# FOREST TREES RESILIENCE TO ELEPHANT DAMAGE IN RABONGO FOREST- MURCHISON FALLS NATIONAL PARK- UGANDA.

**BY**
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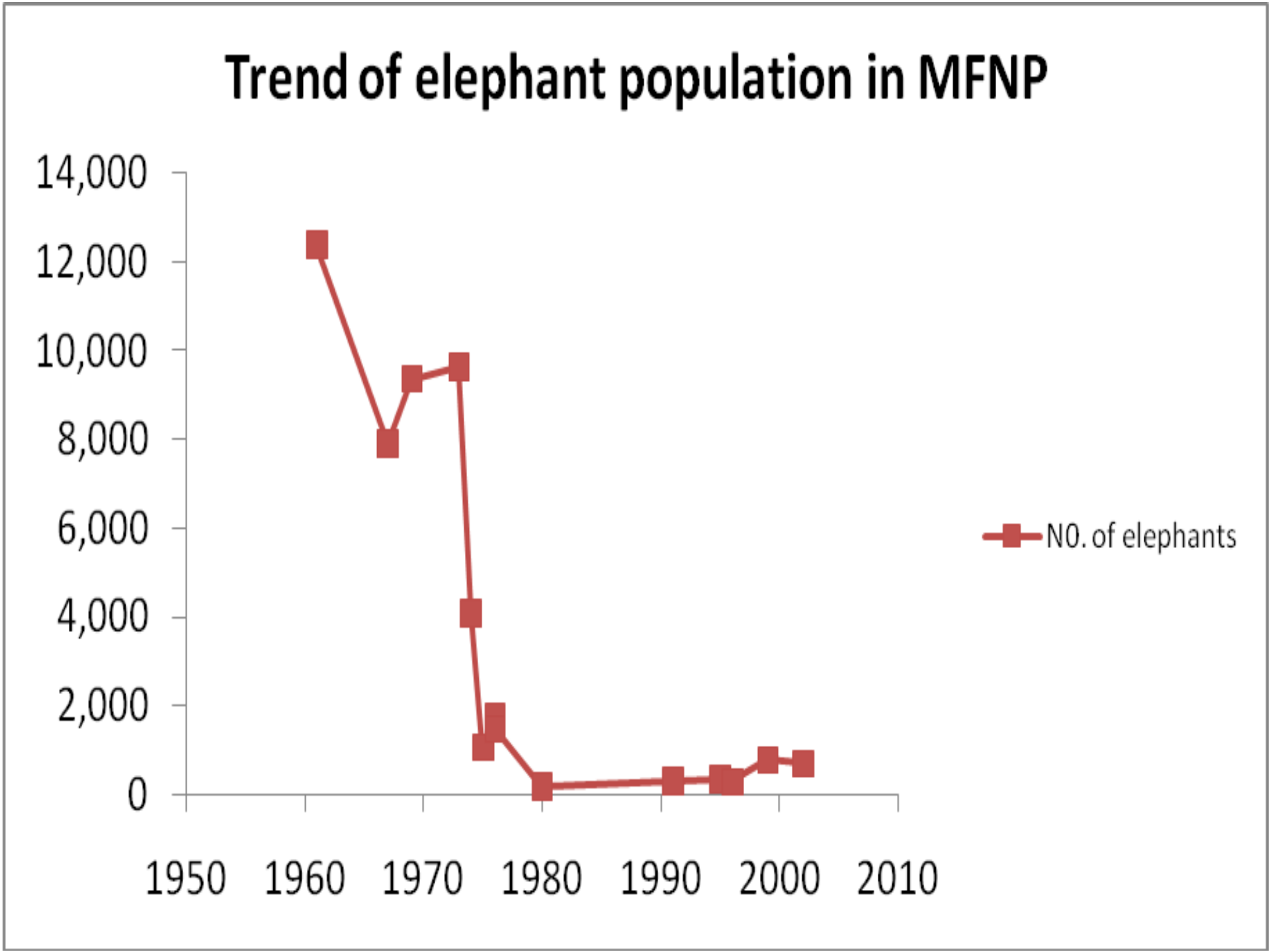
# Introduction

- Elephants are known to cause vegetation change (Turkaso and Fay 2001
- Some forest ecosystems exhibit resilience (Drever *et al* 2006, Norden *et al* 2009)
- **Here we report one of the very few long-term investigations of these dynamics (*20yrs*) .**


Trend of elephant population in MFNP
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
1950
1960
1970
1980
1990
2000
2010
NO. of elephants

# Statement of the problem

- Forest trees suffer various impacts from elephants (Barnes *et al* 1994, Sheil 1996, Pickup *et al* 1994)
- Little has been done on forest ecosystem resilience to elephants (potentially a major cause of ongoing changes).
- Need to study change and resilience to advise PA managers

# Objectives of the study

- GENERAL:

- Assess the impacts of elephants on the forest trees in Rabongo and how tree composition, and survival are influenced.

# Specific objectives

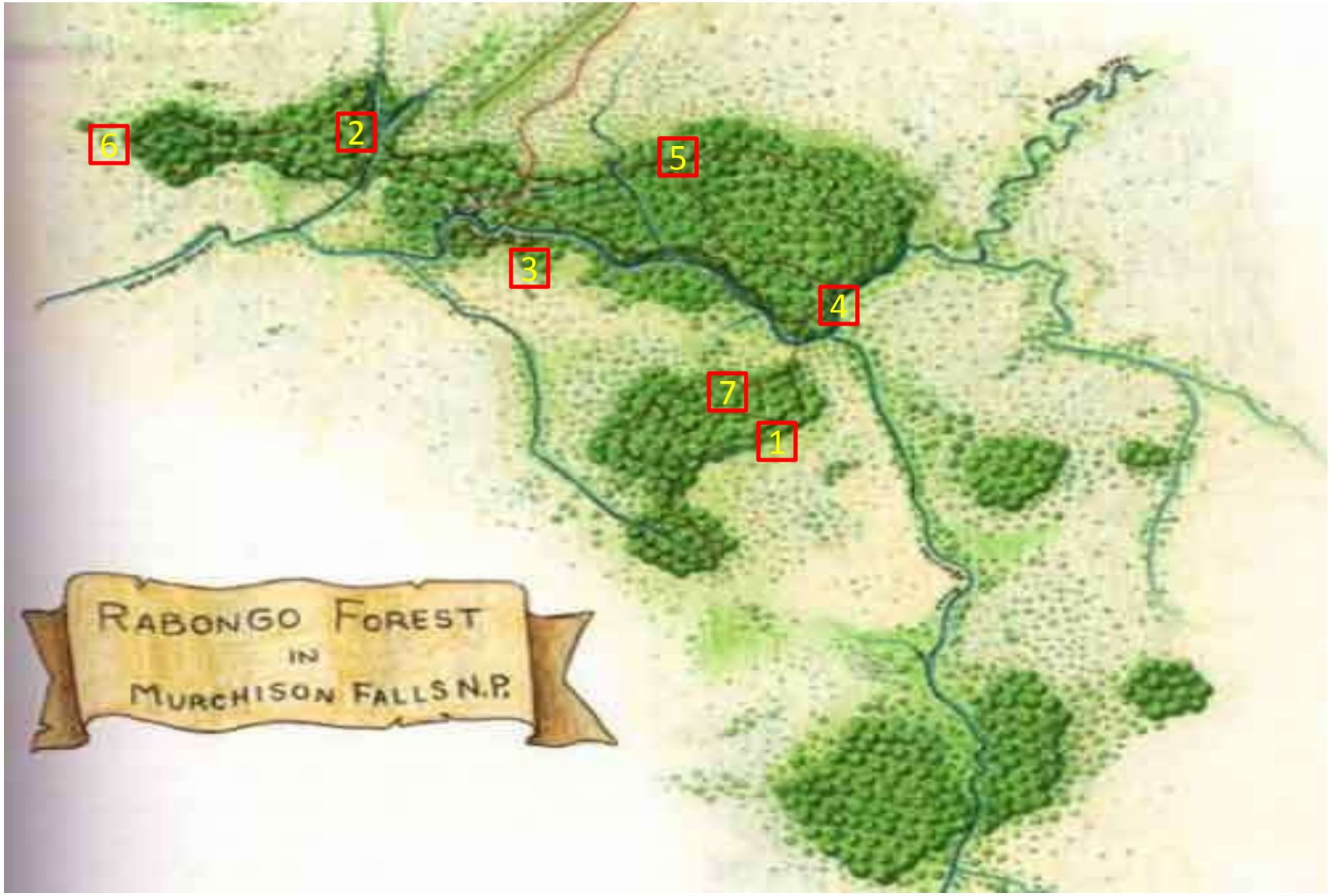
- Ascertain tree species abundance, diversity species richness and evenness in Rabongo forest as compared to Budongo RP7 ‘control’;
- Identify the various tree species and intensity of damage between 1992, 2001 and 2011;
- Determine  how the affected tree species cope;
- Better understand processes of change

