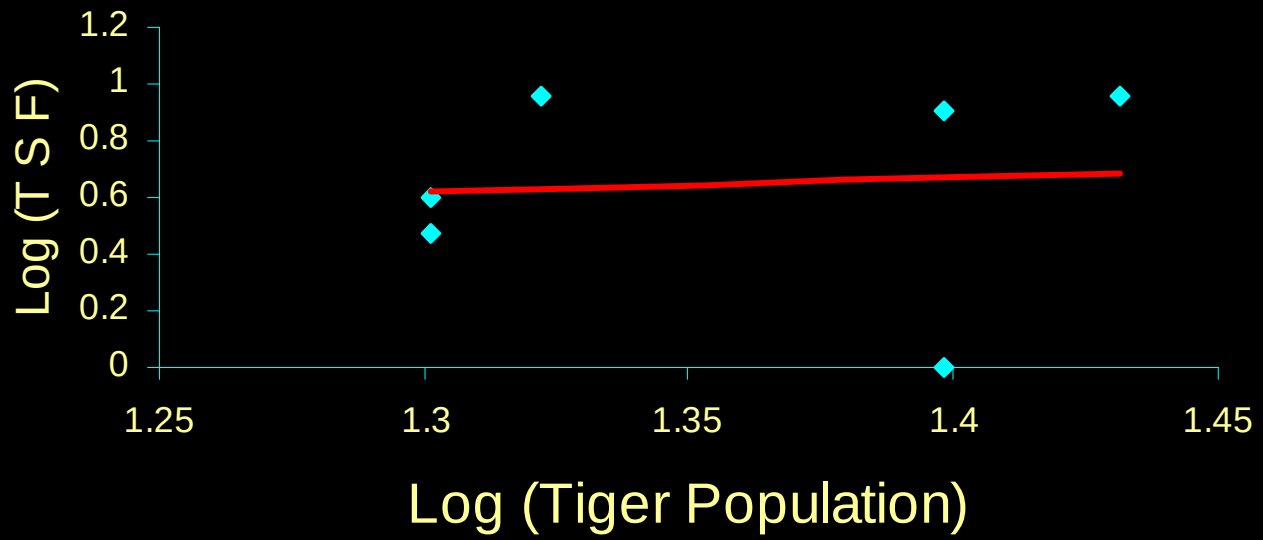
**Sariska Tiger Reserve**

r = 0.6, P = 0.115

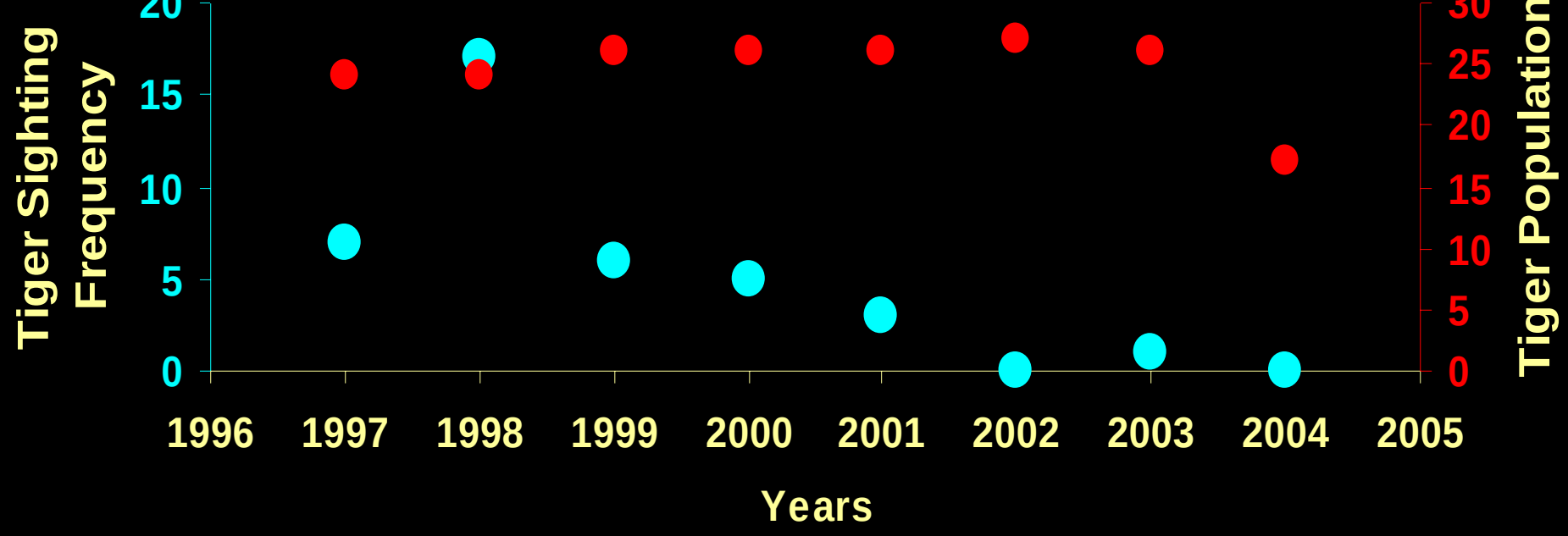



**Indravati Tiger Reserve**

r = 0.075, P = 0.88

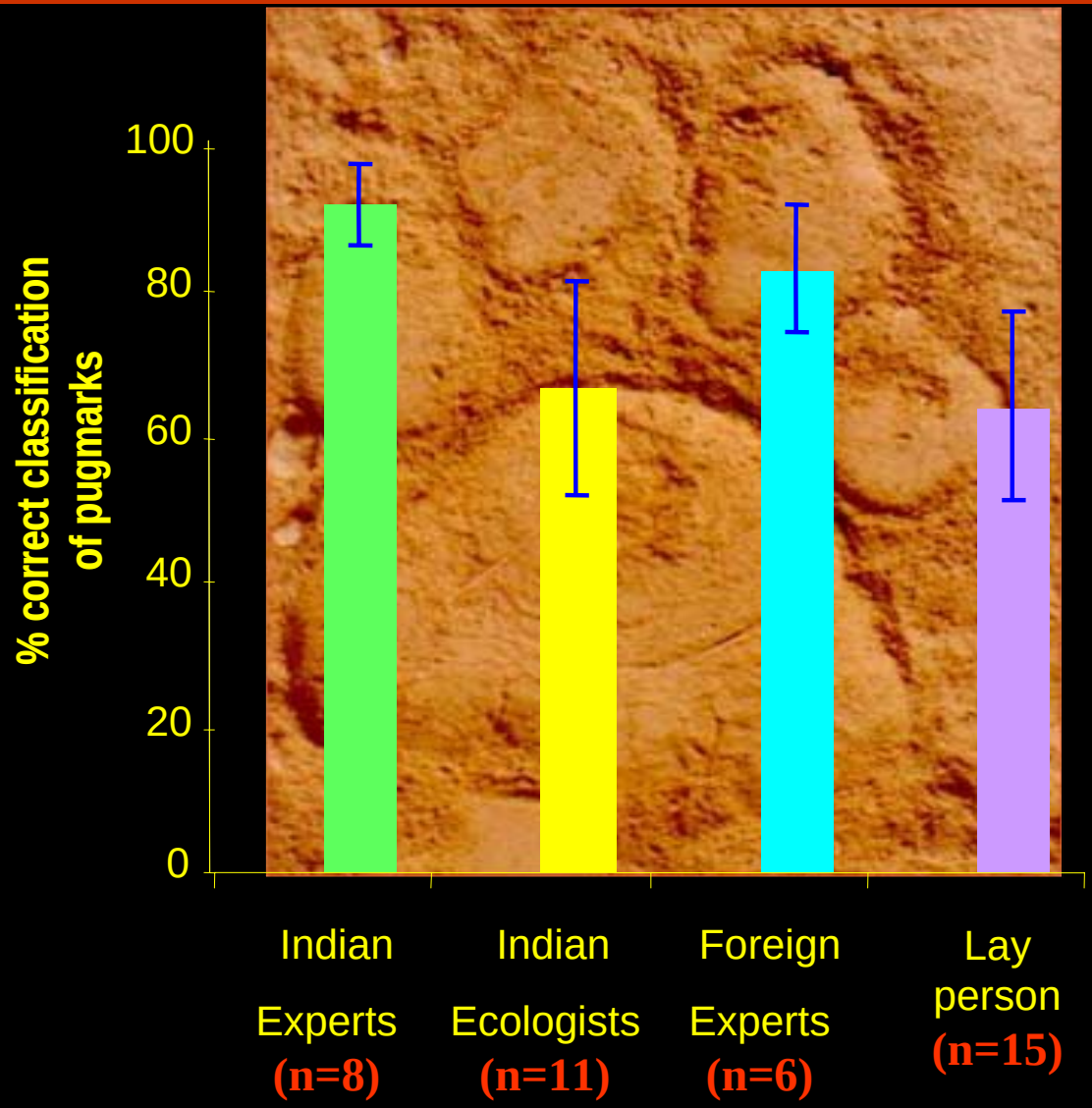


# Correlating Tiger Population with Tiger Sighting Frequency by Forest Staff



# Reliability of Subjective Identification of Pugmarks to Individual Tigers

Estimating the correct number of Tigers represented by 14 Pugmark Tracings from 7 different Tigers.

