

Non-detriment finding for *Encephalartos horridus*

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Summary of finding

Cycads are collectively/globally the most threatened taxonomic group of organisms that have been assessed so far by the International Union for Conservation of Nature (IUCN). South Africa is one of the world centres of cycad diversity with more than 50% of the known African cycad species occurring in the country. This includes 37 species from the *Encephalartos* genus, of which 70% are threatened with extinction and 11% are presumed to be Extinct in the Wild. Targeted removals of individuals from the wild for direct use/collection and trade purposes is the primary threat to all but one of these 37 species. As such, all species of the genus are included in Appendix I to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the export of these species for commercial purposes is prohibited (Article III). However, specimens artificially propagated for commercial purposes are deemed to be specimens of species included in Appendix II (Article VII) of CITES and therefore may be traded. 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. Furthermore, in terms of CITES Resolution Conf. 11.11 (Rev. CoP18) the parental stock that is used to produce specimens for trade must have been established in accordance with the provisions of CITES and relevant national laws and in a manner not detrimental to the survival of the species in the wild. This document details the undertaking of a non-detriment finding (NDF) for *Encephalartos horridus* and is based on the best available information, current as of September 2023.

Encephalartos horridus (Eastern Cape Blue Cycad) is listed as Endangered (A2acd+4acd) in the IUCN Red List. Whilst the species is known from more than five subpopulations, it is distributed across a small (~431km²) and restricted range within the Eastern Cape Province of South Africa. Furthermore, it has been eradicated from several parts of its former range by previous habitat loss and ongoing poaching. Ad-hoc surveys of subpopulations in protected areas have shown recent signs of removal and the species is currently one of the most in demand by collectors around the world. Repeat photographs have indicated a decline of >50% in the population over the past 100 years. The exact number of plants remaining in the wild is unknown, but declines are presently ongoing and are projected to continue into the near future.

Since the 1970s, cycads in South Africa have received legislative protection under various provincial nature conservation ordinances, and more recently in terms of Government Notice No. 371 of 2012 which prohibits wild harvest (of plants and seed) excepting for conservation and enforcement purposes. Resource shortages in terms of budget and adequate staff capacity remains a key challenge in many cycad range provinces, thus rendering strict protection measures ineffective at present. In the Eastern

Cape, on-the-ground monitoring of the species' population is irregular and unstructured. The provincial conservation authorities are inadequately equipped to protect wild populations from unsustainable harvest. No permits have ever been issued for the wild collection of *E. horridus* plants in the past. Despite an exponential increase in propagated cycads and the National trade regulated in terms of the Threatened or Protected Species Regulations (TOPS), the laundering of illegally obtained wild plants into private collections and nursery operations continues, facilitated by the inconsistent and non-implementation of Government Notice No. 371 within key trading provinces.

According to the CITES trade data, more than 33 000 specimens of *E. horridus* have been legally exported from South Africa between 1979 and 2020. As of 2018, a national programme to audit and monitor nurseries involved in the international trade in cycads has been established. Eight South African nurseries are registered with the CITES Secretariat in terms of CITES Resolution Conf. 9.19 (Rev. CoP15) to trade in *E. horridus*. Although effective monitoring of the local trade in cycads, including the interprovincial movement is lacking, there has been some significant efforts to improve the implementation of legislative instruments such as the upskilling and training of law enforcement officials, as well as developments in technological solutions such as stable isotopes and microdots to identify and protect wild cycads, including those that have been laundered into *ex situ* collections.

As of 2014, the management and conservation of all cycad species in the country has been guided by the National Strategy and Action Plan for the Management of Cycads. Additionally, a Biodiversity Management Plan (BMP) for the 11 Critically Endangered and four Endangered cycad species, which includes *E. horridus*, has been published (in terms of section 43 of the NEMBA), for implementation since 2017. These plans include marking wild *E. horridus* populations with microdot technology in order to improve the species protection. The implementation of these plans, co-ordinated by a dedicated National Cycad Steering Committee, has not yet yielded the desired outcomes, mainly due to a lack of resources. Whilst *E. horridus* is known to occur in at least two state protected areas as well as in areas with strong local control over resource use, wild plants remain at risk of illegal harvest. There are currently no incentives or conservation benefits associated with the trade in the species.

The species' biology, which is characterized by a poor dispersal ability, and slow growing long-lived adults that regenerate predominantly from seed, renders *E. horridus* particularly vulnerable to overutilization. This, together with the species' poor conservation status, the ongoing population decline due to poaching activities, the capacity and budgetary constraints that prevent the provincial agencies from effectively managing and monitoring the species, the lack of conservation incentives, and the continuing ineffective implementation of the existing strict protection measures for cycads at a national level, presents a scenario that is unfavourable for the long-term survival of *E. horridus* in the wild.

