

CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES
OF WILD FAUNA AND FLORA



Nineteenth meeting of the Conference of the Parties
Panama City (Panama), 14 – 25 November 2022

SCIENTIFIC ASSESSMENT FOR HIPPOPOTAMUS AMPHIBIUS (HIPPOPOTAMUS)

1. This information document is submitted by South Africa* in relation to CoP19 Prop. 1 (Rev. 1) to retain the listing of *Hippopotamus amphibius* (hippopotamus) on Appendix II with the following annotation: “A zero export quota for wild specimens traded for commercial purposes.”
2. With 9% of the global hippo population (Figure 1), South Africa is an important range State for hippopotamus, and is also a major exporter of hippos and hippo products, having exported 74%, 35%, and 34% of live hippos, hippo trophies and hippo tusks respectively between 2010 and 2020 (Figure 2). It is therefore important for Parties to take note of the scientific assessment recently completed by the South African National Biodiversity Institute (SANBI) as it has relevance to the merits of CoP19 Prop. 1 (Rev. 1).

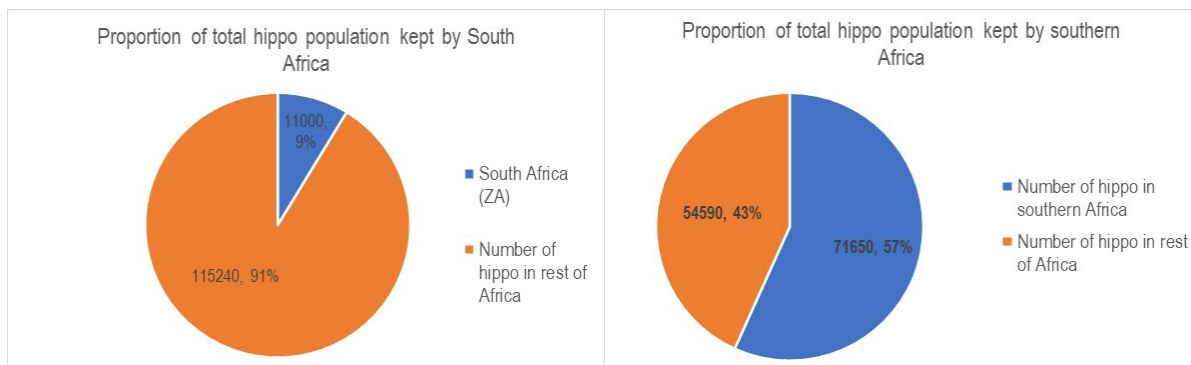


Figure 1. Proportional breakdown of the global hippopotamus population in Africa.

* The geographical designations employed in this document do not imply the expression of any opinion whatsoever on the part of the CITES Secretariat (or the United Nations Environment Programme) concerning the legal status of any country, territory, or area, or concerning the delimitation of its frontiers or boundaries. The responsibility for the contents of the document rests exclusively with its author.

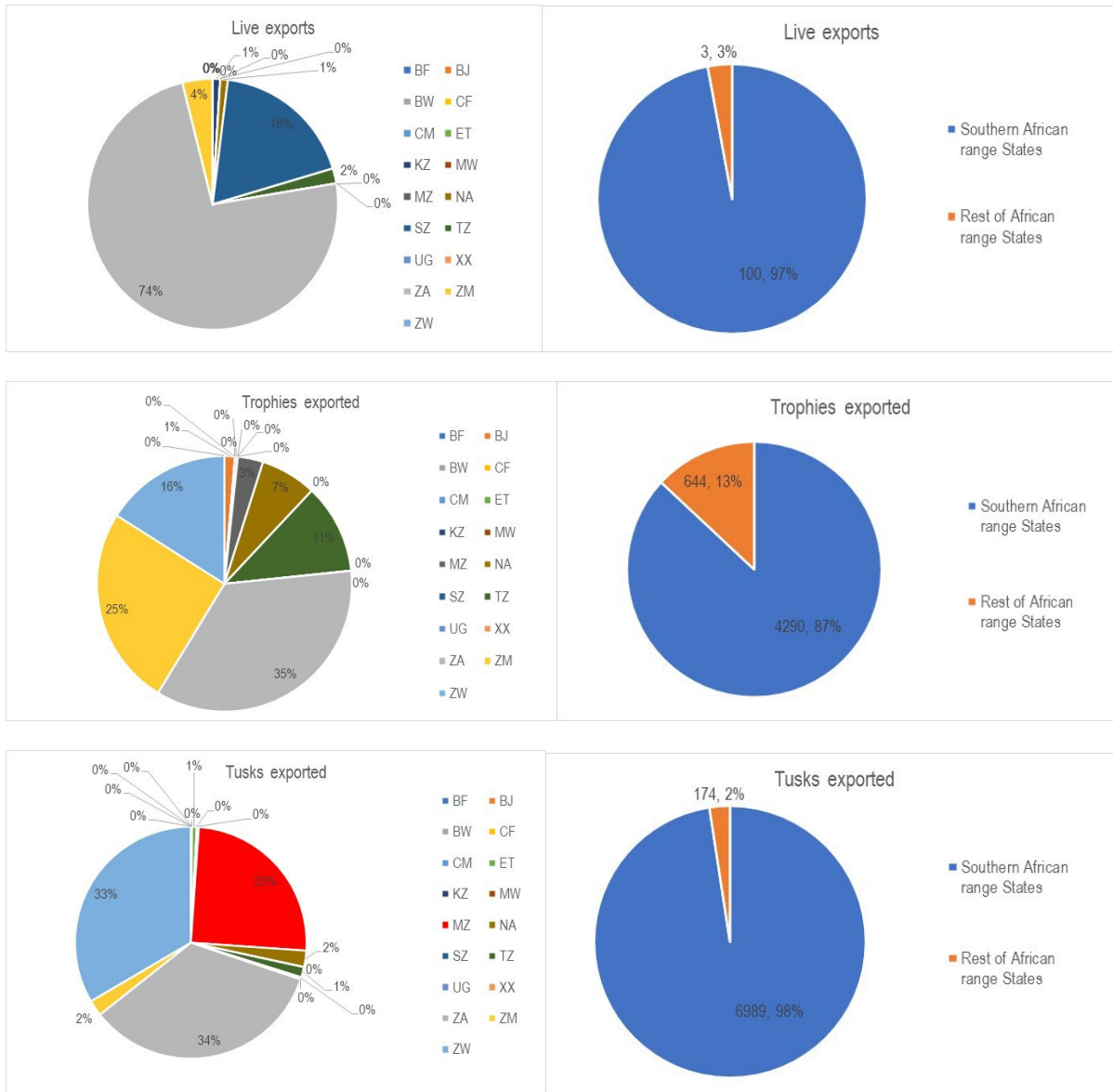


Figure 2. Proportional breakdown of exporters of live hippos, hunting trophies and hippo tusks (source codes W and U) between 2010 and 2020 (CITES Trade Database, UNEP World Conservation Monitoring Centre, Cambridge, UK).

Scientific assessment for *Hippopotamus amphibius* (Hippopotamus)

Compiled by the South African National Biodiversity Institute

Date: October 2022

Summary of findings

Hippopotamus amphibius (hippopotamus) is included in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). In terms of Article IV of the Convention, an export permit shall only be granted for an Appendix II species when a Scientific Authority of the State of export has advised that such export will not be detrimental to the survival of that species. This scientific assessment for *Hippopotamus amphibius* (hippopotamus) (hereafter hippo) was compiled through a review of the relevant literature and deliberations held at an expert workshop convened by the South African National Biodiversity Institute on 12 February 2020 (workshop participants and references included at the end of this document) and amended through various further consultations. The information presented is current as of October 2022.

Hippos are long-lived and have a low reproductive rate. Both males and females can live up to 35 years in the wild. Females start breeding between the ages of 9-11 years in the wild and produce a single calf on average every two years. Hippos are restricted to areas in proximity of water. They are dependent on deep accessible pools for shelter during the day and are almost exclusively nocturnal grazers with the result that feeding time cannot be extended much to cope with food shortages. The species is thus considered a habitat specialist as well as a specialist grazer. The species is however reasonably adaptable to different environments, tolerating semi-arid to very mesic conditions. Hippos are considered very good dispersers, but dispersal within the South African context is somewhat constrained by fences and habitat fragmentation. Compared to some other larger mammals, hippos are generally tolerant of human activities and are perceived as a damage-causing species outside of protected areas, particularly in agricultural and communal lands where they often pose a threat to human life and livelihoods.

