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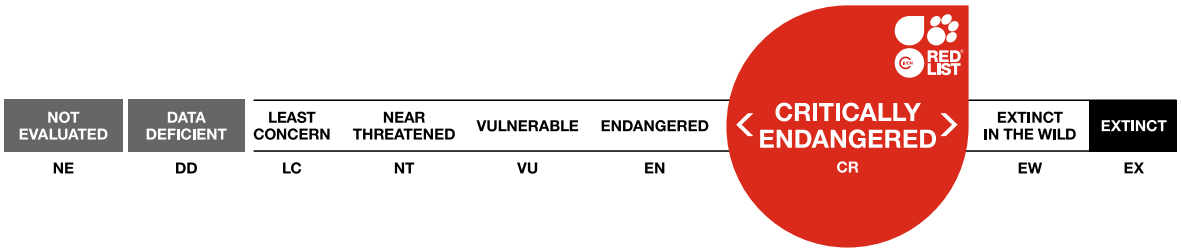
Diceros bicornis, Black Rhino

Assessment by: Emslie, R.



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Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Mammalia	Perissodactyla	Rhinocerotidae

Scientific Name: *Diceros bicornis* (Linnaeus, 1758)

Synonym(s):

- *Rhinoceros bicornis* Linnaeus, 1758

Infra-specific Taxa Assessed:

- Diceros bicornis ssp. bicornis
- Diceros bicornis ssp. longipes
- Diceros bicornis ssp. michaeli
- Diceros bicornis ssp. minor

Common Name(s):

- English: Black Rhino, Black Rhinoceros, Hook-lipped Rhinoceros
- French: Rhinocéros noir
- Spanish; Castilian: Rinoceronte Negro

Taxonomic Notes:

There is significant population genetic differentiation between all three extant subspecies of Black Rhinoceros (hereafter Black Rhino) recognised by the IUCN SSC African Rhinoceros Specialist Group (AfRSG) (Harley *et al*. 2005), and the differences are consistent with them being considered subspecies although it is unlikely that outbreeding depression would occur in any mix of these populations (E. Harley pers. comm. 2016).

Subsequent classification analyses of RhoDIS DNA samples (originally undertaken primarily for forensic purposes) also strongly supported use of the current three surviving subspecies classification at a continental level. It also indicated that *Diceros bicornis minor* samples could be further subdivided into those of Zambesi, KwaZulu-Natal (KZN) or mixed Zambesi/KZN origin (Emslie 2018, Harper *et al*. 2018). Moodley *et al.* (2017) also found this partitioning of *D. b. minor*. The populations founded with KZN animals were found to be less genetically diverse than ones derived from Zambesi animals due to a relatively recent severe bottleneck (Emslie 2018, Harper *et al*. 2018). Data indicates that most of the genetic diversity has been recovered in the large mixed KZN/Zambesi founded population in the Kruger National Park (C. Harper pers. comm. 2018).

Strong support for continuing to use the three remaining subspecies/management units also comes from independent work on different DNA datasets by Moodley *et al.* (2017) and Le Roex (2018). Moodley *et al.*'s (2017) analyses were based on wide sampling of rhino DNA from existing populations as well as from 217 museum specimens worldwide (covering many areas where Black Rhino have since been extirpated). This work found that that 69% of the species' mitochondrial genetic variation has been lost. Based on nuclear and mitochondrial data from Moodley *et al.* (2017) four surviving Evolutionary Significant Units (ESU's) were identified for Black Rhino. Three of these ESU's (SC, EA and CE haplogroups/populations) were found to be co-occurring with secondary contact having occurred in East

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Africa. An East African Community Rhino Management Group meeting which had a focus on African rhino genetics (and was also attended by some IUCN SSC AfRSG and Conservation Specialist Group members) recommended that due to this co-occurrence, these three ESU's in East Africa should constitute and be managed as a single Eastern Black Rhino Management Unit Cluster (equivalent to *D. b. michaeli*). While Moodley *et al.*'s (2017) data also indicated there was a single surviving Evolutionary Significant Unit in Southern Africa, microsatellite data further indicated this Southern ESU should be subdivided into South Western and South Eastern Black Rhino Management Unit Clusters. These two southern African Management Unit Clusters are equivalent to *D. b. bicornis* (SW haplogroup) and *D. b. minor* (SE and SN haplogroups) subspecies respectively).

Moodley *et al.*'s (2017) study also found that the historic range of the Western Black Rhino (*D. b. longipes*) that has been declared Extinct extends into an inter-crossed predominantly *D. b. michaeli* population in the Masai Mara (CV haplogroup). However, very few individuals with this CV haplotype probably survive.

