

ENCEPHALARTOS

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**COVER / VOORBLAD : Female cones of *Encephalartos lanatus*
in a Pretoria garden**

Photo: M.I. Claassen

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WELCOME TO CYCAD 93 PARTICIPANTS

The "production team" and editor of "*Encephalartos*" wish to express a warm welcome to all CYCAD 93 participants, particular those overseas visitors who are seeing our country for the first time.

We hope you have a most successful meeting, that you renew old acquaintances and make new friends, and that the field trips give you a greater appreciation of the wonderful plants you read about in our magazine.

FROM THE PRESIDENT

The colour photograph on the front cover of this issue is intended to create a festive feeling by our members. It is not often that we have the privilege to act as host to the international community of cycad enthusiasts. May the **Third International Conference on Cycad Biology (CYCAD 93)**, which is to be held in Pretoria in July of this year, be a resounding success.

On 17 March 1993, during the 20h00 television news, members of the Cape Nature Conservation Department were shown confiscating cycads from the private garden of a city councillor in East London. The shocking aspect was the crude and unprofessional method used by the officials to remove the cycads. This caused several members to request me to lodge an official complaint with the Director of the Cape Nature Conservation Department. This I attempted to do in a constructive way. Hopefully he will, as a result impress on his subordinates that their first responsibility is to treat rare and endangered flora and fauna with dignity and respect in an attempt to **protect and conserve** them. In any large organization one can expect to find black sheep but I would like to believe that the poor performance of the officials on television is not representative of the way in which nature conservation officials in this country normally go about confiscating cycads.

At the end of this year a new COUNCIL has to be elected. This is a very important Society affair and consequently I will appreciate it very much if you will read and act on the announcement about this matter *which appears on page 33* in this issue of the magazine.

Nat Grobbelaar

VAN DIE PRESIDENT

Ek hoop die kleurfoto op die voorblad van hierdie uitgawe van die tydskrif help om 'n feestelike gevoel by u te laat ontstaan. Dit is immers nie elke dag dat ons die voorreg het om as gashere vir die internasionale gemeenskap van broodboomliefhebbers op te tree nie. My hoop is dan ook dat die **Derde Internasionale Konferensie oor Broodboom Biologie (CYCAD 93)** wat tydens Julie vanjaar in Pretoria aangebied sal word, 'n reuse sukses sal wees.

Op 17 Maart 1993, tydens die 20h00 beeldradionuus, is daar gewys hoe lede van die Kaapse Afdeling Natuurbewaring groot broodbome, weens beweerde onwettige besit, uit 'n stadsraadlid van Oos-London se privaattuin verwyder het. Die skokkende wyse waarop die amptenare die broodboomstamme op 'n uiters onprofessionele wyse uit die tuin gepluk het, het verskeie van ons lede genoop om by my daarop aan te dring dat ek formeel by die Direkteur van die Kaapse Afdeling Natuurbewaring protes aanteken. Ek het dit dan ook op 'n opbouwende wyse probeer doen en vertrou dat hy dit by sy amptenare sal tuisbring dat hul eerste plig is om skaars en bedreigde flora en fauna met groot omsigtigheid te behandel in 'n poging om dit te **beskerm en bewaar**. Uiteraard kry mens swart skape in enige groot organisasie en ek wil aanvaar dat die swak optrede van die amptenare wat op televisie getoon is, nie verteenwoordigend is van alle natuurbewaringsamptenare se hantering van broodbome wat gekonfiskeer word nie.

Daar moet aan die einde van die jaar 'n nuwe RAAD vir die volgende twee jaar verkies word. Dit is 'n baie belangrike Verenigingsaak en ek sal dit waardeer as u die berig hieroor, wat op bladsy 33 in hierdie tydskrif verskyn, onder oë sal neem en daarop sal reageer.

Nat Grobbelaar

FOCUS ON ...

In each edition of ENCEPHALARTOS, we focus on one southern African species, in the form of an indepth article in layman's language. In this edition the spotlight falls on:

FOKUS OP ...

In elke uitgawe van ENCEPHALARTOS fokus ons op een suider-Afrikaanse broodboomsoort, in die vorm van 'n indepte-artikel in leketaal. In hierdie uitgawe val die kollig op:

ENCEPHALARTOS CONCINNUS R.A. Dyer & Verdoorn

Roy Osborne

Department of Chemistry, University of Natal, 4001 Durban

INTRODUCTION

There is an aura to the Zimbabwean Lowveld that defies definition: it can only be experienced. Rudyard Kipling portrays something of his feeling in his description of "the great grey-green, greasy Limpopo, all set about with fever trees". But add to this the stately baobabs and the mopane trees and, moving a little further to the north, the great granite *dwalas*, the rich fauna, the scattered ruins of an early civilization, the tales of the great hunters, the dark stories of the ivory and slave traders and the hint of gold in every stream. It is a passionate country, hard and beautiful, cruel and rewarding - it is "pure" Africa. And it is the home of the little-known Zimbabwean endemic cycad, *Encephalartos concinnus*.



Figure 1 Nyedzi Dwala, the great granite outcrop in the Gwanda district; the site of the plants on the lower southfacing slopes in the right foreground in this photograph.

DISCOVERY

A single female cycad found in cultivation in Mberengwa (previously Belingwe) attracted the interest of D.C. McGaw and Prof. Hiram Wild who collected herbarium specimens of the plant in 1953; it was "different" to other Zimbabwean cycads. Speculation increased as more anecdotes came forward of a lowveld cycad, way distant from the better known stands of *E. manikensis* on the eastern border with Mocambique, but it was not until July 1966 that a party comprising Messrs Leslie Leach, E.J. Bullock and R.H. Rochat found and collected herbarium material from the colony in the Gwanda District, some distance to the southeast of the small mining town of West Nicholson. In the easter weekend of 1967, Mr J.A. Smit of Pietersburg visited the Gwanda colony and, guided by locals, then found a second population further to the north in the direction of Mberengwa village. A subsequent herbarium collection from this site by Oliver West in 1968 bears the note "very abundant on the north-facing slope of a large granite kopje".

It was also in 1967 that Mr Bob Drummond and Mr Raymond Munch separately tracked down a third lowveld colony well to the east, in a ravine near the Runde (previously Lundi) River, an herbarium specimen of this stand being filed by John Rushworth.

Largely through the extensive field work of Mr Munch and Mr Basil Christian, the need for a proper botanical study of the Zimbabwean and Mocambiquan cycads in the so-called "*E. manikensis* complex" had been recognised. In 1966, Mr Munch had invited a South



Figure 2 Several of the Mberengwa plants are found in full sun along the banks of the Biri River, this is also a site much favoured for clandestine gold-panning activities.



Figure 3 Some specimens of *E. concinnus* appear to be growing in full sun in rock crevices; more commonly the plants are found in semi-shaded sites.

Africa party comprising Drs Dyer and Verdoorn and Mr Smit to study the plants in the living collection at Rusape, after which it was possible for the botanists to distinguish five separate species, largely on the basis of

male cone morphology. Thus in 1969, despite not having seen the plants in the wild, Drs R.A. Dyer and Inez Verdoorn named the lowveld plants collectively as *Encephalartos concinnus*, the epithet referring to the "neat" arrangement of the male cone scales, and the holotype for the species being designated as Smit's 1967 collection of the Mberengwa material.

In December 1991 Roy Osborne joined Dr Donald G. Broadley and John Minshull of the Bulawayo Natural History Museum on a field trip to quantify this species for the World Cycad Census; unless otherwise stated, the accompanying photographs were taken on that excursion. In the text which follows, the three populations of *E. concinnus* are referred to as the Gwanda, the Mberengwa and the Runde plants.



Figure 4 Despite a series of very dry years in the Zimbabwean lowveld, the foliage of these plants is a deep healthy green - this specimen in *Brachystegia glaucescens* woodland at the Mberengwa locality.

DISTRIBUTION

The Gwanda population comprises only 48 mature plants, all confined to the southfacing slope of the Nyedzi Dwala, one of several great granite outcrops on

a private ranch about 50 km southwest of West Nicholson (Figure 1). The name "Nyedzi" means "shining star" and much superstition surrounds the site, associated with the evidence of human habitation from prior centuries. The site is typical mopane (*Colophospermum mopane*) woodland vegetation, at an altitude of 800 m and with an annual summer rainfall of 300 mm. The area is in the catchment of the Bubiana River which joins the Bubi and ultimately the Limpopo. There is only slight evidence of seedling recruitment in this population, but the past few years' drought had undoubtedly inhibited reproduction.



Figure 5 A healthy flush of new leaves "pushing" at the apex of this plant.