Although the regional population is fragmented, the species is widespread in the country, occurring in all provinces but is most numerous in Limpopo, Mpumalanga, North West Province and KwaZulu-Natal (KZN). Water and associated resources are the main factors restricting the movement and distribution of hippo across its range in South Africa. Hippos are regarded as uncommon in South Africa, with recent quantitative data indicating that the regional population is comprised of approximately 11,061 individuals. The two largest hippo populations occur within the Kruger National Park (KNP) (approximately 3,986 individuals) and the iSimangaliso Wetland Park in KZN (approximately 1,276 individuals). The distribution and abundance of the species are however significantly reduced from its historical occurrence and abundance as the species no longer occurs within available suitable habitat within the Western Cape, Northern Cape and parts of the Eastern Cape where it historically occurred. The national population is thus considered to be reduced but currently stable with some localised declines. As a result of the 2015 – 2016 drought, hippo numbers in KNP declined by 45.3% from approximately 7,270 individuals in 2015 (prior to the drought) to approximately 3,986 individuals at the end of 2017. However, pre-drought abundances suggest that hippos have a high resilience and recovery ability in protected areas. Animals emigrating

out of protected areas have further resulted in an increase in hippo numbers in surrounding lands where they are often regarded as pests.

Hippopotamus amphibius is regionally listed in the IUCN Red List category of Least Concern and there are currently no major threats facing the species. The species is affected by habitat loss as a result of human population growth and expansion, and the increasing intensity of agriculture on floodplains. Although these threats are not suspected to be causing a net decline in the population over three generations, the cumulative impacts of intensifying threats may cause a population decline in future.

The legal harvest of hippos, which includes harvesting as hunting trophies, harvesting for management purposes, live trade and the killing of damage causing animals, is minimal (less than 2% of total population size per year), with maximizing economic yield as the predominant aim of the harvest. Hunting trophies accounts for 72% of the total exports of hippo from South Africa, between 2007 and 2018 (CITES Trade Database, UNEP World Conservation Monitoring Centre, Cambridge, UK). Legal harvest takes place mostly in protected areas for management purposes and on agricultural farms and communal lands as DCA (damage causing animals) offtakes, with some hunting taking place on game farms and within river systems. The illegal off-take of hippo is considered small, with the only notable poaching taking place in Ndumo Game Reserve in KwaZulu-Natal. There is no hunting quota for this species. Harvest is however managed on a local scale with ecologically based local offtakes.

The species is well managed and there are sufficient controls in place to ensure sustainability in the event of an increase in harvesting pressure or a proposal to harvest large numbers of individuals from the population. Limpopo and Mpumalanga have policies for handling damage causing animals and there is a framework for regulating damage causing animals in KwaZulu-Natal. Hunting on game farms in all provinces is regulated by permit systems and culling of hippos on protected areas is undertaken in accordance with the goals and objectives of approved local management plans. Monitoring of the effects of harvest is based on direct population estimates. There are some budgetary, manpower and logistical constraints for the implementation of management plans and monitoring programmes. Regular monitoring of hippo numbers nevertheless does take place. In Mpumalanga, due to the inherent risk caused by hippo to human lives and livelihoods, funding for managing DCA hippos is readily made available.

The introduction of hippos onto game farms is thought to counteract the effects of habitat loss and human wildlife conflict. Compared to other large animals such as the white rhino however, the conservation of this species and its habitat has not benefited significantly from the hunting and game farming industries.

Thirty-six percent of the national population is effectively protected in the Kruger National Park, while around 75% of the KZN hippo population occurs in protected areas where the species is legally excluded from harvest. A very small percentage of the hippo population is currently lost to poaching from protected areas, with the exception being Ndumo Game Reserve in KwaZulu-Natal.

The scientific assessment undertaken for *Hippopotamus amphibius* (hippopotamus) demonstrates that international trade poses a low risk to this species in South Africa (Figures 1 and 2). The national hippo population is stable and apart from some poaching in Ndumo Game Reserve, there is no evidence of overuse anywhere in South Africa. The species is well managed and there are no current concerns relating to the harvest of the species.

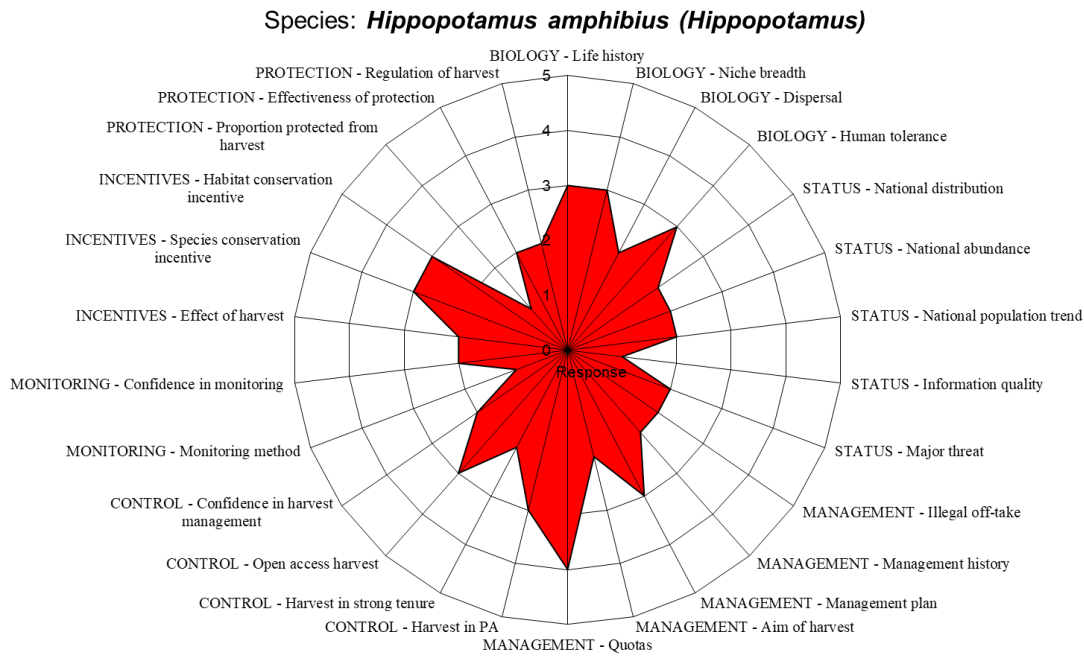


Figure 1: Radar chart summarizing the scientific assessment for *Hippopotamus amphibius* (hippopotamus) in accordance with the CITES NDF checklist. Explanations of scores given are detailed in Table 1. Higher scores are indicative of higher risks to the species. The limited area shaded in the radar chart demonstrates an overall low risk to the species.

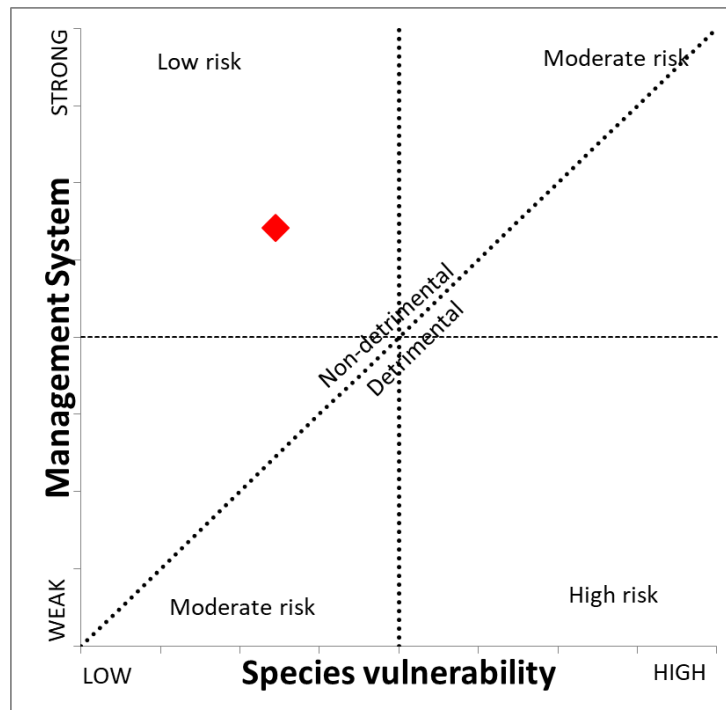


Figure 2: The risk of trading in *Hippopotamus amphibius* (hippopotamus) as represented by the relationship between species vulnerability (biology and status) and the strength of the management system to which the species is subjected (management, control, monitoring, incentives and protection). The figure demonstrates that the species is at low risk, and that trade is not detrimental.

Table 1: Scientific assessment for *Hippopotamus amphibius* (hippopotamus) undertaken in accordance with the CITES NDF checklist. Scores assigned to each question are indicated (bold text and shaded blocks) along with detailed explanations/justifications where relevant. Higher scores are indicative of higher risks to the species.

