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ENCEPHALARTOS

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BROODBOOM VERENIGING VAN SUID-AFRIKA

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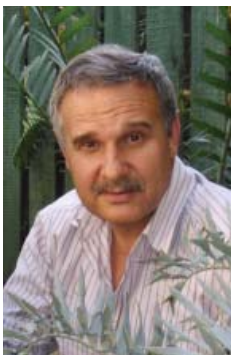

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ON THE COVER:

A group of *Encephalartos bubalinus* plants between Wasso and Sonjo, Arusha Province, Tanzania, photographed towards the end of the dry season by Miles Parisi.

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FROM THE COUNCIL / VAN DIE RAAD

VAN DIE PRESIDENT / FROM THE PRESIDENT

It is unbelievable how fast 2017 time flies. My father used to say as you grow older the years pass like cars on a main highway at rush hour. On behalf of the Board of the Cycad Society of South Africa I would like to use this opportunity to wish every one of our members a merry Christmas and a prosperous new year and may your cycads cone and grow vigorously.

One of the main concerns of the Board is the diminishing number of members every year, this happens in all our branches in South Africa. If one looks at the large interest in the social media platform concerning cycads, I cannot see why our membership is not growing instead of declining. Some of the following reasons could be our problem and should be investigated:

- Is it the stringent laws concerning the cycads in our gardens and nurseries?
- Could it be the unworkable present permit system?
- Is it the import and export permits between South African provinces?
- Maybe it is the transport permits between provinces and even between gardens in the same province?
- It is unthinkable that it could be the low membership fee of R285.00 per year.
- Maybe the yearly excursions, branch meetings and garden visits are not up to scratch.
- It is hard to believe that our interesting quarterly journal, ENCEPHALARTOS, is one of the causes.

I would like members to comment on the above points and make suggestions to increase our membership, because without a large membership we cannot even try to change the stringent laws concerning our love for cycads. Our existing members should try and bring new faces to the meetings and get the many members on social media to join.

The lawmakers should be consider some of the following points to relieve the stress on the wild populations:

- The cycads species that are not under threat of extinction should be freely available in all the nurseries in the country, but according to the law they are obliged to have a special selling permit for all South African species.
- The species that are not under threat should be removed from the permit system.
- Nature conservation should pollinate endangered species in the wild and sell the seeds here and abroad to finance their conservation projects, this will definitely relieve the stress on the endangered wild populations to a large extent.
- Private collectors and nurseries should be encouraged to produce and sell seedlings of the endangered species freely to the public.

Not only are we concerned about the declining membership, but also the fact that most of the founder and older members are selling their collections to large nurseries and bulk collectors. When this happens, we lose their cycad knowledge and also the provenance of the plants. This has a serious detrimental effect on what we as a society can do for conservation. I further believe that if the laws concerning cycads were more lenient, we could double our membership numbers.

A friendly reminder to our members that the 2018 subscriptions are payable in December. Let us hope that the year 2018 will be a good cycad year for all.

Happy cycading
John Kloppers

FROM THE DESK OF THE SECRETARY-TREASURER.

RENEWAL OF MEMBERSHIP FOR 2018

A. South African Members of the Cycad Society of South Africa.

Over the past few years our increase in membership fees was less than the inflation rate. We tried our best to keep the fee as low as possible for as long as possible. I regret to inform all South African members that your membership fee for 2018 will increase to **R285-00**. To cut down administrative duties and keep your membership fees as low as possible, the Society does not send out invoices for renewal of membership anymore. Instead we place notices in ENCEPHALARTOS to remind members to renew before the end of **December** each year.

Membership runs from January to December and benefits include all the issues of ENCEPHALARTOS due for the year in which you **joined**. Therefore, if you **joined** late in the year, you will receive copies of all those issues which appeared earlier this year, **provided that these issues are still available.**

Please note that only NEW members will get all the issues of the year in which they join. As from your second year as member it is expected from you to pay your membership on time. Please take note that in future you will probably **NOT** receive the first (March) issue of ENCEPHALARTOS if you renewed your membership after 31 January. The reason is that as from 2018, only a limited number of extra copies of ENCEPHALARTOS will be printed for March, to save costs. The number printed will be based on the number of payments received by 31 January. The Cycad Society does not have the luxury nor the funds to have unnecessary copies of ENCEPHALARTOS printed. Additional cost is incurred to store the back copies of the journal.

Please pay your membership for 2018 on time.

Only use the following banking details when making a EFT payment:

Bank: Standard
Branch: Montana
Branch code: 011 545 although there is a special code for internet banking which appears automatically.
Account name: Cycad Society of South Africa
Account number: 011 943 300. (cheque).

The reference when making a payment must be your **Surname AND membership number**.

Always sent proof of payment by e-mail to cycad@cycadsociety.org please.

Please also take note that "Stop Orders" are no longer acceptable.

We trust that your association with the Society will be mutually enjoyable and instructive.

B. Overseas Members of the Cycad Society of South Africa.

Members can pay their dues as follows:

- Interbank transfer to the Society's account.
- In United States Dollars and send it to **Willie Tang:** 13320 SW 28 St. DAVIE, Fl. 33330, USA.
- In Australian Dollars and send it to **Bret Dalziel: Tel. 0400 865 731**, Australia. E-Mail: cooroyboy@westnet.com.au PLEASE NOTE NEW ADDRESS.