Lying some 100 km to the north of the Gwanda plants, and about 50 km south of Mberengwa village, the Mberengwa population is spread over a relatively larger area of tribal trust land towards the confluence of the Biri and the Mwenezi (previously Nuanetsi) Rivers (Figures 2, 3). Plants occur on rocky southfacing slopes treed with *Brachystegia glaucescens* (the "mountain acacia") and although we found only 34 mature specimens, we were told that there were "many more" plants in the area (Figure 4). Both the altitude (ca. 900 m) and the rainfall (ca. 500 mm) are higher than those for the Gwanda locality. As before, there was some

evidence of seedling recruitment, but the past dry years seemed to have restricted coning, particularly of the female plants.



Figure 6 *E. concinnus* leaf detail: a leaf sample from the Gwanda locality.

Whilst were unable to visit the Runde locality in person, it appears that the population is very small, possibly comprising only about 10 plants, and confined to a granite outcrop near the Runde River Bridge, about 100 km to the west of the Mberengwa site.

An herbarium specimen collected by Leach and Cannell in 1969, labelled as *E. concinnus*, and purported to come from between Vila Pery and Vila Gouvera in Mocambique, must be regarded with circumspection. Douglas Goode, in his book "Cycads of Africa", refers to unconfirmed reports of *E. concinnus*, or a similar plant, occurring across the Limpopo River in the far northern Transvaal. My own "gut feeling" is that there may just be other small colonies in the Zimbabwean lowveld, but that these are most likely to be found in the Matopos area to the west of West Nicholson; this area has never been botanically searched in detail.

E. concinnus is not well represented in botanical gardens except for small plantings at Harare National Botanical Garden and the nearby Ewanrigg Gardens. Specimens



Figure 7 The author resting on a natural seat provided by this 4.5 m procumbent trunk at the Mberengwa site.



Figure 8 *E. concinnus* leaf detail: a sample from the Mberengwa locality.

are present at the Lowveld and Durban Botanical Gardens in South Africa, at Fairchild and Lotusland Gardens in the USA, at Adelaide in Australia and at Amsterdam and Naples Botanical Gardens in Europe. A limited number of (usually solitary) specimens are in private collections, especially in South Africa, but poor record-keeping has resulted in many cultivated plants

"from Zimbabwe or Mocambique" becoming muddled. Unfortunately it is not possible to re-identify them on the basis of leaf morphology and it takes some experience to be confident of a name if and when the plant does eventually cone.

DESCRIPTION

1. The Gwanda plants have 1-7 trunks, up to 2.9 m long and 500 mm in diameter, becoming procumbent with age and suckering at the base. Leaves are dark green, 1.8 m long, straight and pubescent on emergence (Figure 5). Median leaflets are 150 mm long and 25 mm wide, directed towards the leaf apex and forming a pronounced V in transverse view. Leaflets have 2-3 spines on the upperlower margins and are slightly overlapping (Figure 6). Leaflets are gradually reduced to prickles at the leaf base. Unless burnt by fire, the dead leafstalks remain attached to the trunk forming a "skirt". No fresh cones were seen but the desiccated males cones were pendulous, 1-2 per trunk, 440 mm long by 80 mm wide with densely overlapping scales 40 mm long by 18 mm wide. Female cones were not seen.

2. The Mberengwa plants have 1-5 trunks, up to 4.5 m long and 500 mm in diameter, also becoming procumbent with age and suckering at the base (Figure 7). Leaves are dark green, 1.6 m long, straight and only slightly pubescent. Median leaflets are 130 mm long and 27 mm wide, at right angles to the rachis and lying in a flat plane. They are distinctly yellowish at the leaflet bases and slightly overlapping (Figure 8). They are gradually reduced to prickles at the leaf base. They have 3-4 short spines on the upper margin and 2-3 on the lower. Unless burnt, the old leafstalks remain attached to form a "skirt" around the trunk. No fresh cones were seen but the dried male cones were pendulous, 1-2 per trunk, 490 mm long by 90 mm in diameter with densely overlapping scales 40 mm long by 18 mm wide. Female cones were not seen.

3. Plants from the Runde locality are said to be intermediate in character between the Gwanda and the Mberengwa forms (Figure 9).

A statement in Dyer & Verdoorn's work and also quoted by Goode is to the effect that the prostrate trunks of older specimens of *E. concinnus* produce buds along their length, Goode claiming this to be something of a unique feature in the central African species. We did not notice this in our study of these plants in the field and I speculate that the phenomenon was recorded from one or more garden plants in artificial surroundings.

Female cones are said to be green, 1-2 per trunk, subcylindric, about 450 mm long by 200 mm broad and with a stout peduncle about 80 mm long (Figure 10). Seeds are red in colour. In common with most of the

central African species, little is known of the pollination biology of this cycad.

Male cones are produced in clusters of 1-4 per trunk and are green, narrowly ovate to subcylindrical, and borne on peduncles 50-120 mm long (Figure 11).



Figure 9 *E. concinnus* leaf detail: a leaf sample from the Runde locality, photographed in a private collection at Pretoria.

AFFINITIES AND HYBRIDS

E. concinnus shares some characters with *E. manikensis*, *E. chimanimaniensis*, *E. pterogonus*, *E. munchii* and other as yet undescribed cycads (variously referred to as "Nyarurwe", "Odzi River", "Garezi River", "Chipinga" and "Elizabethvillensis" from Zimbabwe and "Bandula", "Chicamba", "Mt. Chinyayadze", "Mt. Nhaungwe", "Nyoka", "Torrei", "Garuso" and "Vanduzi" from Mocambique), all of which are broadly within "the *E. manikensis* complex". To assist those who would like to attempt to distinguish amongst the named species, I am reproducing the two keys from the Dyer & Verdoorn publication of 1969. In using the keys, it must be noted that the male cone details are based on dried material. Extensive field work needs to be done to resolve the *E. manikensis* fully, i.e. to complete the work started by Drs Dyer and Verdoorn. It will be a tough taxonomic challenge to ascertain the status of each of these populations - conditions are hostile, the area is vast,

local resources are minimal, the plants are limited in number and coning may be infrequent.