# Study area

- Rabongo forest located mid western Uganda at 1°57l′N to 2° 351′N and

  31° 221′E to 32° 081′E.
- South Eastern Murchison falls National Park
- Research Plot 7 – Cpt. N15 is a Strict Nature Reserve in Budongo forest used as control plot
- N15 is ~32km off Masindi-Butyaba road

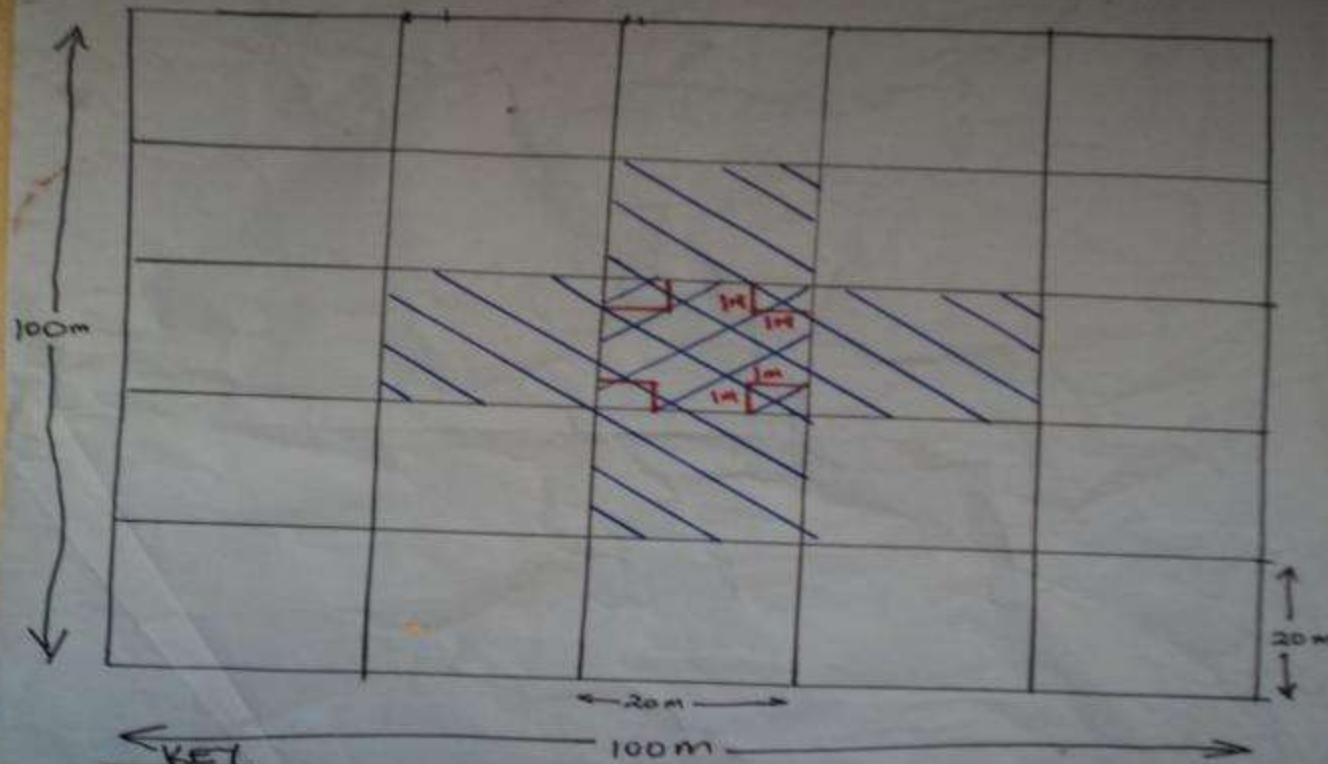
# MAP OF RABONGO FOREST



# Sampling procedure

- PSPs established by Sheil in 1992 were re-assessed
- Stratified random sampling was used for the 7 PSPs
- 1 Ha(100m x 100m) plot was subdivided into 20m x 20m thus 25 quadrants
- 1m x 20m subplots at the central quadrant

# LAYOUT OF PSP QUADRANTS




KEY


>10cm dbh

1.5M tall - <5cm dbh

>5cm <10cm dbh

0.60M tall to <1.5 M tall.