Members in other countries should contact me at cycad@cycadsociety.org to arrange a payment method if they cannot pay by bank transfer..

Membership fees for 2018:

	AIR	SURFACE
Subscription fees for the year 2018	ZAR 440.00	ZAR 395.00
	US$ 60.00	US$ 55.00
	AU$ 62.00	AU$ 55.00
	EURO/€ 44.00	EURO/€ 42.00
	GBP/£ 38.00	GBP/£ 34.00

PLEASE NOTE: If your subscription is not paid by the due date, you are no longer entitled to receive the journal ENCEPHALARTOS and the dispatch thereof will be discontinued until your subscription is paid in full.

A big thank you for all your support and cooperation for paying your membership before end of December.

Kind Regards,
Frikkie Conradie
(Secretary-treasurer)

ENCEPHALARTOS BUBALINUS MELVILLE

Roy Osborne[1], Miles Parisi[2] & Andrew Cameron[3]

INTRODUCTION

Our various "Focus on …" series of articles have featured a number of the east African cycads: *Encephalartos equatorialis* (Vol 44, 1995), *E. hildebrandtii* (Vol 22, 1990), *E. kisambo* (Vol 39, 1994), *E. sclavoi* (Vol 37, 1994), and *E. whitelockii* (Vol 48, 1996). One serious omission in this selection has been a detailed report on *E. bubalinus*, the reason being that until recently we had very few habitat photographs of this species. It's not a "giant" like *E. whitelockii* or *E. ituriensis*, but it's a particularly important and interesting cycad – on which we now report.

DISCOVERY

In September 1944, Peter Bally, a Kenyan-based Swiss botanist working on East African succulents, gathered a male cone and leaf samples from cycad plants that he came across near Moluvane between Loliondo and the north-western end of Lake Natron in Tanzania. These he sent to Royal Botanic Gardens taxonomist Ronald Melville. When Melville described the species in 1957, he based the description on Bally's material, with the holotype filed in the Herbarium of the *Royal Botanic Gardens, Kew* (K, accession number 10600), and an isotope in the Herbarium of the *Botanischer Garten und Botanisches Museum Berlin-Dahlem* (B). In the *Kew Bulletin* of 1957, he named the cycad as *Encephalartos bubalinus*, the epithet relating to the buff colour of tomentum that Bally had noted occurring between the cataphyll and leaf bases. Female cones were not known at the time of the description, despite a second visit by Bally in 1956.

The species became much better known after the expedition by David Heenan and Don Stallard in 1973 (Osborne 1995), and collections by Ian Turner in 1993 (Turner 1994), when seeds and plants were distributed to botanical gardens and private collectors in southern Africa and elsewhere.

Apart from being in many of the better-known international botanical gardens, specimens of *Encephalartos bubalinus* are – surprisingly – present at the Atagawa Tropical and Alligator Garden in Japan, and at the historic Portici University Garden in southern Italy.

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DISTRIBUTION, HABITAT AND ECOLOGY

Encephalartos bubalinus occurs in the northern Tanzanian province of Arusha, where the cycad has a limited range in the Nguruman Hills, from near the towns of Loliondo and Loiyogaz in the west, and towards Ol Doinyo Sambu in the east (Goode 1989). The range then extends across the border into the Narok county of Kenya, to the north-west of Lake Natron and the west of Lake Magadi. The region is in the heart of Maasai country, a territory that covers a large area of Kenya and Tanzania.

Plants grow in open bushland on rocky quartzite hills, or less often in sparsely-wooded valleys, at altitudes from 1,300 to 2,150 masl. The area contains a healthy number of ancient podocarpus, olive and cedar forest. The tropical climate in the cycad habitat is alleviated by the somewhat higher altitudes than those near the

Figure 1. Peter René Oscar Bally (1895-–1980), botanist at the Nairobi Museum, Kenya, who discovered *Encephalartos bubalinus* near Lake Natron, Tanzania in 1944. Photo: Loutfy Boulos, September 1966.

Figure 2. Ronald Melville (1903–1985), botanist at the Royal Botanic Gardens, Kew, England, who wrote the *Flora of Tropical East Africa* and who described *Encephalartos bubalinus* in 1957. Photo from Wikipedia.

coast. Average temperatures range from 10 and 20°C in the cold and hot seasons respectively. The annual rainfall is 900–1000 mm, falling mainly during March-April and November-December, but interrupted by a long and harsh dry period from June-October.

Little is known of the pollination agents of this species. However, Willie Tang (1999) has demonstrated that male cones of *Encephalartos bubalinus* exhibit a pronounced diurnal thermogenesis at the time of pollen release, with cone temperatures reaching 10°C or more above ambient over 5 successive days. Rolf Oberprieler (1995) believes that weevils of the genera *Porthetes* and *Antliarhinus* may be implicated in pollen transfer.

Animals involved in seed dispersal probably include baboons, vervet monkeys, Sykes (Samango) monkeys, dassies, rats, ground squirrels and large birds. Hornbills are known to swallow the fleshy seed whole and then regurgitate the "cleaned seed" once the sarcotesta has been digested. Numerous other birds feast on the cycad sarcotestae but are not big enough to carry seeds away - these include the common Bulbul, Speckled Mousebirds, and various Barbet and parrot species.