Biological characteristics		
1. Life history: What is the species' life history?	High reproductive rate, long-lived	1
	High reproductive rate, short-lived	2
	Low reproductive rate, long-lived	3
	Low reproductive rate, short-lived	4
	Uncertain	5
<p>Hippos are long-lived. Both males and females can live up to 35 years in the wild. The hippo is a K-selected species that has a low reproductive rate compared to some other larger mammals (Smuts and Whyte, 1981). The intrinsic rate of increase of populations ranges between 8% and 10%. Mature females reproduce on average every two years and every 18 months at optimum levels (Smuts & Whyte, 1981). Breeding is not seasonal, but most conceptions are likely to occur in the dry season, and thus the rainy season is the peak birth period (Apps, 2012; Estes, 1991). The gestation period is between 225 and 257 days (Apps, 2012; Estes, 1991; Smith, 1988). At any time of the year, a single young weighing between 30-50 kg is born (Estes, 1991). A calf is weaned at 8 to 14 weeks and it starts grazing at approximately 6 to 8 weeks (Apps, 2012). In the wild the age of first ovulation ranges between the age of 9 -11 years; in captivity it varies from 3 to 8.5 years (Smith, 1988). Males start producing sperm at the age of two years, with peak sperm production at the age of six years (Smith, 1988). Information from Kruger National Park (KNP) showed that during favourable years some calves mature early (males at 2 years and females at 5 years), but generally sexual maturity is attained at six and 9-10 years for males and females respectively (Smuts and Whyte, 1981). Smith (1988) found however that in captivity a male was sexually active at the age of 3.2 years. Males only achieve asymptotic weight between 25 and 30 years of age, with dominant bulls generally at least 26 years of age (Smith, 1988).</p>		
2. Ecological adaptability: To what extent is the species adaptable (habitat, diet, environmental tolerance etc.)?	Extreme generalist	1
	Generalist	2
	Specialist	3
	Extreme specialist	4
	Uncertain	5
<p>Hippos are restricted to areas in proximity of water. They are dependent on deep accessible pools for shelter during the day and are almost exclusively nocturnal grazers with the result that feeding time cannot be extended much to cope with food shortages. The species is thus considered a habitat specialist. The species is otherwise reasonably adaptable to different environments, tolerating semi-arid to very mesic conditions. Hippos do not appear to be susceptible to poor water quality, for example they have been found in Gauteng to live in water with a pH of less than 4, and in the Olifants River in KNP in water with a pH as high as 9 (Kyei and Hassan, 2019) and readily enter sea water in estuaries and along the coast. Furthermore, hippos often wade in their own detritus and aren't susceptible to eutrophic conditions that have been shown to readily kill other species such as zebra (<i>Equus zebra</i>), white rhinoceros (<i>Ceratotherium simum simum</i>) (Bengis, <i>et al.</i>, 2016) and certain fish species (Dutton, <i>et al.</i>, 2018). Deteriorating environmental conditions may however negatively affect the reproductive rate of hippos, through marked declines in conception rates (from 36.7% - 5.6%) (Smuts & Whyte 1981). Hippos are also susceptible to droughts. A 30% decline in hippo numbers was recorded during the drought in KNP between 1982 and 1983. Similarly, as a result of the 2015 – 2016 drought, hippo numbers in KNP declined by 45%. During drought conditions the availability of deep accessible pools becomes a severe limiting factor. As water levels drop in rivers, hippo are forced to congregate in the remaining suitable pools. These gradually become overcrowded and fouled with excreta. As a result hippos become increasingly more stressed as intraspecific competition for wading and grazing resources increases (Smuts & Whyte, 1981). Fritsch and Downs (In review) found that hippos are dependent/controlled by timeous seasonal changes in discharge, where wet season high flows permit movement of hippos to remote feeding areas, and allow mothers to give birth in seclusion, whereas dry season low flows purge the weak animals and play a role in controlling numbers.</p>		

<p>Hippos are regarded as specialist grazers. They are also habitat engineers in that they create grazing lawns. They are furthermore believed to be highly competitive grazers (Field 1970) and particularly so with target conservation species, such as white rhinos. When individuals escape from protected areas, their feeding behaviour alters and they have been found foraging in lucerne and maize fields. In the Sabie area, hippos are known to occasionally feed on banana trees. Hippos have also been observed chewing on Macadamia trees in the vicinity of Lake Eteza in KwaZulu-Natal (KZN).</p>		
<p>3. Dispersal efficiency: How efficient is the species' dispersal mechanism at key life stages?</p>	Very good	1
	Good	2
	Medium	3
	Poor	4
	Uncertain	5
<p>Individual hippos move up and down rivers in times of drought and are able to move easily between water sources. They may walk up to 35 km during their nocturnal foraging activities. Hippos are therefore considered to be very good dispersers, though dispersal within the South African landscape is somewhat constrained by fences and habitat fragmentation. (General fences do not hinder the movement of hippos when aquatic corridors remain unfenced.)</p> <p>A recent pan African genetic study conducted by Stoffel <i>et al.</i> (2015) found that the genetic diversity of hippos in KNP (n=34) is comparably as high as other diverse populations in Africa. There is little to no geographic structuring evident across the hippo's range in Africa, owing to a rapid late Pleistocene population expansion of the species out of East Africa, approximately 100-300 Kya. However, Stoffel <i>et al.</i>, (2015) also detected a Holocene population decline across Africa, leading to local fragmentation that has been further exacerbated by human activities e.g. agriculture, fences etc. In this modified landscape, the hippo's ability to disperse has been severely curtailed, and will eventually lead to reduced local genetic diversity.</p> <p>Hippos have a social structure in which males hold harems and other mature males are evicted. Herds generally consist of one or two large (prime) bulls, sub-adult cows, and adult cows with their offspring. Young females remain in their maternal group (Smith, 1988). Old and young bulls tend to occupy smaller, apparently less favourable wallows.</p>		
<p>4. Interaction with humans: Is the species tolerant to human activity other than harvest?</p>	No interaction	1
	Pest / Commensal	2
	Tolerant	3
	Sensitive	4
	Uncertain	5
<p>Individuals that have escaped from protected areas are regarded as problem animals, particularly in agricultural lands where they often pose a threat to human life and livelihoods. (Citrus and macadamia orchards provide good grazing habitat.) Some farmers in the Lowveld actually regard hippos on their land as an extra security measure and have consequently adapted their farming practices to accommodate the animals. Crops are protected with electric fencing, with sugar cane crops protected up to a height of 1.5 m (hippos do not venture into sugar cane taller than this). In communal areas and land bordering on dams and rivers, particularly in the Lowveld, North West, Eastern Cape, and Maputaland area of KZN, hippos are regularly shot or snared as damage-causing animals. Hippos are nevertheless generally tolerant of human activities and are able to persist in disturbed landscapes.</p>		
<p>National status</p>		
<p>5. National distribution: How is the species distributed nationally?</p>	Widespread, contiguous in country	1
	Widespread, fragmented in country	2
	Restricted and fragmented	3
	Localized	4
	Uncertain	5
<p>Historically the species was widespread throughout sub-Saharan Africa, occurring in virtually all suitable habitats (rivers throughout savannah biomes), but avoiding desert. However, historical records for South Africa reported the presence of hippo in the Desert Biome section of the Orange River (Boshoff <i>et al.</i>, 2016) (Fig. 3). The presence of</p>		

hippo were reported in a number of areas within the Cape provinces (Skead *et al.*, 2011). These areas include Church Square (Skinner & Smithers, 1990), the Orange river in northern Namaqualand (Boshoff *et al.*, 2013), Table Bay, Malmesbury district, Rondebosch, and the region between the West Coast and Port Elizabeth (Skead *et al.* 2011) (Fig. 3). In addition, the presence of hippo were recorded in the Northern Cape (Skead *et al.*, 2011) as well as in the Eastern Cape, along the Orange River along the northern border of the Eastern Cape Midlands and the Transkei (Skead *et al.* 2007) (Fig. 3). Historical records also note the presence of hippo in the Free State along rivers with suitable grazing resources close to water such as the Klip and Vaal rivers (Boshoff & Kerley, 2013).