# Data collection contn

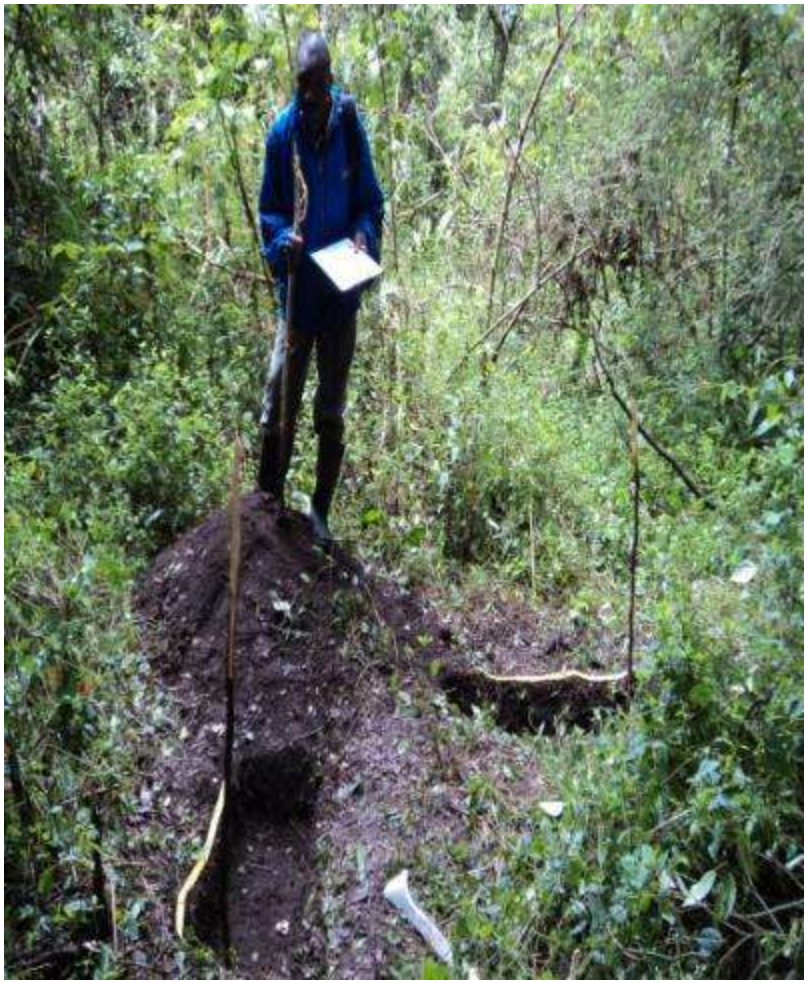
- Trees identified and numbered
- 2 voucher specimen taken for identification at Makerere Herbarium
- Trees painted at point of measurement and numbered.
- Recruits given new numbers

# Data collection contn

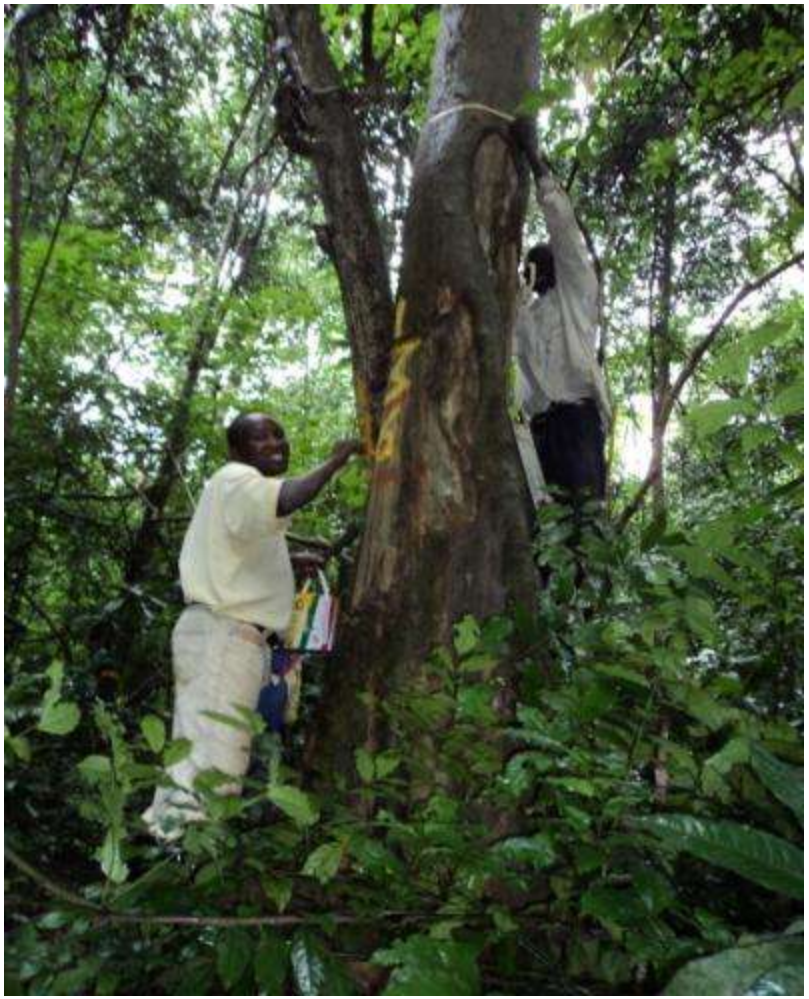
- Any sign of elephant scarring was assessed on lowest 4 m of tree stem
- Scores of 0-5 were recorded for degree of scarring and other damages following Sheil 1992
- The different resilience mechanisms from elephant damage were noted

# Data collection captions

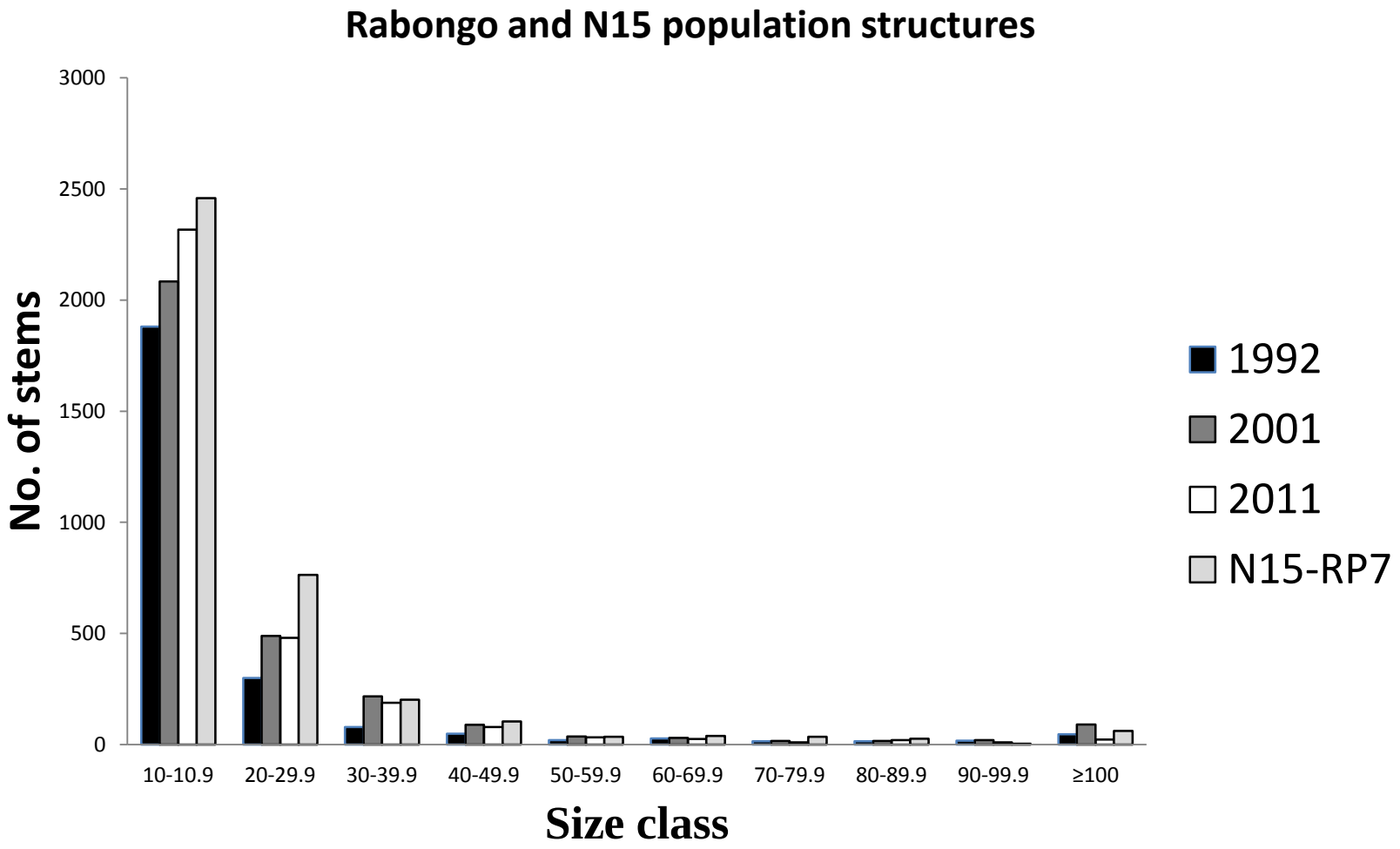
**Plot establishment  before data collection**