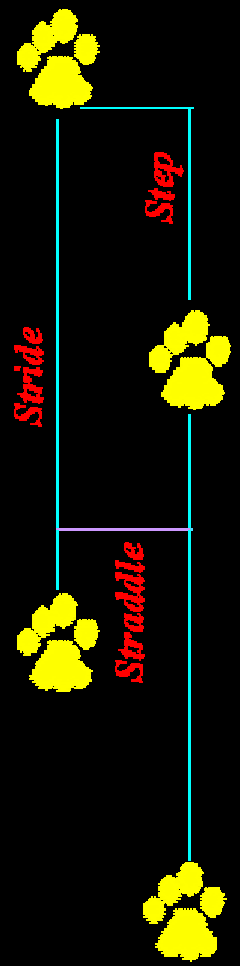


# Removing Subjectivity

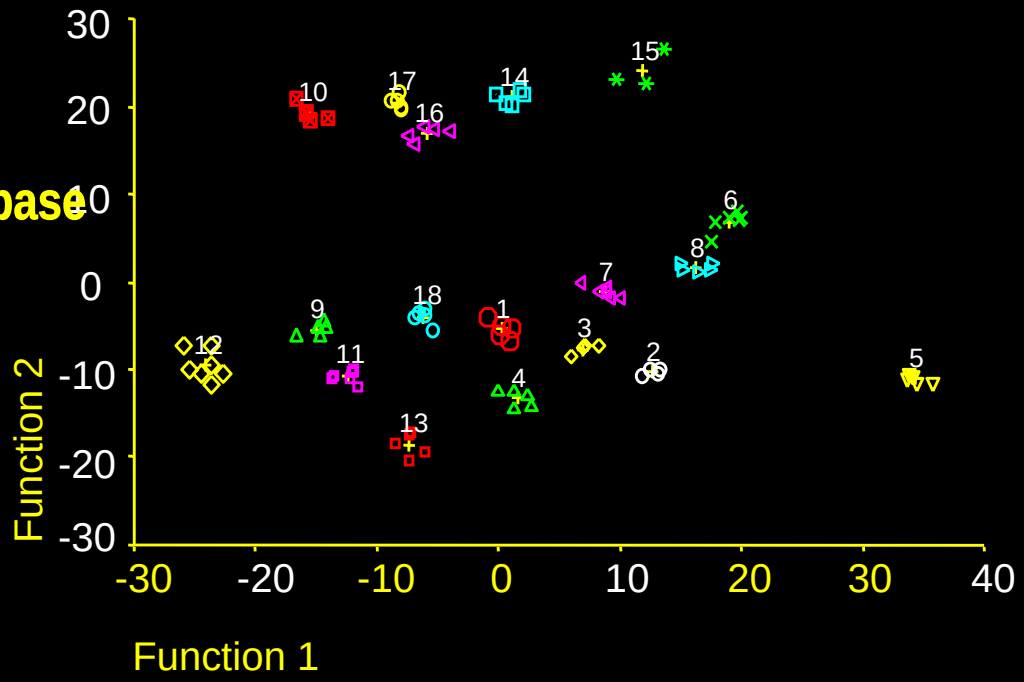
Scanned Pugmark

Morphometric Data

1. Area of Toe 3
2. Length Toe 3
3. Pug width
4. Distance for T2 to T3
5. Angle between T2 & T3
6. Distance between N1 & N2
7. Length T2
8. Heel to toe length
9. Distance of pad to toe base
10. Stride
11. Straddle




**Discriminant Function Analysis for Pugmarks of 18 Different Tigers**



# Addressing Possible Sources of Variation

- Stage I - Systematic Distribution of Sampling Units Throughout Tiger Landscapes for Spatial Occupancy Monitoring as opposed to Total Count.
- Beat level (10-15 $km^2$) spatial resolution of :
  - *Tigers & Other Carnivore (sign indices)*
  - *Ungulates (encounter rates & dung / pellet densities)*
  - *Habitat Details & Human Disturbance*
  - *Capacity building & Training of Forest Staff*
- Simple yet Scientifically Robust Methodology Across Landscapes.
- Appropriate Audit Mechanism by External, National & International Experts.
- Tested the logistics for this data collection Protocols within the Satpura-Maikal Landscape, Madhya Pradesh.