DESCRIPTION, VEGETATIVE STRUCTURES

Data from Melville (1957), Goode (1989), Jones (2002), and Whitelock & Benadom (2015).

Figure 3. *Encephalartos bubalinus* is the dominant plant in this rocky quartzite habitat between Wasso and Sonjo, Arusha Province, Tanzania. Photo: Miles Parisi.

Figure 4. An impressive group of *Encephalartos bubalinus* plants between Wasso and Sonjo, Arusha Province, Tanzania. Photo: Miles Parisi.

Figure 5. *Encephalartos bubalinus* on a rocky hillside in Narok county, Kenya. Photo: Andrew Cameron*.

Figure 6. *Encephalartos bubalinus* on the roadside in the Nguruman Hills, Tanzania, photographed towards the end of the harsh dry season. Photo: Miles Parisi.

Encephalartos bubalinus plants are arborescent with stems up to 2 m in height and 33–45 cm in diameter, but with older stems often procumbent (Turner 1994). Plants are semi-deciduous in that the old leaves mostly tend to brown off before a new flush appears and are retained as a "skirt" around the trunk. Plants clump at the base with up to six stems and numerous suckers.

Leaves are 60–165 cm long, 20–30 cm wide, light or bright green, semi-glossy, slightly keeled with opposing leaflets inserted at 120–160° on the rachis, and held in an erect crown. The rachis is green, straight and stiff. The petiole is short, straight, basal leaflets reducing progressively to a series of prickles, and with a swollen base covered with a buff-coloured tomentum for which the species is named. *Leaflets* are in 50–90 pairs, 10–20 cm long, 10–20 mm wide, lanceolate, leathery in texture, weakly discolorous, not overlapping, not lobed, initially covered with silky whitish hairs, inserted on the rachis at an angle of 45–80°, and with a fine projection at the tip. Leaflet margins are flat, lightly toothed with 1–4 teeth on the upper margin and 0–1 teeth on the lower margin.

DESCRIPTION, REPRODUCTIVE STRUCTURES

Data from Melville (1957), Goode (1989), Jones (2002), and Whitelock & Benadom (2015).

Male plants of *Encephalartos bubalinus* bear 1–5 narrowly ovoid, dark jade-green *pollen cones*, almost sessile on the stem apex, 11–22 cm long by 5–6 cm in diameter (often much larger on cultivated plants).

Figure 7. A vigorous new leaf flush on this specimen of *Encephalartos bubalinus* in bushland in Narok county, Kenya. Photo: Andrew Cameron*.

Figure 8. The progressive reduction from leaflets to prickles along the rachis of *Encephalartos bubalinus*. Photo: Andrew Cameron*.

Female specimens produce one, occasionally more, ovoid *seed cones*, also dark jade-green, on a short bract-enclosed peduncle, 25–30 cm long by 15–18 cm in diameter (also often much larger on cultivated plants), with sharply-angled megasporophyll facets. *Seeds* are oblong, 35–40 mm long, 20–25 mm wide, with a golden-yellow or red sarcotesta when ripe.

ETHNOBOTANY

The seeds of this species are said to be eaten by the local Sonjo during times of famine (Bösenberg 2010).

CONSERVATION STATUS

Encephalartos bubalinus is listed as being of "Near Threatened" (NT) on the current IUCN Red List. Four populations have been documented and the total number of plants in the wild is thought to be more than 10,000, although the difficult terrain makes this number something of an estimate (Bösenberg 2010). It appears that there is a greater number of plants in Tanzania than on the Kenyan side of the border.

The entire region in which the cycads occur is strictly protected as a sacred place by the local Maasai people. To enter the area, permission has to be sought from the local tribal authorities and visitors must be accompanied. This helps to ensure the future protection of the cycad and the unique bio-diversity of grassland and forested areas.

Figure 9. Five pollen cones on this specimen of *Encehalartos bubalinus* in Narok county, Kenya. Photo: Andrew Cameron*.

Figure 10. The sculptured geometry of the megasporophyll facets is clear on the dark jade-green seed cone of *Encephalartos bubalinus*, Narok county, Kenya. Photo: Andrew Cameron*.

Figure 11. Vigorous seedling recruitment of *Encephalartos bubalinus* in bushland in Narok county, Kenya. Photo: Andrew Cameron*.

Figure 12. Local Sonjo children attempting to sell *Encephalartos bubalinus* offsets to travellers along the roadside near Loliondo in Tanzania. Photo: Miles Parisi.

CULTIVATION

Like most of the eastern African cycads, *Encephalartos bubalinus* is a vigorous grower, but is not frost hardy. It likes a well-drained soil, responds well to fertilizer applications, and prefers a sunny situation. It is suitable for containers but will grow to a larger size in a garden planting.

ACKNOWLEDGEMENTS

Roy Osborne wrote the text of this article. Miles Parisi provided the photographs taken in Tanzania. *Those taken in Kenya by Andrew Cameron were downloaded from The World List of Cycads and are reproduced under licence https://creativecommons.org/licenses/by-nc-sa/4.0/]

We thank Michael Calonje, Jody Haynes, Aldo Moretti and Piet Vorster for assistance in preparing this article.