The species is at a high risk from international trade (Fig. 1 & 2). With respect to artificial propagation (source code A), CITES Resolution Conf. 11.11 (Rev. CoP18) requires that parental plants are legally acquired and not to the detriment of the wild population, but it is highly unlikely that exports in the past met these requirements. In order to ensure that international trade does not have any further detrimental impact on wild populations, only nurseries registered in accordance with the CITES Resolution Conf. 9.19 (Rev. CoP15) may export *E. horridus* seedlings. Only seedlings that are (i) artificially propagated in accordance with the CITES Resolution Conf. 11.11 (Rev. CoP18), or (ii) have been grown from wild

harvested seed in accordance with the conditions specified in the CITES Resolution Conf. 11.11 (Rev. CoP18) and within the framework of a Biodiversity Management Plan published in terms of section 43 of the NEMBA, may be exported.

Each nursery applying for CITES registration must be audited in accordance with the decision tree approved by the Scientific Authority, and regular follow up audits must be conducted in order to monitor seedling propagation. All parental plants must

- i. Be accompanied by TOPS possession permits and affidavits from the owner stating that the plants are not of wild origin, and
- ii. Not exhibit any characteristics typical of wild origin.

The export of large artificially propagated specimens (with a stem diameter of more than 15 cm) is prohibited (Government Notice No. 371, May 2012).

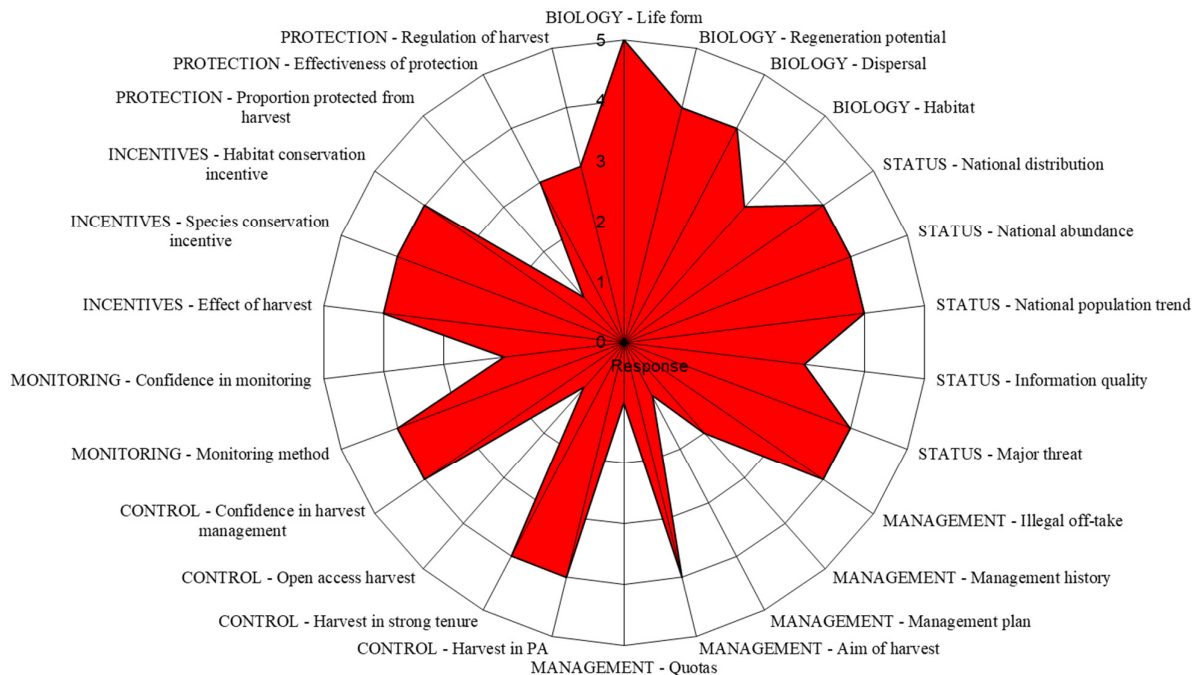


Figure 1. Radar chart summarizing the non-detriment finding assessment undertaken for *Encephalartos horridus* in accordance with the CITES NDF checklist. Explanations of scores given are detailed in Table 1. Higher scores are indicative of higher risks to the species. The shaded area in the radar chart demonstrates an overall high risk to the species.