**Tree measurement and numbering**



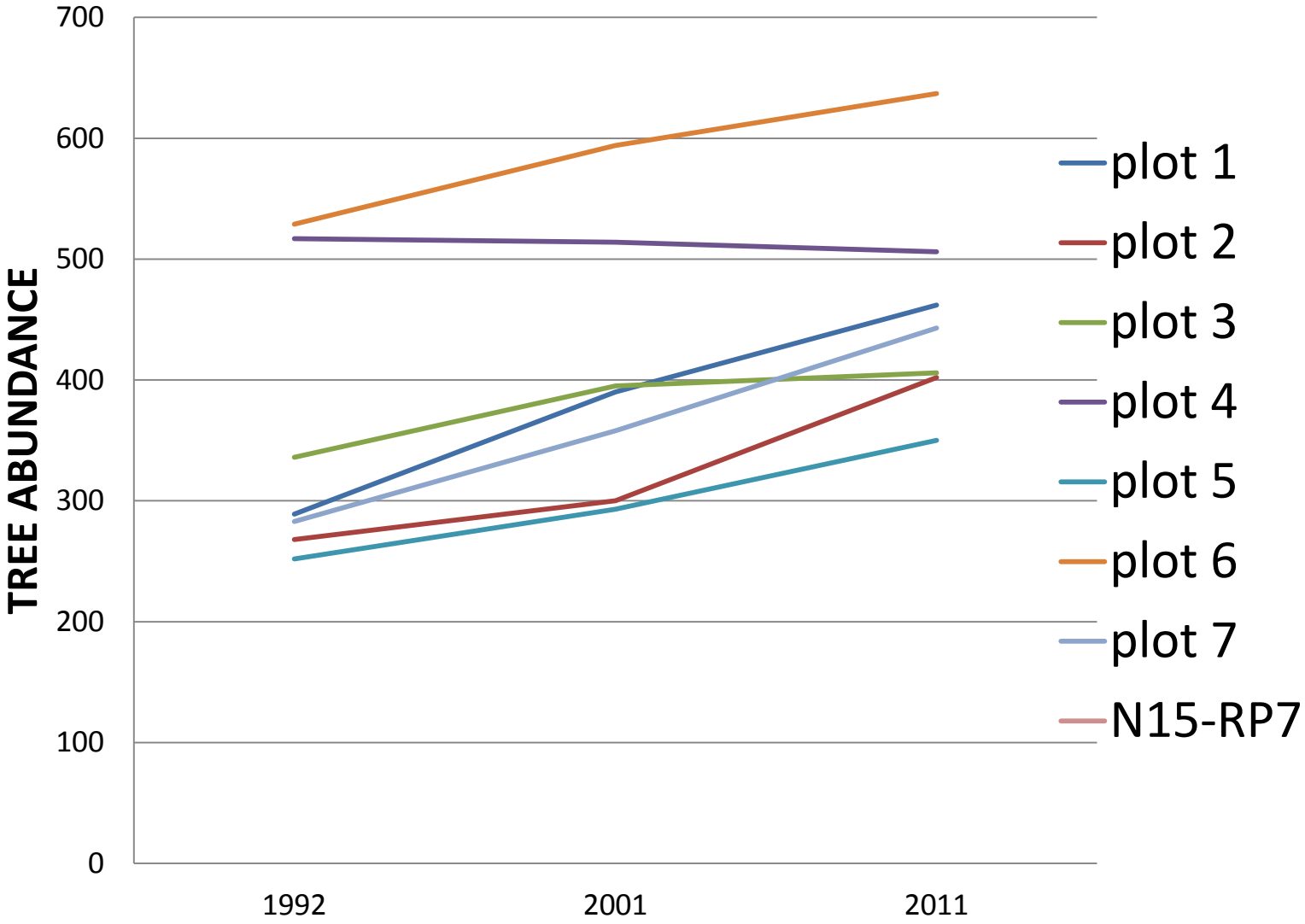
# Forest structure



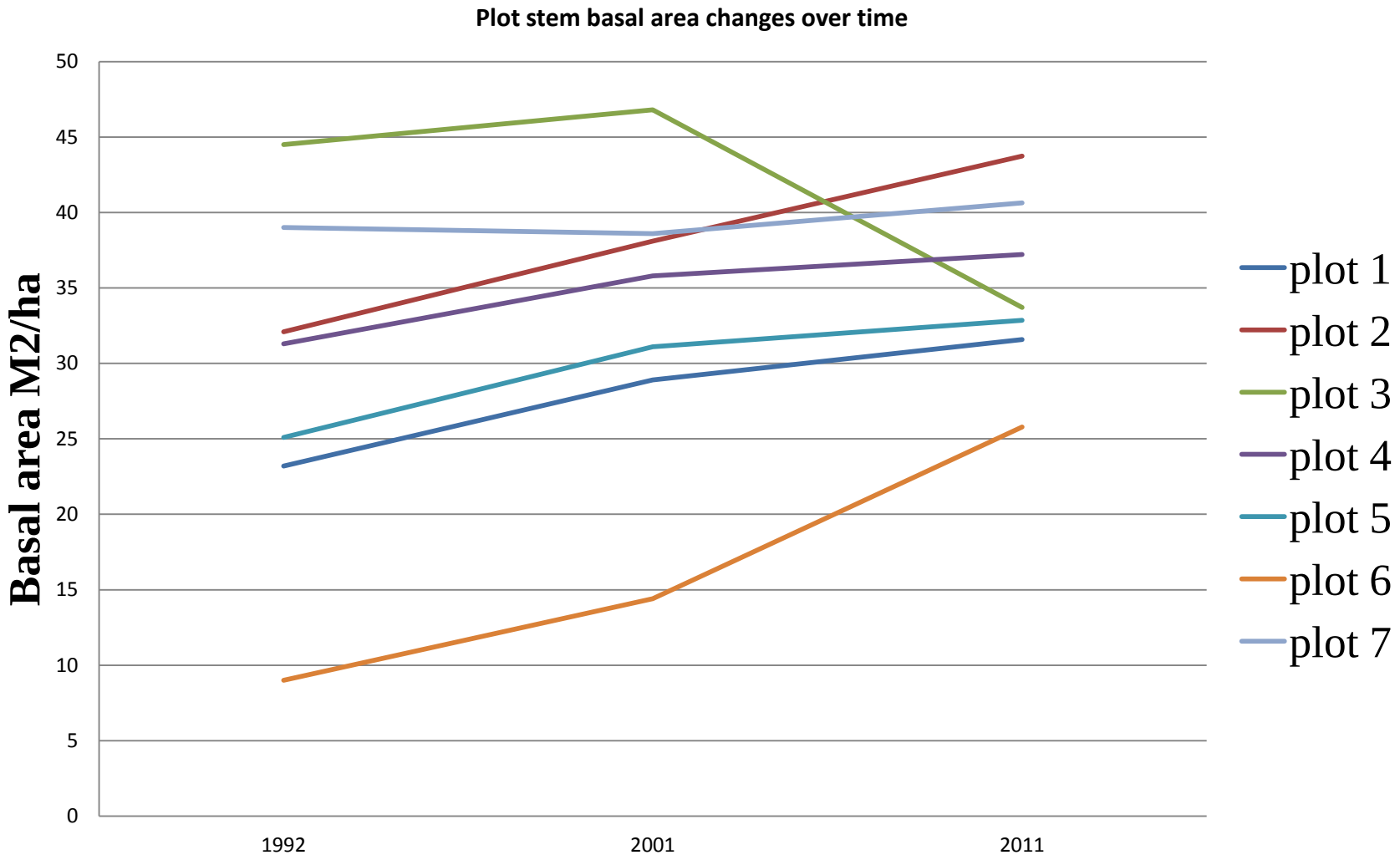
# RESULTS AND DISCUSION
# (stems over 10 cm dbh $ha^{-1}$)

| | Plot Number | | | | | | | | Total Rabongo |
|---|---|---|---|---|---|---|---|---|---|
| **Year** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | N15 | |
| 1992 | 289 | 268 | 336 | 517 | 252 | 529 | 283 | 586 | 2,474 |
| 2001 | 390 | 300 | 395 | 514 | 293 | 594 | 358 | - | 2844 |
| 2011 | 462 | 402 | 406 | 506 | 350 | 637 | 443 | 544 | 3206 |