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STATUS OF *ENCEPHALARTOS MACROSTROBILUS* (SCOTT JONES & WYNANTS JEFF) IN AGORO AGU CENTRAL FOREST RESERVE, UGANDA

Samuel Ojelel[1*] and Desmond Anywar[2]

ABSTRACT

Encephalartos macrostrobilus is an Endangered cycad in Agoro-Agu Central Forest Reserve in Lamwo district, Northern Uganda with a population estimate between 200-300 individuals. However, the entire area where it occurred was not adequately botanized due to insecurity. This study was therefore aimed at (i) estimating the population size (ii) establishing the threats and (iv) inventorying the local uses of *E. macrostrobilus*. In order to collect the data, belt transects of 5x200m wide were established along environmental gradients and all the individuals enumerated. In addition, a semi-structured questionnaire was administered to sixty household heads in two villages within an enclave in the forest reserve. These were selected using systematic simple random sampling. The population size of *E. macrostrobilus* was estimated to be 665 individuals. The majority of respondents (82%) did not report any use of the cycad, 18% reported its use for ornamental purposes while 15% did not know the cycad. Illegal collection was reported by all respondents as a major threat while other threats were indiscriminate cutting, agricultural encroachment and settlement and wild fires. This population remains greatly in danger because of the illegal collection and the continuous habitat quality decline. There is therefore need for the National Forestry Authority (NFA) to relocate the forest encroachers, sensitize the masses about the conservation value of *E. macrostrobilus,* regulate bush burning and raise seedlings for planters and ornamentalists to ease pressure on the wild population.

Key words: Cycads, Endangered, *Encephalartos macrostrobilus*, Agoro Agu, Uganda

1. INTRODUCTION

Cycads are the world's most threatened organisms whereby 62% of the known species are threatened with extinction (Hoffmann *et al.,* 2010). Notwithstanding their representation of only a small fraction of the world's plant diversity, they are a group of global conservation significance (Donaldson, 2003). The greatest threat posed to Africa's cycads is the illegal acquisition of wild plants by unscrupulous collectors for the horticultural trade (Donaldson & Bösenberg, 1999; Okubamichael *et al.,* 2016). The 2003 IUCN Red List assessment for African cycads indicates that all 18 Critically Endangered (CR) *Encephalartos* species had population sizes of <950 plants, and six had estimates of less than 100 plants remaining in the wild (Donaldson, 2003).

Several African cycad species already have very restricted distributions and occur in small numbers even before the advent of intensive cycad collecting (Cousins & Witkowski, 2017). This is true for the *E. macrostrobilus* in Uganda whose population was estimated to be 100 individuals in 1997 by Jones & Wynants and between 200-300 individuals by Donaldson in 2010. All these studies reported inaccessibility of the areas where this cycad occur due to the insecurity caused by the Lord's Resistance Army (LRA) rebels, declining quality of habitat and continued illegal collections. Given the relative peace in Northern Uganda, it become prudent to ascertain the present population size, utilization and threats to the species in order to generate information needed to shape its conservation agenda.

2. MATERIALS AND METHODS

1.1. Study area

Agoro-Agu Central Forest Reserve (CFR) is located along the border between Uganda and Southern Sudan (Figure 1) at 3°40–3°53N and 32°42–33°4E, and an altitude ranging between 110-2700M (Gorsevsk *et al.* 2012). The forest reserve covers a total of 26,508 hectares (IUCN 2015). It was gazetted in 1937, as a natural forest for biodiversity conservation. The Agoro-Agu CFR lies in the sub counties of Agoro and Lokungu, in Lamwo district. Agoro sub-county hosts the largest part of the forest reserve accounting for about 90% (IUCN 2015). Rocky hills and a mountainous relief characterize the Agora-Agu landscape in the North and Northwest and in the East and South are undulating plains with some valleys and swamps (IUCN 2015).

Agoro Agu is a catchment for two streams, the Okura, in the East of the sub-county and Aringo stream in the West. The Okura flows down Southwards to the low lying plain across Agoro trading center, while the Aringo stream runs South wards (IUCN 2015). The vegetation of the landscape majorly includes Afromontane undifferentiated forest, dry Combretum wooded grassland, Butyrospermum wooded grassland, low land Bamboo, and Upland Acacia wooded grassland and has endemic species of the Eastern Afro Montane hot spot (IUCN 2015).

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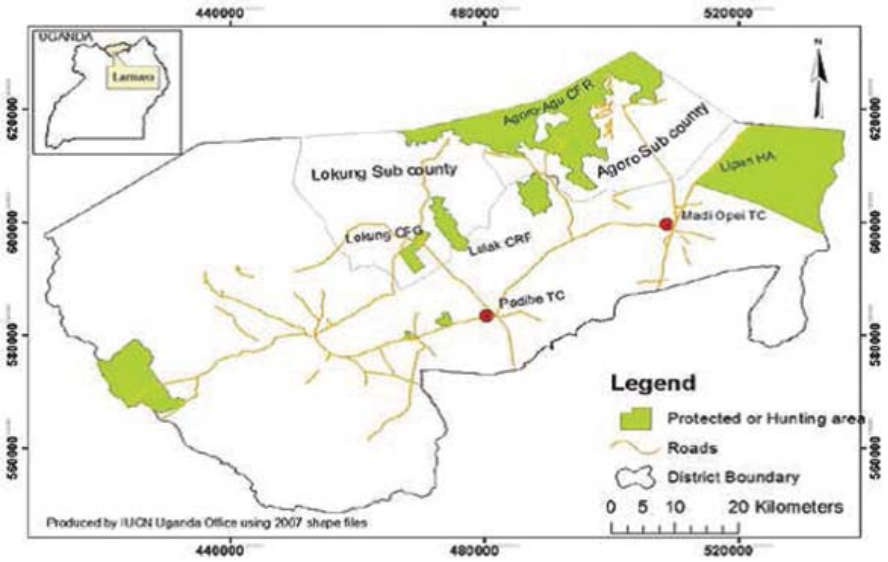