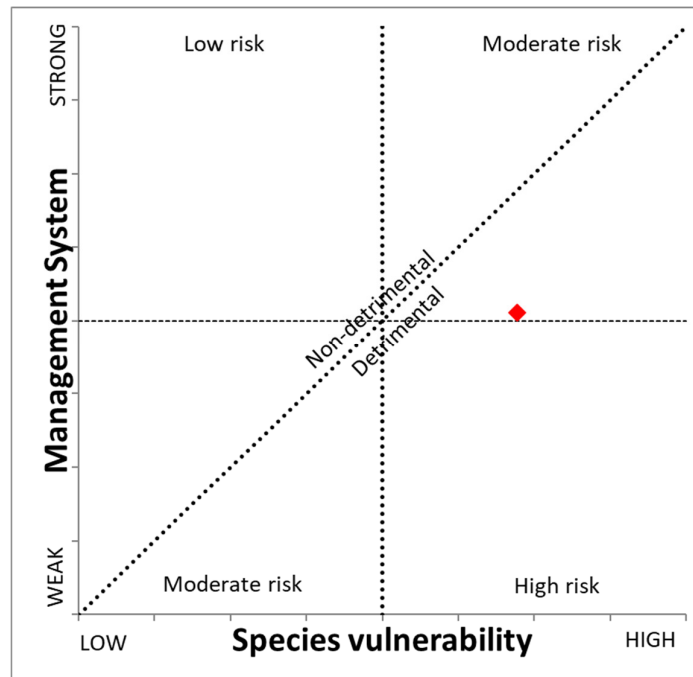


Figure 2. The risk of trading in *Encephalartos horridus* as represented by the relationship between species vulnerability (biology and status) and the management system to which the species is subjected (management, control, monitoring, incentives and protection). The figure shows that the species is at a moderate to high risk and trade is detrimental.

Table 1. Non-detriment finding assessment for *Encephalartos horridus* 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 form: What is the life form of the species?	Annual	1
	Biennial	2
	Perennials (herbs)	3
	Shrub and small trees (max. 12m.)	4
	Trees	5
<i>Encephalartos</i> (African cycads) is a genus of ancient plants characterised by their unique woody trunks, attractive crown of evergreen leaves, and large cones that appear at maturity. Although they differ in their life-history strategies, all species are generally long-lived, surviving for many decades and even centuries with adult plants playing an important role in population persistence (Golding and Hurter 2003; Raimondo and Donaldson 2003). <i>Encephalartos horridus</i> displays some variation in growth form with plants ranging from dwarf to arborescent. The more common form has mature stems that typically grow between 0.5 and 1 m tall and 20-30 cm wide, appearing entirely above ground in rocky areas and largely below ground within deep soil in other areas (Kemp 1986). In comparison, the less common dwarf form has stems that are approximately 20 cm in height and up to 15 cm in diameter along with shorter leaves and smaller cones (Kemp 1986). The species may also exhibit some variation in appearance based on the prevailing habitat conditions (Kemp 1986). Subpopulations typically comprise older plants (generation length of >200 years) with persistent multiple trunked adults. The tendency to produce several trunks is assumed to increase longevity (as new suckers replace old moribund stems).		
		
Figure 3: <i>Encephalartos horridus</i> pictured in habitat. Photo by Jacob Dirsuwei, https://www.inaturalist.org/, CC BY-NC 4.0		

2. Regeneration potential: What is the regenerative potential of the species concerned?	Fast vegetatively	1
	Slow vegetatively	2
	Fast from seeds	3
	Slow or irregular from seeds or spores	4
	Uncertain	5
The cycad life history is characterized by long-lived (dioecious) adults that reproduce predominantly from seed. Coning is typically infrequent and erratic, with many species exhibiting mast-seeding (Cousins and Witkowski 2017). Plants do produce suckers, but they generally play a limited role in the regeneration of cycad populations. Suckers, however, may aid in species persistence, particularly where they remain behind after the main stem has died or has been harvested. <i>Encephalartos horridus</i> is one of the species that produces basal suckers freely with large clusters of plants being formed. The suckers will normally be the same sex as the parent plants although there have been some unconfirmed reports of plants changing sex after transplantation. Wild populations of <i>E. horridus</i> are characterised by a high proportion of adults and fewer juveniles indicative of low recruitment and high juvenile mortality with primary investment into adult plant persistence through vegetative suckering (Konings 2016). This is thought to be a common strategy for species located in more variable habitats with a low, unreliable rainfall and periods of drought, winter frost and, in some cases fire - conditions that do not typically favour seed germination and seedling establishment. Species in such areas typically produce one cone at the longest coning interval of between six and eight years or when suitable conditions do occur (Konings 2016). Male and female plants of <i>E. horridus</i> typically produce one, or rarely two cones (per stem) at a time, every six years on average (Dyer 1965; Giddy 1974; Goode 1989; Konings 2016). Cycad seeds are relatively short-lived without any period of dormancy. Fertilized embryos develop slowly but continuously until germination which typically occurs a few months after dispersal. Usually only a few seeds will survive post dispersal, with others prone to desiccation and/or predation. Recruitment events happen from time to time but seedling survivorship may be further impacted in areas where trampling and grazing by livestock occur. Recruitment by seed is therefore limited and population turnover gradual in most cases. Furthermore, cycads have very specialised (insect) pollinators, so reproduction is also determined by the presence and efficiency of species-specific pollinators (Donaldson 2004). In general, viable seed production in <i>Encephalartos</i> populations tends to decline with decreasing population size (Donaldson 1993).		
3. Dispersal efficiency: How efficient is the species' dispersal mechanism?	Very good	1
	Good	2
	Medium	3
	Poor	4
	Uncertain	5
The dispersal abilities of cycads are not well understood but are generally regarded as poor. Cycads have large seeds with fleshy and brightly coloured outer coats or sarcotesta, which attract animals such as birds and small mammals that act as dispersal agents. The distance that seeds disperse is limited by how far animals can carry the large seeds (which is typically within a radius of less than 20 m around the core population). <i>Encephalartos horridus</i> is broadly distributed within its range and displays good local dispersal, however, the species does not cone every year and not enough viable seeds have been produced to allow for range expansion. Even if seed were dispersed to new sites, the concomitant dispersal of species-specific pollinators would be highly unlikely. Colonization of new sites is furthermore unlikely due to several reproductive limitations, such as limited seed production or non-		

