Survival quest of the African Rhino

Deon Furstenburg, 2022 (Pr.Sci.Nat.115086)

Estimated current global rhino numbers alive is 3 588 greater one-horned rhino, <80 Sumatran rhino, 75 Javan rhino. Numbers of black rhino plummeted from >100 000 in 1960 to an all-time low of less than 2 500 in 1995, and currently between 5 366–5 627. Northern white rhino became extinct in Feb 2018. Southern white rhinos plummeted to an all-time low bottle-necked single population in 1895 of between 20-50 animals remaining in what is known today as Hluhluwe-iMfolozi Park (KwaZulu-Natal).

The entire global white rhino population of today had been re-instated and bred from this single genetic source. The first relocation happened in 1961 to the Loskop Dam Nature Reserve and followed by a second relocation in 1965 to Kruger National Park.

Southern white rhino numbers recovered as a result of protection and conservation and reached a maximum around 21 000 in 2012, whereafter it plummeted to less than 16 000 at present. The current South African population is estimated at less than 13 000, of which 2 458 (official numbers reported) at the end of June 2022 in the Kruger National Park and constantly declining at a rate of -10,2% per annum since 2008, and more than >8 000 white rhinos on private ranches and increasing at a rate of 9% per annum since 2012.

Orphaned white rhino in a rehabilitation centre (Photo: D. Furstenburg)

Adult white rhino (Photo D Furstenburg)

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Refer to latest research & documentary:

- https://www.researchgate.net/publication/365184341_Contribution_of_Private_Game_Ranching_and_Captive_Bred_Operations_in_South_Africa_to_White_Rhino_Ceratotherium_simum_Species_Survival_Conservation
- https://youtu.be/BuhJ99FOvY4

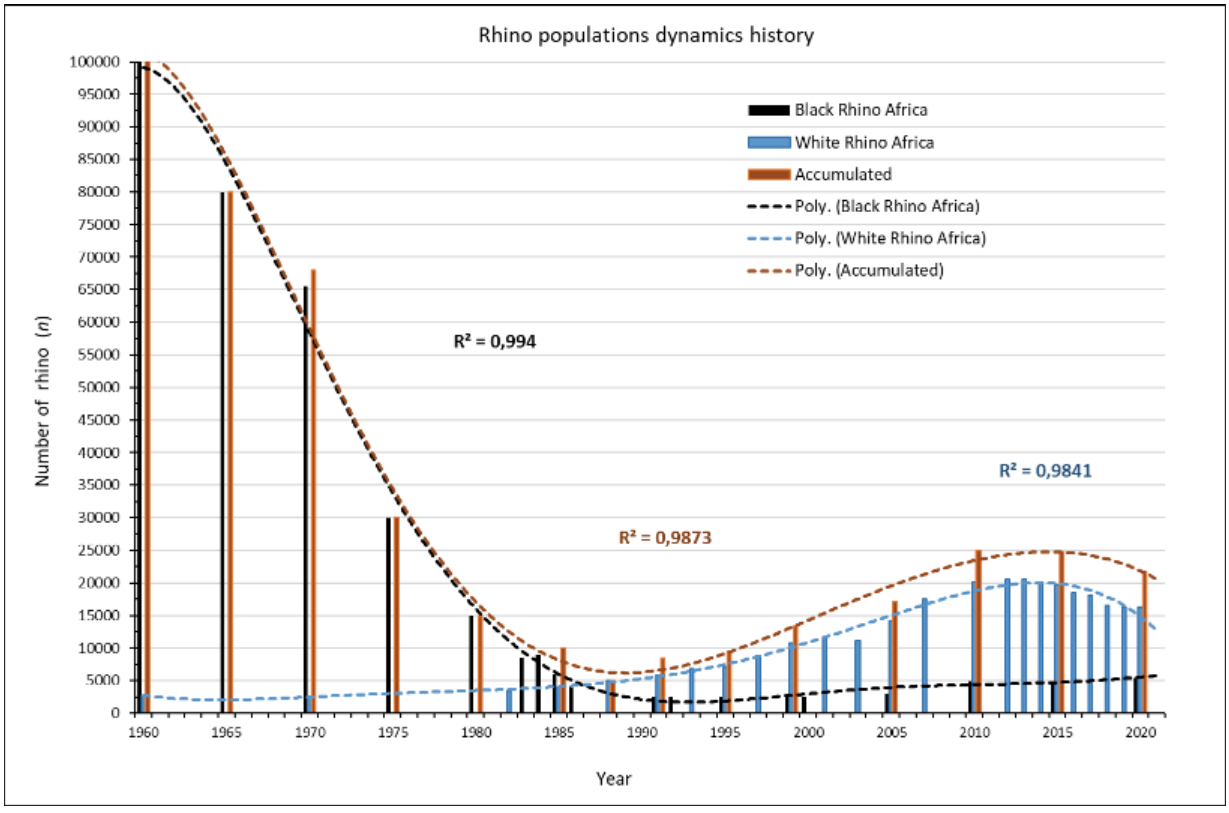

Figure 1: History of black & white rhino numbers in Africa from 1960 to 2020.