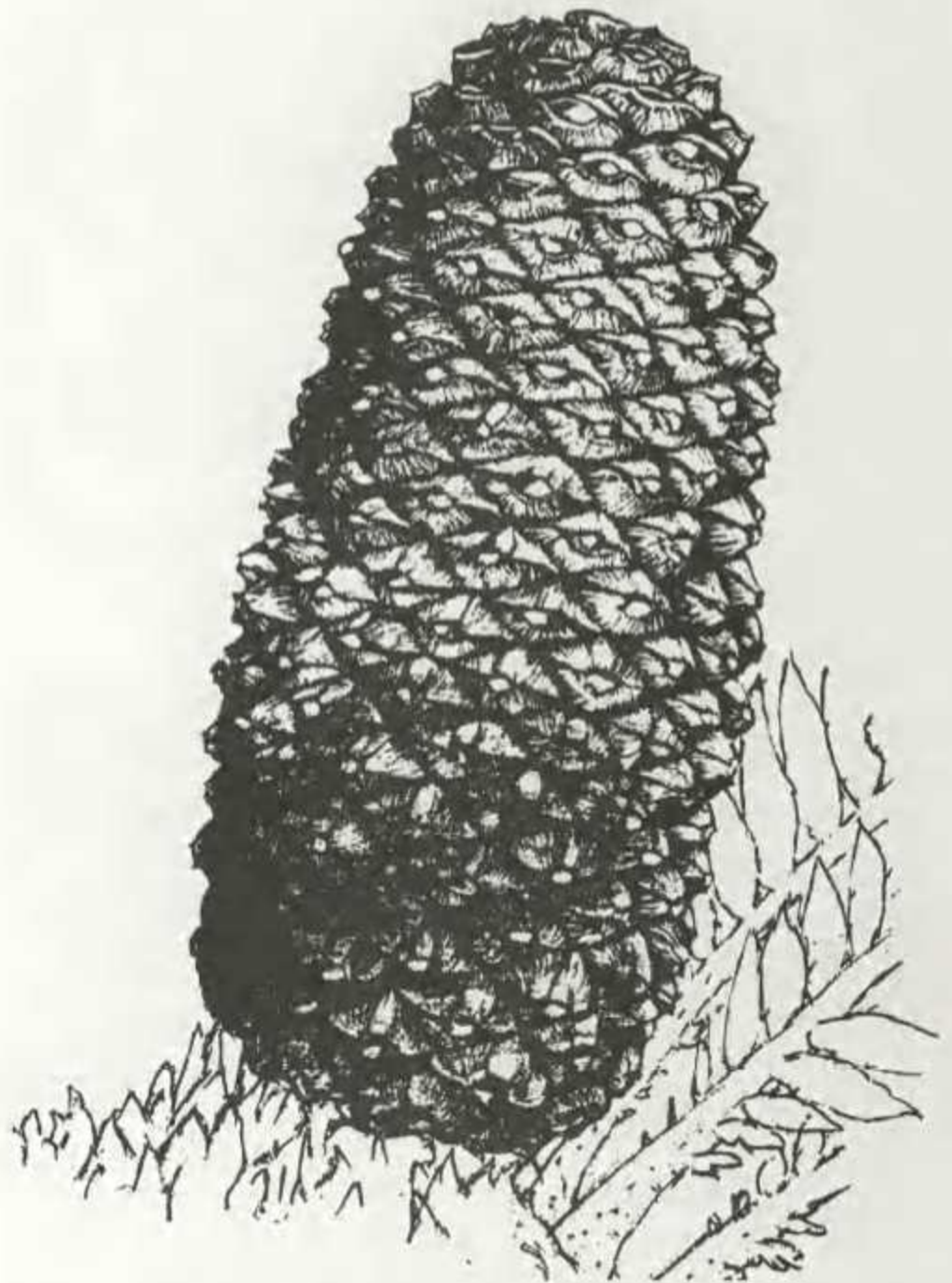


Figure 10 Reproduction of the drawing of a female *E. concinnus* cone. From Goode's "Cycads of Africa" by kind permission of the author and publisher.

Because of its geographic isolation from other cycads, there are no natural hybrids of *E. concinnus*. Further, with the limited number of specimens in cultivation, artificial crosses have not knowingly been produced - with one possible exception. Piet Vorster (1987) refers to seedlings of *E. eugene-maraisii* x *E. concinnus* being offered for sale in the USA but further details are unknown.

CONSERVATION AND CULTIVATION

The small size of the populations, as documented above, necessitates that this species is considered at least as "vulnerable". The Mberengwa locality was extensively plundered by trader-collectors in the 1970's, these activities being reduced when the Control of Goods (purchase and sale of cycads) Regulations were promulgated in 1974 and with the subsequent Parks and Wildlife Act in 1975 which listed all species of *Encephalartos* in Zimbabwe as specially protected indigenous plants. A further attempt at protection of

KEY BASED ON MALE CONES (DYER & VERDOORN, 1969)

E. manikensis and its allies

Cones narrowly ovoid or subcylindric mostly 30-60 cm long, 8-15 cm diam., with tightly set scales concealing the axis:

Scales as broad as long or nearly so, usually 4-5 cm broad across the bulla shoulders, scales spreading at about right-angles from axis, cones somewhat resembling female cones externally:

Scales subrectangular, limb truncate or cordate at base, sporangia usually absent from a 2-3 mm wide margin, bulla with sharp lateral ridges 1. *manikensis*

Scales triangular-cuneate to a fairly acute angled base, sporangia spread to margin, bulla with sharp wing-like and often toothed or lobed lateral ridges which project further forward than the terminal facet 2. *pterogonus*

Scales narrowly oblong-cuneate, much longer than broad up to about 5 cm long and 2 cm broad spreading-decurved 3. *concinus*

Cones subcylindric-elongate, 35-65 cm long, 7-9 cm diam., with mature scales set apart exposing axis, quite unlike female ones externally:

Scales slightly deflexed from attachment with axis, then curving upwards and concave on the upper surface terminating in an enlarged deflexed duck's-bill-like bulla, scales more or less oblong, 3-4 cm long, 2.75-3.5 cm broad, and 2-3 cm thick vertically 4. *chimanianiensis*

Scales spreading more or less at right-angles to axis, relatively thin vertically, obovate, 3.5-4 cm long, 2.5-3 cm broad and 1 cm thick vertically 5. *munchii*

KEY BASED ON VEGETATIVE CHARACTERS (DYER & VERDOORN, 1969)

E. manikensis and its allies

Leaflets light or dark green without bloom, drying rather hard with rigid margin when mature, variably prickly:

Prickles on margin of leaflets slender, rarely up to 5 mm long, sometimes absent:

Leaves with somewhat elliptic outline, leaflets 15-22 cm long, usually in open or nearby open venetian-blind position, well spaced with insertions on rhachis 2-3 cm apart 4. *chimanianiensis*

Leaves with mainly narrowly oblong outline, leaflets 10-15 cm long, spaced or slightly overlapping, with insertions in rhachis usually less than 2 cm apart, leaflets in half-open to nearly closed venetian-blind position:

Leaflets narrowed more or less gradually to the base, apex oblique 3. *concinus*

Leaflets narrowed rather abruptly to the base, margins narrowing more or less equally to the apex 1. *manikensis*

Prickles on margin rather prominent, often towards base, mainly over 5 mm long, rarely some leaflets without spines; outline of leaves mainly narrowly oblong:

Leaflets mostly with margins not or only slightly overlapping, arranged in about half-open venetian-blind formation, spreading, directed slightly upwards towards apex 1. *manikensis*

Leaflets fairly regularly overlapping and arranged in closed or nearly closed venetian-blind formation, often directed upwards from the rhachis towards apex in V position 2. *pterogonus*

Leaflets somewhat dull glaucous until maturity, strongly prickly on upper margin, densely overlapping in upward V position from the rachis, drying rather thin, with flexible margin and becoming yellowish with age 5. *munchii*

these plants was the designation of the area in which they occur as a special nature reserve. Regrettably, the Mberengwa plants are now facing a new risk: the local Shona people, who call the plant *zvingwarara*, have discovered that the leaf rachises are an excellent material from which to make sleeping mats and their rather crude leaf-harvesting methods have killed many old established plants (Figure 12). In due course the philosophy of "sustained resource management" may alleviate this problem.



Figure 11 Male cones of *E. concinnus* on a specimen growing in the Durban Botanic garden. The cones emit a powerful aniseed-like odour at the time of pollen shedding, but it is not known if this is characteristic for the species.

There are insufficient numbers of *E. concinnus* in botanic gardens and private hands to constitute any significant *ex situ* breeding stock but of course anyone with access to a coning plant, definitely known to be this species, must make every attempt to "mate" it. I believe that the Harare and Ewanrigg Gardens' staff should take a lead in establishing and managing a gene pool for these and other Zimbabwean cycad populations, with a programme for re-establishment of propagated plants into depauperate populations, even if in the first instance it means removing additional seed and/or plant material from the wild for this purpose. The owners of the ranch containing the Gwanda plants have indicated that they would like to participate in a structured management

programme of this kind.

I am unable to provide any notes on the cultivation of this species. The few that I have seen in botanical gardens and private gardens appear to adapt comfortably to soil types and climatic conditions that suit most other *Encephalartos* species. Judging on its wild habitat, a recommendation of a well-drained soil, warmth and semi-shaded conditions, would seem appropriate.

The species will not tolerate frost and, compared to *E. manikensis*, is somewhat slow-growing.



Figure 12 One of several dead specimens in the Mberengwa locality where the trunk apex had been severely damaged by people gathering leaf rachises to make sleeping mats. The previous years' dead leaf stalks are too brittle to use and hence only fresh leaves are taken.

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ARTICLES / ARTIKELS

THE APPARENT SEED VIABILITY OF *ENCEPHALARTOS FEROX* GROWING IN SUN AND SHADE CONDITIONS IN THE WILD

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INTRODUCTION

The natural habitat of *Encephalartos ferox* comprises a fairly narrow strip of coastal scrub extending from Sodwana Bay on the Zululand coast up to a point about 650 km north of Maputo in Mocambique (Osborne 1987). Anecdotal accounts relate that cones, in the wild and in garden plantings, are extremely variable in terms of seed viability. This variability is usually explained in terms of pollination effectiveness, although little is known of the relative contributions from wind-borne pollen and/or the activities of specific insect vectors.

In this study we have attempted to quantify the viability of *E. ferox* seeds from adjacent sun-exposed and shaded plants.

METHOD

Twenty coning female plants of *E. ferox* from each of a sun-exposed and a shaded population north of Black Rock in Maputaland were selected for the experiment which extended from August 1986 to January 1988. The total number of seeds was recorded from each cone at the time of fragmentation and the cleaned seed was tested for viability by floating in water. The sinking seeds were stored at ambient temperature for 6 months and retested at the end of the period. The percentage viability is estimated from the seeds that sank on both occasions. The results for the two populations are shown in Table 1.

STATISTICAL ANALYSIS OF RESULTS

An analysis of variance (Snedecor & Cochran 1980) was carried out to determine if there was a significant difference in the total seeds per cone or the number of infertile seeds per cone.

A logistic regression analysis (Dobson 1983) was carried out (using the CATMOD procedure of SAS) to determine if there was a relationship between the number of seeds per cone, and the effect of sunlight, on the seed viability.