viable seeds, irregular coning, infrequent recruitment, and male plant biases in populations. There has been no observed change/expansion in the distribution of any cycad species.

4. Habitat: What is the habitat preference of the species?	Disturbed open	1
	Undisturbed open	2
	Pioneer	3
	Disturbed forest	4
	Climax	5

Encephalartos horridus is found in the Albany Thicket Biome where it occurs in both mesic and xeric thicket vegetation, often on infertile, rocky quartzite outcrops and ridges, but also in deep fertile soils. Approximately 9% of the natural habitat of the Albany Thicket biome has been lost to anthropogenic land uses – croplands (6.6%) and human settlements (1.6%) – including dune thickets, and 45% of the biome is in a moderate to severely degraded state (Skowno *et al.* 2019; 2021). The restoration of thicket vegetation (and the associated services it delivers) is reportedly labour intensive and there is little evidence of post-disturbance recovery to vegetation approximating the pristine state of undisturbed sites (Lloyd *et al.* 2002). Whilst *E. horridus* does grow in climax vegetation types within parts of its range, plants of the species do not require a very specific or complete vegetation structure to be able to establish and survive. The primary vegetation types in which the species is known to occur have been assessed as Least Concern, remaining in a close to 90% natural state and are moderately to well protected at present (Skowno *et al.* 2019).

National status

5. National distribution: How is the species distributed nationally?	Widespread, contiguous in country	1
	Widespread, fragmented in country	2
	Restricted and fragmented	3
	Localized	4
	Uncertain	5

Encephalartos horridus is endemic to South Africa and is distributed in a small area of the Eastern Cape Province with an estimated Extent of Occurrence (EOO) of ~431 km².

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

The exact size of the *E. horridus* population is not known but it is highly likely that the national population does not exceed 5 000 mature individuals. Current estimates suggest upwards of 2 000 plants but there may be colonies in the dense, sometimes impenetrable bush habitat where the species occurs. The species is currently listed in the IUCN Red List category of Endangered (A2acd; 4acd (Bösenberg 2022)).

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

This species has declined across wide areas of its former range due to the historical expansion of urban settlements and significantly due to the ongoing collection of wild plants for horticultural and ornamental purposes. There is evidence of substantial poaching in the last 10 years leading to declines in

subpopulations that were previously regarded as stable. Results derived from spatially and temporally extensive repeat photograph datasets (across 53 accessible areas of the country to date), indicate that almost all cycads (but especially the Critically Endangered and Endangered species) are declining at an alarming rate, due primarily to the illegal removal of wild plants (of all sizes) (Okubamichael *et al.* 2016). The rate of decline increased substantially between the 1990s and 2014 (by up to 70% as of 2016), particularly within the Eastern Cape and Limpopo Provinces (Okubamichael *et al.* 2016). Repeat photography and field observations have provided direct evidence of the decline in at least two subpopulations of the species by 51 (50% of the population) and approximately 150 individuals (100% of the population) over time (Okubamichael *et al.* 2016). Since 2014, the population of 51 plants has reportedly been further reduced with less than 20 plants thought to be remaining at present. Several other subpopulations continue to be impacted by illegal harvest. *Encephalartos horridus* has experienced population declines of more than 50% over the last three generations and this is expected to continue happening into the near future (Bösenberg 2022).

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

Current population data for *E. horridus* is outdated, and monitoring takes place on an ad hoc basis. Comprehensive, up to date population surveys are needed.