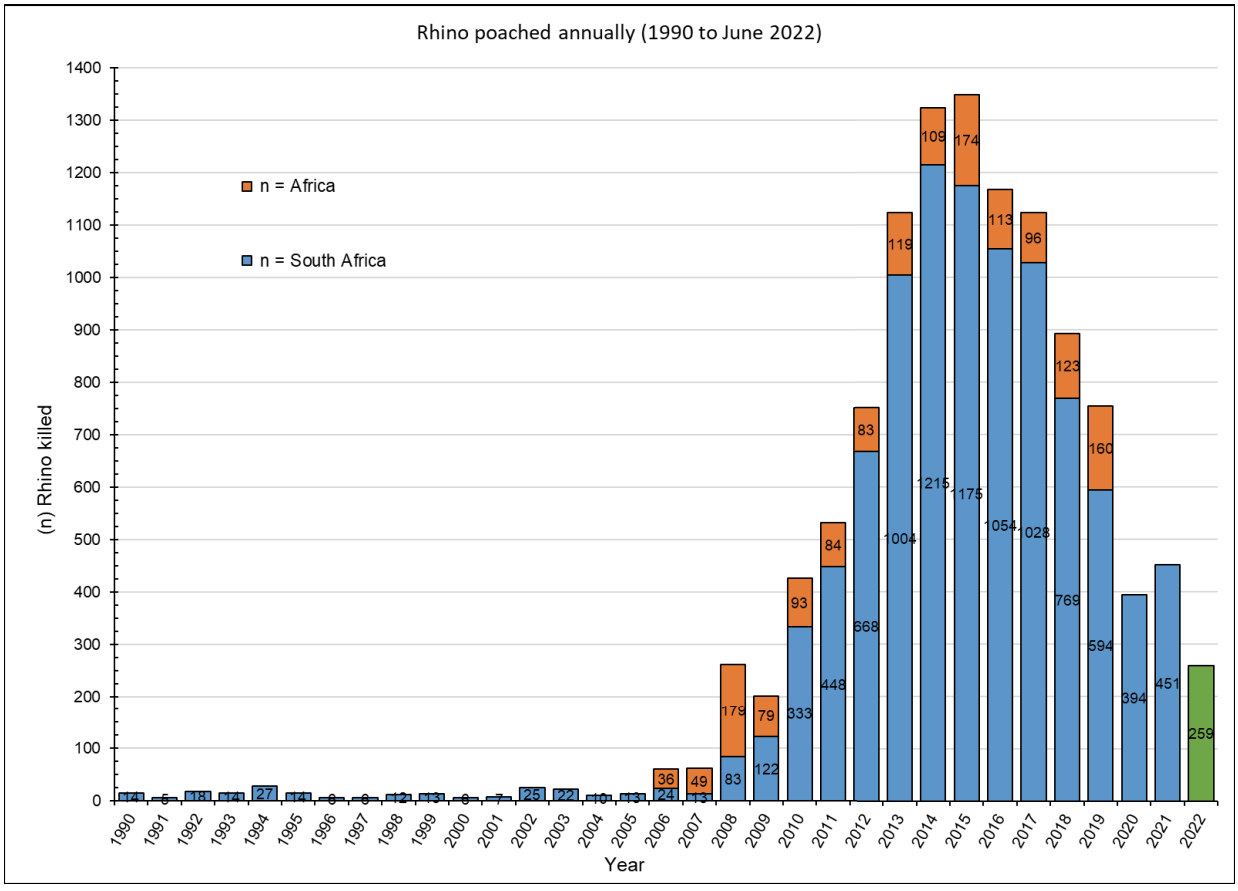

Figure 2: History of recorded number of rhinos poached in Africa and South Africa (2022 is for 6 months until 30 June).

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Origin & Historic Existence

Perissodactyls comprise the Tapiromorphs (tapirs and rhinos) and the Hippomorphs (horses *Equus*) developed from a common pre-ancestor and diverged from each other around 55-60 ma bp (million year before present) in North America. The Tapiritoidea and Rhinocerotoidea shared a small (60-80 cm high) horse-like common ancestor named *Hyrachyus eximus* that lived from 50-47 ma bp (Figure 3) and diverged from each other around 54 m bp. Rhinocerotoidea consisted of three families, Hyracodontidae, Amynodontidae and Rhinocerotidae.

- The **Amynodontidae** (Metamynodons), the "aquatic rhinos" with no horns, from the late Eocene to the early Oligocene (45-30 ma bp) resembled hippos and dispersed in rivers and lakes across North America and transcended into Eurasia.
- The **Hyracodontidae** or "running rhinos " originated in North America (45-40 ma bp) and were well adapted for speed. They ranged from dog-sized to the largest mammals ever found on earth, the *Indricotherium* and *Paraceratherium* (Figure 3), browsers that was 6 m tall, 9 m long, and with a mass exceeding 20 000 kg. These large pachyderms continued to spread across Eurasia until the early Miocene (until 18 ma bp).
- The **Rhinocerotidae** which evolved in Eurasia in the late Eocene (from around 40 ma bp, Figure 4) and crossed into North America, had 26 known genera most of which became extinct in the middle Oligocene (around 25 ma bp). The last of the North American rhinos became extinct during the Pliocene (between 5,3-2,6 ma bp).