Cones taken from plants grown in the shade contained significantly fewer seeds than those taken from plants grown in the sun (Table 2) but there was no significant difference in the numbers of viable seeds per cone. It thus appears that plants growing in the sun produce more non-viable seeds.

We found that the seed viability was significantly affected by the number of seeds per cone (Table 3). Viability was also affected by the availability of sunlight and an interaction between sun and the number of seeds. The results are illustrated in Figure 1. The drop in viability due to number of seeds is clearly seen.

DISCUSSION

We can use the results from the logistic regression to calculate the expected numbers of viable seeds in cones grown in the sun or shade (Figure 2). From this we can see that cones grown in the shade with a mean of 190

Table 1 The viability of *E. ferox* seeds from sun and shade locations in Maputaland

THE SUN LOCATION			THE SHADE LOCATION		
Cone No.	Total seeds	% Viability	Cone No.	Total seeds	% Viability
1	384	66	1	204	23
2	247	97	2	122	97
3	192	70	3	271	83
4	162	94	4	386	33
5	280	66	5	124	82
6	413	53	6	81	98
7	164	98	7	212	72
8	299	63	8	84	76
9	263	84	9	258	92
10	413	47	10	191	99
11	217	43	11	105	98
12	577	4	12	353	79
13	316	70	13	121	68
14	366	82	14	93	90
15	334	28	15	139	98
16	312	76	16	174	64
17	268	3	17	83	27
18	348	84	18	372	91
19	174	64	19	343	7
20	355	84	20	148	90
Average	304	59,5	Average	193	68,7

Table 2 Analysis of variance for sun and shade cones

	MEAN* SUN	MEAN* SHADE	F	P
Seeds	304	193	14.4	<0.001
Fertile	180	133	1.3	>0.1
Infertile	124	60	6.6	<0.05
*Means are number of seeds per cone				

seeds per cone should have about 155 viable seeds per cone, whilst those grown in the sun with a mean of 300 seeds per cone should have approximately 180 viable seeds per cone. Given the large variance in numbers of seeds per cone it is unlikely that the analysis of variance had enough power to detect this difference. Of further interest is the presence in this graph of an optimum number of seeds per cone. This is the value that maximises the number of viable seeds per cone. It can be seen that this value is lower for the shade plants (340 seeds per cone giving 203 viable seeds) than the sun plants (410 seeds per cone giving 212 viable seeds). This may be part of the explanation for plants growing in the shade having fewer seeds than those growing in the sun.

The flotation test in any case is not a measure of true viability. Many seeds that pass this test will still fail to

germinate for a variety of reasons. A common reason for failure to sink in this test is that the seed has been parasitized by beetles, in which case the seeds are extremely buoyant. This was the case with the greater proportion of the non-viable seeds in this study. Parasites commonly gather in areas where their host densities are high (Hassel & May 1974) and this may explain why the cones with more seeds are more heavily parasitized. It should in any case be relatively easy to test this hypothesis.

POSTSCRIPT

The authors are concerned to hear that early in 1992 there was a severe veld fire in the area where the plants had been investigated. Apparently many plants were

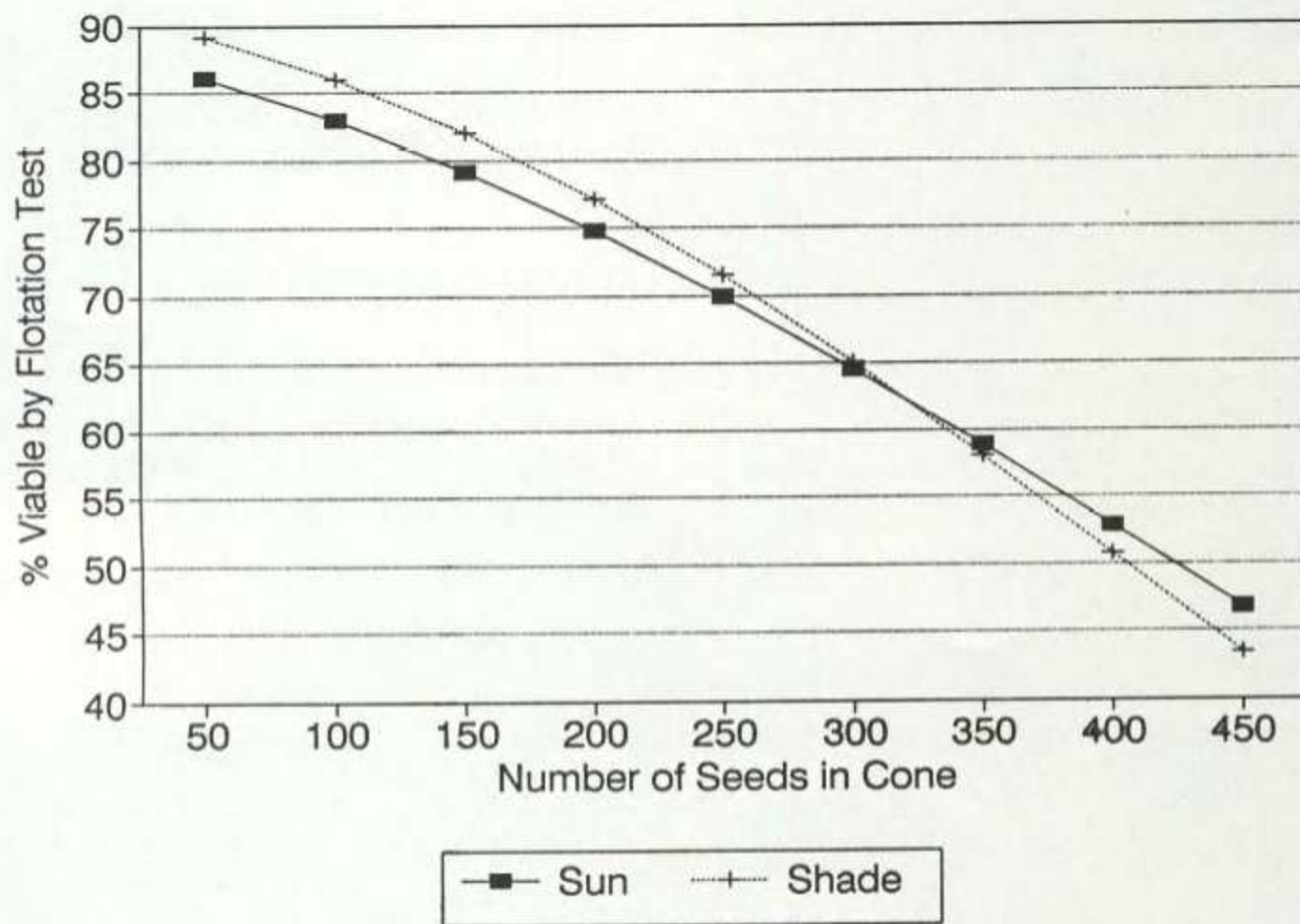


Figure 1 Variation in viability of cycad seeds.

Table 3 Parameters of logistic regression of seed viability

EFFECT	PARAMETER	ESTIMATE	STANDARD ERROR	CHI-SQUARE	PROB-ABILITY
Intercept	1	-2.39872	.0719909	1110.21	0.0001
Seed	2	0.00592	.0002283	673.49	0.0001
Sun	3	0.36634	.0719909	25.90	0.0001
Seed*Sun	4	-0.00105	.0002283	21.10	0.0001