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

Encephalartos horridus is now extinct in several parts of its former range where it has been eliminated by (historical) urban development. Substantial numbers of plants have also been removed by collectors over the past 60 years. This is evidenced by the number of specimens in gardens as well as in local and international collections. Studies using repeat photography have shown how *E. horridus* had fewer adult plants than expected for several subpopulations photographed in the early 90's and again in 2014 (Okubamichael *et al.* 2016). Small farm owners are suspected to have played a role in the decline of the species on private land by allowing poachers to remove plants for a quick but healthy fee in some areas. In general, the mortality rates of cycads removed from the wild is likely to be quite high depending on several factors such as the size of specimens harvested, the quality of aftercare, and the effects of frequent transplantation. It is thus very likely that many wild origin specimens have been and will continue to be lost over time from private collections. Demand for *E. horridus* plants on both the local and international market has increased in recent times and the species is facing an ongoing decline across its range with several easily accessible populations subject to continued poaching.

Within South Africa, cycads are also regarded as a culturally important plant group (Cousins and Witkowski 2017) and all species remain at risk to harvest for traditional medicine and spiritual purposes. Harvesters and healers do not distinguish between the various species. Accessibility of the plants is the key factor determining whether a species is vulnerable to harvesting. Invasive species (such as the prickly-pear) may pose an additional albeit, indirect threat to the species.

Harvest management

10. Illegal off-take or trade: How significant is the national problem of illegal or unmanaged off-take or trade?	None	1
	Small	2
	Medium	3
	Large	4
	Uncertain	5
The scale of illegal collecting for horticultural and ornamental purposes is significant. This species has remained very popular amongst collectors and wild plants continue to be laundered into trade. Information on the level of illegal offtake is currently based on the number of arrests that have been made. Between 2008 and 2009, close to 300 wild plants were found to have been illegally removed within the Eastern Cape Province across both private and state-controlled lands. In 2016, a further 36 wild harvested plants were recovered by the Eastern Cape provincial conservation authority near Uitenhage. A number of <i>E. horridus</i> plants have also previously been stolen from <i>ex situ</i> collections at the National Botanical Gardens that resulted in a significant reduction in the size of these collections. Investigations into the illegal possession and transportation of adult plants and seedlings have also been initiated over the years, with the most recent case involving 35 <i>E. horridus</i> stems seized in a roadblock within the Gauteng province in 2022. Another investigation is currently underway in Gauteng for more than 200 plants that were brought in from the Eastern Cape outside of the stipulated permit conditions. There has been increasing interest in <i>E. horridus</i> from overseas markets and it is currently amongst the most in-demand species. The blue form cycads are more frost tolerant than green cycad species and they are thus more popular on the highveld and on the export market. Nurseries are often found having large plants. A total of 18 wild origin plants (i.e., specimens exhibiting two or more wild characteristics) have been observed at seven different cycad nurseries during audits of such facilities. There are also numerous specimens in private gardens in towns where the species is known to occur, and it is very well represented in collections in the rest of South Africa and overseas. Limited but destructive traditional medicine harvesting is also possibly ongoing where plants occur in more easily accessible areas.		
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
Illegal harvesting of wild cycads has been occurring in South Africa for the past 50 years, becoming more prevalent from the 1990s onwards despite various legislative interventions. Since the 1970s all cycad species have been protected in provincial nature conservation ordinances, with the harvest of any plants or seed requiring a permit (in addition to other activities such as possessing, conveying, selling, etc.). No permits have reportedly ever been issued for the wild harvest of <i>E. horridus</i> plants or seed and the removal of wild plants from habitat within the Eastern Cape was formally prohibited in 2003 with the approval of Operational Policy 4/2003. In general, there has been an exponential increase in <i>ex situ</i> cultivated cycads, which are currently regulated by provincial conservation ordinances/Acts and the National Environmental Management: Biodiversity Act (NEMBA): Threatened or Protected Species Regulations (TOPS). In February 2007 the harvest of cycads from the wild was prohibited nationally in terms of Regulation 25 of the Threatened or Protected Species Regulations, but this was withdrawn and replaced by Government Notice No. 371 in May 2012 which prohibited the wild collection of cycads and all restricted activities for wild origin cycads excepting for possession of plants that had		

TOPS permits prior to the notice coming into effect. Whilst the regulatory responses to the harvest of wild plants have been strengthened since 2012, the illegal removal of cycads from the wild continues.		
12. Management plan or equivalent: Is there a management plan related to the harvest of the species?	Approved and co-ordinated 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
As of 2014, the management and conservation of all cycad species in the country has been guided by a National Strategy and Action Plan for the Management of Cycads. Additionally, a Biodiversity Management Plan (BMP) for the 11 Critically Endangered and four Endangered cycad species has been published (in terms of section 43 of the NEMBA), for implementation since 2017. The aim of the BMP-S is to ensure the long-term survival in nature of the most threatened <i>Encephalartos</i> species. This entails halting the decline of the <i>in situ</i> populations and thereafter attaining a population growth rate. A Cycad Steering Committee/ National Cycad Task Team (consisting of representatives from local, provincial, and national conservation agencies, NGOs, and the private sector) has been established to implement the National Strategy and Action Plan as well as the BMP through a process of ongoing, co-ordinated collaboration and monitoring.		
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
The harvest of wild cycads is prohibited throughout South Africa, except for conservation and enforcement purposes. Any offtake at present is illegal, opportunistic and for the personal benefit of the harvester.		
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
There are currently zero-offtake quotas in place for all South African cycad species. Harvesting of wild plants (and seed) is prohibited under Government Notice No. 371 (published May 2012) excepting for conservation and enforcement purposes.		
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
The harvest of wild cycads (including seed) is controlled by provincial nature conservation legislation and, excepting for conservation or enforcement purposes, is prohibited nationally in terms of		