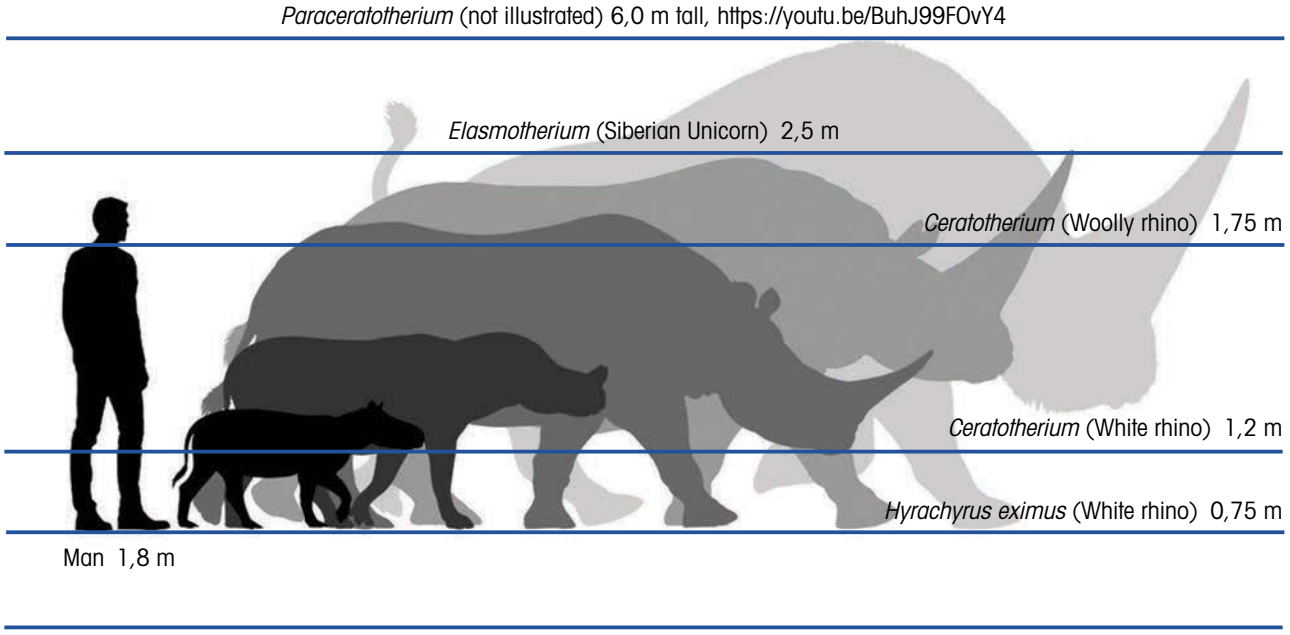


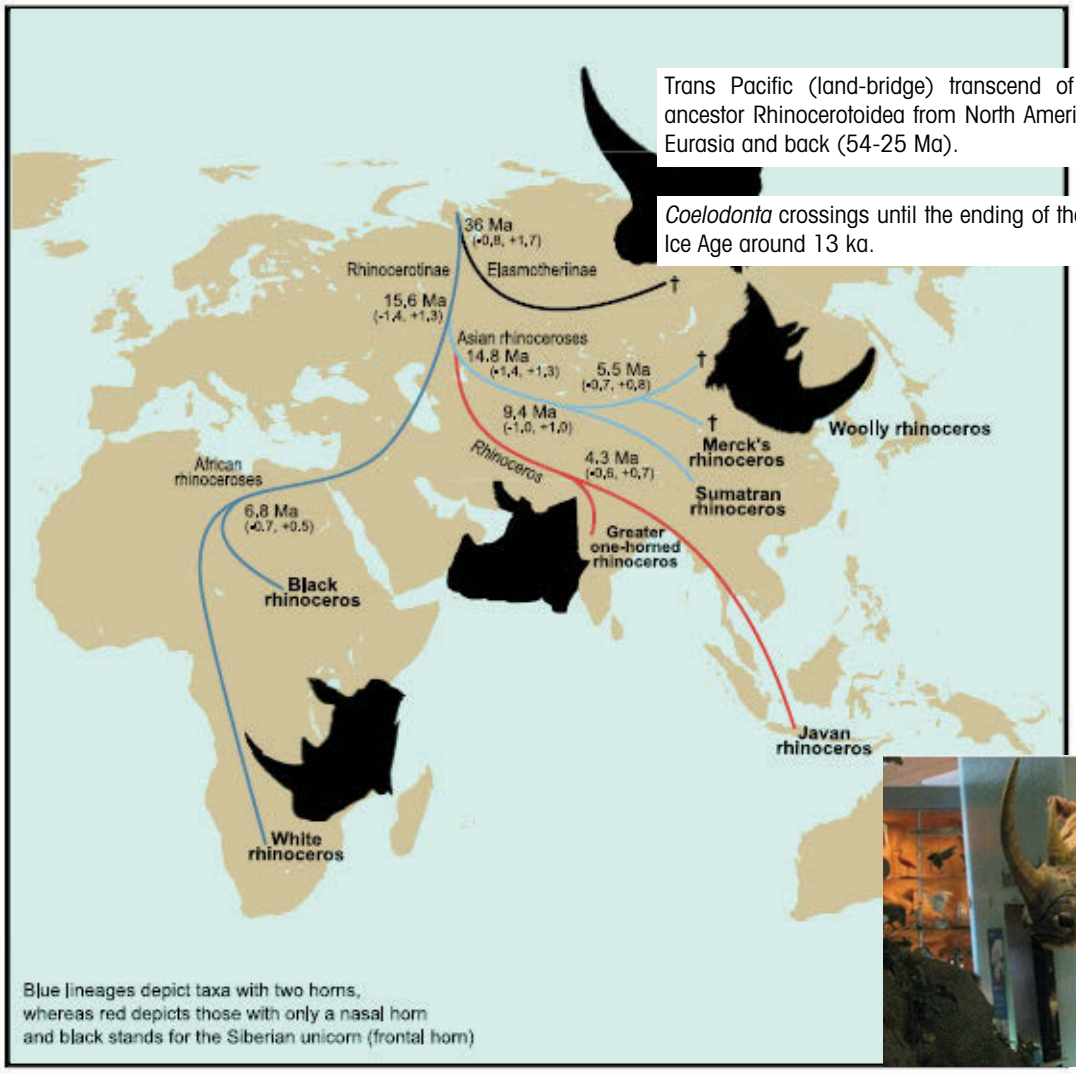
Figure 3: Size comparison of some Rhinocerotoidea from different time eras, from the rhinoceros clade that consists of more than 100 species, of which only 5 extant live species.

