

Rhino Conservation: South Africa - Background

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Joseph Okori

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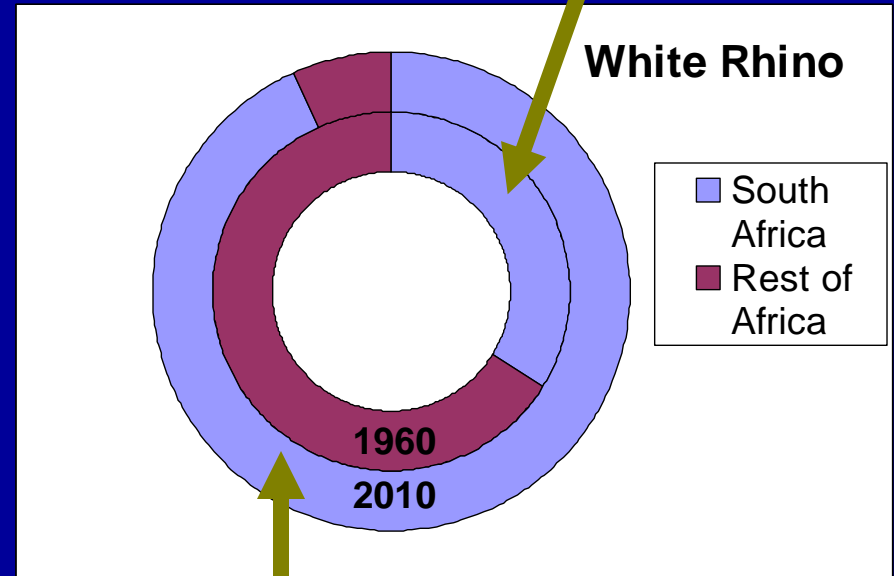
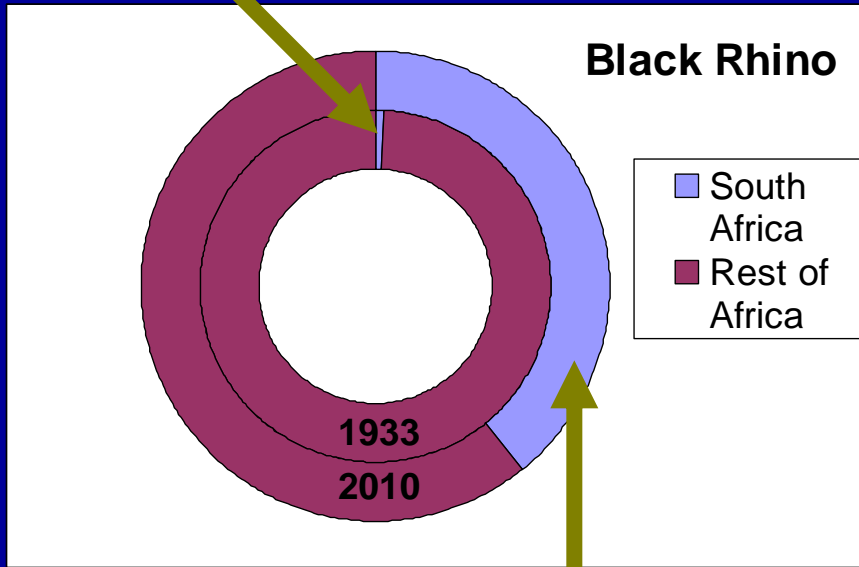
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- **Dr Jo Shaw**
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- **Dr Joseph Okori**
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Numbers & Trends

Growing Continental Importance of South Africa's Rhino

110 in 2 breeding popns <1%

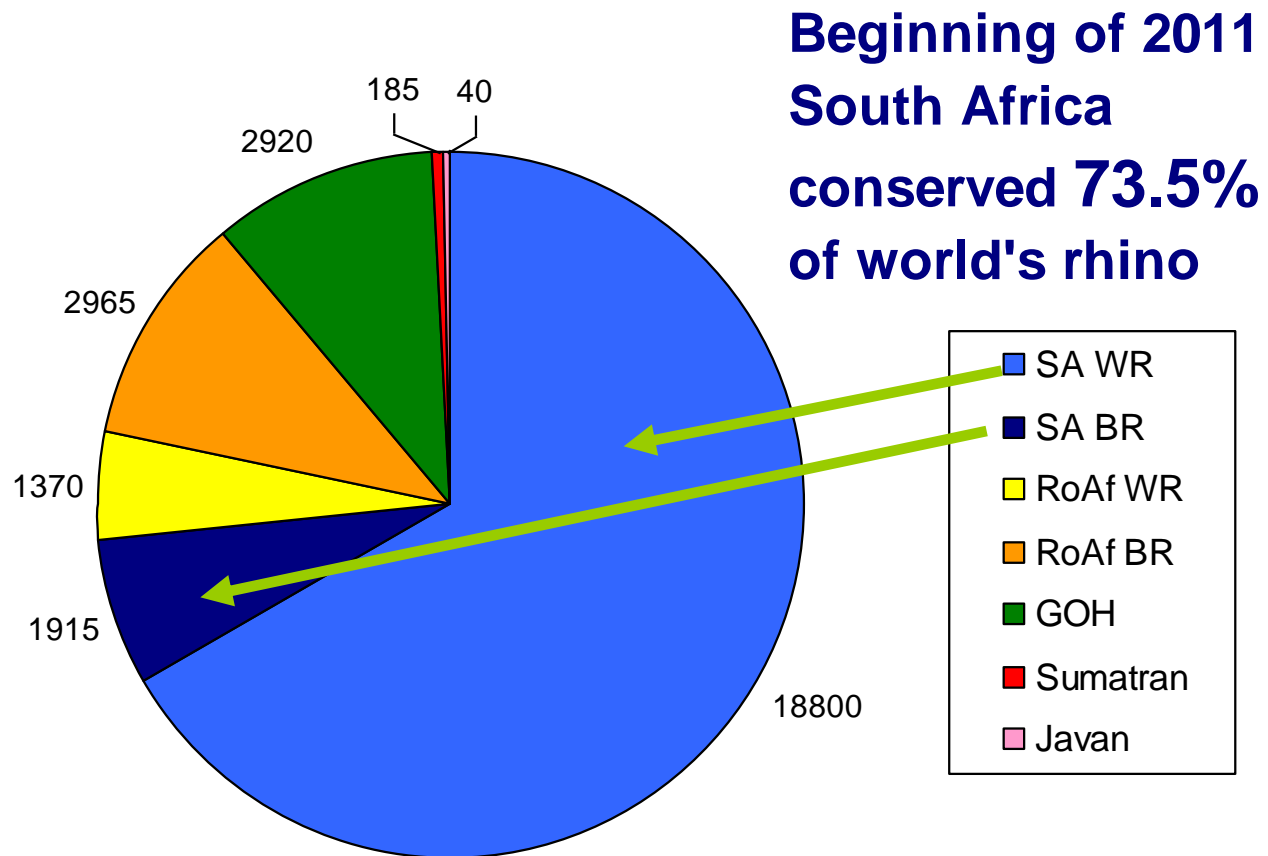
~ 33%



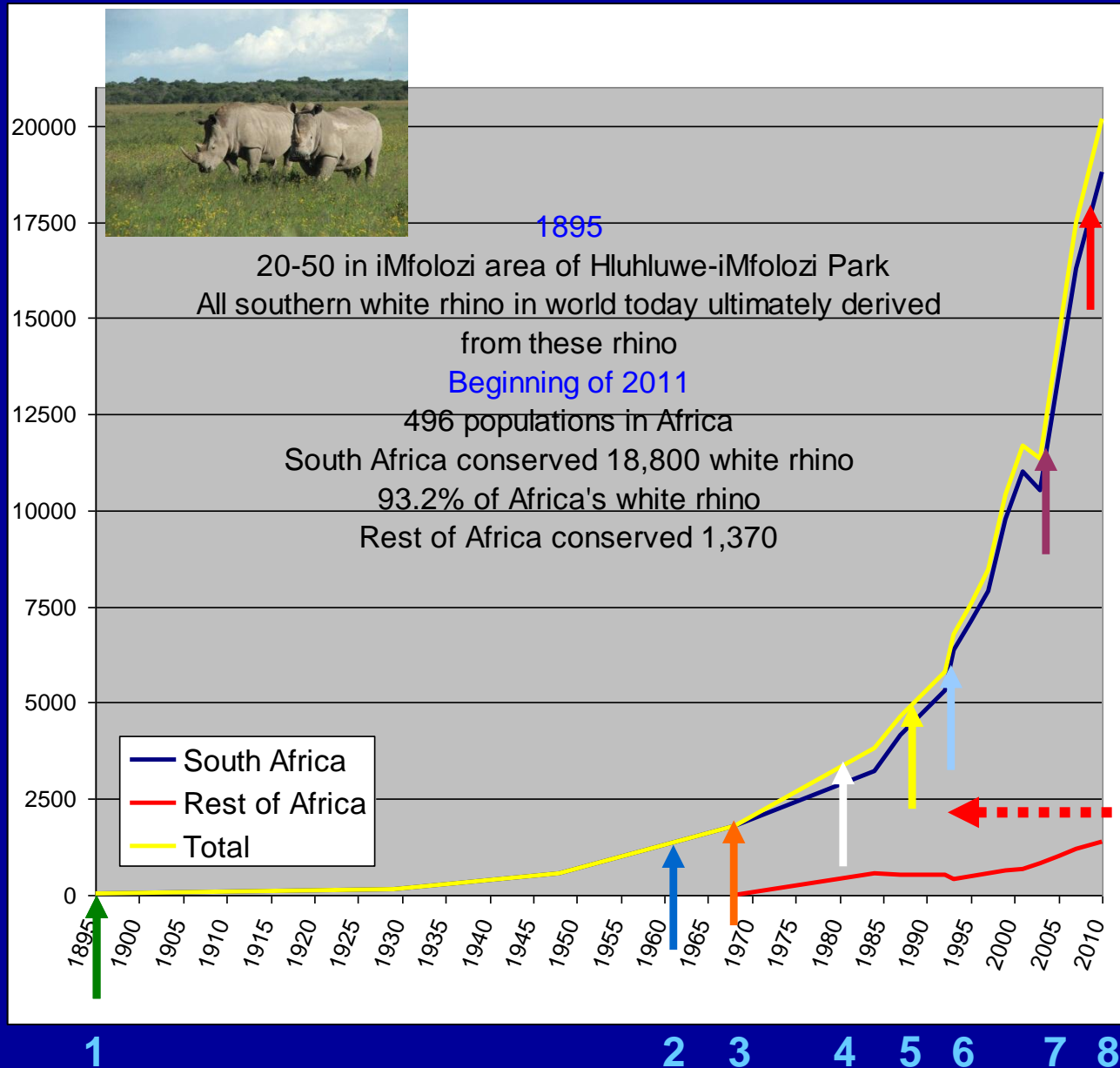
1,915, 61 breeding popns 39%

93%

Importance of S.Africa

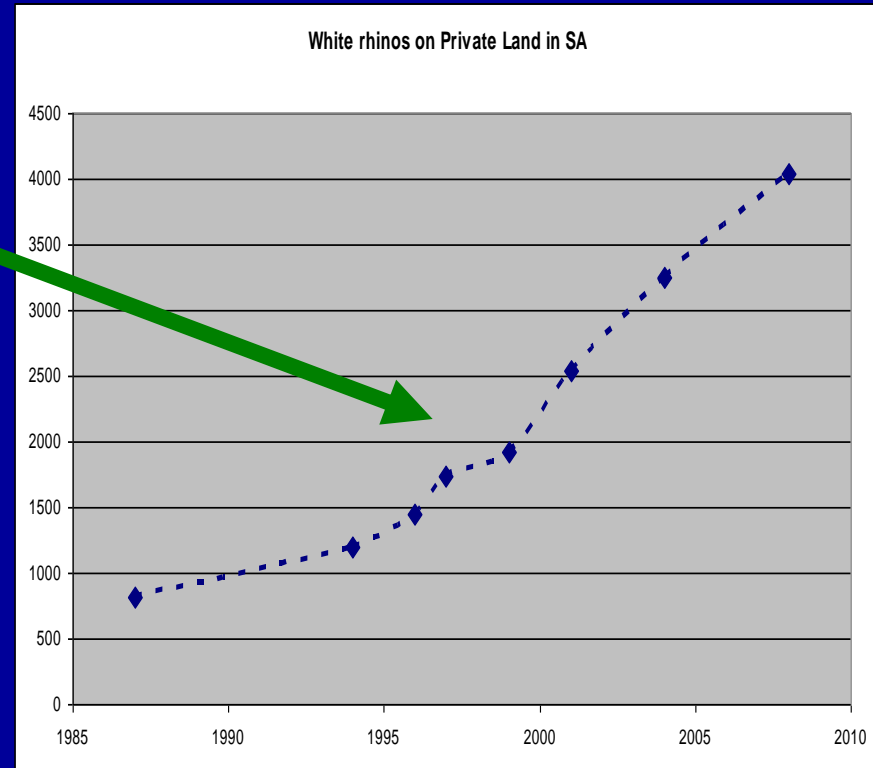


White rhino numbers and trends



Role of private landowners

- Both species +ve role in their recovery
- Different ownership models
- Not always positive 1987..
- 1989 Letting WR find true value on auction = increased numbers since
- Incentives to expand range and numbers
 - Hunting,
 - Live Sales
 - Ecotourism
- Significant revenue for conservation agencies
- Enabled source populations to stay productive.