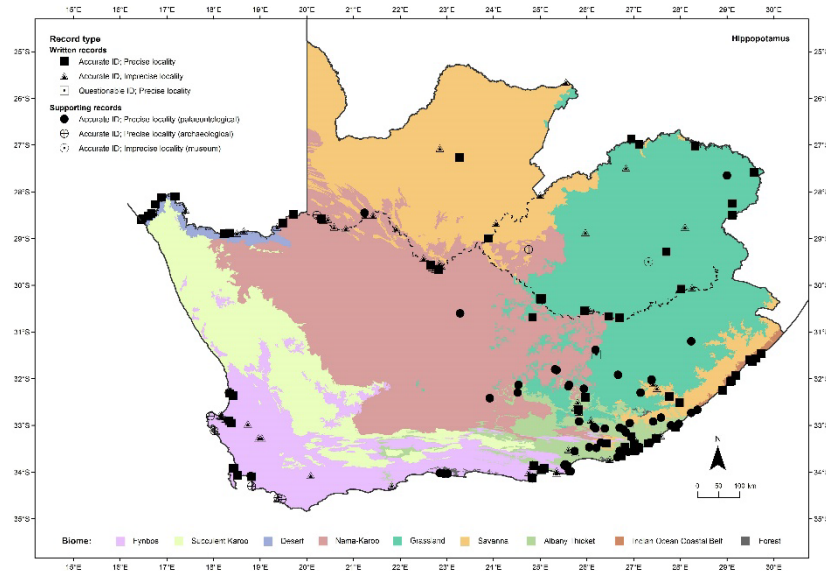


Figure 3: Early historical incidence of the hippopotamus (Map taken from Boshoff *et al.*, 2016).

By 1959, hippos had disappeared from most of South Africa except for the KNP (Sidney, 1965) and north-eastern KZN, where subpopulations survived in the coastal lakes and estuaries of St Lucia and Kosi, Lake Sibaya and the Pongola River downstream of Jozini Dam. This decline was probably due to over-hunting (Bernard & Parker, 2006) and the construction of dams.

Hippos have since been reintroduced into the Fish and Sundays rivers of the Eastern Cape and also into the northern bushveld parks in North West Province (Power, 2014). While the majority of the hippos within the Eastern Cape occur within enclosed state protected areas (Fish River Nature Reserve and Addo Elephant National Park) and game farms, some hippos from the State protected areas is likely to move along the Sundays and Fish rivers and their tributaries. Likewise, in Gauteng hippos are mostly restricted to protected areas and game farms, occurring naturally in the Dinokeng area and having been reintroduced into the Cradle of Humankind World Heritage Site, while in the Limpopo, North West and Mpumalanga provinces hippos now also occur outside of protected areas and game farms along all major rivers. Hippos occur throughout KNP, mainly in the major rivers, but also in isolated pools and man-made dams.

In KwaZulu-Natal, hippos occur at ten localities within protected areas and in 22 localities on communal and private land. The species is mainly confined to the large rivers, coastal lakes and estuaries of north-eastern Zululand and the Maputaland regions of the province. The population has contracted on the Pongola floodplain due to human population growth and the increasing intensity of agriculture on the region's floodplains (Eksteen *et al.*, 2016). The remnants of this population survive in Ndumo Game Reserve where changes in daily, monthly, and annual minimum population numbers have been observed (Fritsch and Downs 2020). Natural expansions have taken place up the Mkuze River into irrigation and other small dams on game ranches (Eksteen *et al.*, 2016). Additionally, a small population is confirmed to reside in southern Swaziland on a small extension of the Pongola Poort (Jozini) Dam which extends into the country.

In the Free State, there is one small population in a protected area and three small populations on private land. There is one small population on private land in the Northern Cape, and in the Western Cape hippos occur in about four localities within protected areas, both private and state owned (Pers. comms, Provincial Authority).

Currently, the national population is considered fragmented, but widespread across the country within its natural distribution range (Fig. 4) (Eksteen *et al.*, 2016).

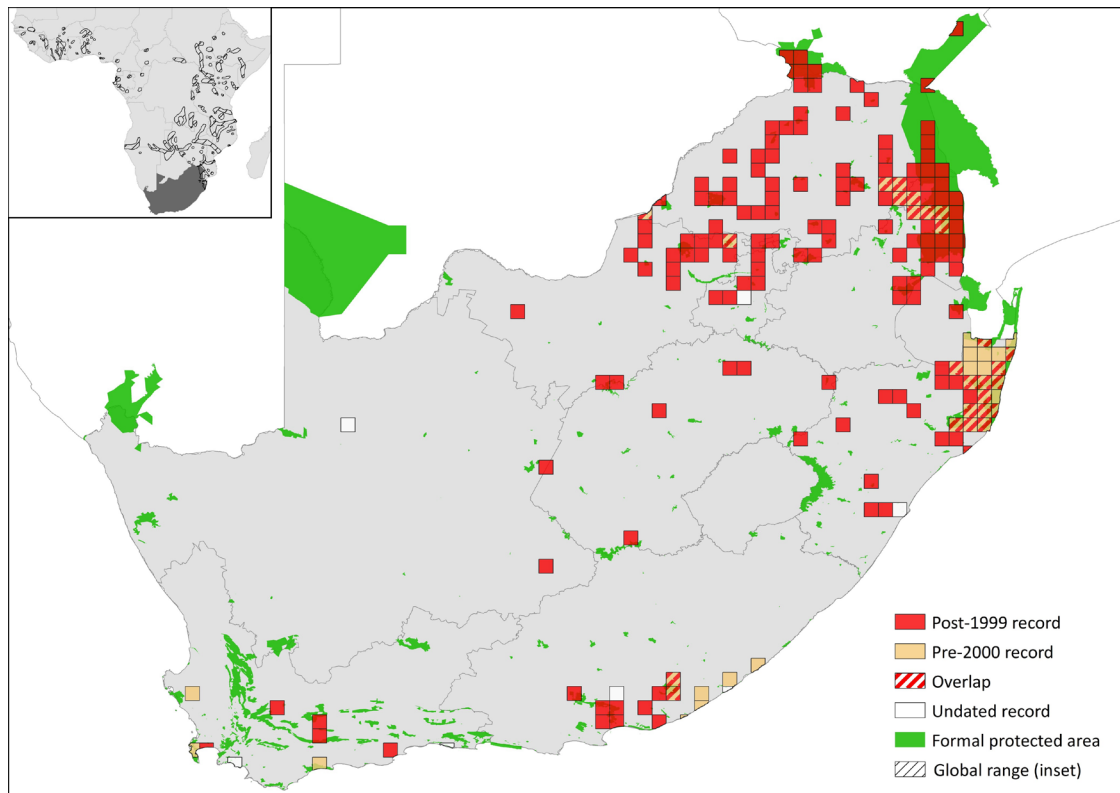


Figure 4: Distribution records for the common hippopotamus (*Hippopotamus amphibious*) within South Africa (Figure taken from Eksteen *et al.*, 2016)

6. National abundance: What is the abundance nationally?	Very abundant	1
	Common	2
	Uncommon	3
	Rare	4
	Uncertain	5

The overall hippo population in Africa is estimated at approximately 115,000-130,000 individuals. Within South Africa the population is estimated at around 11,061 individuals, which equates to c. 6,637–7,743 mature individuals (assuming a 60–70% mature population structure) (Eksteen *et al.*, 2016). The two largest hippo populations occur within the KNP (3,986 individuals) and the iSimangaliso Wetland Park in KZN (approx. 1,276 individuals).

In Mpumalanga, the current hippo subpopulation is estimated at ~1,000 animals, where 782 animals occur in provincial and private nature reserves, and an estimated 260 to 300 hippo occur in the provincial river systems. A 2019 survey of the river systems in Mpumalanga estimated 529 hippos in the Olifants River system, 243 in the Sabi River catchment and 10 hippos in the Komati River catchment. In Limpopo, the hippo numbers are currently estimated at ~751 animals. All permanent rivers within the province were surveyed in February 2019. During this survey 197 hippos were counted along the Olifants River, while 384 were counted within the Letaba River and 25 and 145 in the Levubu and Limpopo rivers respectively. A small population of hippos was also observed in the upper Matlabas River. Hippos are also present in Mapungubwe and Marakele National Parks in low numbers. In Mpumalanga and Limpopo many individuals on private land are not counted.

There are approximately 1,832 hippos in KwaZulu-Natal, occurring in 10 formally protected areas (1,612 individuals) and 16 private and communal protected areas (220 individuals) (2018 figures). Currently the largest single populations are found in the St Lucia Game Reserve component of the iSimangaliso Wetland Park (1,276 individuals) and Ndumo Game Reserve (203 individuals).

Within North West Province approximately 200 hippos occur both on private land and within protected areas. An estimated 45 hippos occur within game farms in the province and an additional 45 hippos persist within river systems within the province. The hippo population in the Eastern Cape is around 100 (about 26 occurring on state land and 38 occurring on private land in the Cacadu Region). While the majority of the hippos within the Eastern Cape occur within enclosed state protected areas (Fish River Nature Reserve and Addo Elephant National Park) and game farms, some hippos from the State protected areas are likely to move along the Sunday and Fish rivers and their tributaries. The hippo population within the Sunday River in Addo Elephant National Park is estimated at between 10 and 20 (2020) and the population within the Great Fish River Nature Reserve is estimated at nine (2018). Upstream of the reserve there is a hippo conservancy and farmers within this area are accepting of hippos within this stretch of the Great Fish River.