Thus there was agreement across different studies that used different data sets and different analytical methods that the three recommended Management Unit Clusters mapped closely onto and supporting the existing three surviving Black Rhino subspecies classification.

All studies found that differences were greatest between *D. b. michaeli* and the other two southern African subspecies *D. b. minor* and *D. b. bicornis*. Putative subspecies boundaries in current species plans also in part reflect climatic and habitat differences as well as taking into account potential barriers to movement such as the “Transkei gap”.

Based on very small sample sizes, Moodley *et al.*'s (2017) results suggested that perhaps the original historical Black Rhino that used to occur in Zambia but which had been wiped out by poaching by 1995 might be better classified as *D. b. michaeli* than *D. b. minor*. However, on account of the small sample sizes, and given that the species was reintroduced with *D. b. minor* founders, and that historically Zambia had been considered *D. b. minor* range, and climate and habitats are more similar to some *D. b. minor* range; reviewers recommended that historical pre-1995 Zambian animals should continue to be allocated to *D. b. minor* for this Red List revision (as has historically been the case). With further data this may change in future. As there were still significant numbers of Black Rhinos in Zambia in the early 1970s how these animals are allocated influences the *D. b. minor* subspecies Red List assessment which would change to Endangered under criteria A2 and A4. The *D. b. michaeli* assessment remains the same whether or not the historical animals are classified as *D. b. minor* or *D. b. michaeli*.

Assessment Information

Red List Category & Criteria: Critically Endangered A2abd+4abd ver 3.1

Year Published: 2020

Date Assessed: January 14, 2020

Justification:

Qualifies for listing as Critically Endangered (CR) under criteria A2abd+4abd. See Figures 8 and 9 and Tables 4 and 5 in the Supplementary Information document. While Black Rhino numbers have more

than doubled since bottoming out in the mid 1990s (due to increased protection and enhanced biological management to keep more subpopulations productive), the species qualifies as CR due to the scale of the decline in numbers over the past three generations as a result of very heavy poaching in the 1970s, 1980s and early 1990s. Three generations ago (i.e., 44 years back in 1973) the point estimate for Black Rhinos was 37,807 rhinos and despite numbers more than doubling from a low of 2,354 were only 5,495 as of end 2017. This represents a decline over three generations of 85% qualifying as CR under criterion A2. An 83% reduction was projected one year (based on data up to and including 2017) into the future (from 1974–2018). This reduction was the same as observed in point estimates for these dates. The next worse projected reduction in point estimates over three generations was when modelling two years ahead from 1975–2019 (an 81% reduction from an estimated 28,674 in 1975). Numbers continue to increase at a continental-level although at a reduced rate due to the escalation of poaching since 2007.

For further information about this species, see Supplementary Material.

Previously Published Red List Assessments

2012 – Critically Endangered (CR)
https://dx.doi.org/10.2305/IUCN.UK.2012.RLTS.T6557A16980917.en

2011 – Critically Endangered (CR)

2008 – Critically Endangered (CR)

2003 – Critically Endangered (CR)

2002 – Critically Endangered (CR)

1996 – Critically Endangered (CR)

1994 – Endangered (E)

1990 – Endangered (E)

1988 – Endangered (E)

1986 – Endangered (E)

1965 – Unknown (N/A)

Geographic Range

Range Description:

There are now three remaining recognised subspecies/genetic management clusters of Black Rhino occupying different areas of Africa. Strong support for this classification has been provided by independent analyses of different genetic data sets by different researchers using different analytical methods. See Taxonomic Notes for more details. A fourth recognised subspecies *Diceros bicornis longipes* once ranged through the savanna zones of central-west Africa but it is now considered to have gone Extinct in its last known habitats in northern Cameroon.

The other three more numerous subspecies are found in the eastern and southern African countries.

Today putative *D. b. bicornis* range includes Namibia, southern Angola, western Botswana, and southwestern and southeastern South Africa (up to the Kei River), although today they occur only in Namibia (the stronghold) and South Africa with a sighting of one animal in Angola and unconfirmed reports of possibly another three animals.

Diceros b. michaeli was distributed from South Sudan, Ethiopia, and Somalia, through Kenya into northern-central Tanzania and Rwanda. Its current stronghold is Kenya. Smaller but growing numbers occur in northern Tanzania. The single animal that survived in Rwanda has died. One important free-ranging subpopulation occurs outside its range in a private game reserve in South Africa. Contractually, these *D. b. michaeli* animals may only be translocated back to historical range and not elsewhere in South Africa. The repatriation of some of these animals back to four areas of former subspecies range in Tanzania commenced in 1997, with animals also subsequently going to found a subpopulation in Rwanda.