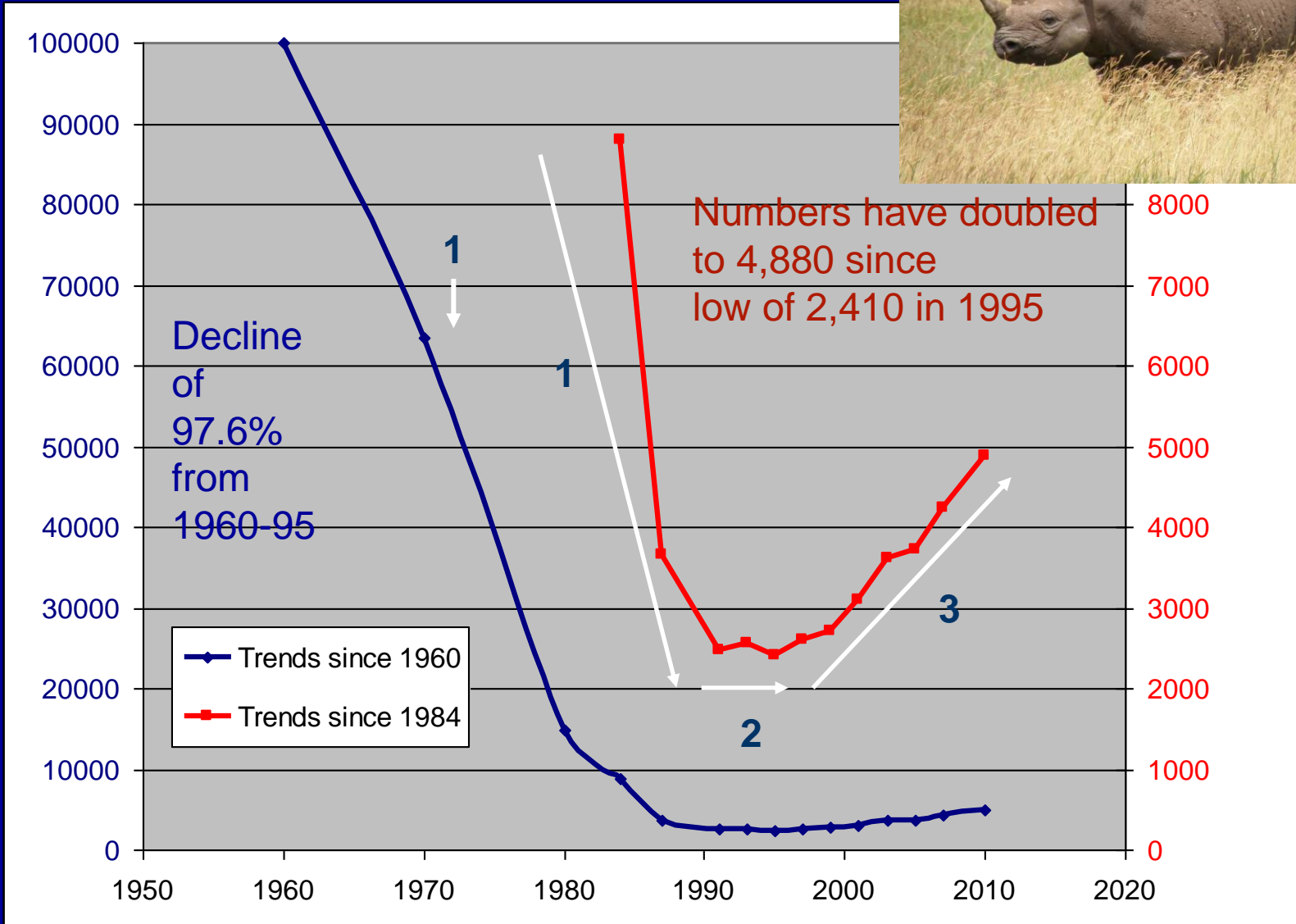
Importance of private sector

- Almost $\frac{1}{4}$ (23.3%) of Africa's rhinos are privately owned.
- Africa's BR: 24.9% under Custodianship and 6.8% under private ownership
- Africa's WR: 27.3% owned and managed by private sector
- SA private sector own more rhino than there are in the rest of Africa.

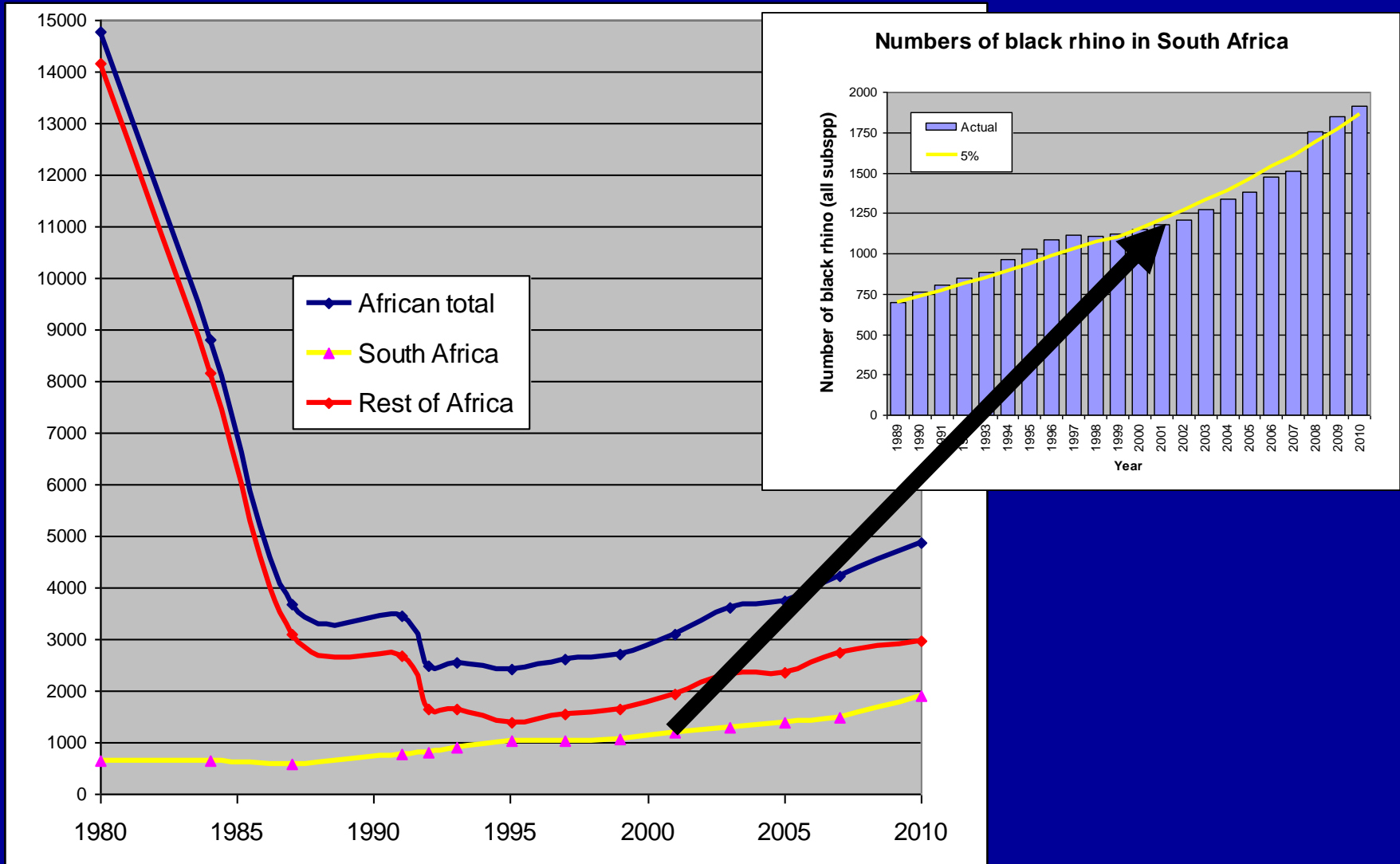
Private sector – Problems...

- Elements ... Illegal trade, psuedohunting and non-compliance with reporting
- Increased Poaching & Security costs + Decreasing incentives ► Unbundling ... Threatens continued rapid expansion of WR numbers and range as well as budgets for conservation
 - Decline in live sale price 2008-2011 wiped over R 549.5m off WR Market Capitalisation in S.Africa
 - WR Live sale turnover (by SANParks, EKZNW and Vleisscentraal) 2008-2011 = R236.3m