# TREE STEM ABUNDANCE TREND IN THE THREE MEASUREMENT REGIMES



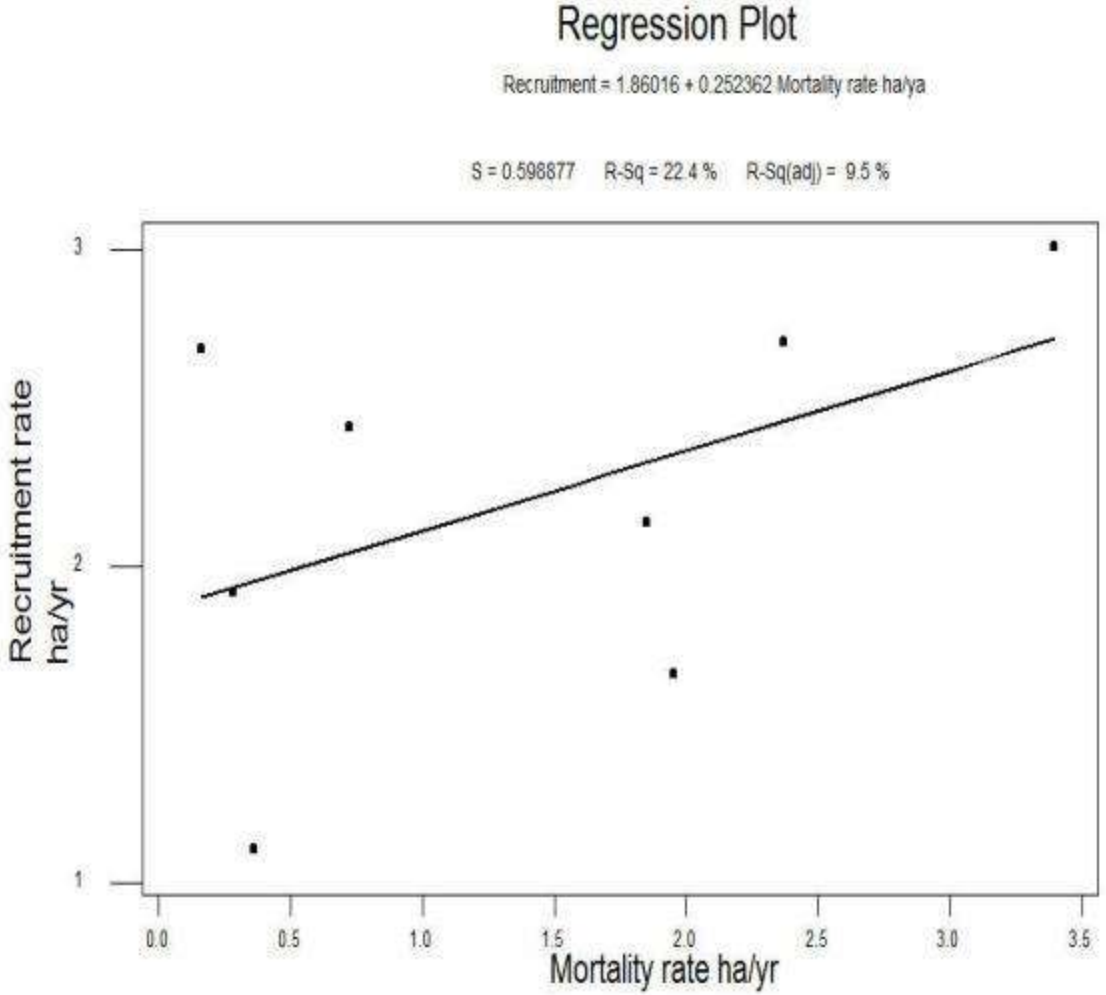
# RABONGO PLOTS BASAL AREA VARIATIONS OVER 20 YEARS



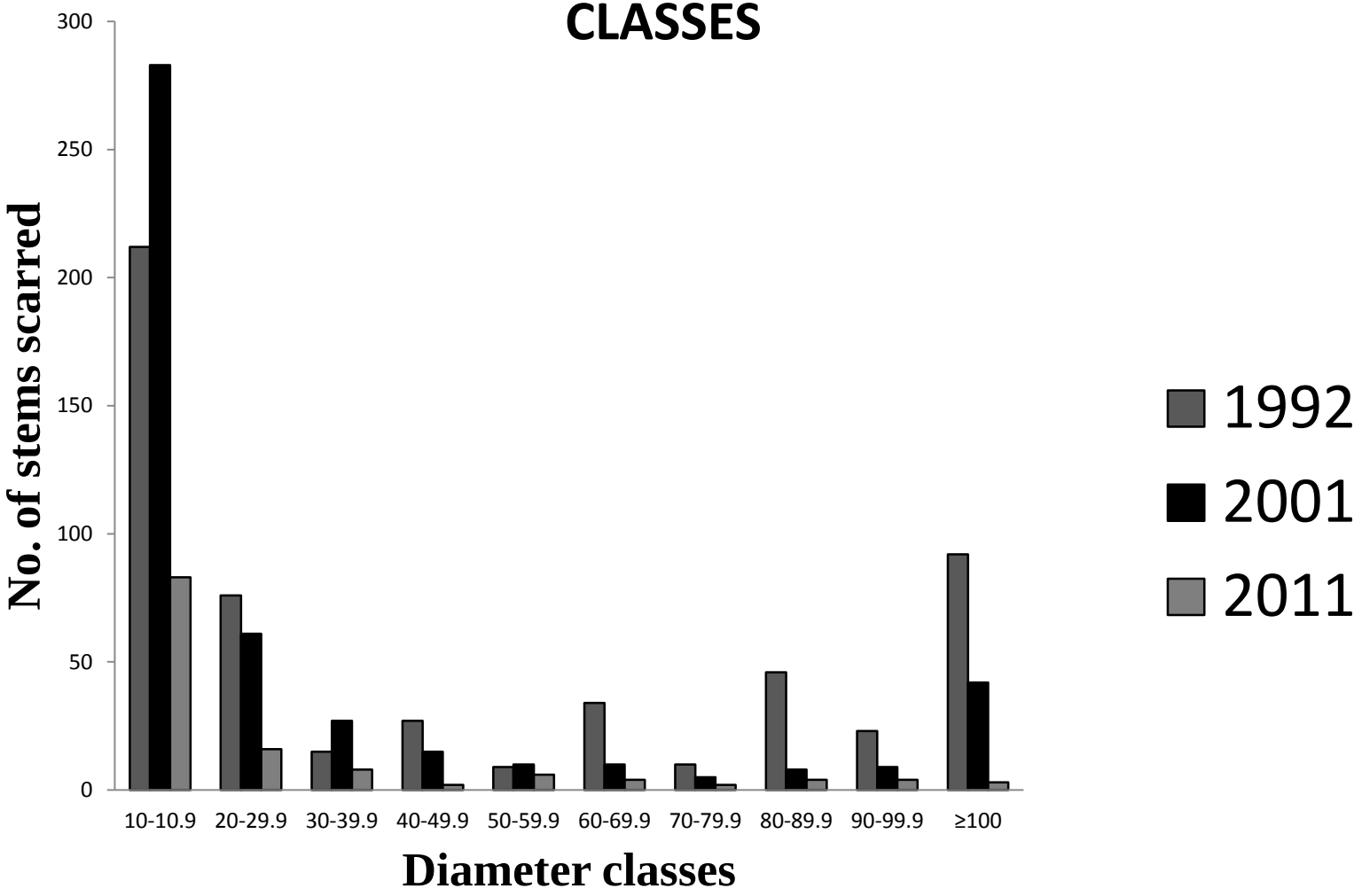
## RABONGO FOREST STEM RECRUITMENT AND MORTALITY RATES 2011

| Plot | Stem abundance | Recruitment rate %/yr | Mortality rate %/yr |