Government Notice No. 371 of 2012. *Encephalartos horridus* does occur within state protected areas in the Eastern Cape province, but harvesting of the species for conservation or enforcement purposes is not taking place at present.

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

The harvest of wild cycads (including seed) is controlled by provincial nature conservation legislation and, excepting for conservation or enforcement purposes, is prohibited nationally in terms of Government Notice No. 371 of 2012. Subpopulations of *E. horridus* do occur in areas where local control over resource use is generally regarded as strong, i.e., on privately owned land, but harvesting of this species for conservation or enforcement purposes is not taking place at present. Strict control over harvest in areas outside of protected areas is however challenging.

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

There are no open access areas in South Africa on which cycads occur.

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

Monitoring and enforcement activities for cycads, and more particularly for rare species, require dedicated capacity and budget. The provincial conservation authorities that are mandated to conserve cycads and monitor trade continue to face severe resource constraints, both in terms of human resource capacity and budget. National funds afforded to the biodiversity sector are becoming increasingly insufficient (in relation to the scale of the challenges faced), making it difficult to effectively (and consistently) implement the strong regulatory and management frameworks needed to protect cycads. The Eastern Cape provincial conservation authorities that are mandated to protect several wild cycad populations from illegal harvesting are currently facing high levels of staff vacancies, low staff recruitment rates, and the impending retirement of experienced staff.

Table 2.1: Regulatory and management interventions in place for the conservation and protection of South Africa's cycads

Management intervention/harvest control	Effectiveness of implementation
CITES Appendix I listing (1977)	Somewhat successful
Provincial legislations	Ineffective
Threatened or Protected Species Regulations (2007)	Ineffective

Government Gazette Notice No. 371 on the Prohibition of trade in certain <i>Encephalartos</i> (cycad) species (2012)	Ineffective due to inconsistent implementation among provinces
National Response Strategy and Action Plan (2014) and the National Biodiversity Management Plan (2017)	Ineffective due to limited progress in undertaking activities and lack of resources for implementation

The non-compliance with and lack of implementation of Government Notice No. 371 in relation to the prohibition of trade in wild origin specimens in key provinces such as Gauteng undermines the intended harvest controls, whilst implementation of management plans and monitoring activities (both *in situ* and *ex situ*) is hampered by inadequate resources. Several subpopulations of *E. horridus* are located on privately owned land and within state protected areas with some monitoring activities ongoing. As part of the National objectives set out in the Cycad Action Plan and the BMP, the South African National Biodiversity Institute (SANBI), funded by the Botanical Society of South Africa (BotSoc), is in the process of piloting the use of microdot technology to mark wild populations of this species in order to improve its protection. Most management interventions have not yet shown a positive conservation outcome.

Table 2.2: Implementation of actions pertaining to *Encephalartos horridus* set out in the National cycad Biodiversity Management Plan (of 2017)

Actions	Intended timeframe for completion	Progress on actions
Conduct a population survey for <i>E. horridus</i>	Within five years of the publication of the BMP	Ongoing
Initiate a Biodiversity Management Agreement (BMA) with landowners on whose properties <i>E. horridus</i> occurs	Within five years of the publication of the BMP	None
Set recovery targets for <i>E. horridus</i>	After five years or once necessary information has been obtained	None

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

Exports of *E. horridus* from South Africa (extracted from the CITES Trade Database, UNEP World Conservation Monitoring Centre, Cambridge, UK) are monitored by SANBI on behalf of South Africa's Scientific Authority. A total of 33 058 specimens of *E. horridus* (estimated total value of R8.3 - R41 million) have been exported between 1979 and 2020 (Fig. 4). The average annual value of *E. horridus* exports is conservatively estimated at around R200 000 (assuming exports of 3-year-old seedlings at 2021/22 prices).