Black rhino

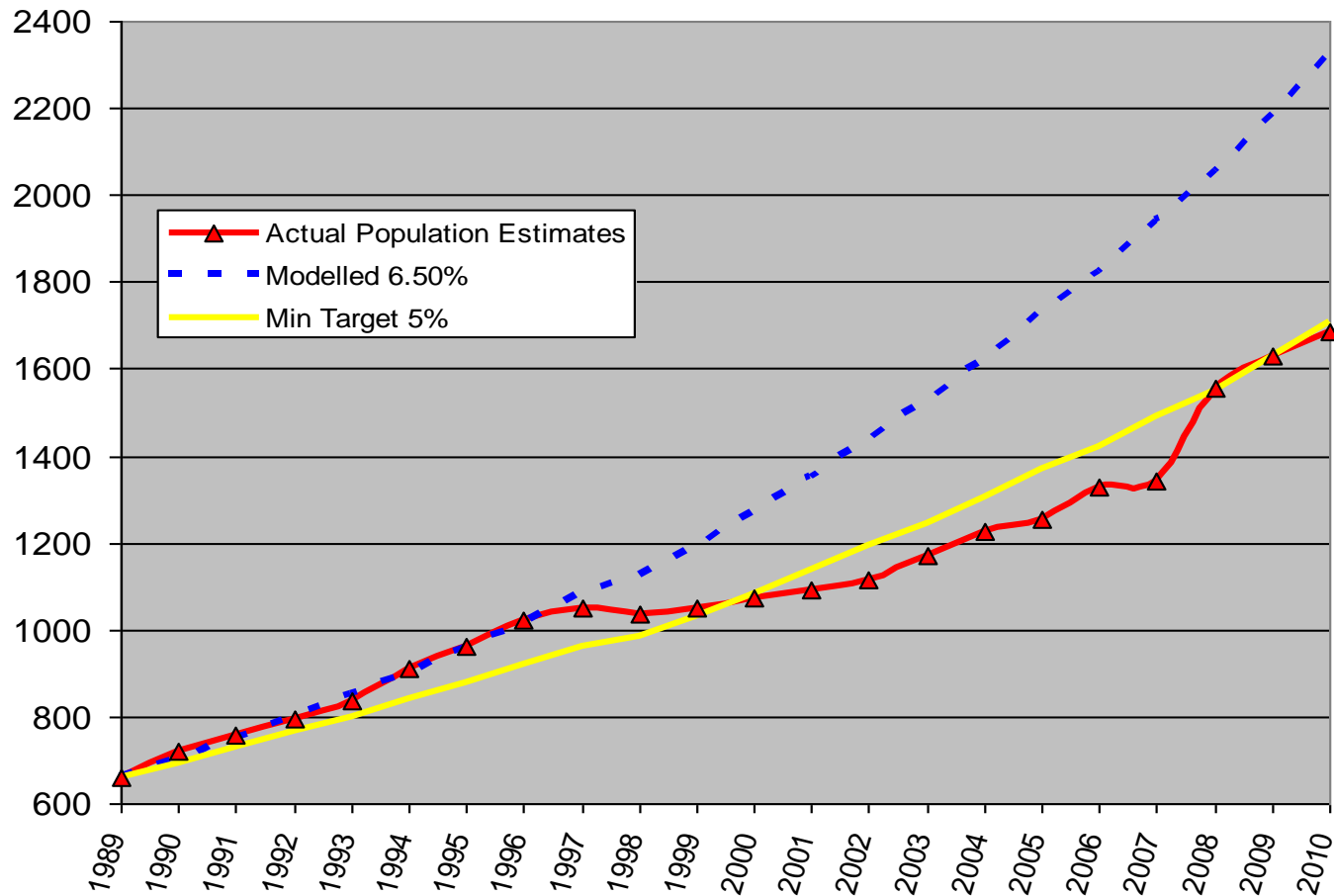


Black rhino trends since 1980



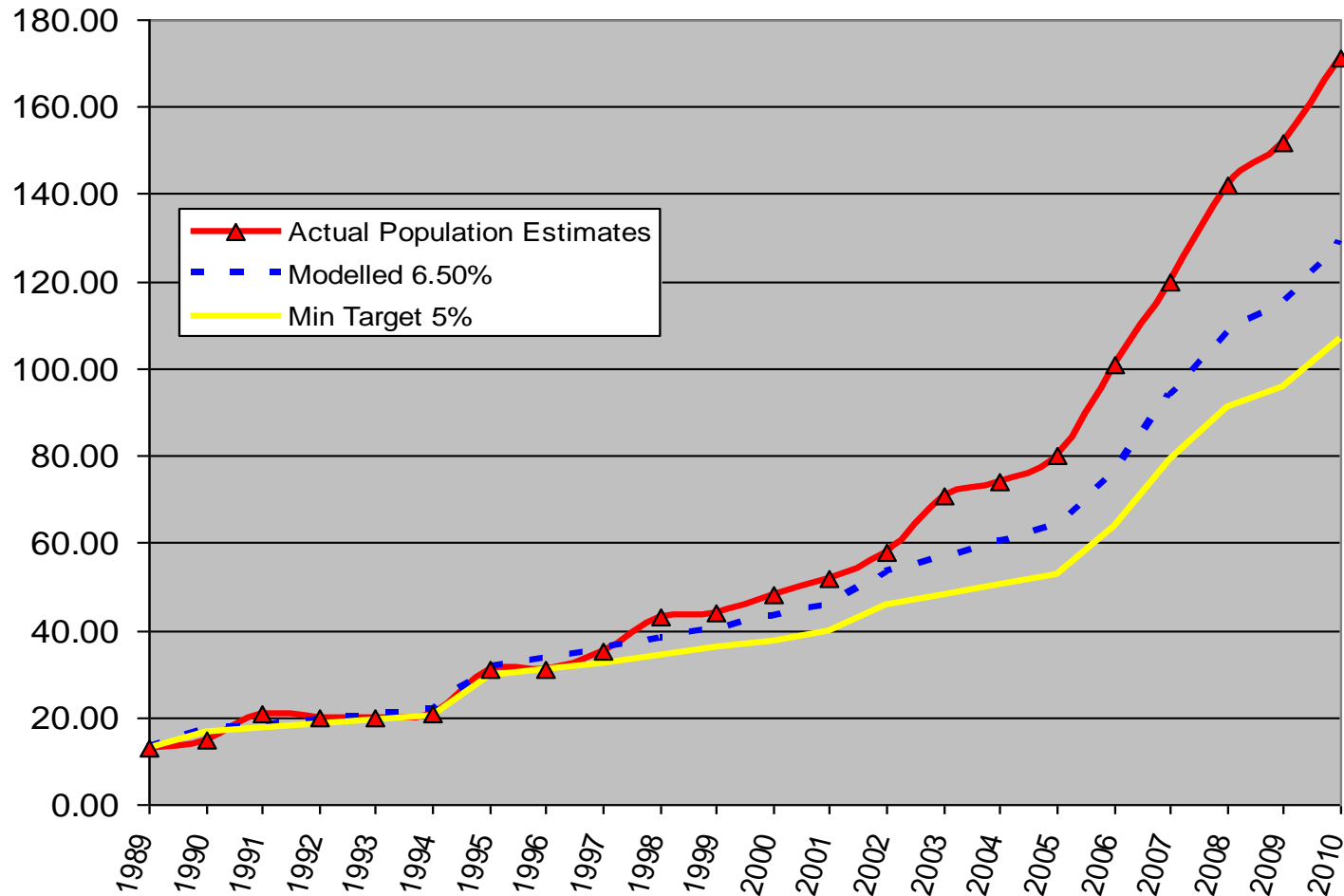
Southern-central BR

**Changes in *D.b.minor* numbers in South Africa
(1989-2010)**



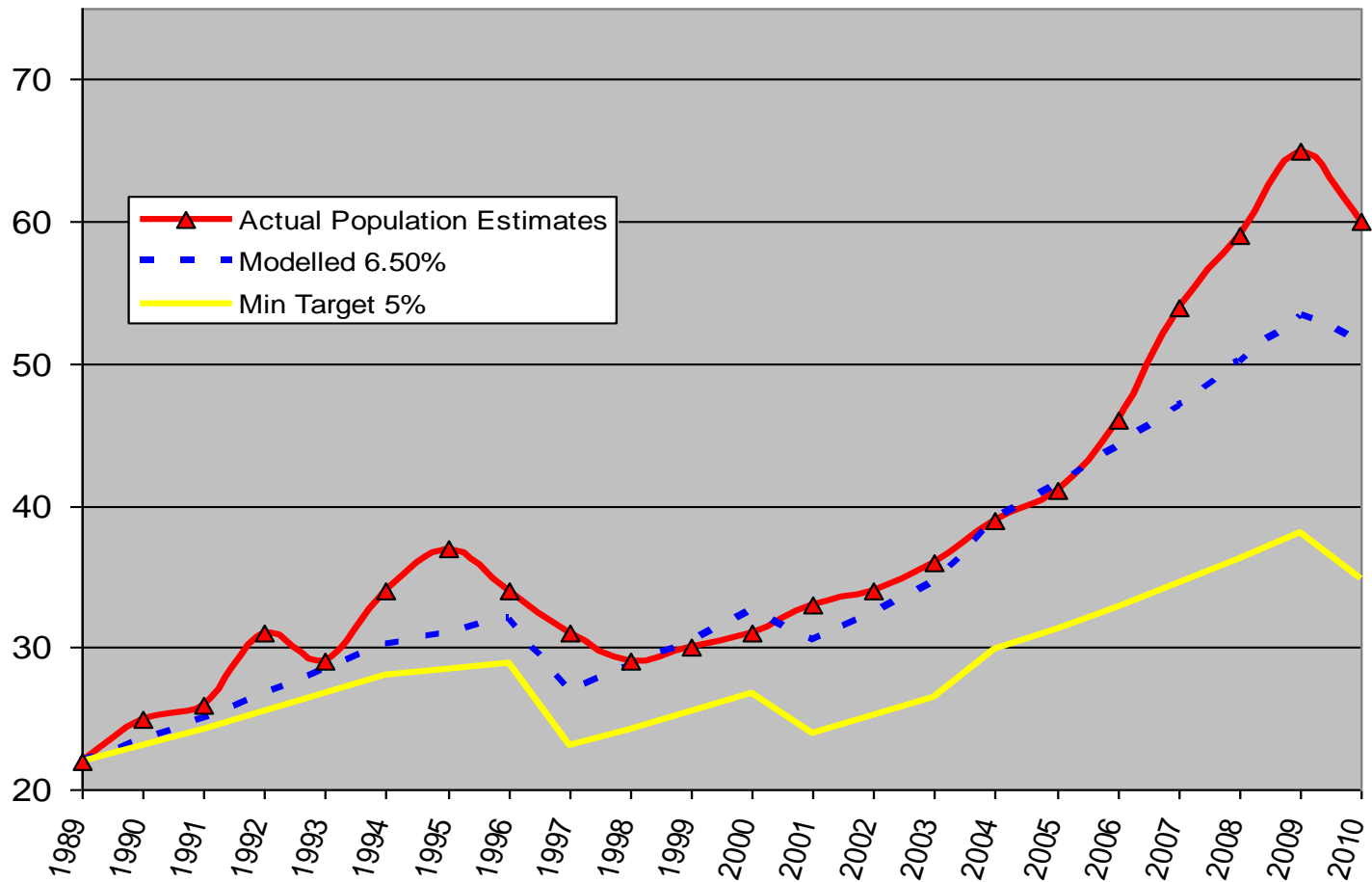
South western BR

**Changes in *D.b.bicornis* numbers in South Africa
(1989-2010)**



Eastern BR

Changes in *D.b.michaeli* numbers in South Africa
(1989-2010)



Causes of worldwide declines

- Poaching pressure
 - TCM in SE Asia
 - Ceremonial Jambiya daggers with rhino horn handles in Yemen
 - Recently new non-traditional uses (especially in Vietnam)
- Lack of political will, capacity and effort by some range states e.g. Cameroon

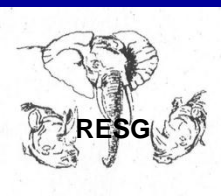
Reasons for recovery

- **+ve Political will and effort**
- Concentrated law enforcement (Sanctuaries, IPZ's)
- Intelligence led investigations
- **Biological management for growth**
 - Translocation of surplus rhinos – keeping established populations productive
 - Investing surplus rhinos in areas with growth potential
 - Benefitted from compounding growth
 - Rapid growth minimises loss of genetic heterozygosity
 - Good rhino investments (e.g. KNP)
 - Private sector (range and numbers)
 - Rapid growth – births in most countries exceeding deaths..
- **Variety of management models**
- **Economic incentives to increase range and numbers**

Coordination



African rhino range state reps, RMG chair, TRAFFIC, specialists, RESG/Interpol, private land owners donors



DEA, SANParks, Provincial conservation agencies, Namibia, Swaziland, Zimbabwe, Private land owners, WRSA, specialists,

National conservation authorities, DEA, Private landowners

SADC RMG

- Body with SA representation from SANParks, Provinces, DEA, Pvt Sector, Experts, RESG/Interpol ECWG (also Nam, Zim, Swz, Bot)
- Elects SA country representative (AfRSG) – avoids “Tanzanian problem”
- Status Reporting.. Jo to discuss
- In operation since 1989 – BR Plan development and monitoring progress, old WR strategy and more recently WR BMP WS development
- Agencies may also have own plans..