Figure 1. Location of Agoro Agu Central Forest Reserve (adapted from IUCN 2015)

The temperature averages at a minimum of 120c and a maximum of 270c maximum in the lowlands (Lamwo District, 2015). It is also indicated to have a fairly distributed rainfall pattern received twice a year March- June and August to November. There is a dry spell in the months of June–July and Nov–March.

2.2. Sampling design and data collection

Belt-transect sampling was used to estimate the population size of *E. macrostrobilus*. In this method, three transects of 5m wide and 200m long were established following environmental gradient in Agoro-Agu Central Forest Reserve where the cycad occurs. Within these transects, the individuals of *E. macrostrobilus* that were encountered were enumerated. In addition, a semi-structured questionnaire was administered to sixty residents in the two villages of Lotuturu A and B within an enclave in Agoro-Agu Central Forest Reserve to elicit information on utilization of *E. macrostrobilus.* These respondents were selected using a systematic simple random sampling technique. In this method, the first household was chosen randomly in each village and thereafter one household was skipped along a walkable path until all the thirty households are reached. The household heads were targeted in this study because of the greater experience they have had with the surrounding environment. In the survey, 38 females and 22 males were interviewed

3.3. Data analysis

The population density and size of *Encephalartos macrostrobilus* in each transect and the entire area surveyed was determined. In addition, the uses of *Encephalartos macrostrobilus* were collated into frequencies and illustrated using graphs.

3. RESULTS AND DISCUSSION

A total of 665 individuals were enumerated within the three belt transects sampled. Figure 2 shows a female cone. This number is higher than that recorded Jones & Wynants, (1997) and Donaldson (2010) because of the larger area surveyed. This has been aided by the prevailing security conditions in the area. Scot & Wynants (1997) cited security as a major hindrance of their study hence an estimate of only 200 individuals of *Encepharlatos macrostrobilus.* It is plausible that natural rejuvenation has allowed the population to increase since the area has been in accessible due to insecurity.

Figure 2. *E. macrostrobilus* female cone.

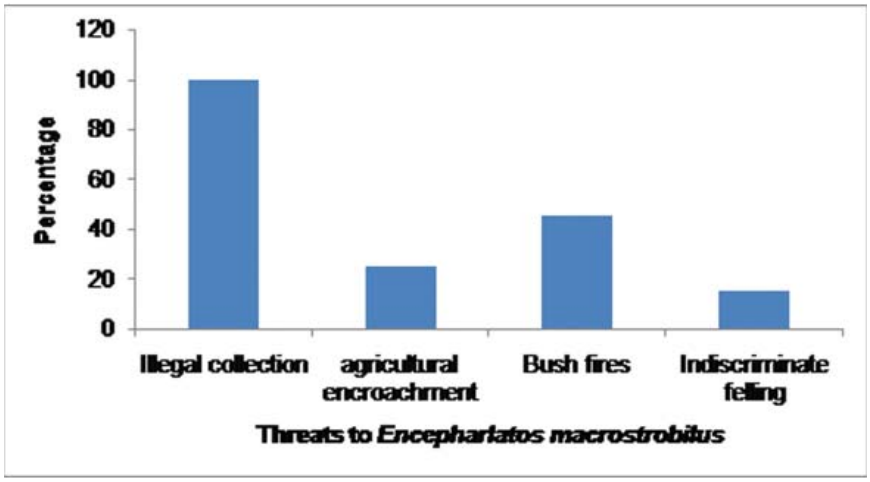

Figure 3. Threats to the survival of *Encepharlatos macrostrobilus*

The majority of respondents (82%) we interviewed did not mention any use of the cycad while 18% cited its usage for ornamental purposes. In addition, some of the respondents 15% did not even know the plant partly because it is found in remote and rugged terrains. Similarly, Jones & Wynants (1997) did not record any human consumption of this cycad except collection of seeds for "chasing demons". This scenario can be attributed to a possible loss of Indigenous Knowledge due to the armed conflicts which either led to the death of old people in the society who had this knowledge or confined them in the Internally Displaced Peoples (IDP) camps. This situation seems to have been exacerbated by the lack of proper mechanisms of systematically documenting Indigenous Knowledge. Another noteworthy explanation for this trend is the limited interaction of the community with the *E. macrostrobilus* since it is located in hard to reach, rugged and remote areas. This study therefore affirms Cousins & Witkowski (2017) assertion that the traditional use of cycads in African countries other than South Africa is poorly known, particularly which species are used, the quantity harvested (and traded), and the actual uses of the taxa concerned. However, this is a sharp contrast with the existing literature on the utilization cycads for food in other parts of the world (Whitelock, 2002; Ravele & Makhado, 2008), medico-magical practices, production of gum and fibre, and decoration during special occasions (Thieret, 1958).