Rhinocerotidae

An early common pre-ancestor was *Trigonias osborni* (the first rhino-like bulky animal of 80 cm high, without horns) living from 38-33 ma bp. The largest of these mammals was *Elasmotherium* the giant Siberian Unicorn of Siberia (2,5 m tall, 5 m long, and 5 000 kg) with one horn. The Elasmotheriinae has split from the Rhinocerotinae in northern Eurasia around 36 ma bp. At about 15,6 ma bp the Asian rhinoceroses diverged

from the European / African lineage. From the Asian lineage, at 14,8 ma bp split-off the Greater one-horned rhinoceros of India, from which developed the Javan rhinoceros (4,3 ma bp). The Asian lineage further split into the Sumatran rhinoceros around 9,4 ma bp, and Merck's rhinoceros (5,5 m bp) and *Coelodonta* the Woolly rhinoceros in China (1 ma bp). The Woolly rhino was hunted to extinction by early man around 13 000 a bp at the end of the last Ice Age. The European lineage of Rhinocerotinae (the group Dicerotini with two horns, genus *Diceros*) spread across the eastern Mediterranean on dry land during times of low sea levels and *Diceros praecox* arrived in northern Africa in the late Miocene 11-8 ma bp, from which developed the black rhinoceros around 6,8 ma bp. From the black rhino descended the white rhinoceros (5-4 m bp).

Elasmotherium Giant Siberian Unicorn (Source: unknown)



Perfectly preserved young *Coelodonta* Woolly rhino, approximately 4 years old when it died around 20 000 Bp, and recently revealed by melting permafrost (Photo: *Chemical Engineer*)

Figure 4: Evolutionary history of the modern rhinoceros family, https://doi.org/10.1016/j.cell.2021.07.032

The Rhinocerotidae has four genera with five extant species and six subspecies (Figure5):

- *Rhinoceros* the single-horned rhinoceros with two species:
  - *R. unicornis* the Indian (Greater one-horned) rhinoceros
  - *R. sondaicus* the Javan rhinoceros
- *Dicerohinus* the two or double-horned Sumatran rhinoceros *Dicerohinus sumatrensis*
- *Ceratotherium* the white or square-lipped rhinoceros with two subspecies:
  - *C. simum simum* the southern white rhinoceros
  - *C.s. cottoni* the northern white rhinoceros (extinct in the wild)
- *Diceros* the hook-lipped or black rhinoceros with six subspecies:
  - *D. bicornis longipes* the West African black rhinoceros
  - *D.b. brucii* the north-eastern black rhinoceros
  - *D.b. michaeli* the East African black rhinoceros
  - *D.b. bicornis* the Cape or black rhinoceros
  - *D.b. minor* the southern black rhinoceros
  - *D.b. chobiensis* the south-western black rhinoceros

Both the black and white rhinoceros evolved in Africa and are thus endemic to the continent.