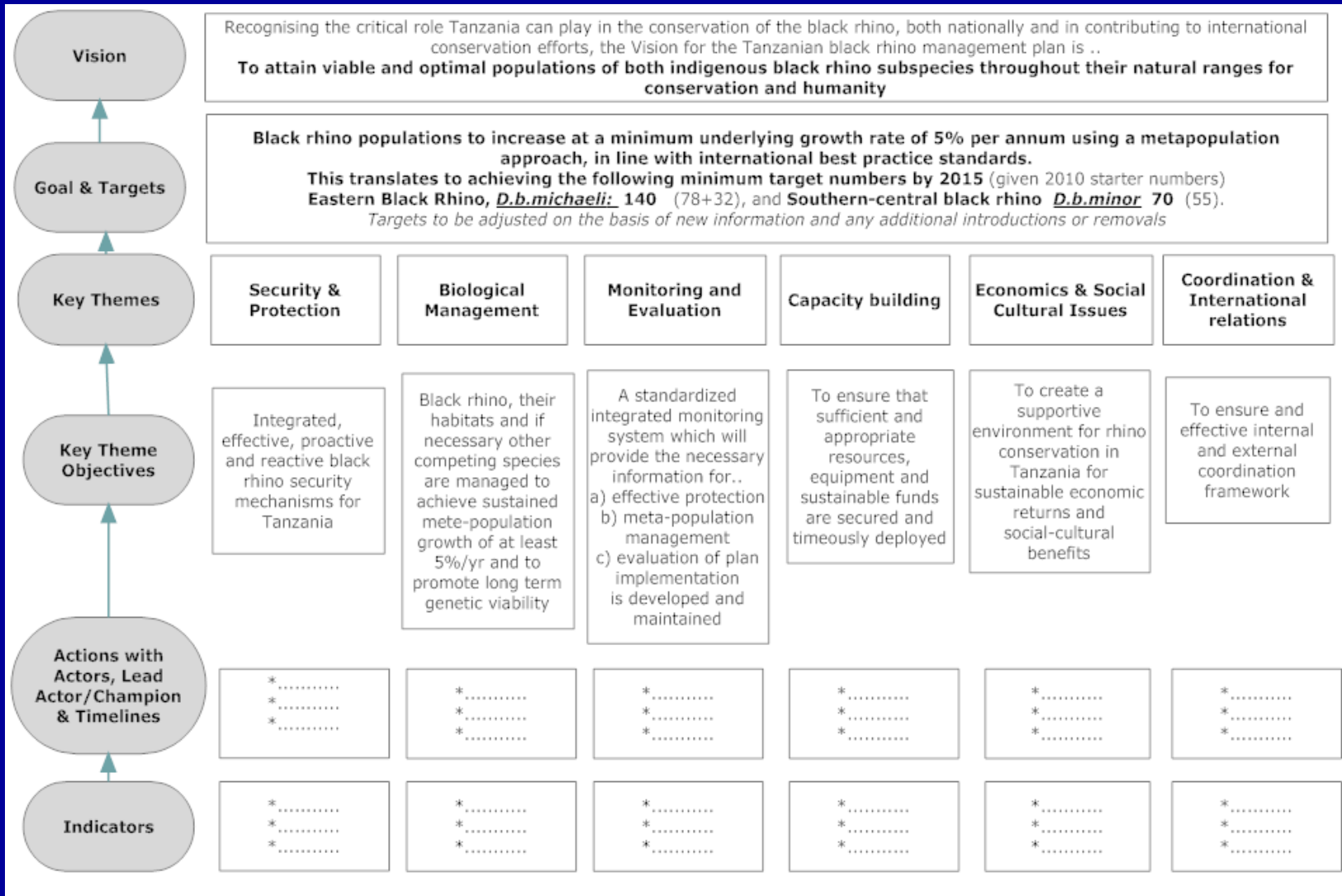
Rhino Management Plans

Very much based on AfRSG and IUCN recommended approaches

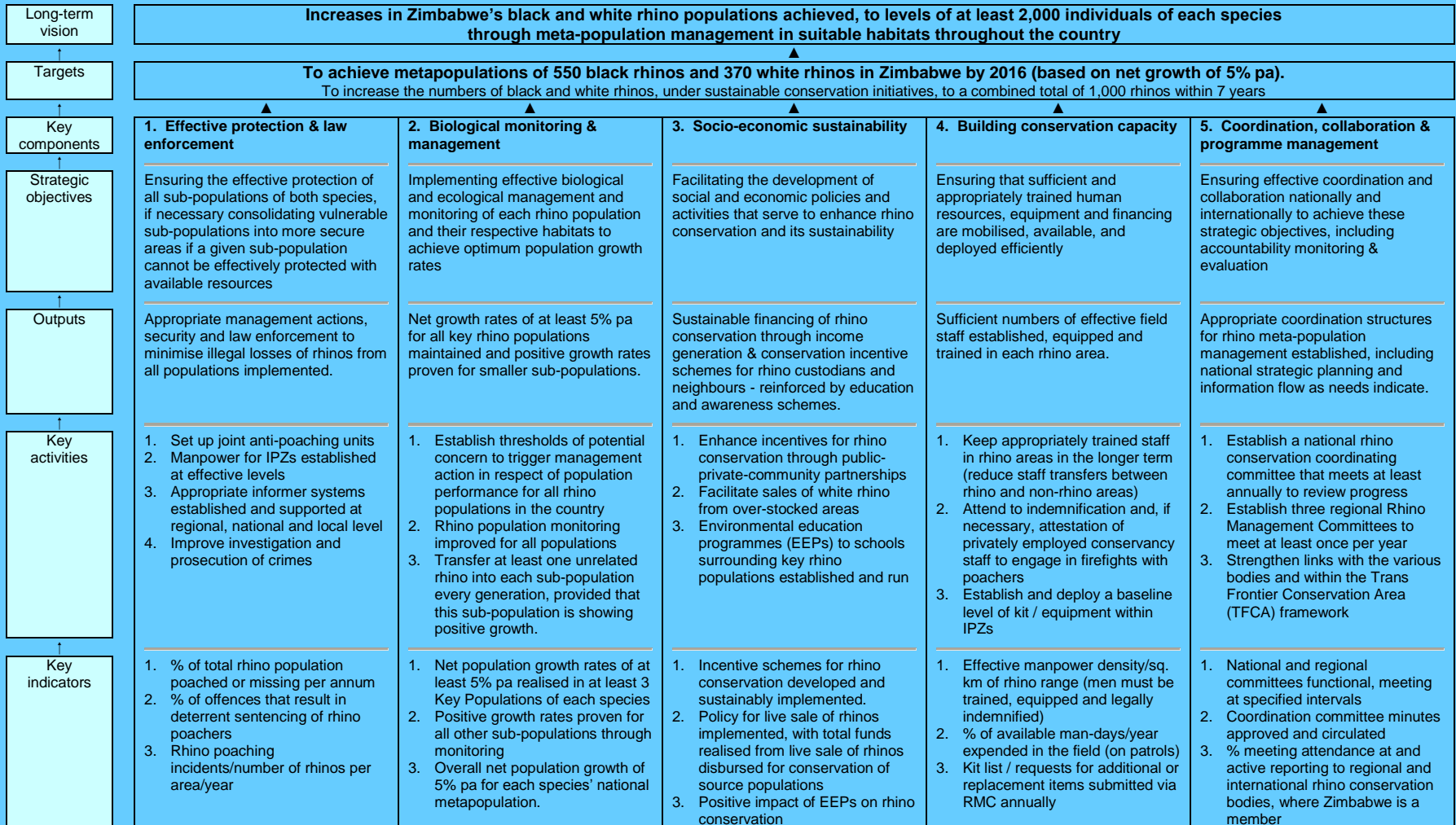
For SA BMP's under NEMBA

Rider: All plans only as good as implementation

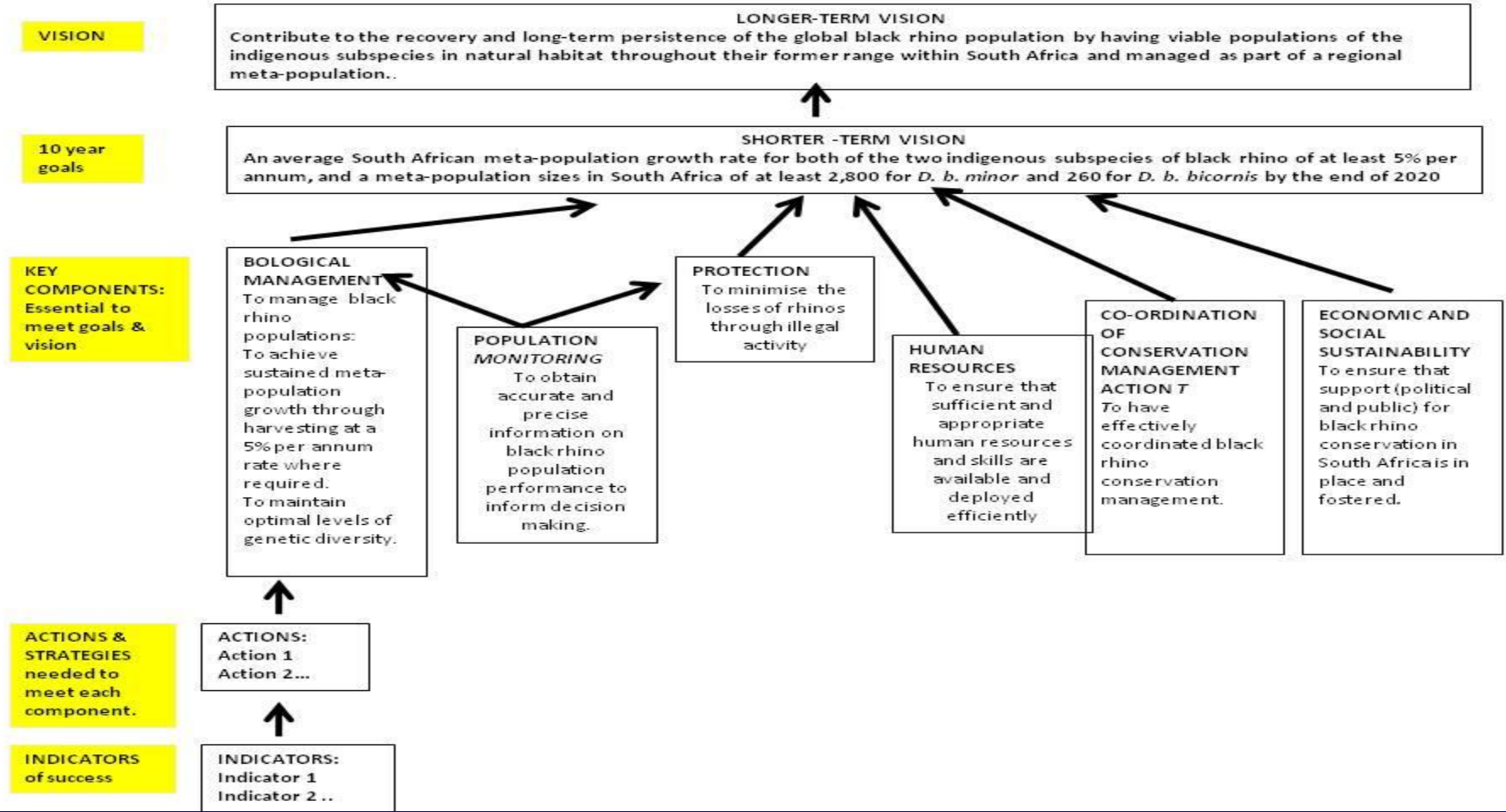
Tanzanian BR Plan



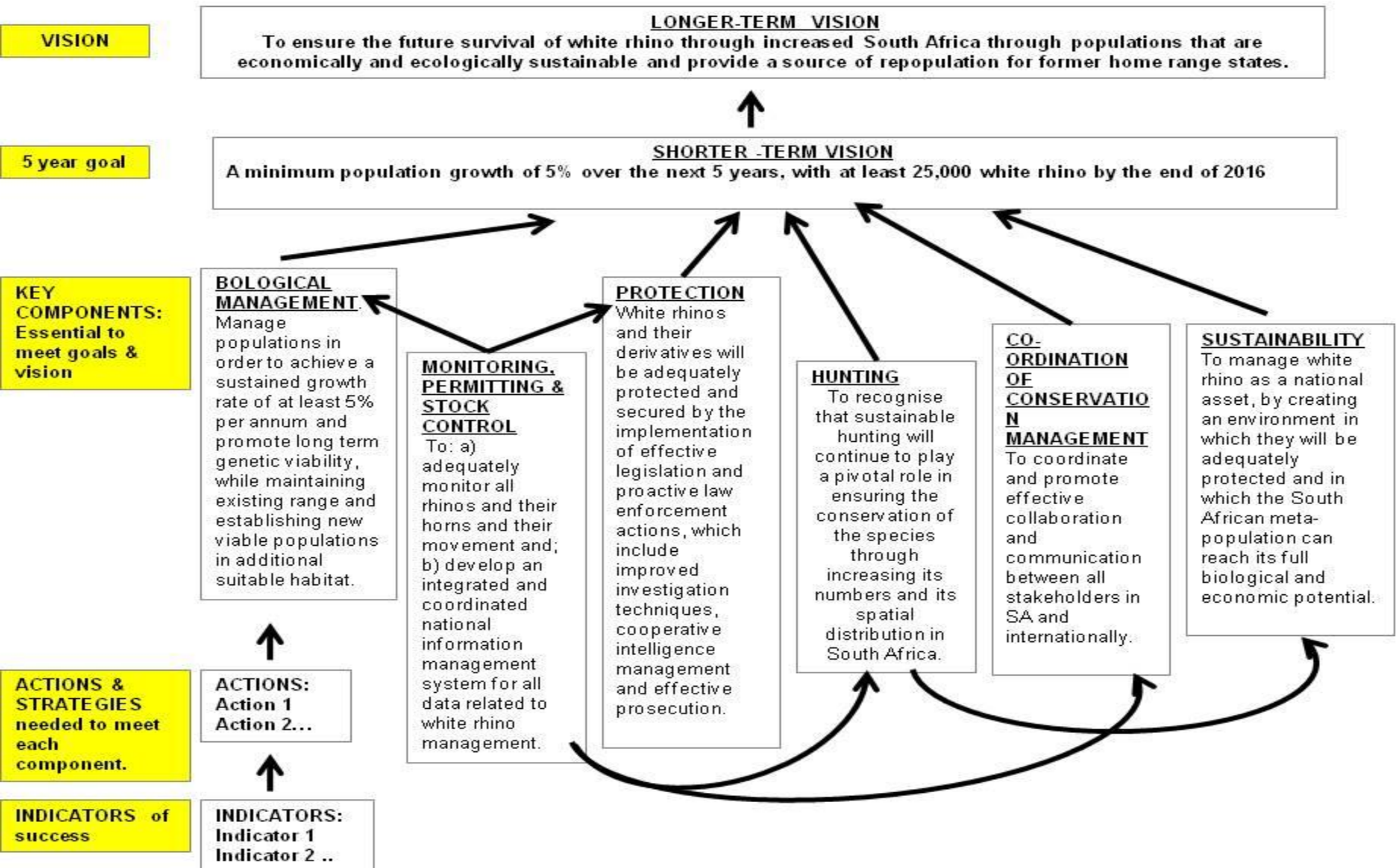
Zimbabwe Plan



SA BR Plan at a Glance



Draft SA WR Plan at a glance



Vision

- BR

Contribute to the recovery and persistence of the global black rhino population by having viable populations of the indigenous subspecies in natural habitat throughout their former range within South Africa and managed as part of a regional meta-population².

- WR

To ensure the future survival of white rhino through increased numbers and suitable habitat in South Africa through populations that are economically and ecologically sustainable and provide a source of repopulation for former home range states.

Longer term goals and Shorter Plan Targets

- BR

Long term goal] To have at least 3,000 *D. b. minor* and 500 *D. b. bicornis* in South Africa³, with at least four *D. b. minor* populations greater than 100 and another 10 greater than 50; and at least one *D. b. bicornis* population greater than a 100 and one greater than 50.

Shorter term Plan targets]

To achieve:

- An average meta-population growth rate¹ for both of the two indigenous subspecies of black rhino of at least 5% per annum.
- Meta-population sizes of at least 2,800 for *D. b. minor* and 260 for *D. b. bicornis* by the end of 2020^{2,3}

- WR

A minimum population growth¹ of 5% over the next 5 years, with at least 25,000 white rhino by the end of 2016²

Key Components

- For each Key Component – define objective
- Actions
- Indicators of success
- Responsibilities
- Constraints/Comments
- Recommended sources of detail

Biological Management

- BR

To manage black rhino populations:

- **To achieve sustained meta-population growth through harvesting at a 5% per annum rate where required.**
- **To maintain optimal levels of genetic diversity.**

- WR

Objective:

Manage populations in order to achieve a sustained growth rate of at least 5% per annum and promote long-term genetic viability, while maintaining the existing range and establishing new viable populations in additional suitable habitat.

Rhino Protection & LE

Not dealing with this today

- BR

To minimise the losses of rhinos through illegal activity.

- WR

Objective:

White rhinos and their derivatives will be adequately protected and secured by the implementation of effective legislation and proactive law enforcement actions, which include improved investigation techniques, cooperative intelligence management and effective prosecution.

Monitoring

- BR

To obtain accurate and precise information on black rhino population performance to inform decision making.

- WR

Objectives:

To:

- a) Adequately monitor all rhinos and their horns and their movement and;**
- b) Develop an integrated and co-ordinated national information management system for all data related to white rhino management.**

Human Resources / Capacity

- BR

To ensure that sufficient and appropriate human resources and skills are available and deployed efficiently

- WR

- Not a Key Component in its own right for WR but a necessary precursor for effective conservation action to meet all Key Component objectives.

- Dr Joseph Okori to discuss later

Coordination, Communication & Collaboration

- BR

To have effectively co-ordinated black rhino conservation management.