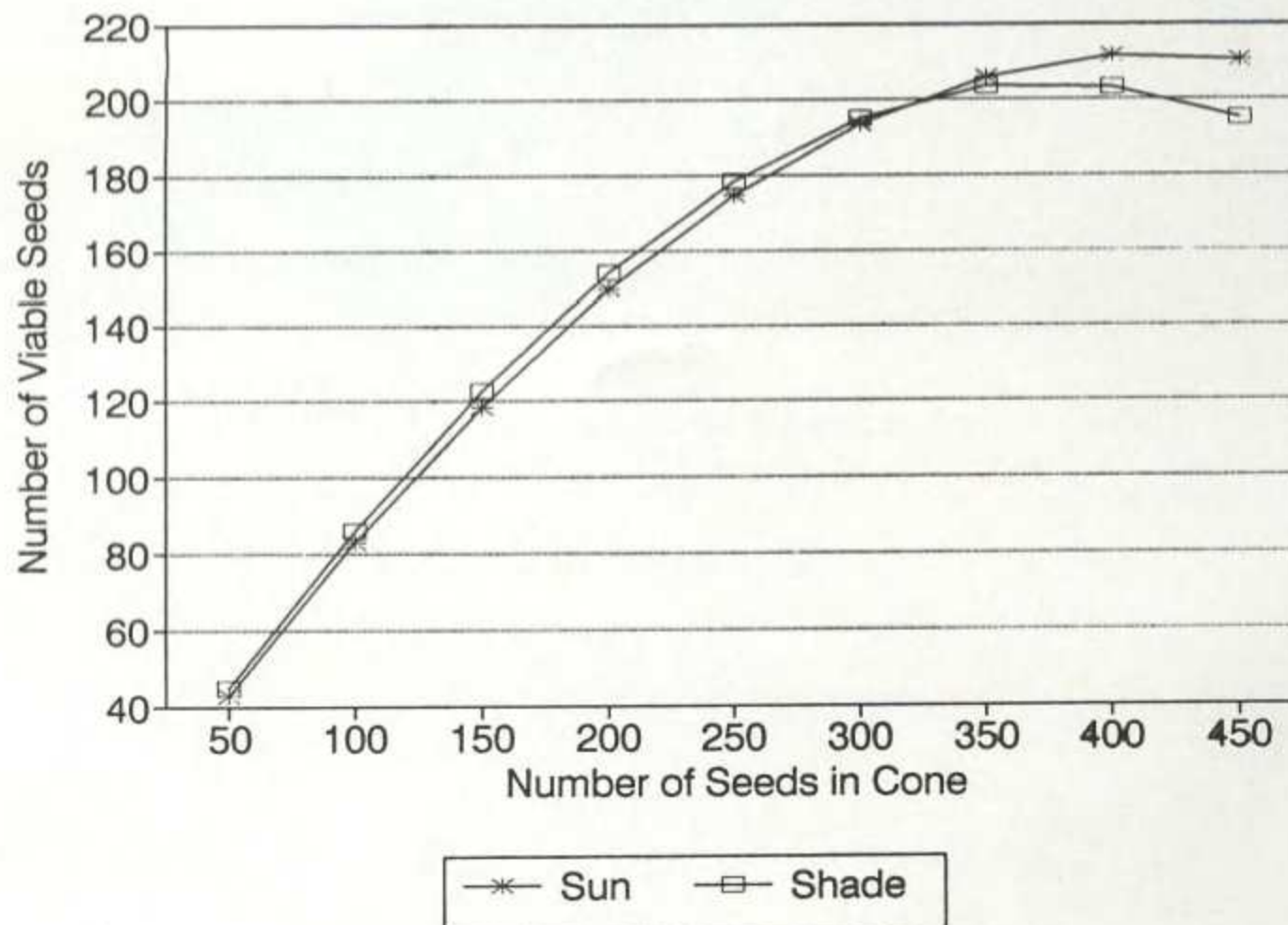


Figure 2 Viable seeds produced per cone.

badly burnt. It is feared that without very careful burning management, too many fires may have a very negative impact on the remaining viable *E. ferox* populations.

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ACKNOWLEDGEMENTS

We wish to thank the kwaZulu Department of Forestry for permission to collect seed samples and John Donaldson and Gary Knight for their comments on the first draft of this text.



Figure 3 *Encephalartos ferox* female cone. Photo: Kathy Musial.



CHARLES JOSEPH CHAMBERLAIN

(WITH PORTRAIT)

J.T. Buchholz

University of Illinois, Urbana, Illinois, U.S.A.

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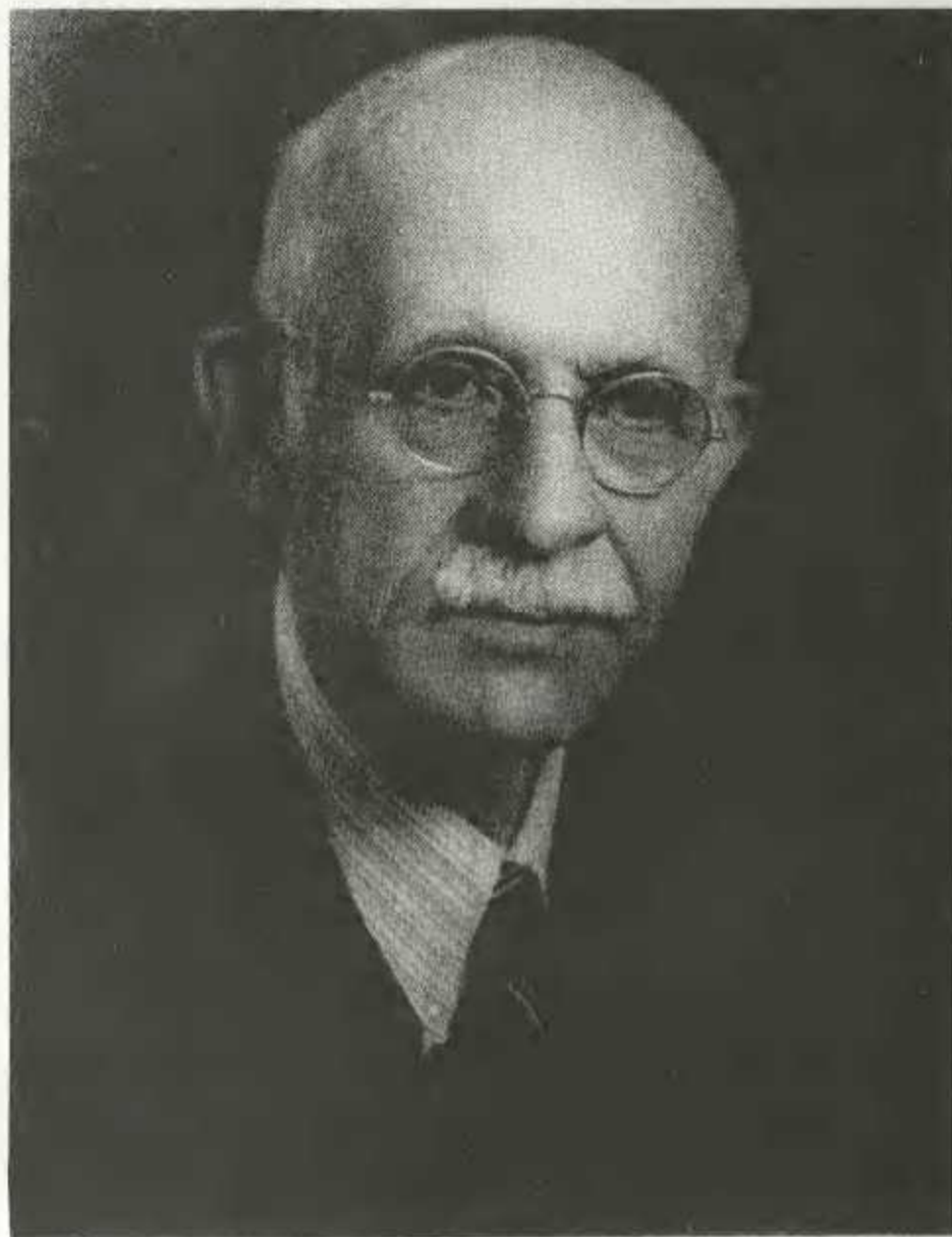
Reprinted from THE BOTANICAL GAZETTE, Vol. 104, No. 3: 369, 370, March, 1943,
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Illinois 60637-1496

The death of Professor CHAMBERLAIN on January 5, 1943, marks the passing of the last of those who, in the nineties, pioneered in establishing the Department of Botany at the University of Chicago. Dr. CHAMBERLAIN was a graduate student on the campus before any botanical courses were offered, and his insistent desire for such work was no small factor in bringing about the establishment of botanical courses and the early organization of the department. He was one of the group on hand to welcome Dr. JOHN M. COULTER in 1894, when he first made weekly visits to the campus for lectures and conferences. As Assistant and Associate, Dr. CHAMBERLAIN was in charge of the botanical laboratories from the beginning. He was the first to receive the Doctor's degree from the department (in 1897), was Instructor in 1901, Assistant Professor in 1907, Associate Professor in 1911, and Professor of *Morphology and Cytology* from 1915 until his retirement as Professor Emeritus in 1929. After his retirement he remained active, lecturing at various institutions and continuing his writing and his research - especially on the morphology and systematics of the cycads.

CHARLES JOSEPH CHAMBERLAIN was born near Sullivan, Ohio, on February 23, 1863. He received the usual rural school education, and attended high school in Oberlin, completing the three-year course in two years. This was followed by a year in the preparatory department and four years in Oberlin College, where he completed the classical course for the A.B. degree in 1888. He taught in the public schools for five years after graduation, including the Crookston (Minn.) high school, where he was Principal, 1889-1893.