Within Gauteng Province the hippo population is estimated at approximately 35 individuals occurring within a number of properties. The populations estimated at 12 and 7 individuals respectively in Dinokeng and Rietvlei Dam Nature Reserve are known and monitored. An additional 10 individuals were introduced to different areas within the Cradle of Humankind more than 20 years ago, but the current population in these areas is unknown. There were also two additional introductions of six animals to areas in Hekpoort (close proximity to the Cradle of Humankind) and Wallmatal (north of Pretoria). In addition, there is an unknown number of hippo in some of the major rivers in Gauteng (e.g. Wilge, Pienaar). Thus the estimate of 35 individuals for Gauteng is likely a conservative estimate and numbers in this province may be higher, based on random reports of hippo sightings on private properties and within the major rivers in the province. Due to a lack of monitoring, numbers on private properties in Gauteng are not known.

Forty-four hippos occur within nine state and privately owned game reserves within the Western Cape. In the Free State there are approximately six individuals within the protected area and 19 individuals within the three private reserves. Only one individual remains in the Northern Cape. Hippos are not expected to be present in the arid areas of the country (approximately two thirds of South Africa), except perhaps in rivers in low numbers.

The total figure of 11,061 is conservative and may be regarded as an underestimate.

Table 2: Conservative provincial hippo population estimates with last survey date.

	Population estimate	Date of last survey
Eastern Cape	100	2018
Free State	25	2020
Gauteng	35	2020
KwaZulu-Natal	1832	2018
Limpopo	751	2019
Mpumalanga	1000	2019
Northern Cape	1	2020
North West	200	2018
Western Cape	44	2020
Kruger National Park	3986	2017
Total	7974	

7. National population trend: What is the recent national population trend?	Increasing	1
	Stable	2
	Reduced, but stable	3
	Reduced and still decreasing	4
	Uncertain	5

Across the southern African region, populations of hippo are generally considered stable, though the species is declining in other parts of Africa (Lewison and Pluhacek, 2017). Overall the South African hippo population is currently considered stable with localised declines (Eksteen, *et al.*, 2016). As a result of the 2015 – 2016 drought, hippo numbers in KNP declined by 45.3% from approximately 7,270 individuals in 2015 (prior to the drought) to approximately 3,986 individuals at the end of 2017. Since the cessation of population control of hippos within KNP in the late 1980s, the hippo population increased from 2,510 in 1986 to 7,270 in 2015. Hippo culling was reinstated in KNP in 2016, due to a lack of forage resources in the park, though less than a 100 individuals have been culled annually within the park since then. The hippo population with KNP appears to be stable and hippo numbers respond dynamically to management and drought. Pre-drought abundances suggest that hippos have a high resilience and recovery ability in protected areas.

In Mpumalanga, hippo numbers increased from 562 animals in 2003 to 1,003 animals in 2013, an increase of 78%. These totals are based on game censuses conducted on provincial and private nature reserves on the western boundary of KNP, and regular hippo counts along the Lowveld rivers. Most of the hippo subpopulations in the protected areas and rivers close to the KNP show strong positive growth trends, in spite of significant hippo removals through damage-causing animal (DCA) complaints and pro-active hippo capture operations. During 2015-2016 when the Lowveld experienced a significant drought, hippo population declines were much lower within the private reserves than within the KNP, due to a much higher availability of artificial water. Within the provincial reserves the hippo numbers were marginally lower at the end of 2019 than prior to the drought. The hippo population within the province is thus considered stable to increasing.

Between 2003 and 2012 the hippo population in Limpopo Province has increased by 20-30%. Within this province the numbers of hippo in the Limpopo River and Olifants River outside of KNP have also increased from 50 to 100 and from 150 in 1994 to 186 in 2003, respectively. These figures may be underestimates and concern has been expressed for the growing problem of human wildlife conflict. However, between 2012 and 2015 the hippo population in the province declined from 629 to 496 individuals. As a result a moratorium on the trophy hunting of hippo within river systems in the province was implemented in 2015. Due to a prolonged drought during 2016 and 2017, the number of hippo observed in the Olifants River declined further from 234 in 2015 to 155 in 2017. However, since 2017 the hippo population in the province increased from 462 in 2017 to 751 individuals in February 2019. Private landowners are also introducing hippos into dams. The population in Limpopo Province is currently considered stable to increasing.

The hippo population in the North West Province is considered stable.

The hippo population in KZN increased at 3% per annum between 2004 and 2011, though the population declined between 2011 and 2013. The population is currently thought to be stable with a slow growth rate between 2004 and 2018 of 0.7% per annum. The hippo population has grown slowly (1.7% per annum) within protected areas in KZN between 2004 and 2018, and appears to be stable at present. On private land the population is small (220), but has increased gradually from 75 (2004) to 220 (2013), signifying a growth rate of 13% per annum. The hippo population on the Pongola floodplain has however contracted due to human population growth and the increasing intensification of agriculture on the region's floodplains. Remnants of this population survive in Ndumo Game Reserve. As a result of ongoing poaching in this reserve, the population has declined in recent years from 300 individuals to approximately 203 individuals. However, natural expansions have also taken place up the Mkuze River into irrigation and other small dams on game ranches.

In the Eastern Cape, the small hippo population in the Great Fish River Nature Reserve is counted from a helicopter every 3rd year and in 2015 and 2018, 19 and 9 hippos were counted respectively. The extended drought over the last few years has encouraged animals to move out of the reserve and this has brought them into conflict with neighbouring communities who grow maize along the river banks. As a result the Eastern Cape Parks and Tourism Agency (ECPTA) had to remove 10 hippo that had escaped from the reserve in 2018. The population is currently estimated at nine individuals. An additional small population of approximately 10 to 20 individuals occur within the Sunday River in Addo Elephant National Park. No information is available on the estimated numbers and trends of hippo populations on private reserves in the Eastern Cape. In Gauteng, there is growing public interest in introducing hippo onto private land for aesthetic reasons. The Dinokeng population has increased slightly over the past five years, but overall the hippo population within Gauteng is considered stable.

The national population trend is considered reduced but stable. This is based on comparing the current population numbers and historical distribution to the historical data indicating that the species was abundant and widespread across all suitable habitats within South Africa. The species no longer occurs in a number of areas once abundant including much of the Cape provinces.

8. Quality of information: What type of information is available to describe abundance and trend in the national population?	Quantitative data, recent	1
	Good local knowledge	2
	Quantitative data, outdated	3
	Anecdotal information	4
	None	5

Recent quantitative data exists for the majority of the hippo populations in South Africa. Aerial surveys of all major rivers are conducted over a three year period in Mpumalanga and Limpopo provinces, while hippo populations within provincial reserves in KZN are counted annually and every third year in the Eastern Cape. In Gauteng hippo populations within protected areas are surveyed on an annual basis. SANParks have quantitative data on hippo population numbers and offtakes as far back as the 1960s. These surveys provide minimum population estimates. Detailed information from private reserves is however lacking in some cases.

9. Major threats: What major threat is the species facing (underline following: overuse/ <u>habitat loss</u> and alteration/ invasive species/ other:) and how severe is it?	None	1
	Limited/Reversible	2
	Substantial	3
	Severe/Irreversible	4
	Uncertain	5

Habitat for this species is being lost as a result of human population growth and expansion, and the increasing intensity of agriculture on floodplains, for example in the Maputaland area. Similarly in Mpumalanga, habitat for this species is being lost as a result of human population growth and expansion. This is however not considered a major threat currently as the species is adequately protected within protected areas. In some areas hippos are moving out of protected areas into areas with a variety of agricultural activities, including citrus orchards where irrigation and mowing of grass has resulted in attractive grazing lawns. The increase in agricultural and industrial activities along major rivers is however reducing available grazing areas for hippo, reducing river flows during critical times of the year, and increasing siltation of river systems (Smuts and Whyte, 1981). Fritsch and Downs (In review) found that hippos are dependent/controlled by timeous seasonal changes in flow, where wet season high flows permit movement of hippos to remote feeding areas, and allow mothers to give birth in seclusion, while dry season low flows purge weak animals and play a role in controlling numbers. As activities that negatively impact on river discharge timing and quality increase, the impact on hippo populations is likely to increase.

Fragmentation by fences or other barriers hinders movement of hippos across the water-savanna ecotone (Eksteen *et al.*, 2016). In addition, water quality and quantity has declined, which has likely led to further fragmentation.

Climate change may become a threat to hippo populations in the future. Increasing frequencies of drought spells due to climate change reduces grazing areas thus causing direct mortality and forcing hippos to move into surrounding agricultural landscapes, which may lead to increased persecution and poaching (Eksteen *et al.*, 2016). This potential threat is however scale dependent and smaller populations are likely to be at greater risk than larger populations (such as KNP).