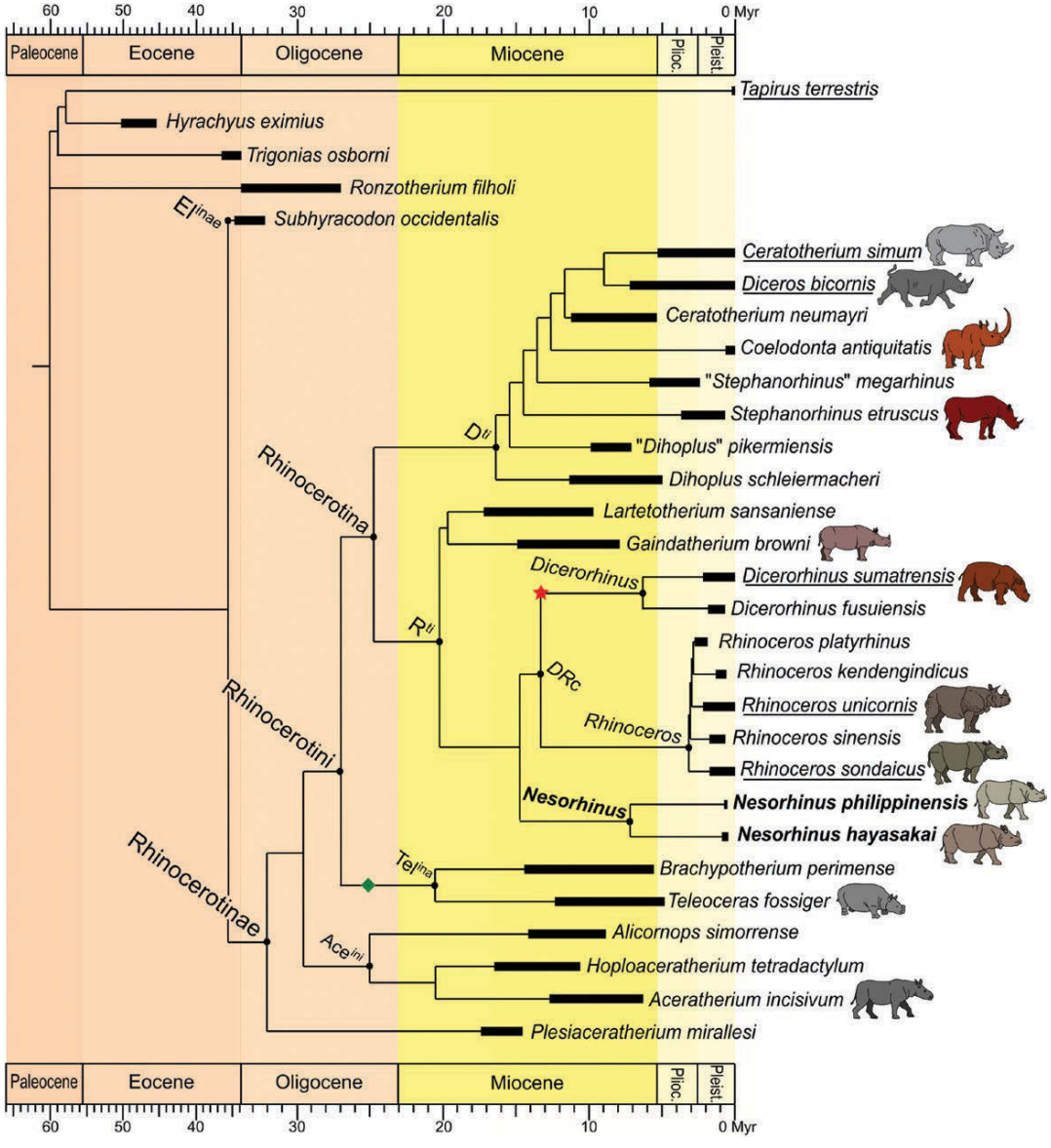


Figure 5: Phylogenetic tree of the Rhinocerotidae, built from 278 unweighted craniomandibular, dental and postcranial characters scored in 30 ceratomorph species, and replaced in their stratigraphical context, https://doi.org/10.1093/zoolinnean/zlab009

Black rhino

Except for the Congo Basin, black rhinos were once found throughout sub-Saharan Africa, as far south as the Cape peninsula and on the slopes of Table Mountain. The last documented individual in the Cape was killed in 1853.

By the 1960s the black rhino had almost disappeared from Ethiopia and Somalia and, at that time, numbered >100 000 but by 1970 it was estimated that only 63 000 remained on the continent. The poaching epidemic that began in the early 1970s eradicated almost all black rhinos outside conservation areas. In 1981 there were <15 000 left and by 1993 only 2 475. Since 1980, black rhinos have probably been eliminated from Angola, Botswana, Chad, the Central African Republic, Ethiopia, Malawi, Mozambique, Somalia, Sudan, and Zambia.

Private ownership of black rhino began in 1990 through the sales conducted by the Ezemvelo KZN Wildlife, and by 1997 there were 50 animals on private land, and globally 2 420. Over the last 19 years a mere annual population growth rate of 2,19% (Figure 1), underperforming the international IUCN targeted norm of 5%.

White rhino

The white rhino occurred from Morocco, across the western Sahara and the Sahel, to the eastern, central, and southern areas of Africa. The most southern record of white rhino is a skeleton found when excavating the foundations for the Grassridge Dam between Hofmeyr and Middelburg, Eastern Cape. The range excluded areas covered by tropical forests, humid highveld grassland and sour montane grasslands at high altitudes. More recently, a gap approximately 2 000 km wide appeared between the northern and southern white rhino sub-populations and resulting the genetic diversion version of the two subspecies and coincided with the global climatic changes between the humid and dry periods that affected the expansion and retreat of the African forest zones. At present the distribution of rhino in Africa is limited to protected parks and private game farms. By 1895 the southern white rhino population approached near extinction with the last, between 20 and 50 individuals remaining in a single population (genetic bottleneck) in the Umfolozi Game Reserve in KwaZulu-Natal. By 1929, conservation measures restored the numbers to 150, by 1960 to 700 and by 1970 to 2000. During the late 1960s and the 1970s several southern white rhinos were relocated to other African countries such as Kenya, the Ivory Coast, Namibia and Zimbabwe. Extensive poaching and civil war in northern Africa reduced the numbers of the northern white rhino from 2 000 animals in 1960, to 17 in 1988, and became extinct in the wild in February 2018 – currently only one living animal remaining. Southern white rhino summited at around 21 000 in 2012 and plummeted to around 13 000 at present – an annual average decline of -4,62% over 10 years (Figure 6).