Diceros b. minor is believed to have occurred from southern Tanzania through Zambia, Zimbabwe, and Mozambique to the northern, northwestern and northeastern parts of South Africa (north of the Mtamvuna River). It also probably occurred in southern Democratic Republic of the Congo, northern Angola, eastern Botswana, Malawi, and Eswatini. Today, its stronghold is South Africa and to a lesser extent Zimbabwe, with smaller numbers remaining in southern Tanzania. The South-central Black Rhino is now thought to be extinct in Angola and only one individual has been sighted in Mozambique since the 2008 IUCN African Rhino Specialist Group (AfRSG) meeting. The subspecies has also been reintroduced to Botswana, Malawi, Eswatini and Zambia. Based on very small sample sizes, Moodley *et al*.'s (2017) results suggested that perhaps the original historical Black Rhino that used to occur in Zambia but which had been wiped out by poaching by 1995 might be better classified as *D. b. michaeli* rather than *D.b.mino*r. However, on account of the small sample sizes, and given that the species was reintroduced with *D. b. minor* founders, and that historically Zambia had been considered *D. b. minor* range, and climate and habitats are more similar to some *D. b. minor* range; reviewers recommended that historical pre-1995 Zambian animals should continue to be allocated to *D. b. minor* for this Red List revision (as has historically been the case). With further data this may change in future. As there were still significant numbers of Black Rhinos in Zambia in the early 1970s, how these animals are allocated influences the *D. b. minor* subspecies Red List assessment which would change to Endangered under criteria A2 and A4. The *D. b. michaeli* assessment remains the same whether or not the historical animals are classified as *D. b. minor* or *D. b. michaeli*.

Note: At the request of certain members and countries, the IUCN SSC African Rhino Specialist Group (AfRSG) has a policy of not releasing detailed information (including maps) showing the whereabouts and names of all rhino subpopulations for security reasons. For this reason, only whole countries of occurrence are indicated on the range maps produced by the AfRSG.

Country Occurrence:

Native, Extant (resident): Angola; Kenya; Mozambique; Namibia; South Africa; Tanzania, United Republic of; Zimbabwe

Native, Extinct: Benin; Burkina Faso; Cameroon; Central African Republic; Chad; Congo, The Democratic Republic of the; Eritrea; Ethiopia; Niger; Nigeria; Somalia; South Sudan; Sudan; Togo; Uganda

Extant & Reintroduced (resident): Botswana; Eswatini; Malawi; Rwanda; Zambia

Distribution Map

Legend

- EXTANT (RESIDENT)
- EXTANT & REINTRODUCED (RESIDENT)
- EXTANT & ASSISTED COLONISATION (RESIDENT)
- EXTINCT

Compiled by:

IUCN (International Union for Conservation of Nature) 2020

The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

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Population

Throughout most of the 20th century, the Black Rhino was the most numerous of the world's rhino species. Relentless hunting of the species and clearances of land for settlement and agriculture reduced numbers and by 1960 only an estimated 100,000 remained. Between 1960 and 1995, large-scale poaching caused a dramatic 98% collapse in numbers with numbers bottoming out in the mid 1990s. Over this period numbers only increased in South Africa and Namibia (Emslie and Brooks 1999). From 1992–1997 total numbers remained relatively stable with increases in some countries (those with the best-protected and managed populations) being cancelled out by declines in others. However, since the lows of the mid-1990s, Black Rhino numbers at a continental level have more than doubled reaching and estimated 5,495 by end 2017 (Emslie *et al.* 2019) and 5,630 by end 2018 (Knight 2019). Figure 1 in the attached Supplementary Information documentation shows how estimated total numbers of Black Rhino have changed over the last three-generations based on best estimates of rhino numbers per subspecies per country per year going back three-generations to 1973.

See Supplementary Information documentation for more information on sources of data.

Point estimates of subspecies/genetic management cluster totals as of 31 December 2017 were (see also Table 1 in the Supplementary Information): Southern-central Black Rhino (*D. b. minor*) 2,305, South-western Black Rhino (*D. b. bicornis*) 2,188 and Eastern Black Rhino (*D. b. michaeli*) 1,002 based on AfRSG data with assistance of Range States. Subspecies totals as of 31 December 2018 were: Southern-central Black Rhino (*D. b. minor*) 2,196, South-western Black Rhino (*D. b. bicornis*) 2,390 and Eastern Black Rhino (*D. b. michaeli*) 1,044 based on AfRSG and Southern African Development Community (SADC) Rhino Management Group (RMG) data and with assistance of Range States.