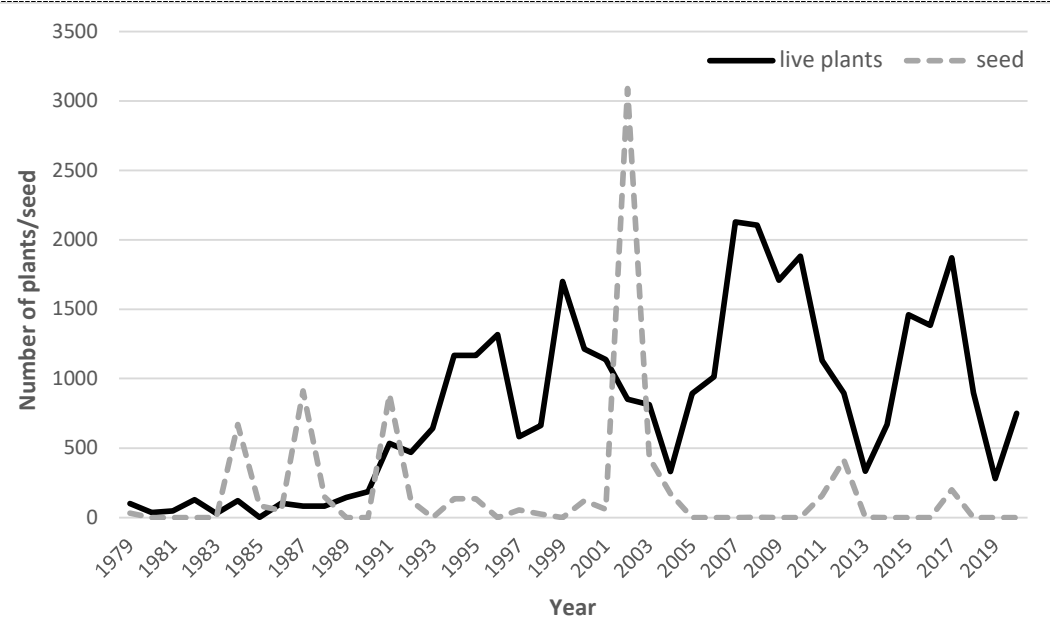


Figure 4: Gross (legal) exports of *Encephalartos horridus* plants and seed from South Africa since the inception of CITES in 1975 (CITES trade statistics derived from the CITES Trade Database, UNEP World Conservation Monitoring Centre, Cambridge, UK).

As of 2018, a national programme to audit and monitor nurseries involved in the international trade in cycads has been established. Only those facilities that are fully compliant with CITES Resolution Conf. 11.11 (Rev. CoP18) (Regulation of trade in plants) are allowed to export small plants and seeds. At present, eight South African nurseries are registered with the CITES Secretariat in terms of CITES Resolution Conf. 9.19 (Rev. CoP15) to trade in *E. horridus*.

A complete population survey has never been completed for this species, although some monitoring does take place in certain subpopulations. On the ground monitoring is nevertheless irregular and unstructured, and hampered by a number of staff vacancies within both the Eastern Cape Department of Economic Development, Environmental Affairs and Tourism (DEDEAT) and the Eastern Cape Parks and Tourism Agency (ECPTA).

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

The quality of the CITES trade data is not always as accurate as it should be owing to errors and inconsistencies in reporting by both exporting and importing countries. Historically, a lack of monitoring across local nursery facilities has also facilitated the illegal collection and laundering of wild plants, particularly as parental stock, of this and other species, but the national programme established in 2018 to audit and monitor cycad nurseries should improve this situation. Local trade in cycads, including the interprovincial movement of plants, is ineffectively monitored at present.

Incentives and benefits from harvesting		
21. Utilization compared to other threats: What is the effect of the	Beneficial	1
	Neutral	2

harvest when taken together with the major threat that has been identified for this species?	Harmful	3
	Highly negative	4
	Uncertain	5
Illegal collection for ornamental purposes and the horticultural trade is the major threat to this species. The species has been and continues to be propagated to supply the legal trade with seedlings and plants, but this is likely to have aggravated the illegal harvest of wild plants to establish parental stock <i>ex situ</i>. There is a potential for growers to contribute to the recovery of wild populations, but this is not happening at present. There are thus no incentives and/or benefits to the species accrued from utilisation at present. Whilst it could be argued that any removal of plants from the wild, even if it were to be legalised, would be highly detrimental given the current state of the national population, a well-managed and controlled legal harvest of seed may prove to be beneficial as in the case of <i>E. latifrons</i>. Nevertheless, this scenario remains hypothetical, and the effects of any possible future harvest are largely speculative.		
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
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
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
Government Notice No. 371 published in May 2012 in terms of section 57(2) of the National Environmental Management: Biodiversity Act (NEMBA) of 2004 prohibits the harvest (and trade) of wild cycads throughout South Africa, unless required for conservation or enforcement purposes. (This law pertains to the wild origin specimens currently in <i>ex situ</i> collections as well). All South African cycad species are also included in Appendix I to CITES, and thus commercial international trade in wild sourced plants is not allowed. The species is present in several formally protected areas within the Eastern Cape province.		
25. Effectiveness of strict protection measures: Do budgetary and other factors give confidence in the effectiveness of measures taken to afford strict protection?	High confidence	1
	Medium confidence	2
	Low confidence	3
	No confidence	4
	Uncertain	5
The nature conservation legislation pertaining to cycads has firmly improved over the past two decades, with strict protection currently afforded to wild cycads (including <i>ex situ</i> cycads of wild origin) under Government Notice No. 371 on the prohibition of trade in certain <i>Encephalartos</i> (cycad) species. The		