The most recent conservation assessment of the South African hippo population was conducted in 2015 as part of the national Red List assessment (Eksteen, *et al.* 2016) and listed the species as Least Concern. Although these threats are not suspected to be causing a net decline in the population over three generations, the cumulative impacts of intensifying threats may cause a population decline in future (Eksteen, *et al.*, 2016). The severity of the threat is thus considered substantial.

Harvest management		
	None	1

10. Illegal off-take or trade: How significant is the national problem of illegal or unmanaged off-take or trade?	Small	2
	Medium	3
	Large	4
	Uncertain	5
<p>Poaching of hippo is not considered a major threat to the species at present, and is currently localised to two areas. The population in Ndumo Game Reserve (KZN) has declined in recent years from 300 individuals to approximately 203 individuals due to ongoing poaching.</p> <p>Hippo is listed as “protected” in terms of the various provincial ordinances and acts which provide legislative protection. Permits are therefore required to undertake a variety of activities in relation to hippo, e.g. hunting and other forms of direct use. Within the Limpopo Province, hippo is listed as a “Protected Wild Animal” under the Limpopo Environmental Management Act (2003). Permits are therefore issued in terms of this Act. Hippos may however be hunted without a permit on registered game farms where hippo has been included as an exempted species, and there is some evidence that hunters may be hunting hippo illegally within rivers, claiming afterwards that the hunt took place on a registered game farm. A moratorium on the trophy hunting of hippo within river systems has been in place since 2015 due to a decline in hippo numbers observed and the fluctuation of hippo numbers in the river systems.</p> <p>In the North West province the species is listed as “Protected Game” under both the Transvaal Nature Conservation Ordinance (No. 12 of 1983), section 15(1)(a) (distribution – Crocodile River, north of Brits) and Schedule 1 of the Bophuthatswana Nature Conservation Act (No. 3 of 1973) (distribution – Molatedi dam, Moretele river – Klipvoor dam). In addition, the species is not granted exemption, as per the Fencing policy, which is gazetted by provincial notice (DACE 2007). A permit is thus required to hunt, catch or transport the species.</p> <p>Incidences of illegal off-take have not been noted in the North West, Gauteng, Western Cape, Free State or Northern Cape provinces. Low levels of illegal off-take however do occur in Mpumalanga and the Eastern Cape. Hippo poaching incidents have shown an increasing trend in KZN, with average poaching in the province increasing by 21% per annum between 2004 and 2013 (average of six poached per year) (Goodman & Craigie, 2014). There has also been some by-kill of hippos in KNP as hippos are mistaken for rhinos by poachers at night.</p>		
11. Management history: What is the history of harvest?	Managed harvest: ongoing with adaptive framework	1
	Managed harvest: ongoing but informal	2
	Managed harvest: new	3
	Unmanaged harvest: ongoing or new	4
	Uncertain	5
<p>An experimental cull of hippo in the KNP was conducted in 1966, and subsequently culls were executed annually between 1974 and 1982, during which a total of 1,105 individuals were culled (Joubert, 2007). Population declines in the 1980s necessitated the halting of this management practice, and in the late 1980s culling was no longer considered a necessary strategy for population management, especially since hippo abundance was naturally regulated by environmental conditions, e.g. drought (Whyte, 1987). Culling at St Lucia has been documented by Taylor (2009). In the period from 1981 to 1983 a total of 184 hippos were culled. Since 2005 a small number (up to 22 per annum) of hippos have been captured each year in order to reduce the estimated 3% per annum population increase, and also to provide hippos for conservation purposes elsewhere. At the same time the necessary expertise in the capture of hippos has been gained.</p> <p>More recently (2016), hippo culling has been reinstated in the KNP (S. Ferreira unpubl. data) as an adaptive management response (M. Hofmeyr pers. comm. 2016) to the severe drought across South Africa during late 2015/early 2016 (Table 2), which resulted in a lack of forage resources in the park. Between 2016 and 2018, approximately 143 hippos were removed for management reasons from the KNP population (Table 2). In 2019, the Sabi Sands Private Nature Reserve in Mpumalanga received a permit for the culling of 40 hippos in response to major concerns of eutrophication in dams with high hippo densities. Generally, hippos are culled in protected areas in accordance with the goals contained in ecological management plans. SANParks uses an adaptive management removal framework with ecological and socio-economic elements. Hippos are removed where they pose an ecological threat, and where possible their meat is donated to local communities.</p>		

Hippo is listed as “protected” in terms of the various provincial ordinances and acts which provide legislative protection. Permits are therefore required to undertake a variety of activities in relation to hippo, e.g. hunting and other forms of direct use. In North West Province, KwaZulu-Natal, and Limpopo, hippos are mainly hunted on game farms under the control of a permit system. In Mpumalanga, hunts mainly take place in rural and communal areas in the Onderberg area along the Crocodile river and adjacent areas and as far west as Montrose. Along the Sabi river and adjacent areas, mainly in the Phabeni area but as far north as Manyeleti and in the Thulamahase district. There are no more than five farms with exemption for hippo in the province. The Associated Private Nature Reserves (APNR), bordering KNP also hunt hippo on an annual basis but numbers are limited to two or three a year. A private landowner can register a game farm in terms of the Threatened or Protected Species (TOPS) Regulations (2007) (promulgated in terms of the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEMBA)) or apply for a Certificate of Adequate Enclosure under the provincial ordinances. Within Mpumalanga, Limpopo and KwaZulu-Natal hippo can be included as an exempted species, which means both hunting / off-take of hippo are then exempted from individual applications. Landowners are however required to issue permits for each hunt or translocation event, and the permit book is submitted on an annual basis to the provincial conservation authority for assessment and recordkeeping. The decision to grant a Certificate of Adequate Enclosure to a landowner remains a regulatory management decision taken by the provincial conservation authority, and is based on good sound ecological knowledge and reviewed every three years. With each application or renewal, the landowner is obligated to submit a list of all species present on the property and the estimated population sizes, thereby allowing the provincial authority to manage trophy hunting off-takes on a property level. In North West Province, hippo is classified as dangerous game and thus cannot be included on an exemption permit. Landowners require a keeping permit to keep hippo on a game farm and a permit is required for a trophy hunt.

Within all provinces, all trophy hunts by international clients must be recorded in the Professional Hunter's Register. The professional hunter accompanying the international client is responsible for completing and submitting the register to the provincial conservation authority. The Department of Forestry, Fisheries and the Environment (DFFE) collates the provincial registers into a national register on an annual basis.

In the Northern Cape, the Northern Cape Nature Conservation Act (No. 9 of 2009) requires landowners to apply for a Game Farm Permit to keep and hunt certain wildlife species. A habitat analysis must be conducted for the property to determine the suitability of the habitat before the species (such as hippo) may be introduced. The necessary import/export/hunting permits must also be obtained to ensure that this specific species may be hunted legally if applicable.

There is a formal framework for regulating the control of DCAs in KwaZulu-Natal, where incidences are investigated first to determine if the problem animal can be contained, while in Mpumalanga hippo complaints are managed in accordance with a policy on the handling of DCAs. Since management of problem / damage causing hippos is based on complaints received, it is largely reactive. In the Eastern Cape, the culling of damage causing hippos is regulated through a permit system. Between 2010 and 2018 a total of 1,413 hippos were removed through DCA procedures (580), trophy hunting (534) and translocations (298) (Table 3) (excluding the KNP). In Limpopo province, a DCA animal may be hunted by a local hunter, or the landowner or can be destroyed by provincial conservation officer. Mpumalanga and North West provinces allow for the hunting of a DCA by an international hunter after an investigation by a provincial DCA officer has been conducted to determine the extent of the damage caused. KZN province do not allow the hunting of DCAs by local or international hunters.

Table 2: The number of hippo removed through natural mortalities and human intervention within the Kruger National Park between 2016 and 2018.

	Management					Natural Processes			Illegal		Total
	Damage Causing Animal	Problem Animal	Self defence	Humanitarian	Culling	Fighting	Predation	Drought	Poaching	Unknown	
2016	2	4	2	5	126	1	3	205	2	2	352
2017	2	0	0	0	0	0	0	0	0	0	2
2018	1	0	0	1	0	1	1	0	0	0	4
Total	5	4	2	6	126	2	4	205	2	2	358

Table 3: Number of hippos trophy hunted, killed as damage-causing animals (DCAs) and culled per province between 2010 and 2018. (Trophy hunting data provided by the Professional Hunter’s Register. The remainder of the data provided by the respective provinces through the permit system.)