Sudoku oplossing

9	8	3	6	4	5	1	7	2
4	1	5	3	7	2	6	9	8
6	7	2	1	9	8	4	3	5
8	6	1	5	3	7	2	4	9
7	2	4	8	6	9	3	5	1
3	5	9	4	2	1	7	8	6
5	4	8	7	1	6	9	2	3
1	9	7	2	8	3	5	6	4
2	3	6	9	5	4	8	1	7

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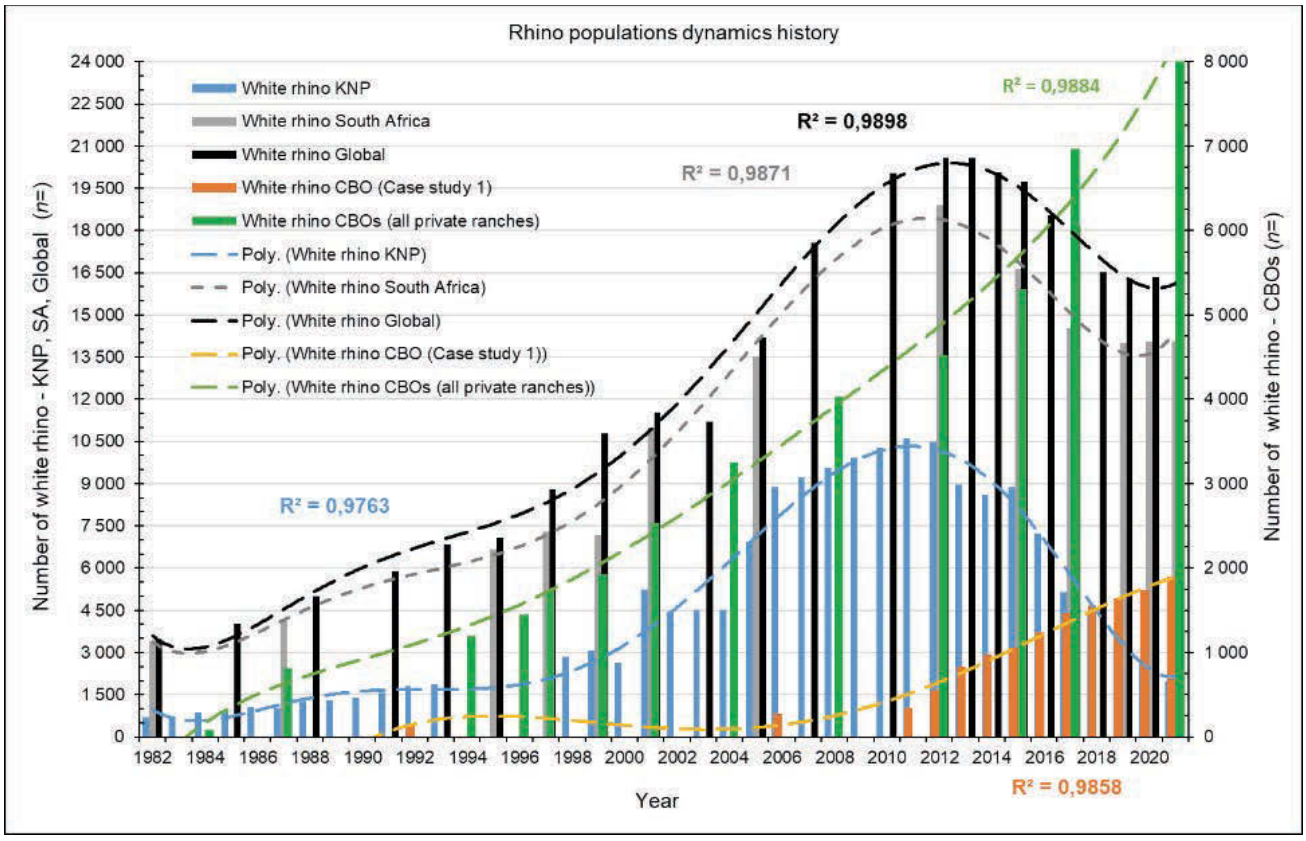


Figure 6: Meta-population dynamics of Southern White rhino numbers since 1982, for Africa, South Africa, Kruger National Park, Private ranches and captive breeding operations, https://doi.org/10.33140/JVHS.03.04.05