Increases in numbers have occurred in countries where investments in conservation programmes, including monitoring and law enforcement, have been high. As of 2017 four Range States (South Africa, Namibia, Zimbabwe and Kenya) conserved the majority (93.9%) of remaining wild Black Rhino.

For further information about this species, see Supplementary Material.

Current Population Trend: Increasing

Habitat and Ecology **(see Appendix for additional information)**

Black Rhino occur in a wide variety of habitats from desert areas in Namibia to wetter wooded areas. The highest densities of rhinos are found in savannas on nutrient-rich soils and in succulent Valley Bushveld areas. Black Rhino are browsers and favour small acacia's and other palatable woody species (*Grewia*'s, Euphorbiaceae species, etc.) as well as palatable herbs and succulents. However, because of high levels of secondary plant chemicals, much woody plant browse (especially many evergreen species) in some areas is unpalatable. Failure to appreciate this, has in the past led to carrying capacities being over-estimated in some areas. Apart from plant species composition and size structure, Black Rhino carrying capacity is related to rainfall, soil nutrient status, fire histories, levels of grass interference, extent of frost and densities of other large browsers. To maintain rapid population growth rates and prevent potential habitat damage if the population overshoots carrying capacity, populations of Black Rhinos should be managed at densities below long term ecological carrying capacity (i.e., below zero growth densities). Surplus rhino that are removed from such established populations are routinely being

profitably invested in new areas with suitable habitat and protection where populations can grow rapidly.

Systems: Terrestrial

Use and Trade

Limited hunting of specific individual surplus Black Rhino males to further demographic and genetic metapopulation goals was only recently sanctioned by CITES. Black Rhinos, however, are currently only openly sold in South Africa and in all other Range States Black Rhino on communal or private land are managed on a custodianship basis for the state. Black Rhinos are primarily threatened by illegal killing for horn.

Live specimens for translocation are invariably taken from natural habitat with the occasional zoo animal being reintroduced.

Threats (see Appendix for additional information)

Black Rhino face a variety of threats. The main threat to the species is illegal hunting (poaching) to supply the illegal international rhino horn trade. It is estimated that currently around 95% of rhino horn sourced in Africa for end user illegal markets in SE Asia are from this source (Emslie *et al*. 2019). Rhino horn has traditionally had two main uses: use in Chinese medicine, and ornamental use. Recently rhino horn has become a highly prized material for making carved expensive high-status items such bowls and bangles. In the past it was also used to produce ornately carved handles for ceremonial daggers (jambiyas) worn in Yemen and some Middle East countries. Historically rhino horn was also used in traditional Chinese medicine (as a fever reducer). However, most recently it appears to be shavings from carvings that are illegally sold to the medicinal market at lower prices than worked items. While Black Rhino numbers continue to increase at a continental-level poaching has slowed overall growth. Some populations have also declined. Black rhino poaching peaked in 2015 and has been declining since. See Figure 2 and Table 2 and 3 in attached Supplementary Information file.

The significantly increased poaching since 2007 has greatly increased protection costs and risks to investment and staff. This has resulted in reduced incentives. Some private owners in South Africa have got rid of their rhino. If this worrying trend continues this threatens to possibly reverse the expansion of range and has the potential to also reduce conservation budgets and incentives to conserve Black Rhino privately (both those privately owned and those managed for the state on a custodianship basis (due to declining live sales and greatly increased protection costs). For more information on threats see the joint IUCN/TRAFFIC rhino report for CITES CoP18 (Emslie *et al*. 2019 http://www.rhinoresourcecenter.com/pdf_files/156/1560170144.pdf).

For further information about this species, see Supplementary Material.

Conservation Actions (see Appendix for additional information)

Black Rhino have been listed on CITES Appendix I since 1977. All international commercial trade in Black Rhinos and their products have been prohibited. To help reduce illegal trade, and complement CITES international trade bans, domestic anti-trade measures and legislation were implemented in the 1990s by a number of consumer states. Effective field protection of rhino subpopulations has been critical.