Province	Hunts	DCAs	Culls	Captures	Total
Eastern Cape	13	9	0	0	22
Free State	10	1	0	0	11
Gauteng	2	1	0	0	3
KwaZulu-Natal	38	10	0	0	48
Limpopo	190	288	0	0	478
Mpumalanga	261	261	0	298	820
Northern Cape	2	0	1	0	3
North West	18	10	0	0	28
Western Cape	0	0	0	0	0
Total	534	580	1	298	1413

According to the CITES Trade Database (UNEP World Conservation Monitoring Centre, Cambridge, UK), a total of 1,413 hippo hunting trophies were exported from South Africa between 2007 and 2018, on average 118 hippos per annum over a twelve-year period (using the exporter quantities). Over the same time period approximately 118 live hippos were exported from South Africa, of which 85% were wild sourced. Hunting trophies accounts for 72% of the total exports of hippo from South Africa, between 2007 and 2018 (CITES Trade Database, UNEP World Conservation Monitoring Centre, Cambridge, UK). If however, the importer quantities are used for the calculations of trophies exported only 815 trophies were exported between 2007 and 2018 (619 trophies exported for period 2010 to 2018). This is similar to what is reported in the PH Hunter’s Register, which 534 hippos hunted by international clients between 2010 and 2018, averaging approximately 59 hippos per annum. The reason for the discrepancy between importer and exporter quantities reported is likely due to South Africa reporting on number of permits issued which is likely to be higher than the actual number of hippos hunted in any year.

12. Management plan or equivalent: Is there a management plan related to the harvest of the species?	Approved and coordinated local and national management plans	1
	Approved national/state/provincial management plan(s)	2
	Approved local management plan	3
	No approved plan: informal unplanned management	4
	Uncertain	5
<p>There are approved local management plans for protected areas and also some local management plans for private land outside of protected areas, however no species specific management plans for hippo exist. SANParks uses an adaptive management removal framework with ecological and socio-economic elements. Hippos are removed where they pose an ecological threat, and where possible their meat is donated to local communities.</p> <p>As hippo is considered a habitat engineer, the species is monitored and managed within fenced areas. All use activities related to hippo are permitted and a habitat availability assessment is required for introductions of hippo on game farms. In some provinces, i.e. Northern Cape, Mpumalanga and Limpopo, a management plan is required for the introduction of hippo within a fenced reserve or game farm.</p>		
13. Aim of harvest regime in management planning: What is harvest aiming to achieve?	Generate conservation benefit	1
	Population management/control	2
	Maximize economic yield	3
	Opportunistic, unselective harvest, or none	4
	Uncertain	5

Once a large population is established, hippos can be very resilient to off-takes, especially calculated off-takes conducted as part of management. Unlike other large herbivores, hippos aren't really susceptible to direct predation or more conventional natural mediums of population control (Smuts and Whyte, 1981). Instead their numbers are controlled by drought, disease and habitat loss.

SANParks uses an adaptive management removal framework with two elements – ecological management to mimic ecological processes if these are impeded and cannot be restored (this is not relevant for KNP), and contribution to socio-economic-development when removals are conducted so as not to impact on the ecological integrity of large populations. Between 2010 and 2018 approximately 1,413 hippos were removed through DCA procedures and trophy hunting (Table 3) (excluding the KNP).

According to the CITES Trade Database (UNEP World Conservation Monitoring Centre, Cambridge, UK), a total of 1,413 hippo hunting trophies were exported from South Africa between 2007 and 2018, on average 118 hippos per annum over a twelve-year period (using the exporter quantities). Over the same time period approximately 118 live hippos were exported from South Africa, of which 85% were wild sourced. Hunting trophies accounts for 72% of the total exports of hippo from South Africa, between 2007 and 2018 (CITES Trade Database, UNEP World Conservation Monitoring Centre, Cambridge, UK). If however, the importer quantities are used for the calculations of trophies exported only 815 trophies were exported between 2007 and 2018 (619 trophies exported for period 2010 to 2018). This is similar to what is reported in the PH Hunter's Register, which 534 hippos hunted by international clients between 2010 and 2018, averaging approximately 59 hippos per annum. Eighty five percent of all trophy hunts occurred within Limpopo and Mpumalanga provinces. The reason for the discrepancy between importer and exporter quantities reported is likely due to South Africa reporting on number of permits issued which is likely to be higher than the actual number of hippos hunted in any year.

In North West Province, KwaZulu-Natal, and Limpopo Province hippos are mainly hunted on game farms under the control of a permit system. In Mpumalanga, hunts mainly take place in rural and communal areas, within river systems and on game farms and private game reserves. There are no more than five farms with exemption for hippo in the province. The Associated Private Nature Reserves (APNR), bordering KNP also hunt hippo on an annual basis, but numbers are limited to two or three a year. Most of the trophy hunts that took place in the Eastern Cape were for damaging causing animals hunted by an international client under a hunting permit. In Limpopo a DCA animal may not be hunted as a trophy animal by a foreign hunter. DCA control takes place by officials or a permit is issued to the landowner who may shoot/hunt the animal or the land-owner may use a local hunter to hunt such an animal. Mpumalanga and North West provinces allow for the hunting of a DCA by an international hunter after an investigation by a provincial DCA officer has been conducted to determine the extent of the damage caused. KZN province do not allow the hunting of DCAs by local or international hunters.

In 2019, the Sabi Sands private nature reserve received a permit for the culling of 40 hippos in response to major concerns of eutrophication in dams with high hippo densities. Between 2010 and 2018, 298 hippo were captured and translocated within Mpumalanga province. The majority of these translocations were within South Africa to avoid conflict with agricultural farmers and communities and thus not considered a harvest. However, in 2012, five hippo were translocated, for reintroduction purposes, from a private game farm in the province to a private reserve in Namibia. Since 1998, 222 hippos have been captured within iSimangaliso Wetland Park for live sales. However, due to high water levels and the recent COVID pandemic no hippos have been captured in recent years.

DCA harvest is mainly unselective and opportunistic, while trophy hunting on game farms are to maximize economic yield. Within protected areas and many private reserves and game farms the main aim of harvest is population management.

14. Quotas: Is the harvest based on a system of quotas?	Ongoing national quota: based on biologically derived local quotas	1
	Ongoing quotas: "cautious" national or local	2
	Untried quota: recent and based on biologically derived local quotas	3

	Market-driven quota(s), arbitrary quota(s), or no quotas	4
	Uncertain	5
<p>There is no hunting quota for this species. Within protected areas, hippos are harvested / culled in order to meet the biological or socio-economic objectives of those protected areas. Permits for hippo hunts in South Africa are issued by the relevant provincial conservation authority.</p>		
Control of harvest		
15. Harvesting in Protected Areas: What percentage of the legal national harvest occurs in State-controlled Protected Areas?	High	1
	Medium	2
	Low	3
	None	4
	Uncertain	5
<p>The legal harvest of hippos within protected areas is low and includes mainly harvesting for biological control, live trade and killing of DCAs. In KZN, legal harvest occurs predominantly in protected areas, with some hunting of hippos on game ranches. Since 1998, 222 hippos have been captured within iSimangaliso Wetland Park for live sales. However, due to high water levels and the recent Covid pandemic no hippos have been captured in recent years. SANParks uses an adaptive management removal framework with two elements – ecological management to mimic ecological processes if these are impeded and cannot be restored (this is not relevant for KNP), and contribution to socio-economic-development when removals are conducted so as not to impact on the ecological integrity of large populations. Between 2016 and 2018, SANParks has harvested a small number of hippo from KNP for management purposes (Table 2).</p>		
16. Harvesting in areas with strong resource tenure or ownership: What percentage of the legal national harvest occurs outside Protected Areas, in areas with strong local control over resource use?	High	1
	Medium	2
	Low	3
	None	4
	Uncertain	5
<p>In Limpopo and Mpumalanga, all of the legal harvest occurs outside of protected areas (including killing of DCAs) where there is local control over resource use on private land. The majority of the trophy hunts in KwaZulu-Natal, and Limpopo takes place on game farms. In Mpumalanga, hunts mainly take place in rural and communal areas in the Onderberg area along the Crocodile river and adjacent areas and as far west as Montrose. Along the Sabi river and adjacent areas, mainly in the Phabeni area but as far north as Manyeleti and in the Thulamahase district. There are no more than five farms with exemption for hippo in the province. The Associated Private Nature Reserves (APNR), bordering KNP also hunt hippo on an annual basis but numbers are limited to two or three a year. The killing of damage causing hippos takes place on agricultural farms and on communal lands. In Mpumalanga, hunts mainly take place in rural and communal areas in the Onderberg area along the Crocodile river and adjacent areas and as far west as Montrose. Along the Sabi river and adjacent areas, mainly in the Phabeni area but as far north as Manyeleti and in the Thulamahase district. In 2019, the Sabi Sands Private Nature Reserve received a permit for the culling of 40 hippos, due to major concerns of eutrophication in dams with high hippo densities.</p>		
17. Harvesting in areas with open access: What percentage of the legal national harvest occurs in areas where there is no strong local control, giving <i>de facto</i> or actual open access?	None	1
	Low	2
	Medium	3
	High	4
	Uncertain	5
<p>There is no open access land in South Africa, particularly for species protected by legislation. Communal lands are not open access. These areas are under the control of communities. In addition, if a permit is needed (in terms of provincial or national legislation) or landowner permission is required then it is not open access – there is control. Any harvesting anywhere without a permit or landowner permission would be illegal.</p>		