|---|---|---|---|
| 1 | 462 | 2.14 | 1.85 |
| 2 | 402 | 3.01 | 3.4 |
| 3 | 406 | 1.92 | 0.28 |
| 4 | 506 | 2.69 | 0.16 |
| 5 | 350 | 1.66 | 1.95 |
| 6 | 637 | 2.44 | 0.72 |
| 7 | 443 | 2.71 | 2.37 |
| N15 | 544 | 1.11 | 0.36 |

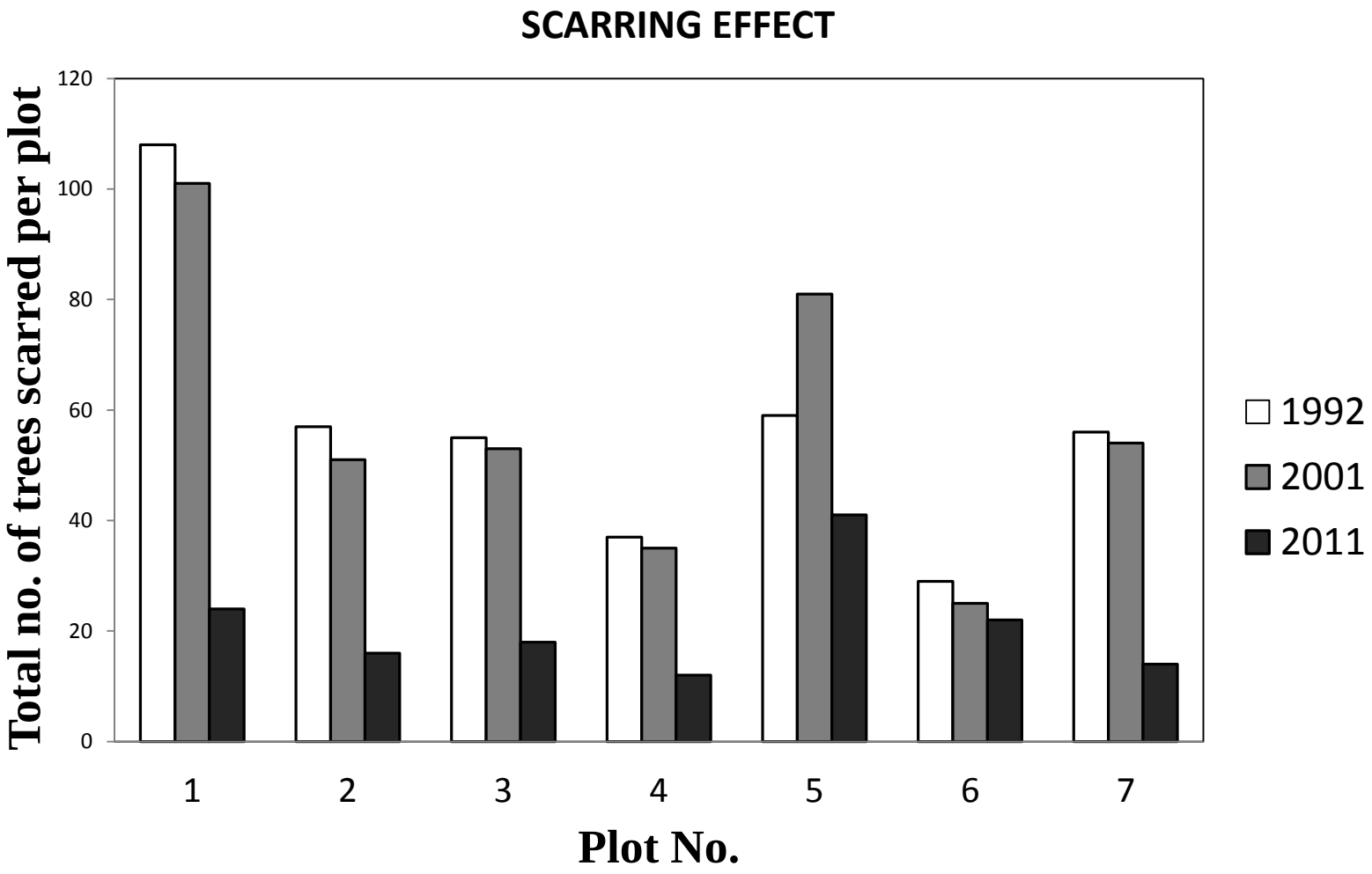
# Plot of stem recruitment and mortality rates $yr^{-1}$2011