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Many remaining rhino are now concentrated in fenced sanctuaries, conservancies, rhino conservation areas and intensive protection zones where law enforcement effort can be concentrated at effective levels. Monitoring has also provided information to guide biological management decision-making aimed at managing rhino subpopulations for rapid population growth. This has resulted in surplus animals being translocated to set up new populations both within and outside the species' former range. Following a decline in breeding performance in some areas, increased effort has recently been given to improving biological management with a view to increasing metapopulation growth rates. Increasing efforts are also being made to integrate local communities into conservation efforts (most notably in the Kunene region of Namibia). Strategically, Black Rhinos are now managed by a range of different stakeholders (private sector and state) in a number of countries increasing their long term security. In contrast to Southern White Rhino, most Black Rhino on privately owned land are managed on a custodianship basis for the state. Since CITES CoP13 limited sport hunting quotas have been approved for the two Range States with biggest populations (South Africa and Namibia). Removal of specific individuals can enhance demographic and/or genetic conservation. In addition to local and, national initiatives, there are a number of regional African rhino conservation initiatives: the SADC Rhino Management Group, the Southern African Rhino and Elephant Security Group and the East African Community Rhino Management Group. In addition to National Rhino Plans there is a Continental African Rhino Range States Conservation Plan. IUCN SSC African Rhino Specialist Group is the continental coordinating body for rhino conservation in Africa.

Credits

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Authority/Authorities: IUCN SSC African Rhino Specialist Group

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External Resources

For Supplementary Material, and for Images and External Links to Additional Information, please see the Red List website.

Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
2. Savanna -> 2.1. Savanna - Dry	-	Suitable	Yes
3. Shrubland -> 3.5. Shrubland - Subtropical/Tropical Dry	-	Suitable	Yes
8. Desert -> 8.3. Desert - Cold	-	Suitable	Yes

Use and Trade

(http://www.iucnredlist.org/technical-documents/classification-schemes)

End Use	Local	National	International
Establishing ex-situ production *	Yes	Yes	No
Handicrafts, jewellery, etc.	Yes	No	No
Food - human	No	No	Yes
Sport hunting/specimen collecting	Yes	No	No
Medicine - human & veterinary	Yes	No	No

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score
5. Biological resource use -> 5.1. Hunting & trapping terrestrial animals -> 5.1.1. Intentional use (species is the target)	Ongoing	-	-	Low impact: 3
	Stresses:	2. Species Stresses -> 2.1. Species mortality		
6. Human intrusions & disturbance -> 6.2. War, civil unrest & military exercises	Ongoing	-	-	Low impact: 3
	Stresses:	2. Species Stresses -> 2.2. Species disturbance		
7. Natural system modifications -> 7.3. Other ecosystem modifications	Ongoing	-	-	Low impact: 3
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation		
8. Invasive and other problematic species, genes & diseases -> 8.1. Invasive non-native/alien species/diseases -> 8.1.1. Unspecified species	Ongoing	Minority (50%)	Causing/could cause fluctuations	Low impact: 5
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation		

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action in Place
In-place research and monitoring
Action Recovery Plan: Yes
Systematic monitoring scheme: Yes
In-place land/water protection
Conservation sites identified: Yes, over entire range
Percentage of population protected by PAs: 91-100
Occurs in at least one protected area: Yes
In-place species management
Harvest management plan: Yes
Successfully reintroduced or introduced benignly: Yes
Subject to ex-situ conservation: Yes
In-place education
Subject to recent education and awareness programmes: Yes
Included in international legislation: Yes
Subject to any international management / trade controls: Yes

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action Needed
3. Species management -> 3.1. Species management -> 3.1.1. Harvest management
3. Species management -> 3.1. Species management -> 3.1.2. Trade management

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Research Needed
3. Monitoring -> 3.1. Population trends
3. Monitoring -> 3.2. Harvest level trends
3. Monitoring -> 3.3. Trade trends

Additional Data Fields

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Distribution
Estimated area of occupancy (AOO) (km²): 179136
Extreme fluctuations in area of occupancy (AOO): No
Number of Locations: 126
Continuing decline in number of locations: No
Extreme fluctuations in the number of locations: No
Population
Number of mature individuals: 3,142
Continuing decline of mature individuals: No
Extreme fluctuations: No
Population severely fragmented: No
No. of subpopulations: 126
Continuing decline in subpopulations: No
Extreme fluctuations in subpopulations: No
All individuals in one subpopulation: No
No. of individuals in largest subpopulation: 581
Habitats and Ecology
Continuing decline in area, extent and/or quality of habitat: No
Generation Length (years): 14.96

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The IUCN Red List Partnership

The IUCN Red List of Threatened Species™ is produced and managed by the IUCN Global Species Programme, the IUCN Species Survival Commission (SSC) and The IUCN Red List Partnership.

The IUCN Red List Partners are: Arizona State University; BirdLife International; Botanic Gardens Conservation International; Conservation International; NatureServe; Royal Botanic Gardens, Kew; Sapienza University of Rome; Texas A&M University; and Zoological Society of London.