18. Confidence in harvest management: Do budgetary and other factors allow effective implementation of management plan(s) and harvest controls?	High confidence	1
	Medium confidence	2
	Low confidence	3
	No confidence	4
	Uncertain	5
<p>There are budgetary, manpower and logistical constraints for the implementation of management plans in all provinces. Though most culling operations for hippos are effectively implemented, targets for population control off-takes are often not met because hippos are difficult to remove, particularly as these operations are not well funded.</p> <p>In Mpumalanga, due to the inherent risk to human lives and livelihoods, funding for managing DCA hippos is readily made available. Officials attend all DCA hippo hunts in the province, whether hunted by international or local hunting clients. In Limpopo, there is no special funding to manage DCA hippos, however in case of financial restrictions, a permit is issued to the landowner to either destroy the problem hippo or sell the hunt to a local hunter. There is a lack of staff to attend all trophy hunts in the provinces of Limpopo, Northern Cape and North West, however this is not required by national nor provincial legislation. In Limpopo there is some evidence that hunters may be hunting hippo illegally within rivers instead of on registered game farms. In KZN trophy hunts only takes place on private game farms and the attendance of a provincial officer is not required. DCAs within the province are dealt with by the province and a damage causing hippo may not be sold to as a local hunt. Within the Eastern Cape and Gauteng there a high confidence in the implementation of harvest controls within protected areas, which for Gauteng include both provincial and municipal reserves, and within the Eastern Cape all hunts are attended by a provincial conservation official. There is thus an overall medium confidence for the country.</p>		
Monitoring of harvest		
19. Methods used to monitor the harvest: What is the principal method used to monitor the effects of the harvest?	Direct population estimates	1
	Quantitative indices	2
	Qualitative indices	3
	National monitoring of exports	4
	No monitoring or uncertain	5
<p>Monitoring in all provinces involves direct population estimates. At present harvest of hippos is being monitored through provincial permit systems, Professional Hunter's Register and CITES exports. The effects of harvest, which includes both live exports and hunting, are however not currently monitored and databases are either lacking or not updated and monitored continuously. For example, in Limpopo Province hippo populations are monitored but not on an annual basis. Due to budget constraints, annual surveys are rotated between river systems. There is further no link between the counts and the permits issued, i.e. population trends are seldom linked to what has been legally removed from the population.</p>		
20. Confidence in harvest monitoring: Do budgetary and other factors allow effective harvest monitoring?	High confidence	1
	Medium confidence	2
	Low confidence	3
	No confidence	4
	Uncertain	5
<p>There are budgetary, manpower and logistical constraints in all provinces. In Limpopo, Northern Cape and the North West, it is difficult to motivate for regular monitoring of the species due to the high cost of surveys. Within Limpopo and Mpumalanga, due to budgetary constraints it is not possible to count all river systems annually, and due to the current poaching threat to rhinoceros, the use of helicopters is limited. Within the Eastern Cape and Gauteng there is a low confidence in the monitoring of hippo on private land, but a high confidence in the monitoring taking place within protected areas. Within the Eastern Cape funds are made available every year to survey the species. Notwithstanding these constraints, regular monitoring of hippo numbers does take place. Number of permits issued for all use activities are recorded but there is no follow up on whether the permits are used.</p>		

The effects of harvest, which includes both live exports and hunting, are however not currently monitored and databases are either lacking or not updated and monitored continuously. For example, in Limpopo Province hippo populations are monitored but not on an annual basis. Due to budget constraints, annual surveys are rotated between river systems. There is further no link between the counts and the permits issued, i.e. population trends are seldom linked to what has been legally removed from the population.

Incentives and benefits from harvesting

21. Utilization compared to other threats: What is the effect of the harvest when taken together with the major threat that has been identified for this species?	Beneficial	1
	Neutral	2
	Harmful	3
	Highly negative	4
	Uncertain	5

There are no major threats facing the species at present. However, the effects of habitat loss and fragmentation on the species is considered substantial. The introduction of hippos onto game farms is thought to counteract the effects of habitat loss and human wildlife conflict. However, low numbers of hippo have been introduced on game farms and these small isolated pods of hippo may over time become inbred and thus cannot be considered genetically viable. In addition, the low numbers of this species on game farms, reduce the potential benefits gained from trophy hunting. At present the main aim of off-takes is population control, and economic benefits are limited. Offtakes from PAs is likely beneficial as the main objective of population management is to maintain ecological integrity of the PA. The removal of DCAs from river systems might be harmful as this offtake is opportunistic and unselective. However, overall the effect of harvest at present to not exacerbate the main threat to this species.

22. Incentives for species conservation: At the national level, how much conservation benefit to this species accrues from harvesting?	High	1
	Medium	2
	Low	3
	None	4
	Uncertain	5

Rivers are often fenced out of private land and hippos are consequently introduced into dams instead of rivers, thus providing limited opportunities for conservation of the species on private land and on game farms. However, within Limpopo Province there are anecdotal evidence that hippo move onto game farms and are then hunted as an exempted species. Compared to other large animals such as the white rhino, the conservation of this species has not benefited significantly from the hunting and game farming industries. There is a lot of habitat available for hippo in the Eastern Cape, but game farmers are reluctant to introduce the species due to the high risks to humans and livelihoods. Similarly, in the last three years the demand for hippo for game farms were limited in Mpumalanga.

23. Incentives for habitat conservation: At the national level, how much habitat conservation benefit is derived from harvesting?	High	1
	Medium	2
	Low	3
	None	4
	Uncertain	5

Rivers are often fenced out of private land and hippos are consequently introduced into dams instead of rivers, thus providing limited opportunities for conservation of the species' habitat on private land and on game farms. Stocking hippo on game farms is often regarded as an "add on" as ideal hippo habitat is limited. There is a lot of habitat available for hippo in the Eastern Cape, but game farmers are reluctant to introduce the species due to the high risks to humans and livelihoods.

Protection from harvest

24. Proportion strictly protected: What percentage of the species' natural range or population is legally excluded from harvest?	>15%	1
	5-15%	2
	<5%	3
	None	4

	Uncertain	5
<p>The two largest hippo populations occur within the KNP (3,986 individuals) and the iSimangaliso Wetland Park in KZN (approx. 1,276 individuals). The population of $\pm 3,986$ hippo in KNP represents approximately 36% of the South African hippo population. Seventy-five percent of the hippo population in KZN occurs within protected areas. However, since 1998, 222 hippos have been captured within iSimangaliso Wetland Park mainly for live sales. Approximately 53 hippos occur within Pilanesberg National Park, North West province, and 25 hippos in Loskop Dam Nature Reserve, Mpumalanga. There is thus a high level of protection granted to hippos in all national and provincial reserves. Management actions to control population numbers may take place in all protected areas, for example a small number of individuals are removed annually from the hippo population of KNP. While there are offtakes from PAs, these offtakes are all for management purposes and these offtakes are to the benefit of the species and its habitat.</p>		
<p>25. Effectiveness of strict protection measures: Do budgetary and other factors give confidence in the effectiveness of measures taken to afford strict protection?</p>	High confidence	1
	Medium confidence	2
	Low confidence	3
	No confidence	4
	Uncertain	5
<p>A very small percentage of the hippo population is currently lost to poaching from protected areas. It is really only known to take place in Ndumo Game Reserve, which has led to a significant reduction in numbers. Between 2016 and 2018 only two hippos have been poached in KNP (table 2). The high level of poaching within Ndumo Game Reserve is mainly due to unresolved land tenure issues and a resulted encroachment of agriculture land and people into the reserve.</p>		
<p>26. Regulation of harvest effort: How effective are any restrictions on harvesting (such as age or size, season or equipment) for preventing overuse?</p>	Very effective	1
	Effective	2
	Ineffective	3
	None	4
	Uncertain	5
<p>There is good legislation in place on both a national (CITES Appendix II) and a provincial level to regulate all use activities relating to hippo. Hippo is listed as “protected” in terms of the various provincial ordinances and acts which provide legislative protection. Permits are therefore required to undertake a variety of activities in relation to hippo, e.g. hunting and other forms of direct use. Management of DCAs outside of protected areas is effective in all provinces. Permits for the removal or hunting of damage causing hippo are issued on a case by case basis based on inspections done by DCA officers in the respective provinces. There is thus a high confidence that the correct animal is removed. The offtake however is unselective as there are no restrictions on age or size. In addition, ecological and behavioural considerations are not taken into account with DCAs. The national hippo population is stable and there is no evidence of overuse anywhere in South Africa.</p>		

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