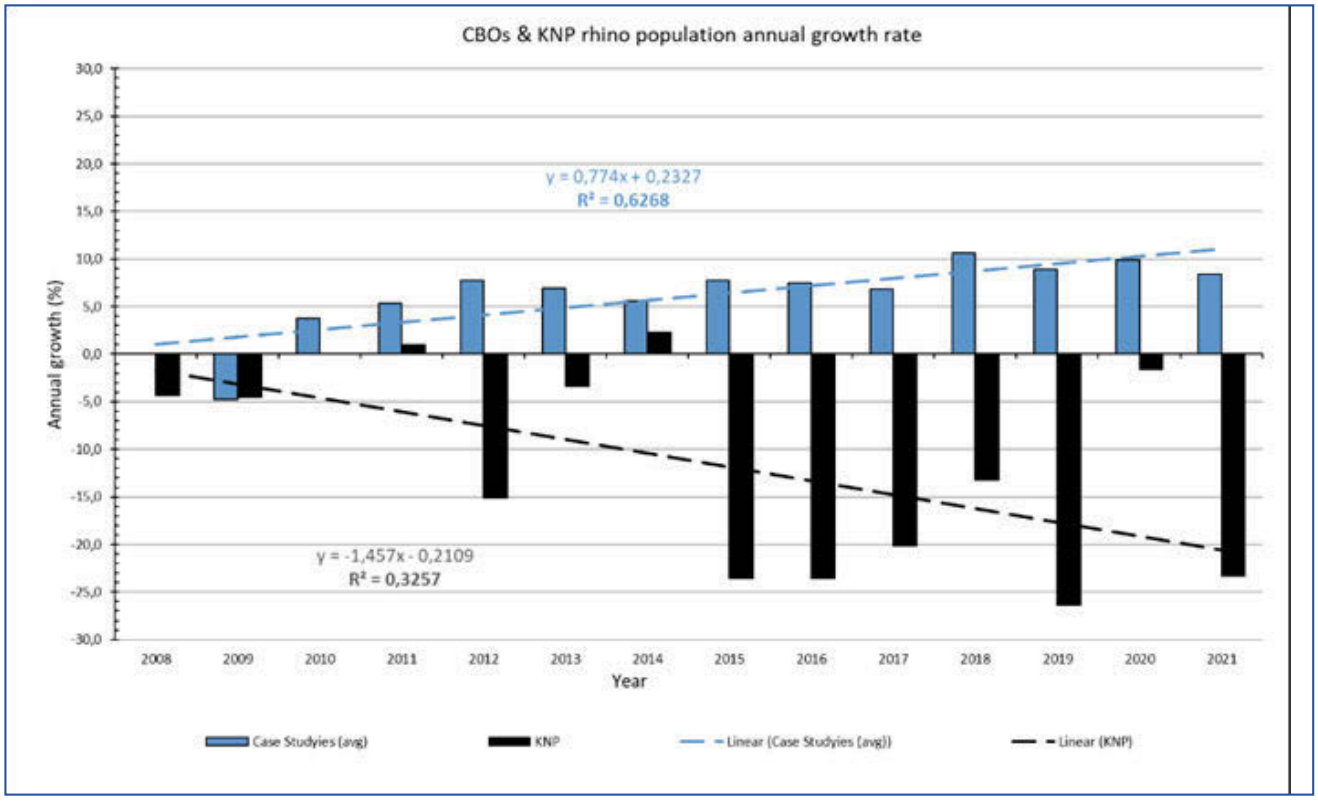


Figure 7: Southern white rhino population trend for six Privately Managed populations (9,6% avg. annual growth, n= 2 882 rhinos by mid 2021) versus KNP (minus -10,2% avg. annual decline, n= 2 607 rhinos at end of 2020), https://doi.org/10.33140/JVHS.03.04.05

Hunting

The introduction of trophy hunting of adult bull white rhinos started in 1968 when there were only 1 800 animals. It is estimated that the direct contribution of trophy and biltong hunters in 2016/2017 to the South African economy was ZAR 13,6 billion, also the indirect and induced impact need to be added. Prior to 2012 an average of 0,7% of the national white rhino population were hunted annually, and 0,4% since 2013 to present. It was only after the first wildlife auctions in the late 1980s that rhinos began to realise their commercial market value, incentivising private owners to also bring the rhino population up through breeding. According to Knight (2015) the simultaneous development of more incentivising legislation (not by design!) around the ownership of wildlife saw the white rhino population grow to >4 000 animals on approximately 400 private properties in South Africa by 2008. Legal hunting has not yet caused a cessation in population growth.