- WR

**Objective:
To coordinate and promote effective collaboration and communication between all white rhino stakeholders in South Africa and internationally.**

Economic & Social Sustainability

- BR

To ensure that support (political and public) for black rhino conservation in South Africa is in place and fostered through multiple and innovative initiatives to improve the actual and perceived value of the species

- WR

Objective:

To manage white rhino as a national asset, by creating an environment in which they will be adequately protected and in which the South African meta-population can reach its full biological and economic potential.

Not dealing with any trade component of this today

Economic & Social Sustainability

- BR

To ensure that support (political and public) for black rhino conservation in South Africa is in place and fostered through multiple and innovative initiatives to improve the actual and perceived value of the species

- WR

Objective:

To manage white rhino as a national asset, by creating an environment in which they will be adequately protected and in which the South African meta-population can reach its full biological and economic potential.

Hunting

- BR
- Hunting application approval and allocation system in place but not Key Component in Plan in its own right
- WR

Objective:

To recognise that sustainable hunting will continue to play a pivotal role in ensuring the conservation of the species through increasing its numbers and its range in South Africa

Draft white rhino plan

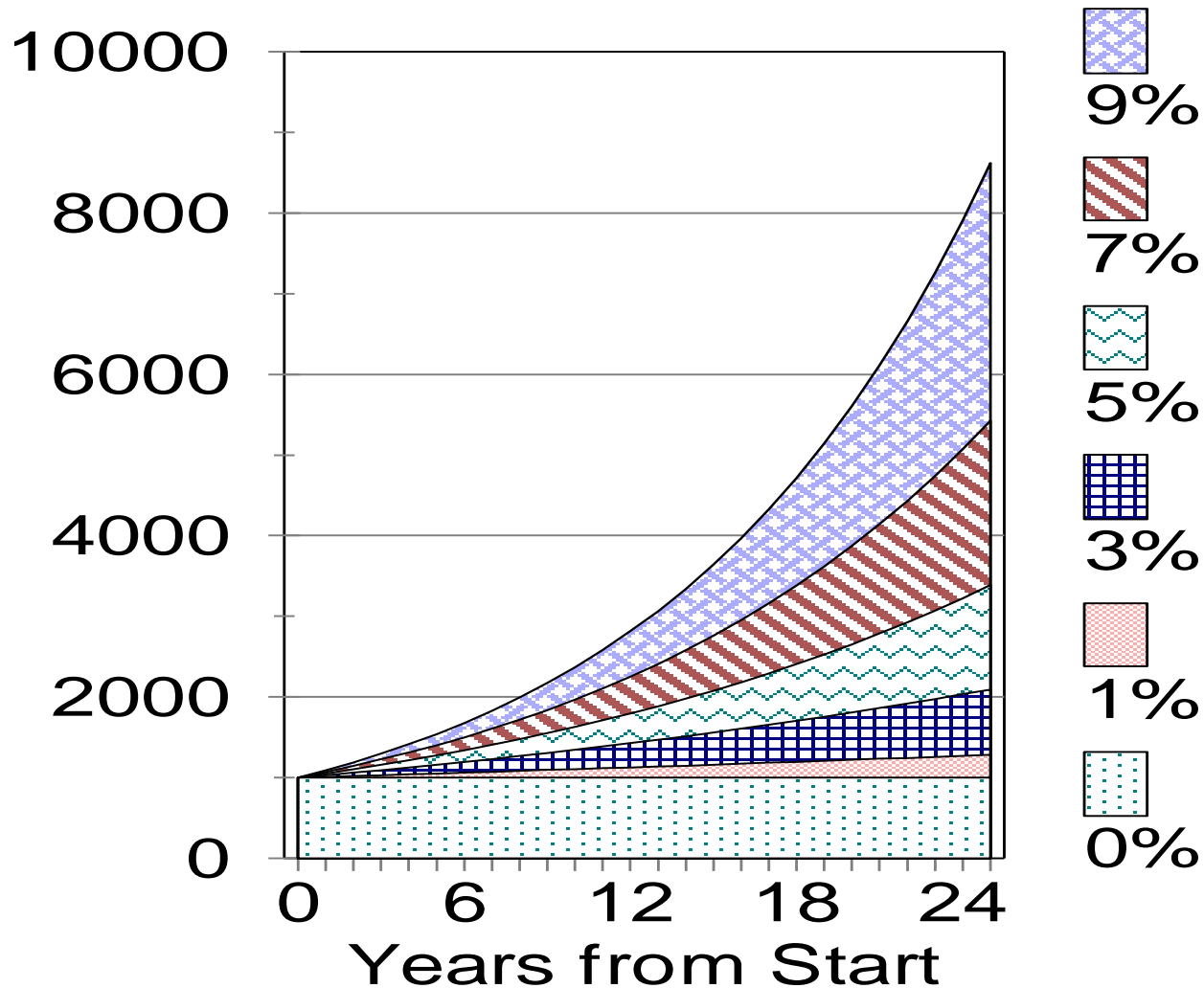
- Tables for each Key Component listing Activities and for each ...
 - Responsibility
 - Indicators of Success
 - Threats to deliver and of concern

Biological Management:
Managing rhino populations to
meet demographic and
genetic goals .. with a brief
outline of best practice
guidelines for rhino
translocations

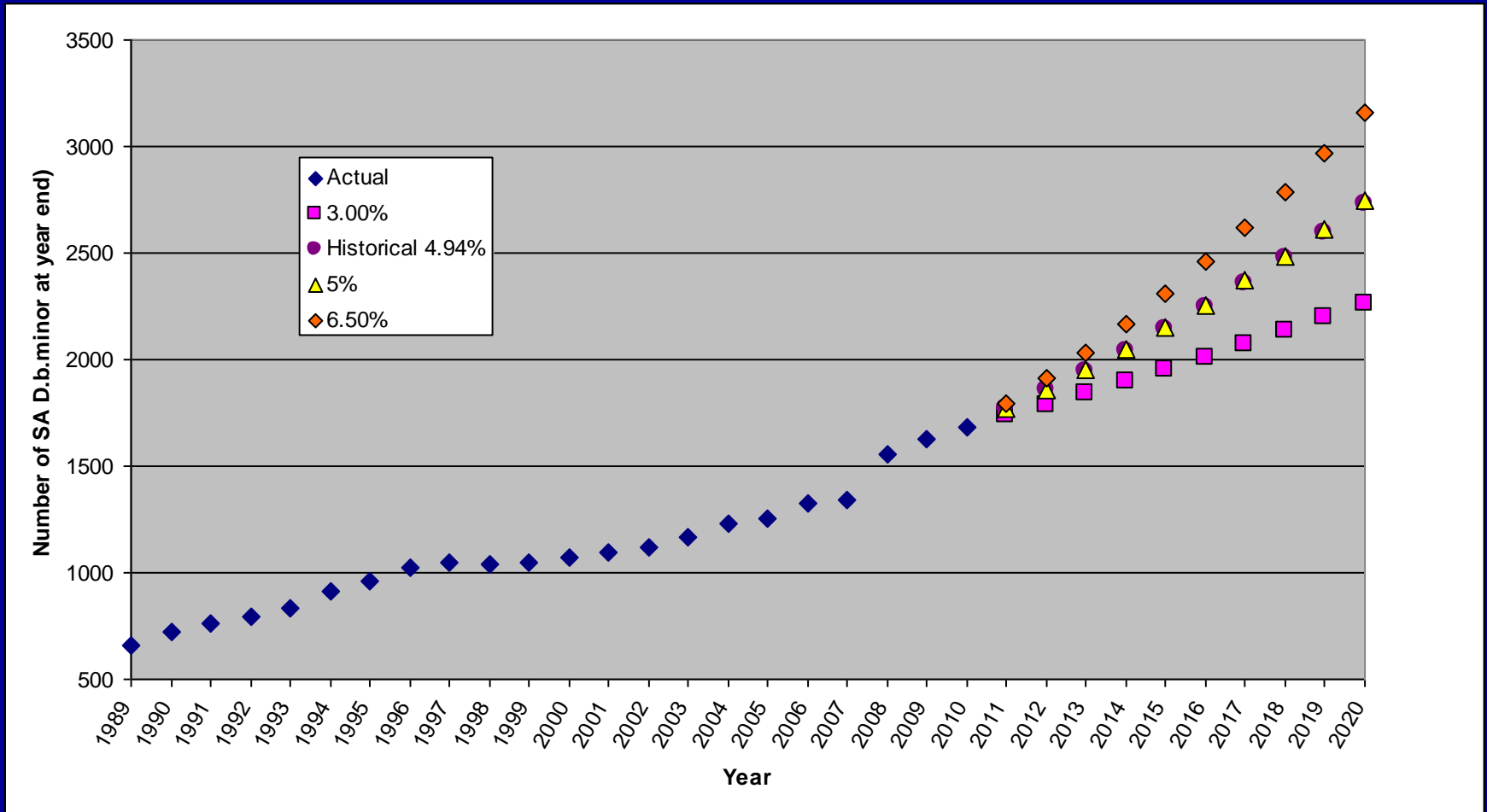
To win need to score goals as well as
keeping them out
Biological Management = Key



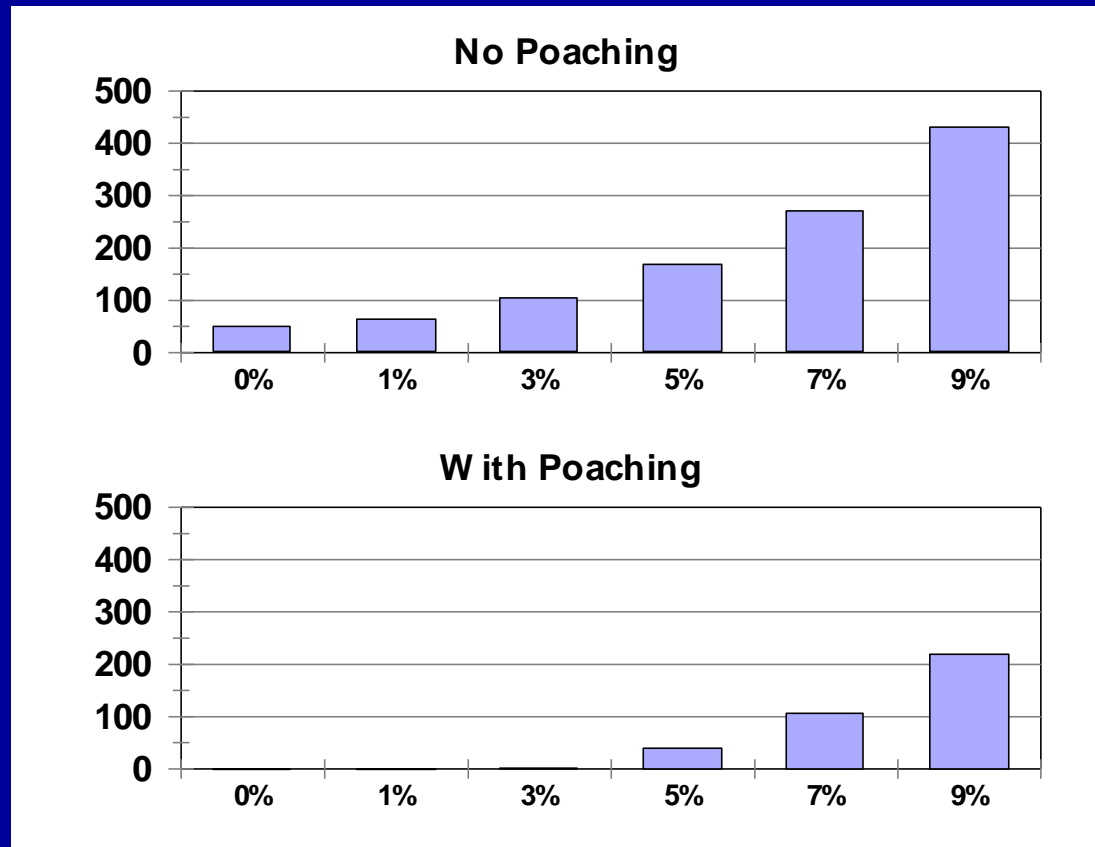
Importance of growth – Small differences in growth rate matter – a lot