His early attraction to botany came from interest inspired by Prof. A.A. WRIGHT of Oberlin College, a geologist who taught botany and zoölogy with equal enthusiasm. Returning to Oberlin during the summers, Dr. CHAMBERLAIN completed the requirements there in botany for the M.A. degree (1894). He was awarded the D.Sc. from the same Institution in 1923. At Oberlin he first saw the celloidin method and a sliding microtome used on animal tissues. During his first year at Chicago, zoölogical courses acquainted him with the

newer techniques in animal histology and cytology. This training constituted his foundation for the adaptation of these and other methods in the study of plant tissues. His volume, *Methods in Plant Histology*, still the standard book of its kind, first appeared in 1901, and was enlarged and revised through five editions to 1932.



Close collaboration with Professor COULTER in teaching and research resulted in the publication of the *Morphology of Seed Plants* (1901), the *Morphology of Angiosperms* (1903), and the *Morphology of Gymnosperms* (1910, 1917). His books also include *The Living Cycads* (1919), *Elements of Plant Science* (1930; translated into Spanish, Buenos Aires, 1942), and *Gymnosperms: Structure and Evolution* (1935). His monograph on the cycads had not reached publication

stage at the time of his passing, but it is so nearly completed that it may be expected to appear soon.

His botanical researches are too numerous to mention in detail and include investigations in all major groups of plants as well as gymnosperms. The investigations of cycads at Chicago were inspired by him and the material he provided. His special interest grew out of a collaborative investigation with Dr. COULTER on the embryogeny of *Zamia*, which led to the realization of the general lack of knowledge concerning the other cycad genera, mostly tropical. While in Germany at Bonn (1901-02) for a year's research in Professor STRASBURGER'S laboratory, he learned the approximate location of *Dioon edule* in Mexico. After his return from Europe he made a collecting trip into Mexico, which resulted in the discovery of several excellent cycad localities. Four trips to that country, together with an arrangement for the periodic shipment of cones and plant material to Chicago, provided him with material of *Dioon edule*, *D. spinulosum*, and *Ceratozamia mexicana*. He visited Cuba in 1914, and again in 1922, in the study of *Microcycas*. His most extensive excursion for cycads was made in 1911-12 to New Zealand and Australia, returning via South Africa, for a study in their habitats of the remaining genera and most of the species.

These collections resulted in the assembling in the botanical greenhouses at the University of Chicago of the most extensive and complete collection of cycads ever brought together. His book, *The Living Cycads*, includes an account of these botanical excursions. This initial interest in cycads, and the stimulation of much research in this field, have developed the knowledge of the group, so that from the least known they are now the best known of the gymnosperms.

NOTE: Referring to Chamberlain's Monograph on the cycads, this manuscript was never published but the "Cycad Ecology" we are working on is based on it and is complete now in draft version. *Knut Norstog, 5925 J. Road, Waterloo, Il 62298, U.S.A., October 1992.*

THE CYCAD COLLECTION OF THE DURBAN BOTANIC GARDENS

Roy Osborne

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Set not far from the hustle and bustle of one of Africa's biggest ports, the Durban Botanic Gardens is an island of tranquility much loved by locals and visitors. A central feature in the garden is one of the world's finest collections of *Encephalartos* species. In this text, the history of the gardens is traced over one and a half centuries and the present cycad collection is described

Professor CHAMBERLAIN was well known internationally as a foreign or corresponding member of botanical societies in England, Germany, Switzerland, India, and elsewhere. In 1923 he was Vice President and Chairman of the Botanical Section of the American Association for the Advancement of Science and was elected President of the Botanical Society of America in 1931. Among other activities, he was for many years American editor for cytology in *Botanisches Zentralblatt*; he was also Associate Editor of the *Botanical Gazette*.

As a boy, early musical talent had led his parents to expect that he might pursue music as a profession, but he contented himself with participation in orchestras, bands, and choral organizations of the college and community, a type of activity which remained an avocation throughout life. In Chicago he served for 10 years as director of music at the Woodlawn Baptist Church and was a member of the Apollo Club for 35 years. When a youth, he had learned to transcribe and arrange band music, and some of his original compositions were played by the town band. One of his musical themes was rendered on the Chapel organ at his funeral service.

During World War I, he joined in activities of the Rifle Club organized by Dr. W.J.G. LAND and soon qualified as Sharpshooter at Ford Sheridan, later as Expert Rifleman in both the Navy and unified Army-Navy courses.

Not only his family, but his wide circle of friends and colleagues, will miss him. His former students, now found in all parts of the world, gratefully remember his kindly but critical advice and counsel and will always cherish his memory as a friend. His passing is a deep personal loss to all of us.

and illustrated.

HISTORICAL BACKGROUND

The history of the Durban Botanic Gardens dates back nearly one and a half centuries to the founding of the

Natal Agricultural and Horticultural Society on April 18, 1848 and a grant of 50 acres of land at the foot of Durban's Berea to that Society in 1851. Mark McKen emigrated from Scotland that year to commence duties as Curator [a list of the Curators for the period 1849-1989 is given in Table 1], with the brief to propagate and distribute plants of economic importance to the Colony of Natal. Crops like arrowroot, tea, coffee, mango, breadfruit, ginger, camphor, paw-paw, guava, cocoa, cinnamon, orange and pepper were experimented with, but it was sugar that was to become the most significant agricultural crop in the Colony. Apart from the edible crops, a number of timber trees and some ornamentals were propagated in the early gardens.

Table 1 Curators of the Durban Botanic Gardens for the period 1849-1989

Dr C. Johnstone	1849-1850
M.J. McKen	1851-1853
A. Smith	1853-1854
R.W. Plant	1854-1856
J. Weir	1856-1857
R. Rogers	1857-1859
D. Chaumette	1859-1859
A. Moore	1859-1860
M.J. McKen	1860-1872
J.W. Keit	1873-1881
J. Medley Wood	1882-1903
J. Wylie	1904-1916
H. Rutter	1917-1930
W. Poulton *	1930-1932
F.W. Thorns *	1932-1936
E.R. Thorp *	1936-1950
E.R. Thorp	1950-1975
K.J. Wyman	1975-present

* denotes unofficial appointment

Following McKen's death from yellow fever in 1872, a young German named Julius Wilhelm Keit (William Keit), was sent out to Natal on the recommendation of Sir Joseph Hooker of Kew. On arrival in 1873, Keit found the gardens in something of a state of neglect and he set about organizing the plantings on a more botanical basis - despite difficulties caused by the combined effects of drought, labour shortages and a lack of funds. Keit was intrigued by the indigenous and exotic cycads and listed the plants in his garden as *Cycas media*, *Encephalartos altensteinii*, *E. caffra*, *E. ghellinckii*, *E. hildebrandtii*, *E. natalensis*, *E. villosus* and *Macrozamia tenuifolia*. He was active in distribution of plants both locally and overseas, exchanging material with botanic gardens internationally; e.g. records indicated that he sent a specimen of *Encephalartos natalensis* to Kew in September 1873. These exchanges were not without difficulties; a Wardian case of *Encephalartos natalensis*

dispatched to Adelaide languished one and a half years in a bonded store in Melbourne and "it was nearly three years in a dormant state before being planted out" (McCracken 1986).



Figure 1 John Medley Wood, Curator of the Durban Botanic Gardens 1882-1903. Bust by Hannah Lurie.

Keit resigned his Curatorship in 1881 and the following year local naturalist and farmer John Medley Wood was given charge of the gardens (Figure 1). By the 1890's, Medley Wood had achieved the remarkable feat of developing these "into the finest botanic gardens in Africa" (Hitchcock 1988). The focus of the gardens shifted from agricultural to botanical and a considerable number of new ornamentals were introduced. Wood's interest in and knowledge of the local indigenous flora is a legend. He established an extensive herbarium which remains in use as the present Natal Herbarium, in the original building, at present. But perhaps he will best be remembered for the discovery of the cycad which bears his name. His own description of the find (Wood 1908) of *Encephalartos woodii* follows:-

"In the year 1895 I was on a botanical collecting trip with wagon and oxen in Zululand, and having reached a spot where the country was very rough, I stayed for several days botanizing in the vicinity, and in doing so

found a solitary clump of *Encephalartos*, consisting of four stems, the tallest of which was 18 ft. high with proportionate girth of stem, and with a few offsets at the base; the stems were all male, and not another plant of the species could be found in the vicinity."



Figure 2 One of the two specimens of *Encephalartos woodii* collected by James Wylie in 1907, this plant has increased in height by about 300-400 mm annually.

In 1903, Wood sent his assistant, James Wylie, who later succeeded him as Curator of the gardens, to Zululand to fetch some of the smaller offsets. Three of these, about a meter high, were planted in the gardens where, after two years of dormancy, they commenced vigorous growth. Dr Wood reported later (Wood 1908) that, of the seven species of *Encephalartos* then in the gardens "these three, as far as the foliage is concerned, are, in my opinion, not only the handsomest of all, but are strikingly different from any others". In a subsequent expedition to the Zululand site in March 1907, Wylie collected two of the larger trunks for the botanic gardens; these two are the magnificent pair presently to be seen on the Old Conservatory terrace (Figure 2).