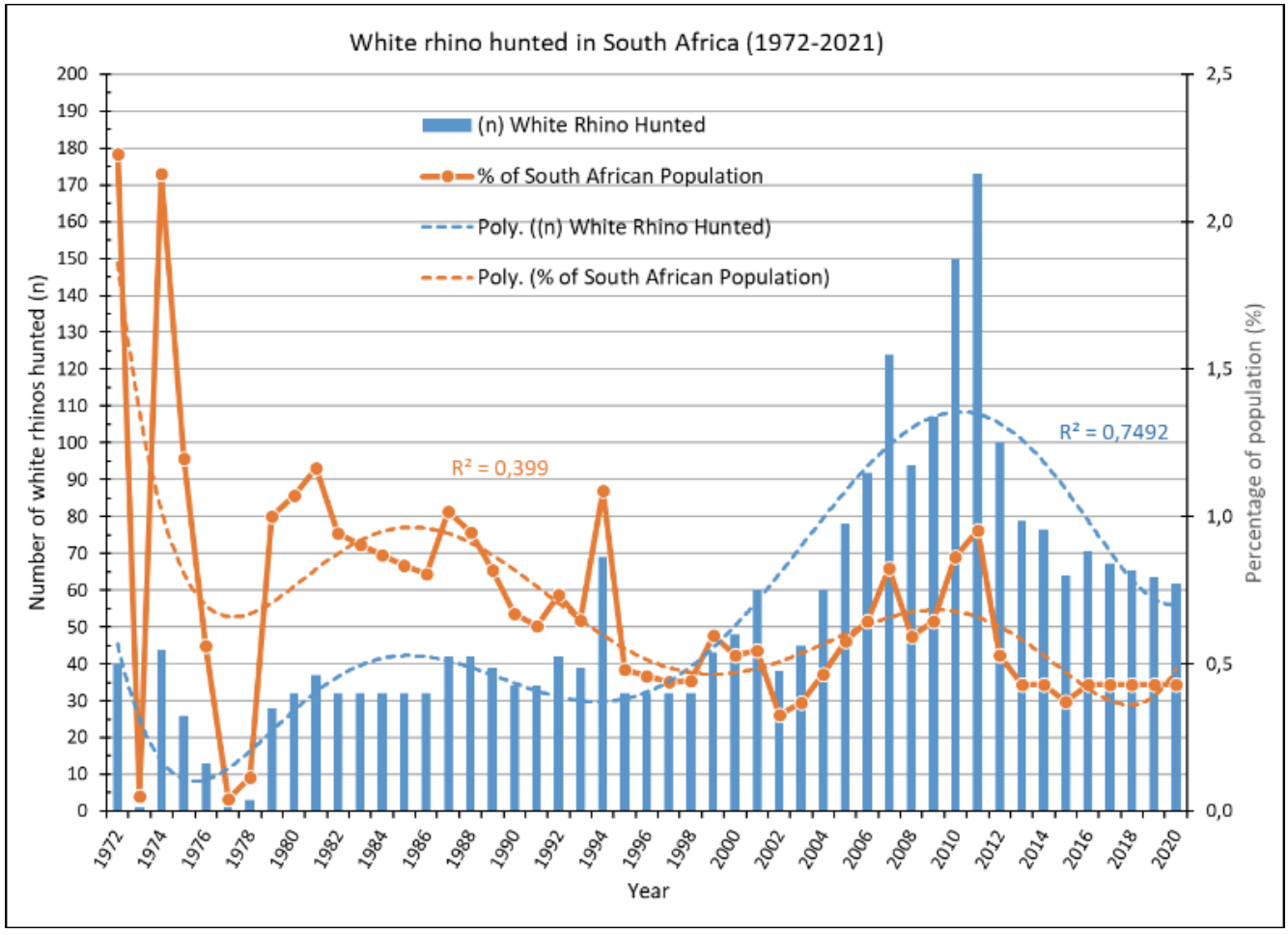
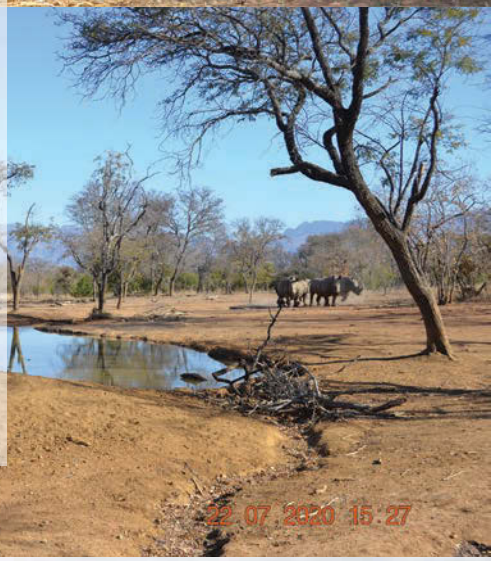


Figure 8: Annual number of rhino hunted in South Africa as a percentage off-take (avg 0,6%) of the national population. tSasRolfes et al. (2022).

Private rhino management

Scientific studies of six private rhino captive bred operations that contained 2 882 white rhino in 2021 (20,6% of the national South African population) on 22 769 ha of land, revealed the operations to be semi-wild, and of rewilded ecological biodiversity enhancement, and an annual population growth rate of 9,6% (https://doi.org/10.33140/JVHS.03.04.05)



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Save the Rhino. 2022. www.savetherhino.org

Collage from four different studied Captive Breeding Operations illustrating the ecological semi-wild nature of private Agro-sustainable biodiversity rhino production management (Photos: D Furstenburg).

AFRI WILD Services

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SERVICES include, but not limited to:

- Habitat assessment / evaluation
- Impact assessments
- Environmental Scoping reports
- Game Ranch & Reserve planning
- Optimization of existing Ranches
- Veld management strategies
- Vegetative carrying capacity
- Habitat suitability & Animal / plant interactions
- Animal composition & stocking
- Population dynamics & modelling
- Semi-intensive -extensive breeding programmes & system outlays
- Politics – Policies & Legislation
- Scientific Advisor to WRSA
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