Importance of Growth

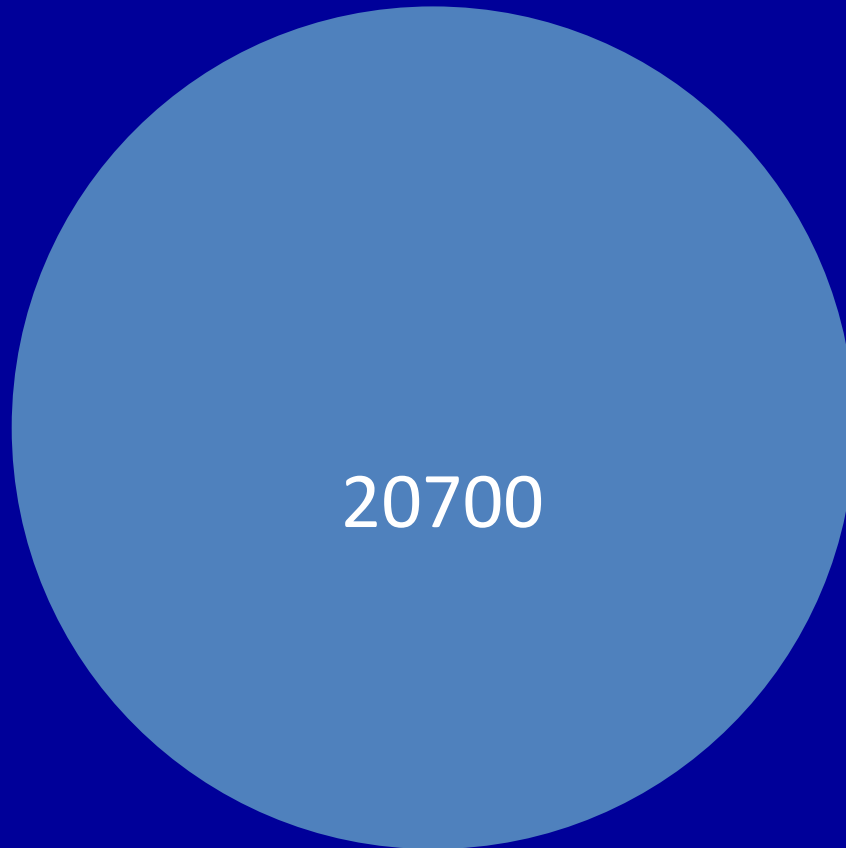


Growth – Buffer against poaching

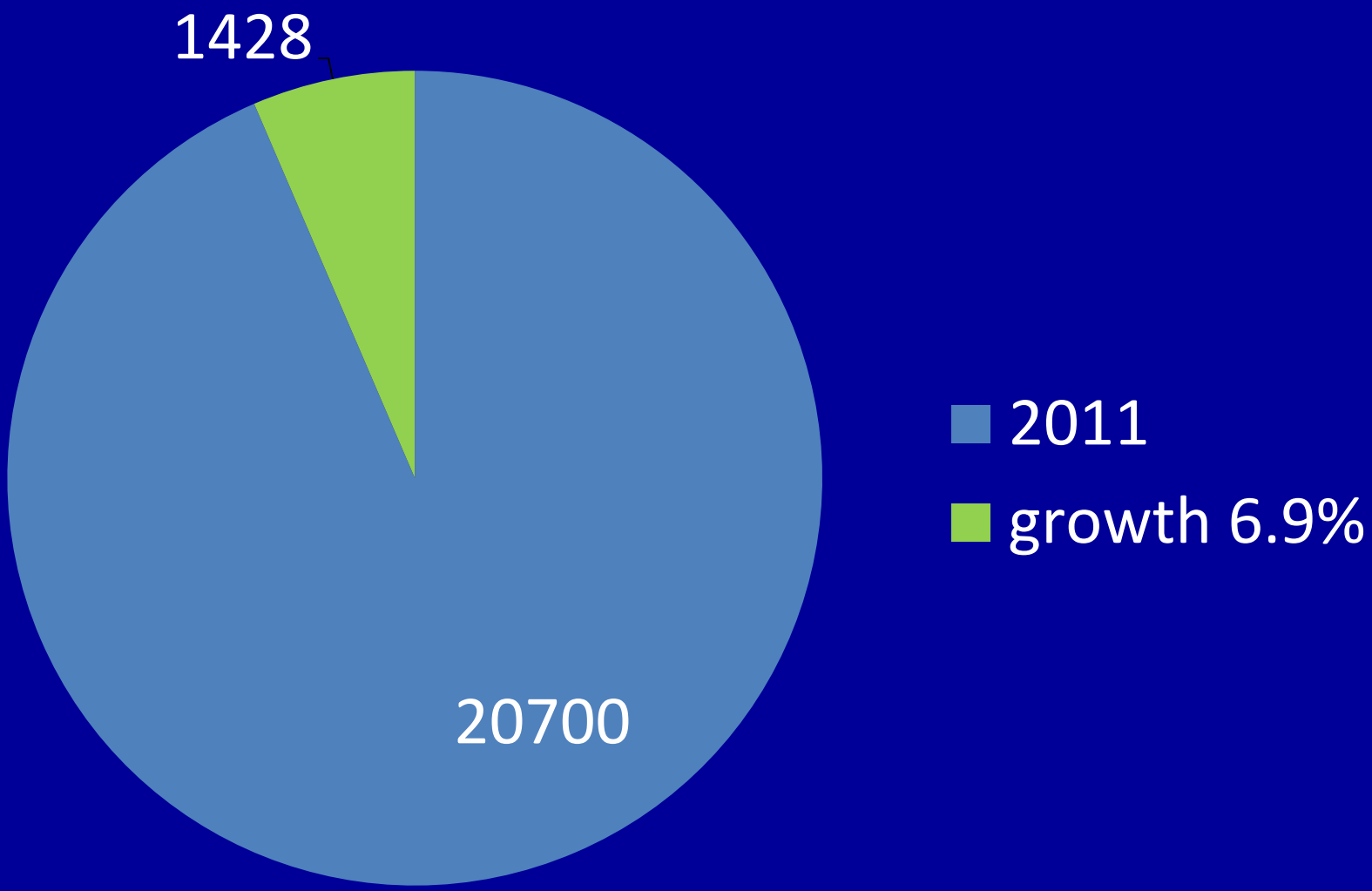


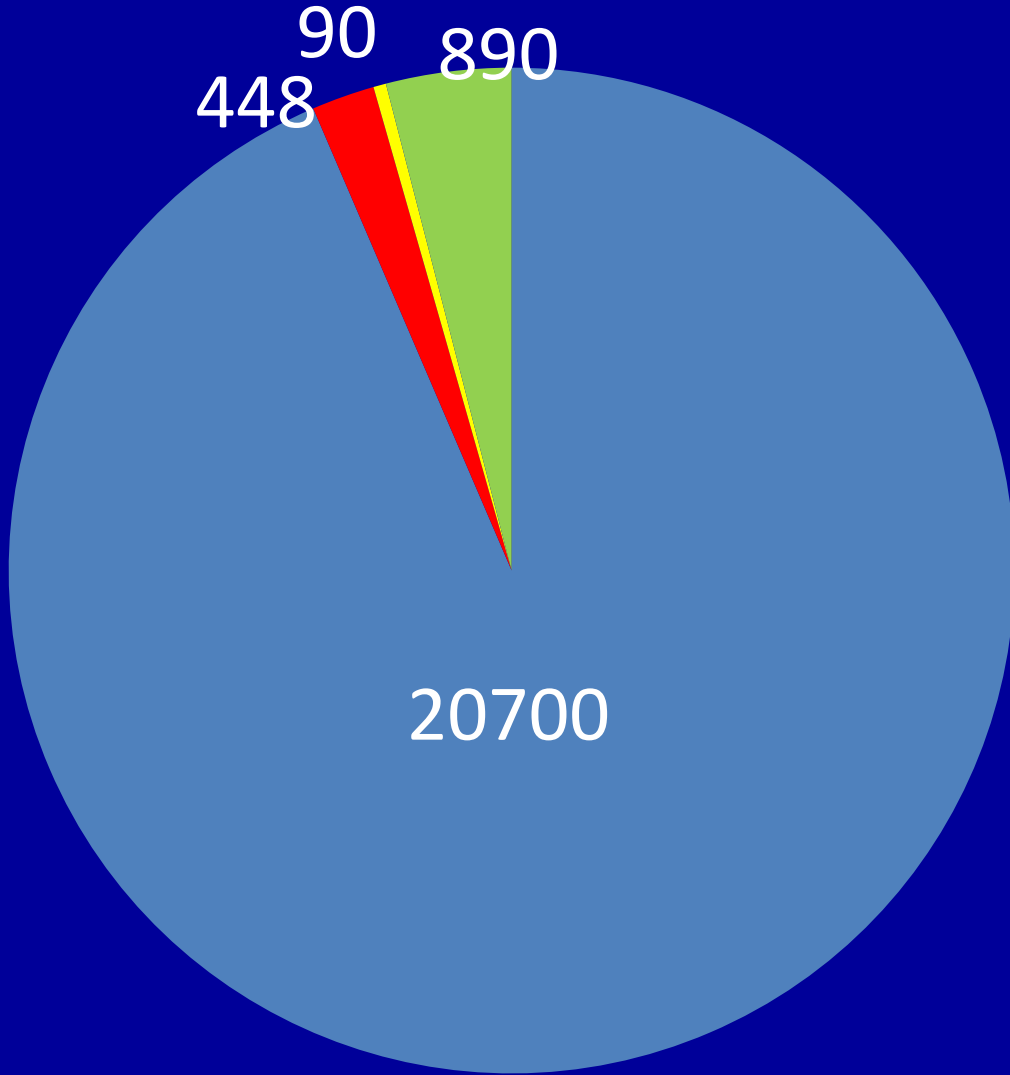
Numbers of rhinos after 25 years for two different scenarios starting with 50 rhino (no poaching and poaching outbreaks [15 poached every 5 years starting at year 5]) for a range of different growth rates from 0% to the approximate r_{max} for rhinos of 9%.

Starting population beginning 2011



■ 2011





■ 2011

■ Poaching

■ Pseudohunting

■ Balance of growth

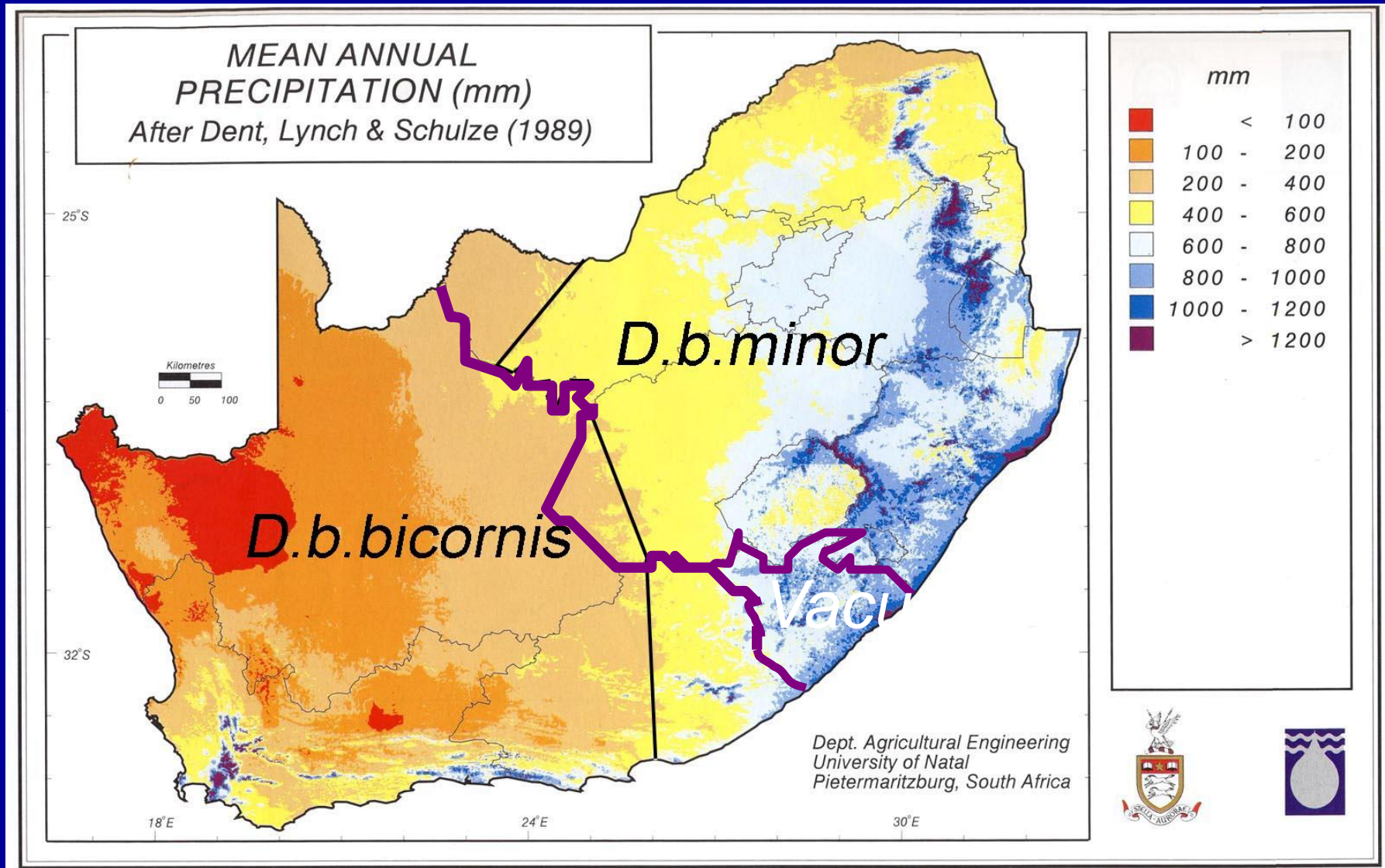
What is a metapopulation ?

- What do we mean by “metapopulation”?
- This term is often used loosely or incorrectly. A metapopulation is NOT simply the sum of a set of separate rhino breeding groups within a region or country.
- Instead, it is defined by the fact that there is occasional interchange of genetic material between subpopulations (geographically separated groups) so that they amount to a single population in genetic terms.