In 1913 the gardens came under the control of the Durban Municipality and in 1927 the Durban Parks Department was established as the administering authority. Despite the difficulties of the depression of the 30's and Second World War, continuous improvements were made to the gardens, including the



Figure 3 Plantings of *Cycas revoluta* are complemented by a Japanese stone lantern.



Figure 4 A large specimen of *Dioon spinulosum* is a feature in a shady corner.

construction of hardened footpaths and the construction of a magnificent sunken garden in 1934. Ernest Thorp took charge of the gardens from the period 1936 to 1975 and took a special interest in the expansion of the cycad collection. He used offsets from the original plants of *E. woodii* to increase the number of plants and was able to secure many valuable additions for the gardens by means

of exchanges for these valuable plants. During his term of office the swampy flat area was landscaped into the present lake feature and the orchid and bromeliad collections were established.



Figure 5 A large clump of *Stangeria eriopus* in a grassy part of the gardens.

The present Curator, Ken Wyman, was appointed in 1975 and has continued a vigorous programme of improvements. Notable features introduced in the last ten years have been the Herb Garden in 1979, a Garden for the Blind in 1984 and the indigenous orchid house in 1987. Mr Wyman has a special interest and expertise in the 240-odd palm species and the bromeliad collections in the garden. It has been during the tenure of Ken Wyman's curatorship that a partnership has been developed between volunteer workers from the Cycad Society and the Durban Botanic Gardens staff, a cycad advisory committee comprising representatives from these two groups being set up in 1991 and a special fund commenced specifically for cycad project work. The work of this group led to a decision to undertake an ambitious and major re-organization of the cycad plantings into a more scientifically-organized and more accessible series of geographical groupings of specimens. This re-organization commenced in 1992 with the establishment of the Cape, Natal, Transvaal, Central African, Australian, Asian and meso-American cycad

zones. This project will be completed in June 1993 in time for the visit to the gardens by the CYCAD 93 delegates. In addition, this committee ensures that the pollen from male cones is properly harvested, labelled and stored and that every female cone is properly pollinated.

DEMOGRAPHIC DETAILS

Durban (population 3.5 million) is a large, commercially important, metropolitan city on the eastern coast of South Africa and is southern Africa's busiest port. The climate is sub-tropical with a dry mild winter and a warm humid summer. The 50-acre gardens are situated just outside the business centre of the city and are 2.8 km from the Indian Ocean and 2.0 km from Durban Bay. The lower area of the gardens, with a high water table, is 14 m above sea level and this rises westwards to 42.6 m elevation on the Berea slopes. The soil is a reddish sandy loam of aeolian origin and is rather poor in nutrients. The average annual rainfall is 1030 mm, falling mainly in the early summer period.



Figure 6 One of the many tall specimens of *Cycas thouarsii* in the gardens.

THE PRESENT CYCAD COLLECTION

The cycad collection in die Durban Botanical Gardens is undoubtedly one of the world's finest, in terms of size and age of the plants, numbers of plants and the diversity of the collection. The central core of the collection comprises an almost-complete collection of *Encephalartos* species and is complemented by a selected range of exotic cycads. At the time of writing, the Durban Botanic Gardens cycad collection comprised 379 mature specimens in 51 different taxa (Figures 3-5), ranking it amongst the top ten cycad gardens in the world. In addition to the main DBG collection, the associated Old Fort Gardens has many fine specimens of four species of Natal cycads as well as some very well established *Cycas thouarsii* plants (Figure 6), this collection comprising an impressive 183 mature plants.

The DBG hosts an estimated 250 000 visitors annually and each one leaves the gardens enriched through their visit. The cycad collection is a wonderful and scientifically important central feature to a magnificent

garden.

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ACKNOWLEDGEMENTS

I am indebted to Tony Hitchcock and Ken Wyman of the Durban Botanic Gardens for their assistance in the preparation of this text.

SHORT COMMUNICATIONS / KORT MEDEDELINGS

NBI's CYCAD CONSERVATION PROGRAMME

Roy Osborne

Department of Chemistry, University of Natal, 4001 Durban



The National Botanical Institute has responded to the need to conserve South Africa's cycads by formulating a *cycad conservation programme*. This will complement the activities of other conservation agencies by focussing on existing strengths within the N.B.I., i.e. cultivation of cycads for *ex situ* breeding programmes, certain educational initiatives and research on the viability of cycad populations and habitats.

The NBI's programme will operate at most of the National Botanic Gardens, i.e. Kirstenbosch, the Karoo NBG at Worcester, and Natal NBG at Pietermaritzburg, the Lowveld NBG at Nelspruit, The Pretoria NBG, the Witwatersrand NBG near Roodepoort and the OFS NBG at Bloemfontein. The research programme will be centred at the Conservation Biology Research Unit at Kirstenbosch.

In October 1992 the programme was given a boost when the Mazda Wildlife Fund supplied a 4x4 B2600 vehicle

for use in fieldwork in the programme. Dr John Donaldson, Programme Leader of the cycad conservation project, said that "by providing a vehicle for the NBI cycad conservation programme, the Mazda Wildlife Fund has made a significant contribution

towards the success of this endeavour, for which we are very grateful".

Details of the programme are obtainable from Dr J.S. Donaldson, NBI, Private Bag X7, 7735 Claremont.

WILDLIFE EXPO '92: NATAL SECTION EXHIBITION

Avis Meresman
P.O. Box 4726, 4000 Durban

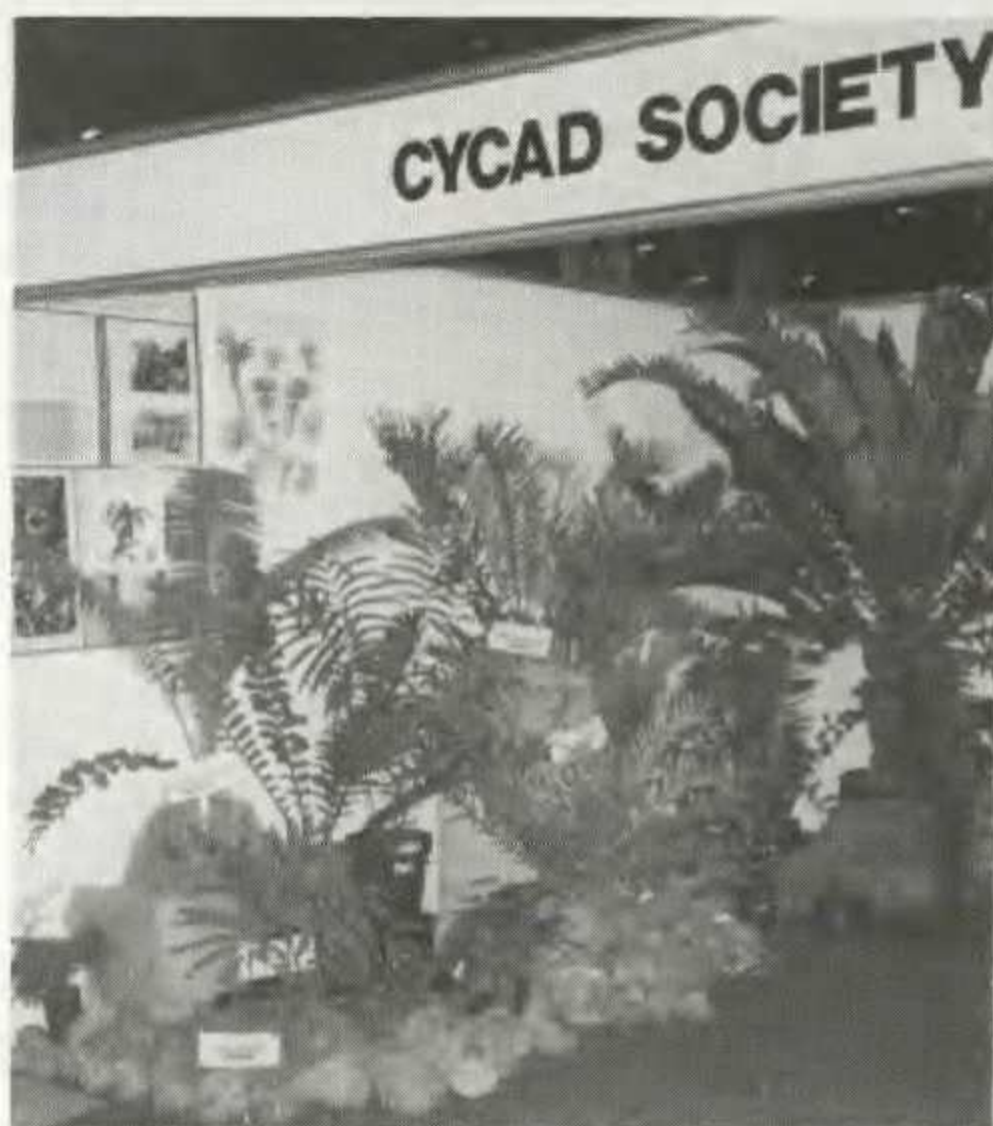
Once again, the Natal Section of the Society mounted a stand at the annual Wildlife Expo in Durban in September 1992. There were many enquiries about membership and three persons insisted that we immediately take their cash for their membership fees, which we did. I would guess that, from the enquiries, at least ten new members will have joined.