Threatened or Protected Species Regulations (TOPS) further provides for a solid legal framework to promote and support the sustainable trade in artificially propagated plants. The cycad trade is however quite complex, and substantial resources are required to monitor all the legal and illegal activities related to this trade and ultimately to enforce the prohibition. Unfortunately, resource capacity deficiencies in terms of budget and staff remains a key challenge in many provinces, thus rendering strict protection measures ineffective at present. In the Eastern Cape, the provincial conservation authorities are inadequately equipped to protect all wild cycad populations from illegal harvest. The laundering of illegally obtained wild plants into private collections and nursery operations has not been curbed due to the inconsistent or non-implementation of Government Notice No. 371 within key provinces such as Gauteng, where most of the cycad trade is centred. There has been some efforts to improve the implementation of legislative instruments, such as the development of guidelines to assist law enforcers with distinguishing wild cycads from artificially propagated specimens, as well as training sessions to educate and upskill (e.g. in relation to identifying species, see [IdentifyIt Cycads](#) app) those involved in investigations and prosecutions (including South African Police Service (SAPS) officials). Nevertheless, the illegal harvesting and movement of illegally harvested cycads across the country, and particularly into and around Gauteng, remains an ongoing problem with seemingly limited effort to address the scourge on a national level.

All species of South African cycads have been included in Appendix I to CITES since 1977, thereby ensuring that international trade in cycad specimens is subject to strict regulation. However, the CITES listing has had little impact on preventing the removal of plants from the wild. Some parental stock for the propagation of seedlings for both the domestic and international trade has been sourced from the wild to the detriment of the survival of a number of cycad species including *E. horridus*. This is primarily due to poor application of the CITES provisions by the relevant state agencies, particularly in respect of the definition of artificial propagation (source code A) as per CITES Resolution Conf. 11.11 (Rev. CoP18). Interventions to improve compliance of exporting facilities with the CITES provisions have been put in place (as of 2018), and only CITES registered facilities that meet the strict requirements for international trade are now allowed to export juvenile cycads and cycad seedlings. More than 160 artificially propagated mother plants of the species have been recorded during the national audit programme across cycad nurseries, including 146 plants within the eight registered facilities.

At least two subpopulations of *E. horridus* are known to occur within state protected reserves and the protection of the species within at least one of these reserves appears to be adequate at present despite capacity constraints (rangers regularly patrol the reserve). Additional *in situ* measures of protection, including the micro-chipping of several wild populations of *E. horridus* have also been implemented, albeit with a low success rate in preventing the continued harvest and trade of wild plants. Presently, several technological solutions are being employed to aid in efforts to curb the illegal trade in wild cycads, including novel marking/tracking techniques (Williamson *et al.* 2016; Zondi 2023) and strontium isotopes (Retief *et al.* 2014), which will provide the scientific evidence needed to prove wild origin in a court of law. Law enforcement agencies have yet to take full advantage of these modern innovations in prosecuting cycad-related offences.

The measures put in place to protect wild cycads and prevent unsustainable use have not yet yielded the desired outcomes, primarily due to a continued lack of resources in the provinces that are increasingly operating under ballooning mandates.

26. Regulation of harvest effort: How effective are any restrictions on harvesting (such as age or size,	Very effective	1
	Effective	2
	Ineffective	3
	None	4

season or equipment) for preventing overuse?	Uncertain	5
Regulatory measures are ineffective at present. Despite an exponential increase in <i>ex situ</i> propagated cycads, coupled with focused efforts in the regulatory and management space to curb the unsustainable harvest and trade of South African cycad species, wild plants continue to be illegally obtained and laundered into private collections and nursery operations. <i>Encephalartos horridus</i> is listed on Schedule 3 (Endangered Flora) of the Eastern Cape Nature and Environmental Conservation Ordinance (No. 19 of 1974) so that no person may without a permit, possess, sell, buy, donate, receive as a donation, pick, or import into, export from or transport in or through the Province, any South African cycad species. South African <i>Encephalartos</i> species are also protected in several other provinces under the respective provisional ordinances, however, most of these conservation legislations are outdated and have been inconsistently enforced. The Threatened or Protected Species (TOPS) Regulations of 2007 provided an improved national legal framework to govern the use of all indigenous cycads. As with several other regulatory interventions, compliance with and enforcement of the TOPS regulations has been met with some challenges over the years. A revision of the TOPS regulations has attempted to address some of the implementation challenges, but this has been a long and arduous process stretching across a decade, and it will require some time to assess the effectiveness of the revised regulations once they come into effect.		

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