Biological Management

- **Biological management** is about managing rhino populations to achieve **demographic and genetic goals** at a country, regional or subspecies metapopulation level and individual sub-population level.
- In the case of black rhinos, conservationists seek to manage the animals (and sometimes also their habitats and other competing species) to achieve **sustained metapopulation growth of at least 5% per annum (overall and per population)**;
- and where possible to **promote longer term genetic viability (limiting inbreeding and minimising genetic drift)**.

SA Plan Revised subspecies boundaries with “vacuum” area.



Subspecies areas approximately follow 400mm isohyet but with North West and Free State provinces as *D. b. minor* only provinces for logistical reasons. “Vacuum” areas could be extended in future to cover parts of *D. b. minor* area with unsuitable habitats (e.g. highveld grassland in Free State).

Management for Growth

5% Underlying Growth Target

- This **5% target** is for the population growth, (growth of a population after allowing for removals and introductions).
- This figure represents **an achievable minimum target well below the estimated intrinsic maximum rate of increase** of a population with typical age/sex structure, which would be around 9% annually.

Growth target

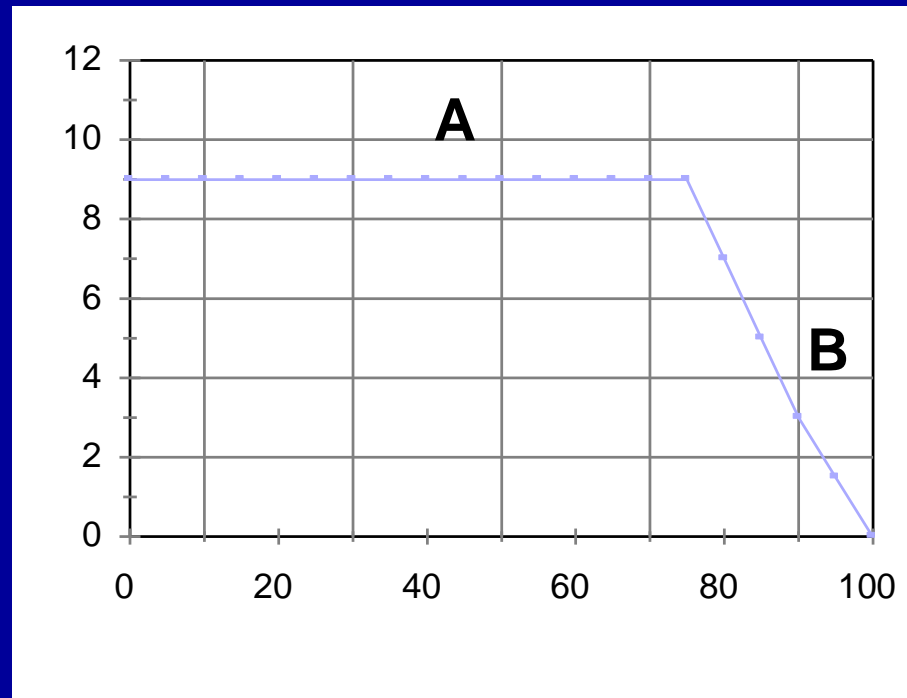
- Managers should certainly be striving to achieve growth rates of 6.5% plus.
- Rhino areas stocked well below habitat carrying capacity, and having female-biased sex ratios and low mortality rates, can sometimes achieve average population growth rates as high as 10-15% per year.
- With unfavourable skewed sex ratio's can adjust growth rate calculations and also look at indices like calves/adult F age female and female months/calf born and ICI and AFC etc.

Management for growth

- **Key is to keep populations productive**
(below ECC)
- Should be proactive
- **A lost rhino is a lost rhino...**
- Due to effects of compounding small differences in growth end up mattering a lot.
- **Issue of KNP offtake levels ?**

Hypothesised Non-linear Ramp shape response curve for rhino

- Complicated by lag effects



How to manage for growth

- BR Biological Management Workshop in 2001.
- Established black rhino populations that are reaching relatively high densities (in terms of the estimated ECC) should be managed productively and pro-actively by..
 - either **keeping rhino numbers at or below 75% of ECC**; or preferably, in larger populations,
 - by **annually translocating a set percentage** (min **5%** to max of 8%) of the population once densities exceed 50% of ECC. (Can move say 15% every 3 years instead of 5%/year)

Set % Harvesting

- With set-percentage harvesting, the population should adjust its density and eventually stabilise at a level that can sustain that level of harvest.
- Thus if one removes 5% annually the population's density should adjust to the point that the regeneration rate of the population is 5% (although numbers remain stable as this reproduction is cancelled out by removing 5% of the animals). Can do 15% every 3 years. Example Nairobi NP.
- The corollary is that if one removes less than 5%, the population performance will in due course decline to below the target 5% level. Concerns re Kruger?

Advantages of Set%

Harvesting

- Advantages of set-percentage harvesting, compared with the strategy of harvesting to a level that maintains a population at an estimated level of 75% of ECC, are that the latter approach:
 - is less influenced by the accuracy of ECC estimates;
 - should automatically result in densities adjusting in response to fluctuations in ECC;
 - yields more predictable and more constant annual removals each year, hence facilitating the planning for translocations and other forms of management.

Empirical support

- Evidence indicates set % harvesting working e.g. Nairobi and Hluhluwe-iMfolozi
- Evidence also indicates failure to implement removal strategy results in reduced performance or even negative growth rates.

Lags

- As rhinos are long-lived, taking years to grow to their full size, and are relatively slow-breeders, they may overshoot carrying capacity before signs of density-dependent reductions in performance are recorded.
- Thus it is **inadvisable to wait for signs of reduced performance** (increased inter-calving intervals, increased neonatal and adult mortality rates) before taking action.
- The **ideal** is to **pro-actively start removing rhinos** before population performance starts to suffer.
- BR also not great dispersers – help along process?

Translocation risks vs. potential gains

- Rhino managers are often overly cautious about undertaking rhino translocations, particularly in situations where national or provincial rhino numbers are low and/or where poaching losses have been high, or where custodians or other stakeholders are opposing the removal of rhinos from an area in which they have a vested interest.
- Experience has shown that field managers faced with reduced performance in a population that is close to estimated ECC can become more hesitant to remove more animals, at the very time when removals should increase to return the population to productivity.

Other considerations

- It should, however, be appreciated that biological management is not just a simple case of managing rhino numbers.
 - **Social factors** following removals in donor populations may have short-term negative effects.
 - The **age and sex structure of the donor population** should be considered when choosing animals to remove. For example, the selective removal of young female rhinos over a long period may potentially skew the age (and sex) structure of a donor population, reducing its future performance.

Other considerations

- The **build-up of populations of competing browsers** of other species, may also have a significant impact on rhino performance in some well-established populations. A reduction in densities of competitors may therefore improve rhino performance.
- **Alien plants**

Strategic benefits

- Big advantage of rapid growth and more populations
 - Spread risk
 - Bigger buffer against impacts of any future poaching escalation.
 - Reach goals quicker
 - Reduces loss of genetic diversity

Genetic Management

Why manage as a metapop'n?

- The reason for maintaining a metapopulation is **to avoid losing genetic diversity** that is essential for the long term evolutionary potential of rhino species, which means the ability to adapt to changing environments.
- Loss of genetic diversity can arise through two main processes that affect small populations:
 - **Inbreeding**, and
 - **Genetic Drift**.

Problem of small founder number

- Small population sizes can cause both **genetic drift** and **inbreeding**.
- Metapopulation management not really an option – it is a necessity.

Why is inbreeding bad?

- Inbreeding not generally recommended because of the existence of deleterious recessive alleles in most populations.

Inbreeding – Lessons

- Avoid if possible
- Far more likely to occur in populations with very small founder numbers or where only a couple of animals have dominated the breeding in a smallish population for some time.
- Solution = add new blood and perhaps remove some of major breeding bulls.

Effect of genetic drift

- Genetic drift results in loss of genetic variation. *We may lose key adaptations in the process. Animals are then “less fit” and also changing genetically from others of the same species/subspecies.*

Pop'n size, growth and speed of GD

- Genetic Drift faster in small isolated populations.
- Genetic Drift slow in small isolated populations that are actively managed as part of metapopulation (i.e. limited animal exchanges every so often)
- **Genetic Drift slower the faster the breeding**
- Why? If I tossed a coin twice, and get 2 heads, you would not be surprised. If I tossed 20 times, and got 20 heads you would be very surprised. (Here you can think of not getting any tails in a generation of tosses as

Solution

- **One migrant per generation** (which in rhinos is about say 14 years) rule based on some simplifying assumptions that may not hold in the wild.
- Now thought one/generation is desirable minimum and may be inadequate for some populations
- **Revised recommendation of minimum of 1 and maximum of 10 per generation.**
- **Doesn't have to be just males**

Overlap between demographic and genetic goals

- The demographic objective of maintaining the maximum possible rate of population growth overlaps with the genetic factors outlined above;
- This is because rapidly expanding populations will pass on more genetic diversity from one generation to the next than will populations with stagnant growth rates.
- As mentioned - An annual population growth rate of 5% is regarded as a minimum target for rhino populations although well-managed introduction programmes can double this rate.

Ideal solution when setting up new populations

- Each population should ideally be established with 20 or more effective founders. By “effective founders” it is meant that these animals will as far, as is known, be unrelated and will be capable of breeding (so if a population is started with five bulls and five cows each of which has a calf, then the maximum founder size is not 15 but only 10 because the cows and calves are directly related).
- Ideally, each new population will be established in an area with a carrying capacity of greater than 50 and preferably 100+ rhinos. Not always possible

Often can't achieve the ideal

- Ideal 20+ founders $ECC > 100$ often not possible
- If it cannot be achieved then alternative is to try to maintain at least one such population within a national or regional metapopulation and to manage all sub-populations as part of a metapopulation. **Standard practice**
- Can be done very successfully e.g. Namibian Custodianship programme where most indiv. Pop'ns are small (but there are costs..)

Recap : Genetic Mgmt

- There should be periodic exchange of effective breeders between populations of the same subspecies; i.e. at least one male or one female, rhino capable of breeding, should be brought into each population every 10-15 years in order to compensate for inbreeding, genetic drift, etc. Experience of this....
- To minimise loss of genetic diversity through GD
 - rapid rates of population growth must also be maintained, particularly in the smaller populations.

Lessons

- **Not acting is NOT the safe option** for either
 - Biological management to meet demographic growth targets
- Or..
 - Genetic management to prevent inbreeding and genetic drift and to maintain long term viability of subspecies.
- IUCN Rhino Reintroduction Guidelines

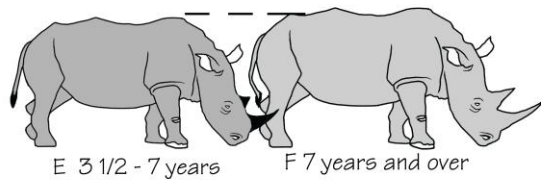
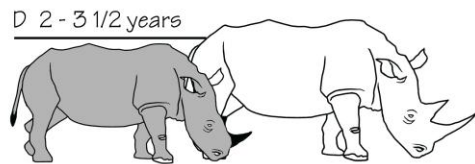
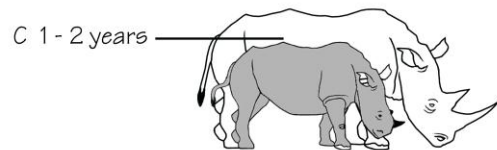
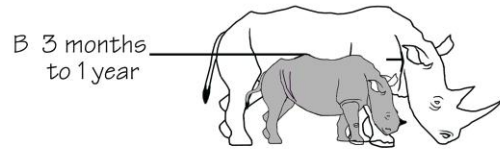
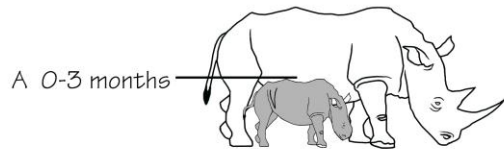
Monitoring

Monitoring

- Done regularly – Different methods for different situations
- Individual population estimates provided to RMG (BR) and AfRSG (Both Spp) but are not released. However country totals by subspecies updated regularly and released.
- Essential for informed management decision-making
- Assess progress towards plan targets
- Learn how to improve management
- LE Monitoring (not today)
- TRAFFIC's Rhino Horn Stockpile database

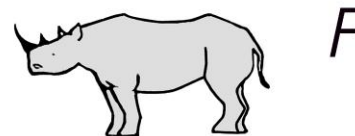
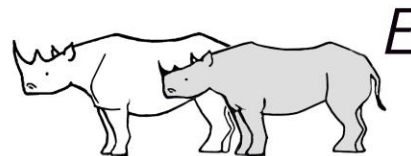
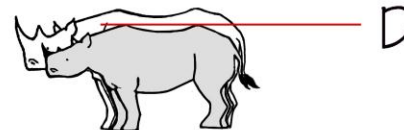
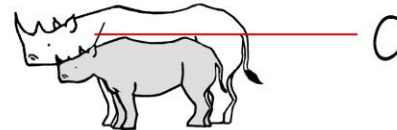
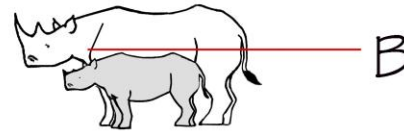
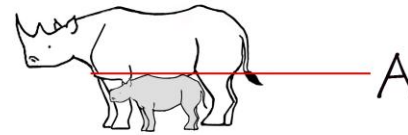
Ageing rhino