# SCARRING EFFECT WITHIN THE DIAMETER CLASSES



# Per plot scarring/damage effects

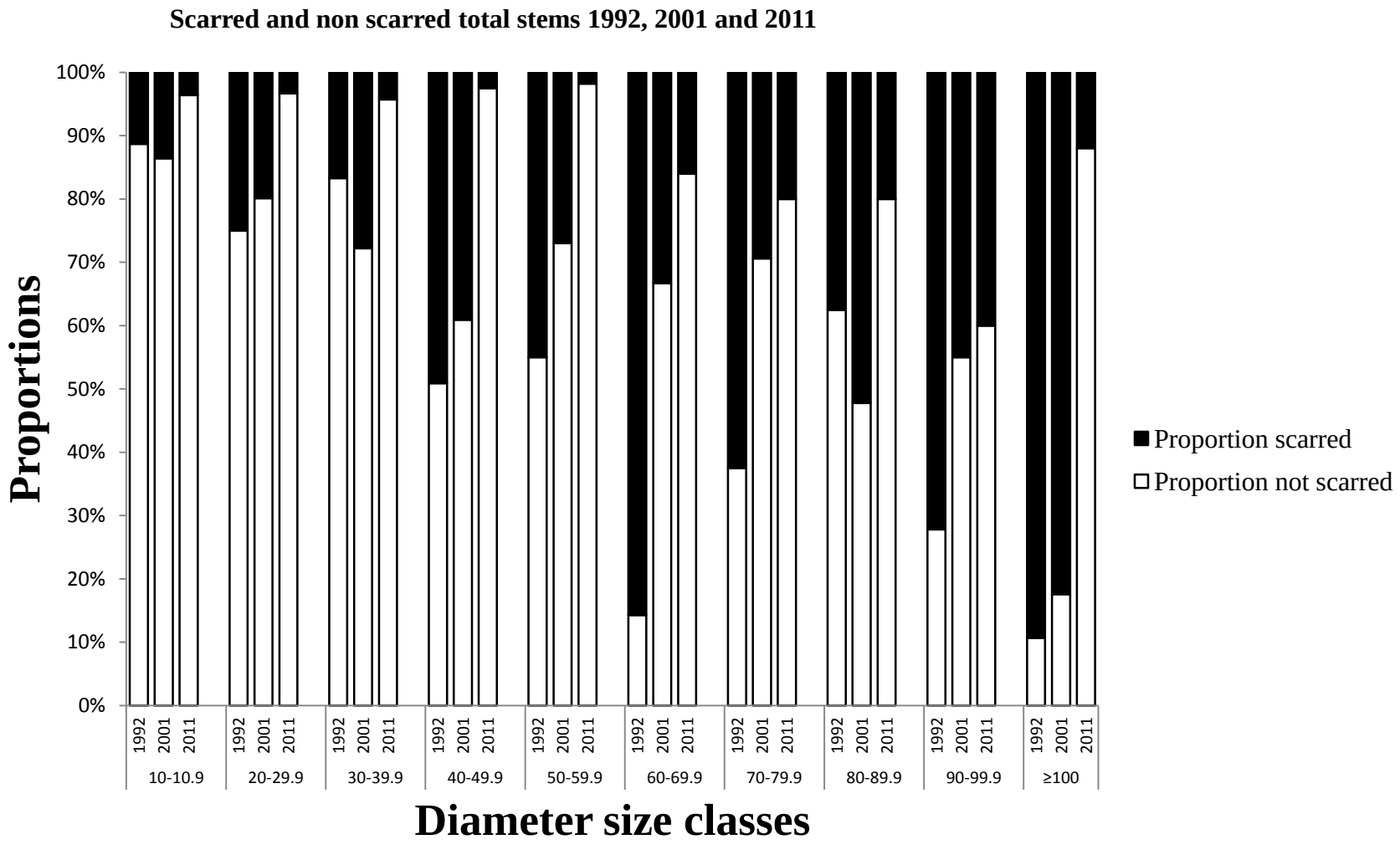


# Scarring effect in Rabongo forest

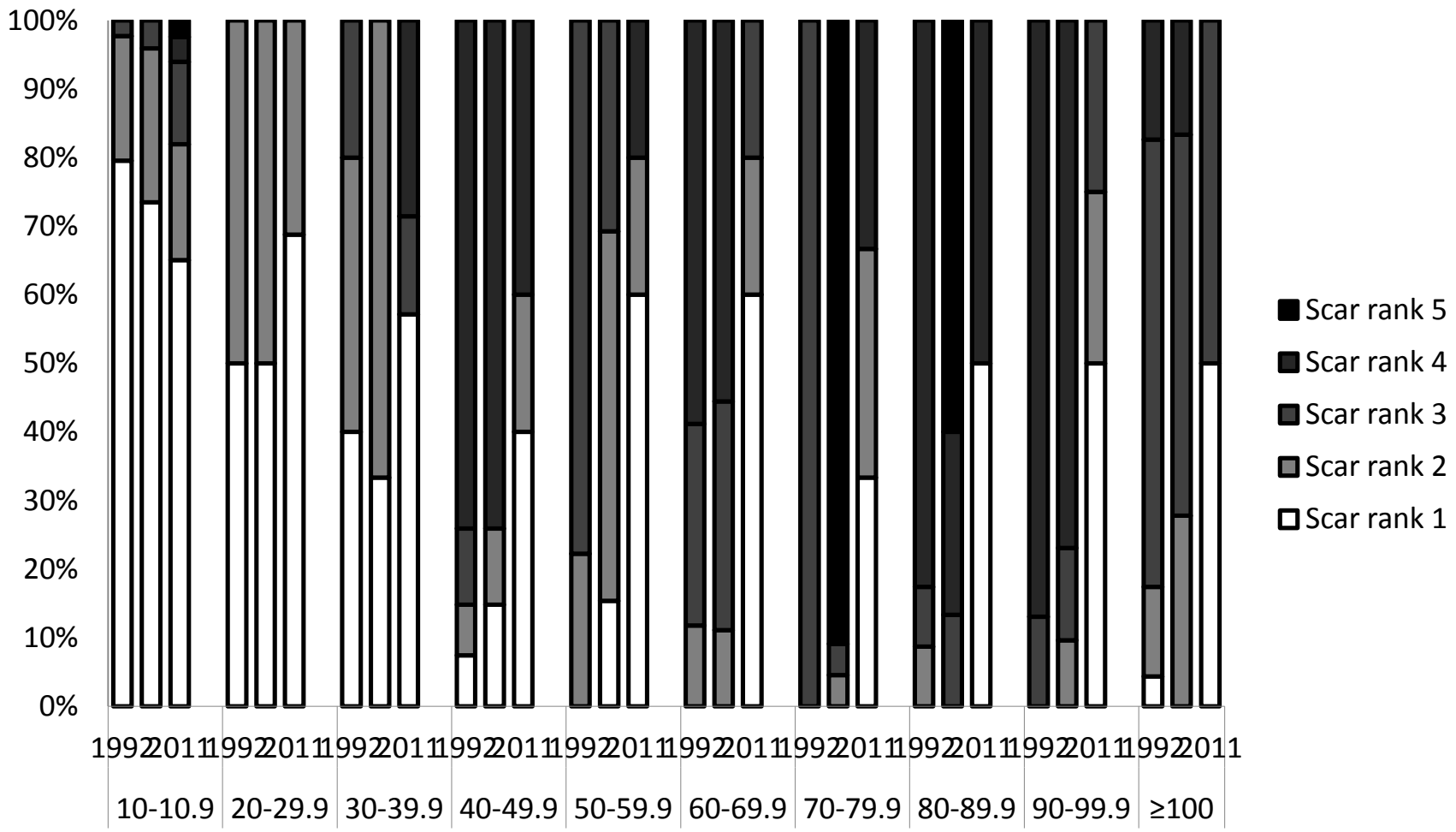
***Melicia excelsa*** **surviving on a strip of bark in Rabongo forest**