In terms of threats to the survival of this cycad, Figure 3 offers the summary. Our interactions with the community show that there is an emerging market for cycads from outside the local community and this is fuelling illegal collection. In the previous studies by Jones & Wynants (1997) and Donaldson (2010), illegal collection had been mentioned as a threat. It is worth noting that these illegal collectors work in collusion with some local community members who are vastly unaware of the conservation status of the species. This illegal act has been largely perpetuated by growing levels globalization and the weak implementation of the existing laws on governance of central forest reserves as contained in National Forestry and Tree Planting Act (2003), CITES regulations on trade in Endangered species.

Annual wild fires are equally a major threat to the survival of *Encephalartos macrostrobilus.* Our observation was in tandem with Jones & Wynants (1997) that the trees showed evidence of fire resistance as witnessed by stem charring (Figure 4). However, the biggest concern is that, these regular fires may significantly hamper recruitment (Donaldson 2010). In Africa, very few scientific studies have investigated fire ecology of cycads (e.g. Donaldson 1995) although it is widely accepted that many *Encephalartos* species are fire-tolerant and some are fire-stimulated (Cousins & Witkowski, 2017). According to Cousins & Witkowski, (2017), it is therefore pertinent to generate information on the most appropriate burn frequency and season would also be useful for providing ecologically sound fire management guidelines for cycads in fire-prone habitats.

These threats also stem from the lack of clear cut individual, community or cultural benefit that is derived from the cycad. This is arguably explained by the curiosity to fell mature trees (Figure 5). This does not however mean that the species does not have any value as it is just a matter of lack of awareness. It should also be pointed out that the National Forestry Authority (NFA) that is mandated to manage central forest reserves in Uganda has limited capacity in terms of personnel to enforce the existing laws. A classical example in Agoro Agu is the illegal settlement and cultivation in the forest reserve with minimal or no intervention of NFA. The illegal settlement has culminated into increased opening of subsistence farms thereby contributing to decline in the quality of habitat. There is even a contract farming agreement between the local farmers and a beer producing company in the country to produce barley. If this trend is untamed, it is likely to jeopardize the quality of the habitat as farmers as farmers seek to produce more barley to meet the demand.

4. CONCLUSION

The population of *E. macrostrobilus* recorded in this study is higher than the previous records. However, the risk to this population has escalated with the return of security in the area which has facilitated human penetration into remote and hard to reach areas and opening of global markets.

Figure 4. Evidence of stem charring on mature cycad trees.

Figure 4. Indiscriminate felling of cycad trees.

5. WAY FORWARD

The NFA and the local government authorities need to sensitize the community on forest reserve management laws and open boundaries in a conflict sensitive approach. The sensitization programs can use flagship species such as *Encephalartos macrostrobilus* and their potential for tourist attraction and ecosystem functions such as Nitrogen fixation, habitat for other organisms among others. Thereafter, illegal settlers within the forest reserve need to be evicted. Efforts to raise the seedlings to meet the need of ornamentalists would go a long way in reducing the pressure on the wild population. Future research endeavours can focus fire ecology of cycads, population sex-ratios and genetic variability of this isolated population.

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AUTHOR CONTRIBUTIONS

SO designed the project, participated in data collection and drafted the manuscript while DA participated in data collection.

CONFLICT OF INTEREST

There is no conflict of interest between the authors

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LETTERS TO THE EDITOR / BRIEWE AAN DIE REDAKTEUR

Dear editor,

I was doing some shopping at a small center in Windhoek and as I left my attention was drawn to some street vendors selling orchids. I politely said 'no thank you, not interested in orchids" and wanted to leave when he said but he also has cycads. I stopped my car and went over to see what he was talking about and there they were. A selection of round stems, no leaves and no roots. I asked him where they were from and he clearly answered from the Chimanimani mountains between Zimbabwe and Mozambique.

As I do not believe in supporting these vendors, I took note and left. The person was disappointed because he thought he was going to make a great sale. I looked up my Cycad book and lo and behold, that species did exist and it seemed the fellow knew what he was talking about.

I went back a few days later, all the stems were still there. I presume it is because not many people in this area really know what a cycad is and to be honest, the plants looked anything but appealing. This is when my conscience started nagging me, out of principle I do not support these vendors due to the shady origins of all their products, but then again, as a cycad lover, I could not let all these plants die. So I started bartering, and eventually he let me have two stems, about the size of a small soccer ball for two hundred Nam Dollars each. I took them home and planted them.

Figure 1

After two weeks, I passed by there again and this time the guy was really desperate, but I just told him that I already had more cycads than I could care for or had space. But most probably being the only one to have bought and return, he sold me four more plants.

I have managed to salvage all six of them, but our climate is not humid enough during the year, and our winters are cold, which I think are contributing factors to their slow growth, but they are surviving and look healthy.

Some questions that arise in my mind are, how do these plants get across the borders. They must pass at least two or more border posts. Normally the forestry representatives on the border post are very strict but still these guys get away with their illegal trade. Some good news is that for a long time we have not experienced any of these vendors with plundered cycads. This is good news to me as the market in Nam has not supported this type of business.

Currently I am in possession of six Chimanimani plants, all look healthy and I trust that one can in the near future possibly harvest pollen and pollinate female plants. At this stage, however, none of them has produced any cones, so I do not know what gender I have at present. Any advice in this regard would be welcome.