WHITE RHINO AGE CLASSES



6.8

STANDARDISED BLACK RHINO AGE CLASSES





AGE CLASS BOUNDARIES

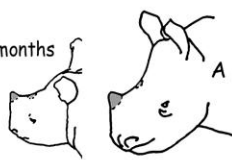
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Ageing black rhino


AGEING OF BLACK RHINO CALVES OF 0 - 12 MONTHS

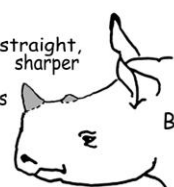
0 - 1 month  A


1 - 2 months  A
at c. 2 months, front horn just visible

2 - 3 months  A
at c. 3 months, back horn just visible


3 to 4 months  B

4 to 5 months  B
very rounded horn tip

7 - 8 months  B
often straight, sharper


c. 12 months  B
very slight curve


11-12 months calf (c. 1 year old)





6.2


Approximate Appearance Of Horns In Black Rhino From 1 Year Old Until Adult

near 1 year old (end of B-class) 

near 2 years old (end of C-class) 

near 3 1/2 years old (end of D-class) 

near 5 years old (still E-class) back horn even-sided triangle 

7 years and older (F-class, adult) 

6.3

Master file Identikits



BLACK RHINO IDENTIKIT SHEET



Reserve: _____

Name: _____

Status: Alive / Dead / Removed

Date First Known: _____

Code #: _____

Origin: _____

Date of Birth _____

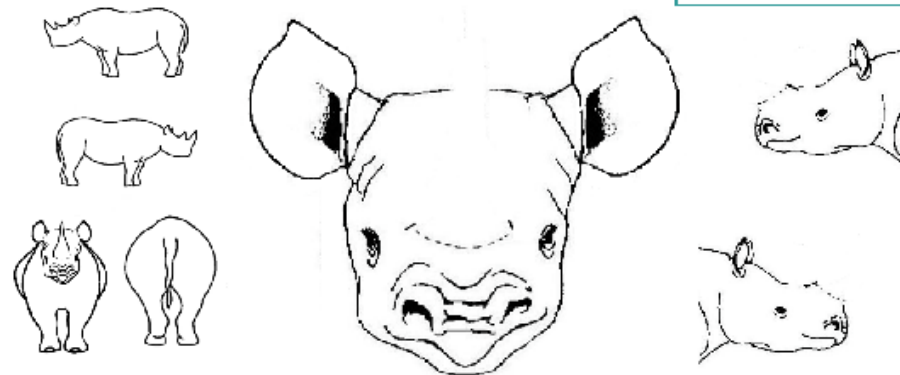
Conf. _____

Sex _____

Current Age Class: A B C D E

Date of Independence from Mother: _____

Date Notched: _____



Notch #: _____

Notes (e.g. on Main Range Patterns, Associations, Events and Major Movements):

Blank area for handwritten notes.

Mother _____ Father (if known) _____

Transponders:	Number
Position:	
_____	_____
_____	_____
_____	_____
_____	_____

Introduction details:

Place of Birth: _____

Introduced from: _____

Date of Release: _____ Time Boma'd: _____

Notes: _____

Calf Details:

Birthdate	Conf.	Sex	First Seen	Calf ID	Survived?

Death Details:

Date found: _____ Time Since Death: _____

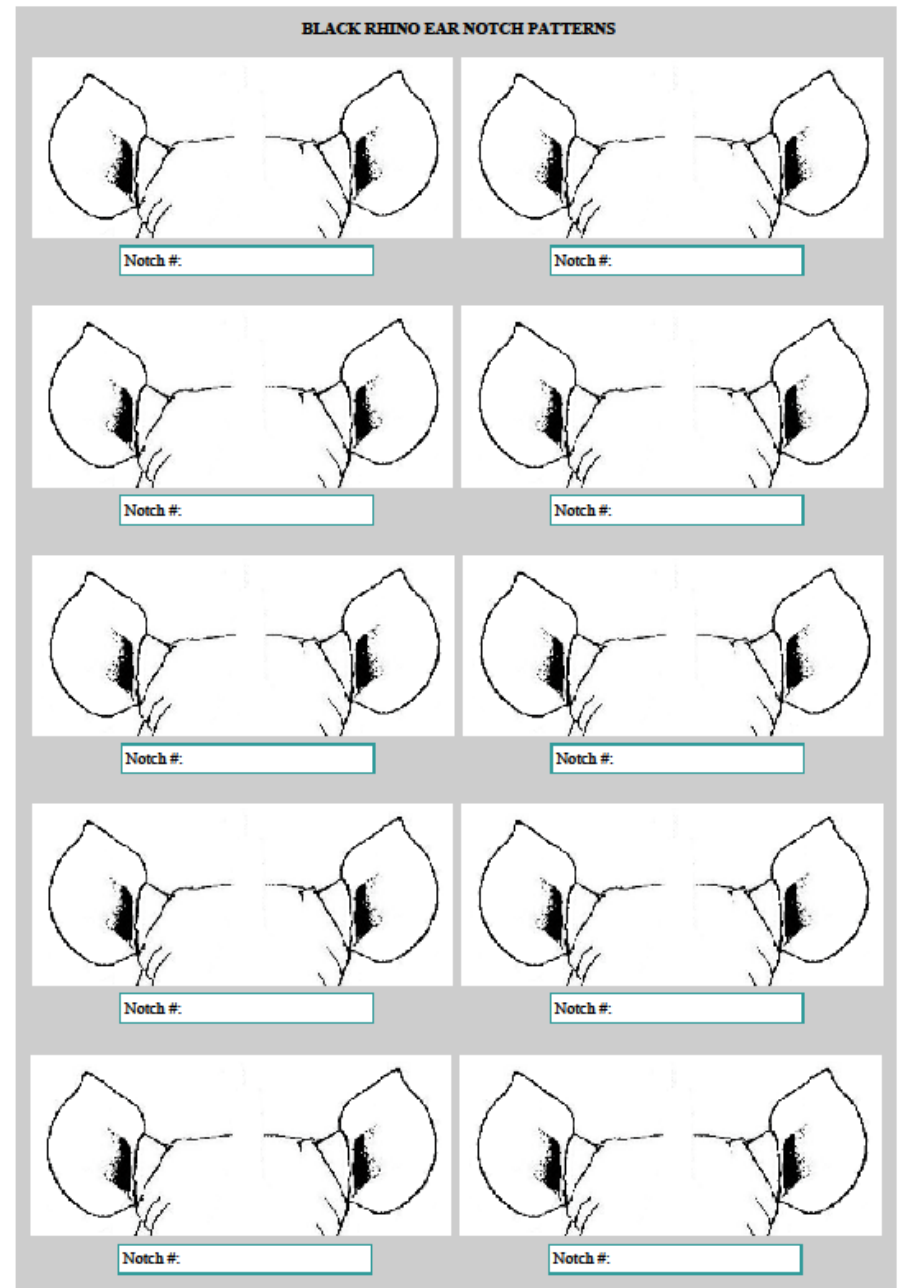
Cause of Death: _____

Removal Details:

Date Captured: _____ Destination: _____

Master file

- Ear notch pages for front of file to speed up ID



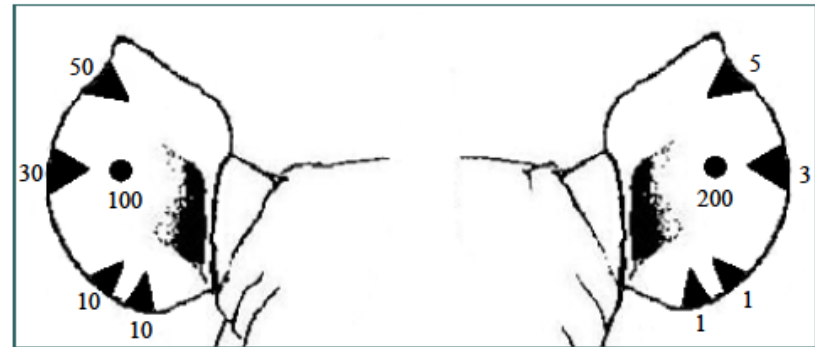


Ear notches

- Different notch systems.
- Key is for each animal in a popn to have a unique ID
- ID not suitable for very large areas or where say 400+ rhino

Rhino's Right

Rhino's Left



The Zimbabwean National Numbering System works by taking the ear notching number and adding:

+1000 for males

+2000 for females

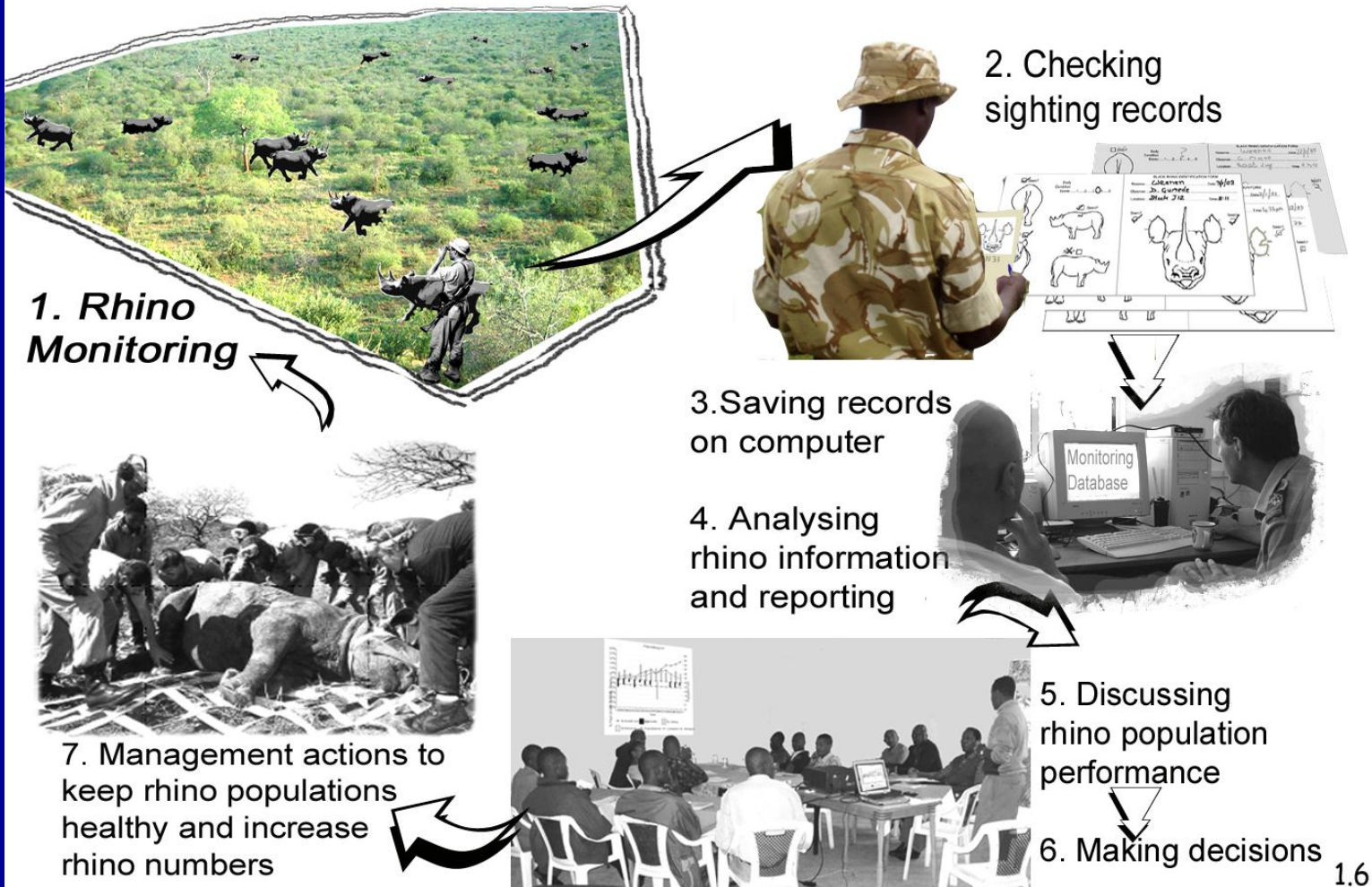
Example:



Notch #: 2245

Monitoring – Quality Key

THE IMPORTANCE OF GOOD MONITORING INFORMATION



Population estimation

- ID based
 - Counts of known ID rhino seen in specified time
 - RHINO Mark-Recapture is proportion “clean”
- Aerial & Ground
 - Helicopter block counts (accurate as precise and relatively unbiased) Kruger, Etosha
 - Distance sampling (estimates true number but imprecise unless sample sizes large so any one count may be innaccurate)
Ground based in HiP Aerial KNP
 - Other counts – if uncorrected simply a minimum number (NOT estimate of true number)
- AfRSG System (excludes speculative guesstimates and often errs on side of conservatism).

Monitoring / Capacity / International

- Over to Dr Jo Shaw
 - RMG Black Rhino Status Reporting
 - Current WR survey and database
 - Horn stockpile management
- Then over to Dr Joseph Okori
 - Capacity building
 - South Africa and furthering regional and continental rhino conservation (eg translocations to restock other range states)
- Finally back to me briefly
 - Hunting

Hunting

Black rhino fine...

White rhino Quota? Criteria?
National Central System?

BR Hunting Application Assessment System