# Enhanced Methodology: Spatial Monitoring of Tiger, Prey & Habitat

Panna

Bandhavgarh

Satpura

Kanha

Pench

~48,000 km$^2$ sampled

# Spatial Monitoring of Tiger, Prey & Habitat

Ungulates

~48,000 km$^2$ sampled

# Spatial Monitoring of Tiger, Prey & Habitat

Panna

Bandhavgarh

Satpura

Kanha

Pench

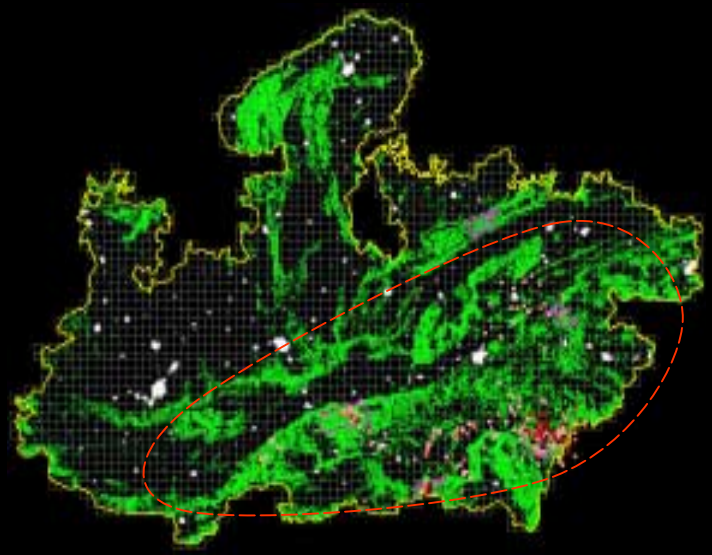
Tiger Presence

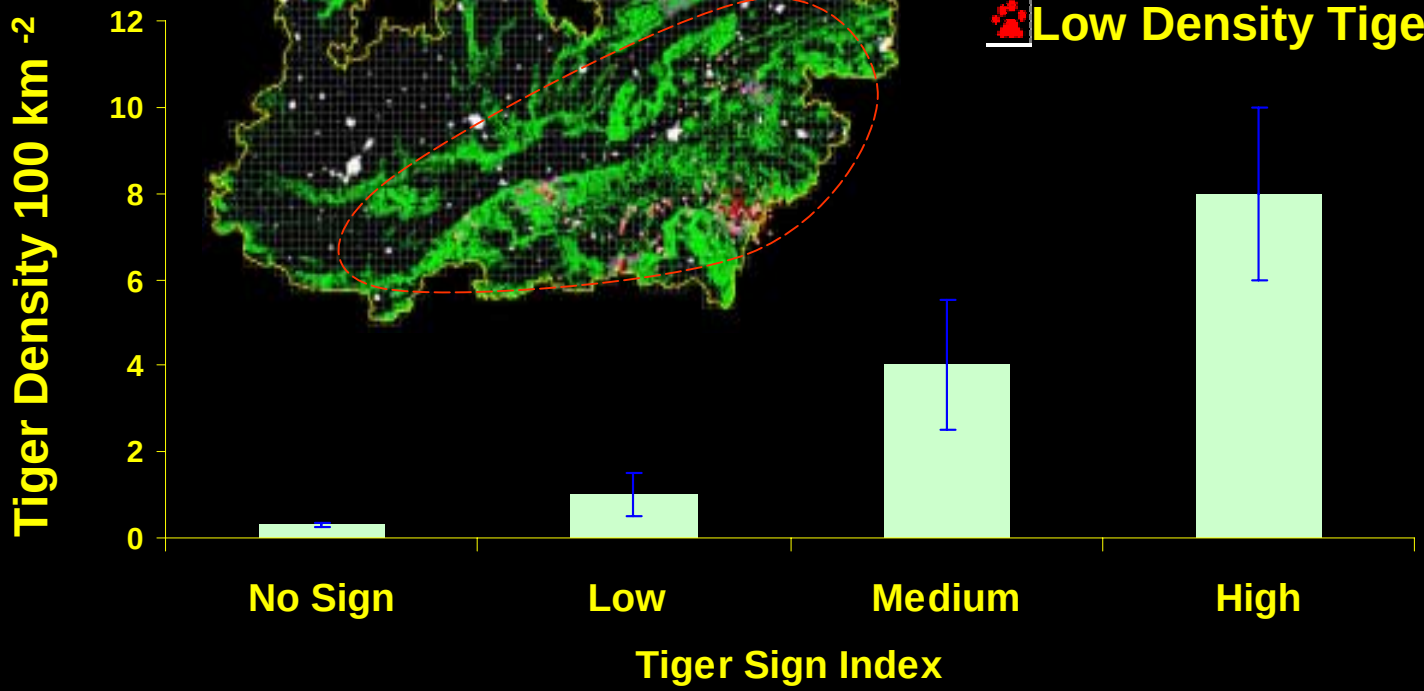
~48,000 km$^2$ sampled

# Spatial Monitoring of Tiger, Prey & Habitat

**Stage II – Intensive stratified Sampling for Tiger Density Estimation (Currently Ongoing, preliminary data)**

- **Area Sampled ~48,000 km²**
- **High Density Tigers ~1,800 km²**
- **Medium Density Tigers ~1,000 km²**
- **Low Density Tigers ~2,200 km²**






Preliminary Data Suggests Tiger Population in the Satpura-Maikal Landscape Ranges between 239-392 (315)