***Pterigota mildbraedii*** **with a sign of elephant task. Recruit just next to it**

# PROPORTIONS OF ELEPHANT SCARRED AND NON SCARRED TOTAL STEMS IN RABONGO FOREST

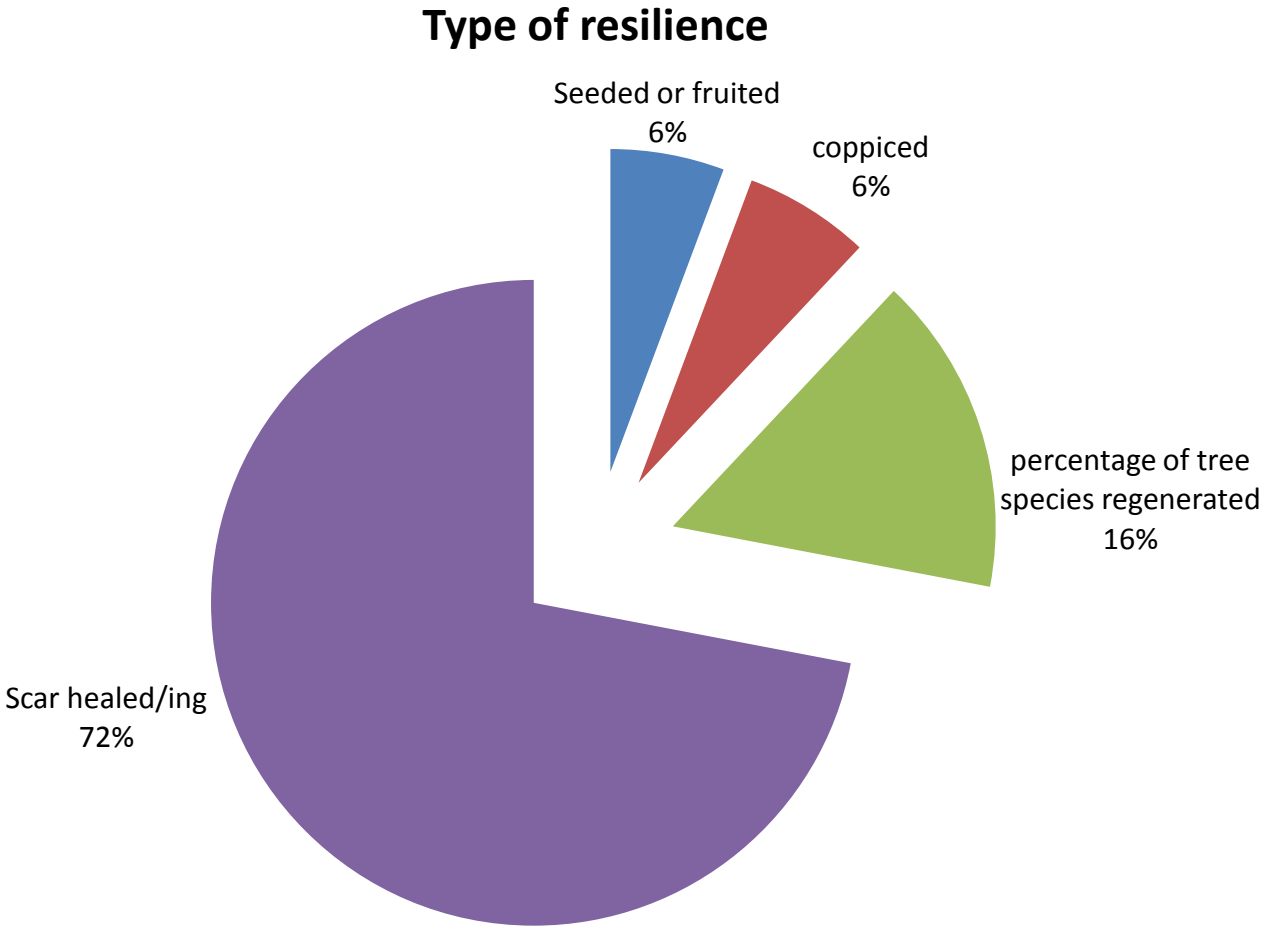


# RABONGO TREES SCARING EFFECTS AND INTENSITY PER SIZE CLASSES FOR 1992, 2001 AND 2011 ASSESSMENTS COMPARISON



*Albizia grandbracteata*, *Khaya senegalensis* sapling and *Craibea brownie*

# Forest trees resilience mechanism to elephant damage from Rabongo forest-MFNP



# Induced fruiting due to plant damage

***Trichilia sp*** **seedling prematurely fruited due to damage on its terminal shoot**

**Clear view of the damaged part and the fruits**

# Conclusion and recommendations

- Conclusion:

- Study important in long term investigation on forest ecology
- Stem abundance, basal area and species diversity increased
- Reduced elephant activity promotes stem and species increase
- A combination of resilience mechanism exhibited
- Earlier damaged/scarred trees recovered
- Abundant stems/species most damaged

# Recommendations

- Monitor elephant population
- Relate climate change with herbivore feeding behavior
- Next re-assessment after another 10 years to monitor long term forest ecology
- Creation of elephant free zone for in-depth studies.
- No need for management intervention at present

# Still to do

- Examine species by species
- Effect of scarring on survival
- Summarize how elephants (or loss of elephants) influences the tree community
- Examine species selectivity over time

# Acknowledgements




# SHOWERS OF BLESSINGS!!