Figure 2

Figure 3

The first three pictures are the same plant, which has just produced new leaves, and the other are three more plants I managed to save. We had a nursery in Windhoek where the owner was also a lover of cycads, but due to unforeseen circumstances, they closed down. The other two nurseries only keep *Cycas revoluta* and sometimes *Cycas thouarsii* . If you are very lucky also a *Zamia furfuracea* or two and that is where their selection stops.

I have always loved the look of these plants because they are just different, totally in their own league and fascinating. The fact that sometimes they only produce one flush of leaves in a year, but the intense speed involved in this process, and once the leaves have reached their full size, nothing happens for a long time. I suppose a necessary characteristic for any cycad lover would be patience. Greetings from Namibia

Figure 4

Horst Pritzen
Email rphint@afol.com.na

[Dear Horst, you are quite right not to support sellers like these. Once they find a market more plants will be taken from habitat to be sold illegally. This also goes for the local muthi markets. I have had people telling me how they go to these markets “to rescue” plants before they are chopped into bits to sell as indigenous medicine. What they do not realise is any plant sold, is just replaced by another poached plant! So the less you buy the less plants are poached, a very simple principle indeed. Eventually this will lead to total destruction of populations that are easy to poach!

I asked Dr Piet Vorster to comment on your pictures and he is of the opinion that the plant in Figure 4 may perhaps be *Encephalartos chimanimaniensis*, senso stricto, but the others are probably forms of *E. manikensis*. Some plants at Chipinga display the shorter and broader pinnae but without cones, they are almost impossible to identify. As far as I know, *E. chimanimaniensis* is extinct or very close to it, in Zimbabwe and only occurs in Mozambique in a localized area. The IUCN lists it as endangered (2010 assessment) and only about a 1000 individual plants are left in one population. This species, however, grows in an inaccessible and remote area in the mountains and there may be small populations left that nobody has found yet. Ed.]

Dear editor,

I recently saw *Encephalartos manikensis* in a garden in the Western Cape in cone. The cone had leaves coming out of the top the female cone. Is it known that this phenomenon for this species? I know that *Encephalartos transvenosus* does form leaves at the top of the female cone. Your input or any input from the members would be greatly appreciated.

Yours sincerely
Ferdie Endemann (ferdie.endemann@gmail.com)
Western Cape

[Ferdie, this phenomenon was explained in a previous edition of ENCEPHALARTOS, where the cone of *Encephalartos ferox* was shown with sporophylls reverting to normal leaves. I have seen this in a few *Encephalartos* species and it is probably not abnormal for *E. manikensis*. I have only seen this in female cones and usually only in the sterile, terminal sporophylls. Does any member have a photographic record of a male cone showing this?

Figure 1. Ovulate cone of *Encephalartos manikensis* with abnormal, terminal sporophylls.

Figure 2. Ovulate cone of *Zamia lindenii* showing leaf development all over the cone, not just at the apex.

Figure 3. Fully developed leaf of *Z. lindenii*.

More interesting, however, is that *Zamia lindenii* also does this, but for this species, it is possible to remove the plantlets from the cone and grow them like suckers or offsets. Looking at the pictures, it seems the cone either last long enough for a proper stem (stem cells differentiating into tissues found in the stem of the cycad) to be formed or the genus or even species, is better adapted or retained the ability to regenerate. It may also indicate that *Zamia* is more primitive than *Encephalartos* in evolutionary terms. Compare this with a gecko's ability to grow a new tail as opposed to a crocodile.

Figure 4. Section through cone to show where growth is starting. Note the cataphylls at the base of the leaf.

Note in Figures 4 and 5 that the leaf originates from the central axis of the cone. It is not a sporophyll with a leaf-like growth at the apex. Also evident from Figure 4 is a cataphyll at the leaf base.

I have never seen sporophylls, normal or otherwise, growing into plants in *Encephalartos*. The leaf / sporophyll always dies after a while and fail to form roots. One can argue that this is because the cone is "programmed" to die to release the seeds and can there for not develop further. I have tried treating it with rooting hormone but had no luck.

It is documented that one can grow plants from leaf bases and I know of one such plant. Roy Osborne used this knowledge as the basis for research done on *E. woodii*. Suckers were dissected and the individual leaves treated and then planted in an attempt to vegetatively reproduce the species. Results were not encouraging but modern technology and better knowledge may change this.

Ander Lindström, Nong Nooch Tropical Garden, Thailand, sent me the information and pictures of *Z. lindenii*. Thank you Anders, this is informative and shows we still have a thing or two to learn about cycads. Ed.]

Figure 5. Single sporophyll showing corruptules and base of leaf growth.