# Monitoring Tiger Demography & Dispersal

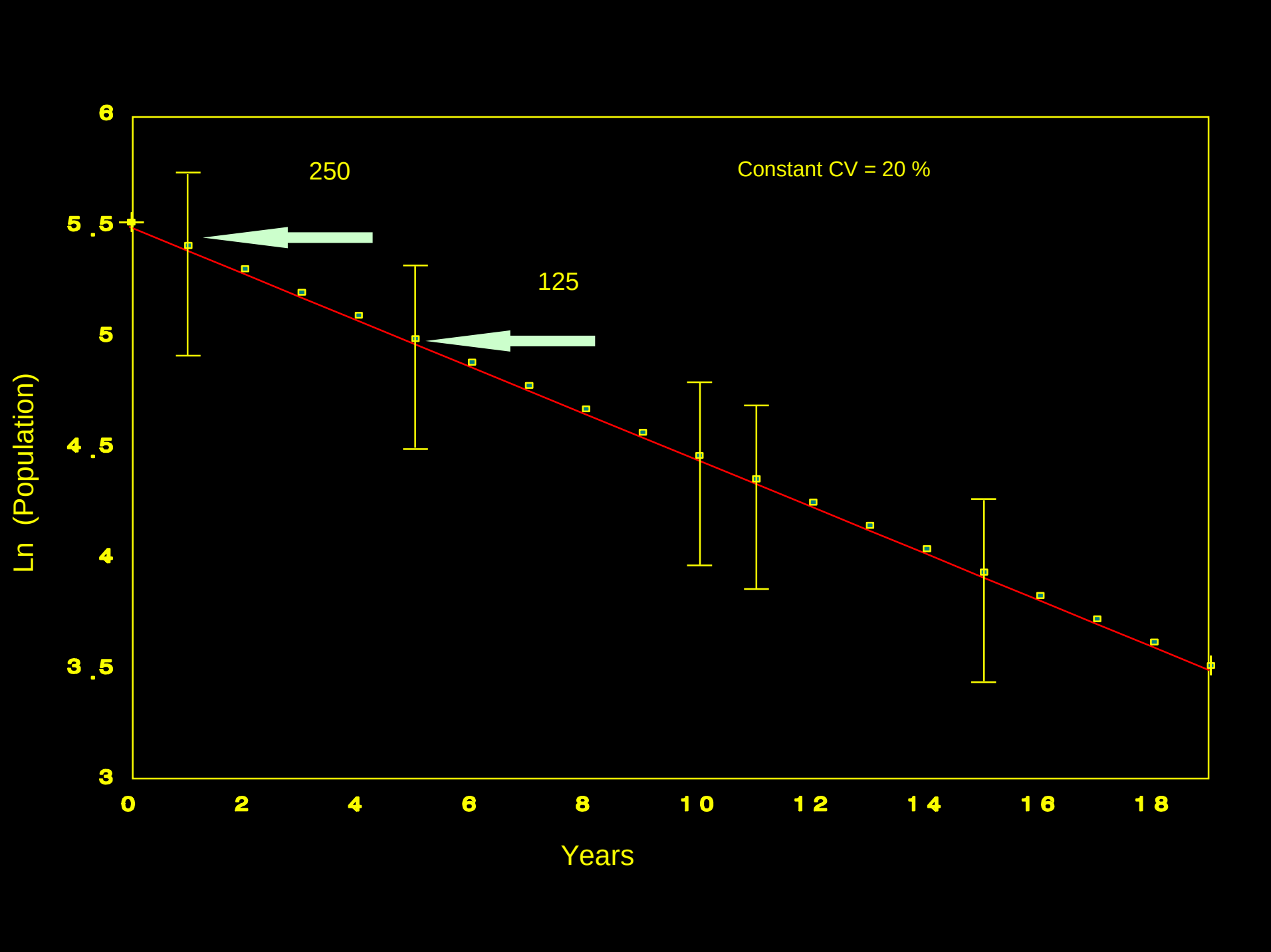
## Using Modern Technological Tools of VHF/GPS/Satellite Tracking

- Dispersal
- Source / Sink Concept
- Meta Population
- Basic Ecology
  - - Ranging Patterns,
  - -Predation Ecology,
  - -Recruitment,
  - -Behaviour.

# Conservation at Work
# Chilla Range in Rajaji National Park

- Removal of Anthropogenic Pressures
- Tigers recolonise and breed within 1 year

Thank You !


250
125
Constant CV = 20 %
Ln (Population)
Years
6
5.5
5
4.5
4
3.5
3
0
2
4
6
8
10
12
14
16
18