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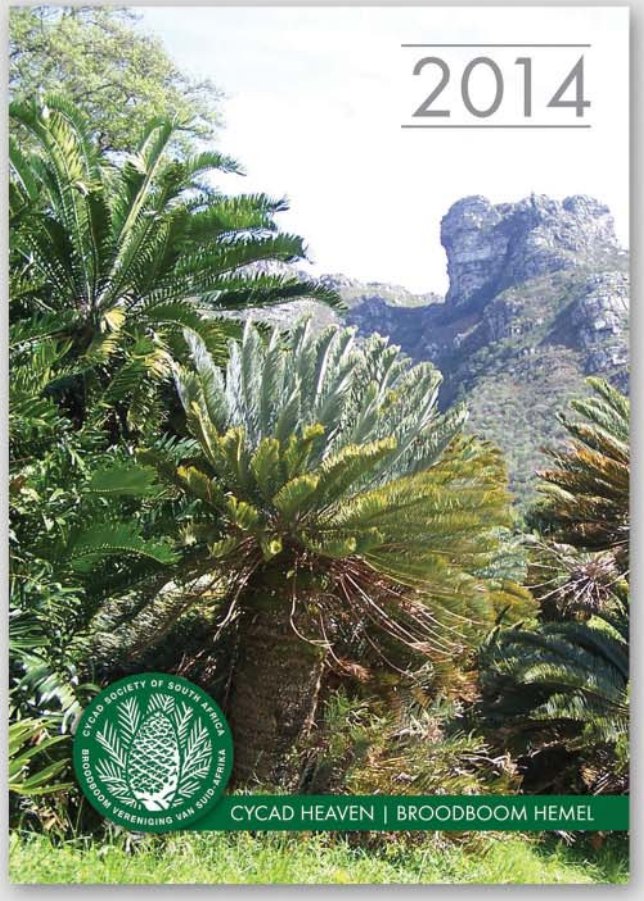

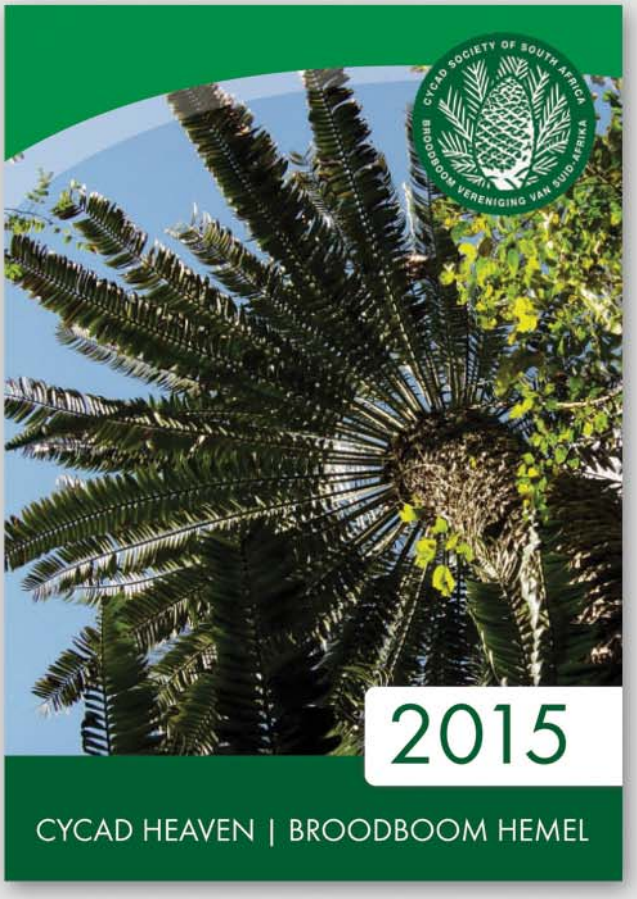

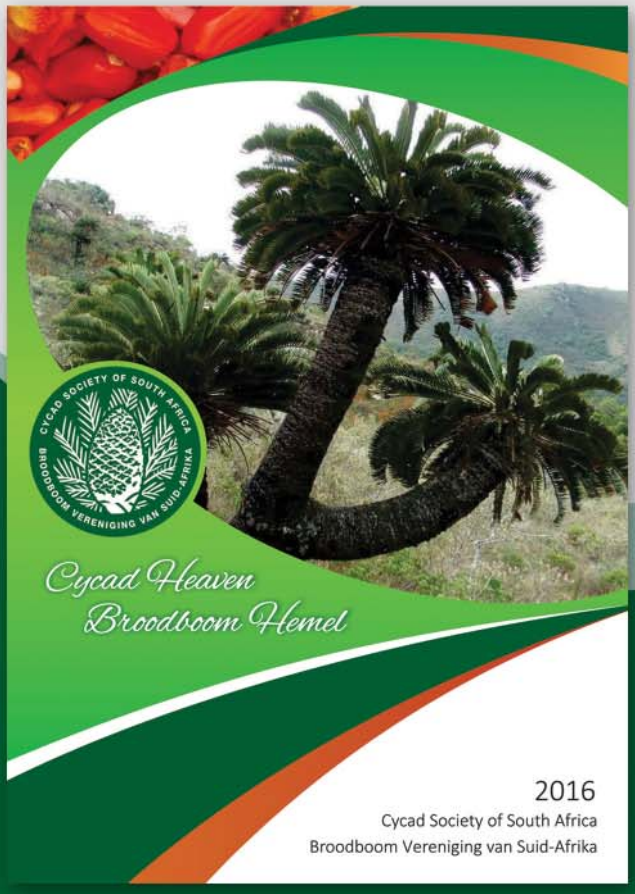

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ENCEPHALARTOS

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The tables and figures/photographs of a manuscript should be numbered and all tables should have a heading. All figures and photographs should have a legend. All figures/photographs should bear written on the reverse the name of the author, figure number and the top of the figure or photograph.

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