We did quite well at raising funds at this show in the form of daily raffles of plants which were donated by a member. Each and every person receiving a prize was totally elated, so much so that some of them couldn't *wait for us* to meet them at the gates, and actually paid a second entrance fee so that they could claim their prize. At a rough estimate, at least 300 persons per day passed through our stall. Some had extremely interesting stories, others with interest, many with fear about permits, and others just plainly interested and enthralled to meet up with something from the dinosaur age.

One of the highlights of this show was "Horridus the Horrible". On day two of the show this plant started to show its true colours; all the little children came to visit had purchased balloons, and being rather inquisitive "Horridus the Horrible" stretched out his feelers to touch these balloons. The first loud bang was great fun and so he played on. Each time it cost the parents R5, then there were the screams and tears. Fortunately for "Horridus the Horrible" the bloodbank was next door; they saved his life for they were selling helium-filled balloons. Immediately the kids started screaming and crying, the ladies popped around the corner and offered the parents a new balloon for only 50c.

Then we had the famous *ENCEPHALARTOS WOODII* on the stall. We had many good laughs about that as every second person who came past had one "just like that" in his backyard. This is when you found out that you needed a lot more than just patience to work on this stall, and tactfully each member who assisted in manning the stall would say "well now ..." (I don't have to tell you folks what they said, do I?)

Many thanks for the strong support from members who willingly volunteered their spare time to assist - without you all we wouldn't have been so visible as a conservation group. To Danie Nel who manned the stall everyday from 9am - 9pm: we are extremely grateful to you. Finally, our thanks to the staff of the Durban Botanic Gardens for their invaluable assistance in loaning and transporting the big specimens for the display.



THE WILDLIFE SOCIETY OF SOUTHERN AFRICA

WILDLIFE

EXPO '92

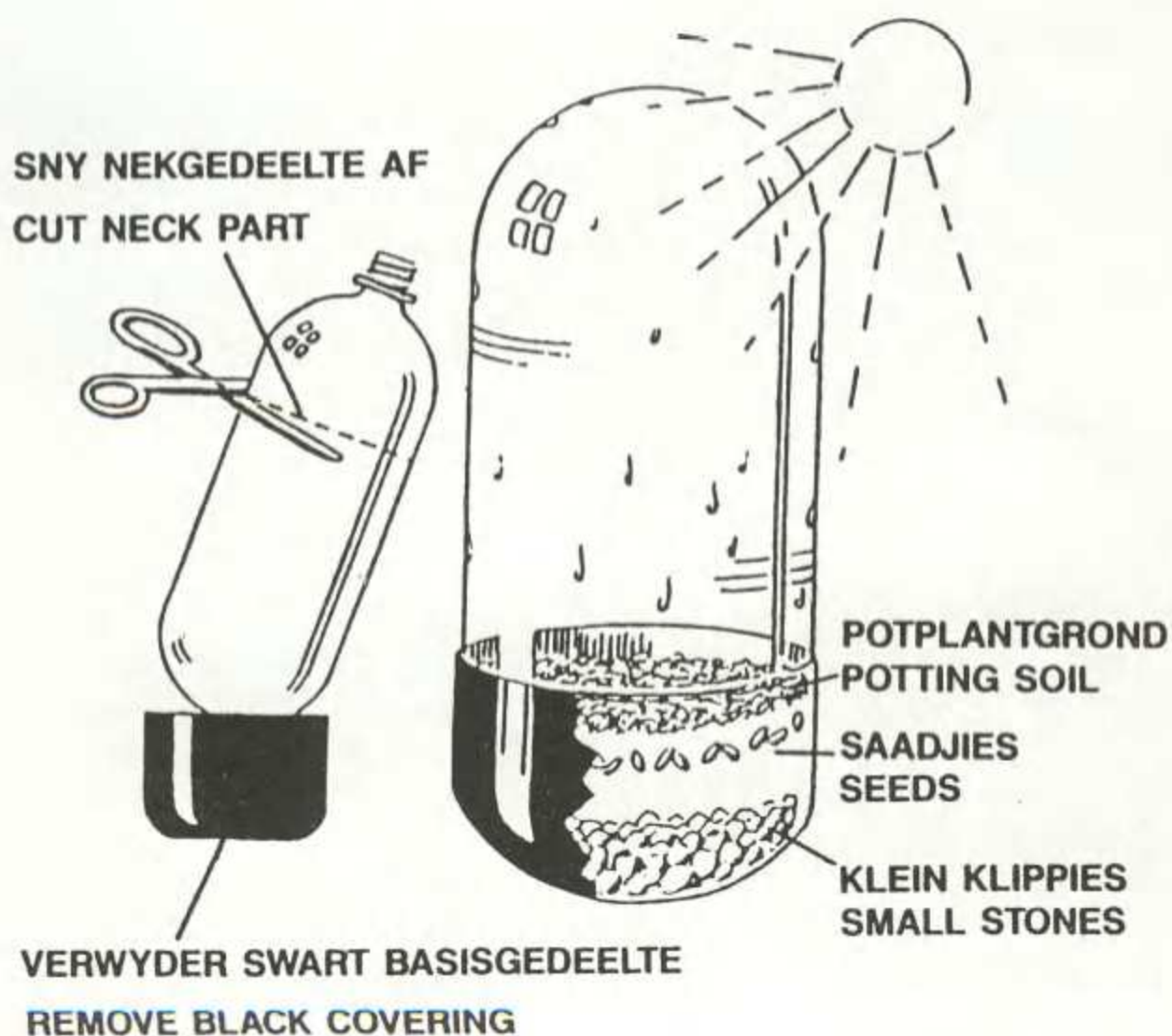
20 - 27 SEPTEMBER 1992
DURBAN EXHIBITION CENTRE

HINTS FOR BEGINNERS ON GROWING CYCADS FROM SEEDS or How do I get this cycad seed to become a cycad?

Danie Nel
120 Bowker Road, 4093 Escombe

That's easy! Just follow these simple steps and watch your cycad grow:

1. Remove the black base of a 2 litre plastic cooldrink bottle by pouring some hot water into the bottle.
2. Cut off the neck of the bottle (see the sketch).
3. Place a few small stones in the bottom of the black section and cover it with a mixture of equal volumes of potting soil and river sand. If you do not have potting soil just mix some compost into ordinary soil.
4. The soil must be moist, but not too wet.
5. Plant the seeds so that they are just covered with soil. If they are too deep they will take longer to grow.
6. Turn the bottle upside down and place the open end over the black base. Remove the top once a week and water the soil (but do not overwater).
7. Place the bottle in a warm spot but not in direct sunlight.
8. The seed should germinate within four to five months.
9. Leave the seedlings in the bottle for about three weeks (not longer).
10. Transplant the seedlings to a plastic plant bag with potting soil.
11. Place the seedlings in a protected place and water them once a week.
12. When the seedlings reach a leaf height of 300 mm, they can be planted out into the garden.



If you place a few pieces of brick in the garden hole and cover them with compost, the water stays in the soil longer for the roots to feed on. Do not overwater the cycads and be sure to label the plants with their species name and date.

Congratulations! Thank you for doing your bit towards the survival of the cycads and creating a friendlier, healthier world for all to live in.

"ALL ABOUT CYCADS" : EXHIBITION IN SCHÖNBRUNN, AUSTRIA

Julius Brunner

Bundesgärten Schönbrunn, A-1131 Vienna, Austria

In October 1992 the Austrian Botanical Garden (Österreichische Bundesgärten) presented a special exhibition about cycads in the "Palmenhaus" in Schönbrunn, a big greenhouse specifically designed for the cultivation of palms. According to the motto "ALL ABOUT CYCADS" a great variety of different items were to be seen: various living plants of the families Cycadaceae and Zamiaceae, loaned to the exhibition by the herbarium of the Museum of Natural History in Vienna, as well as fossil remains of our cycads' ancestors (Figures 1-6).

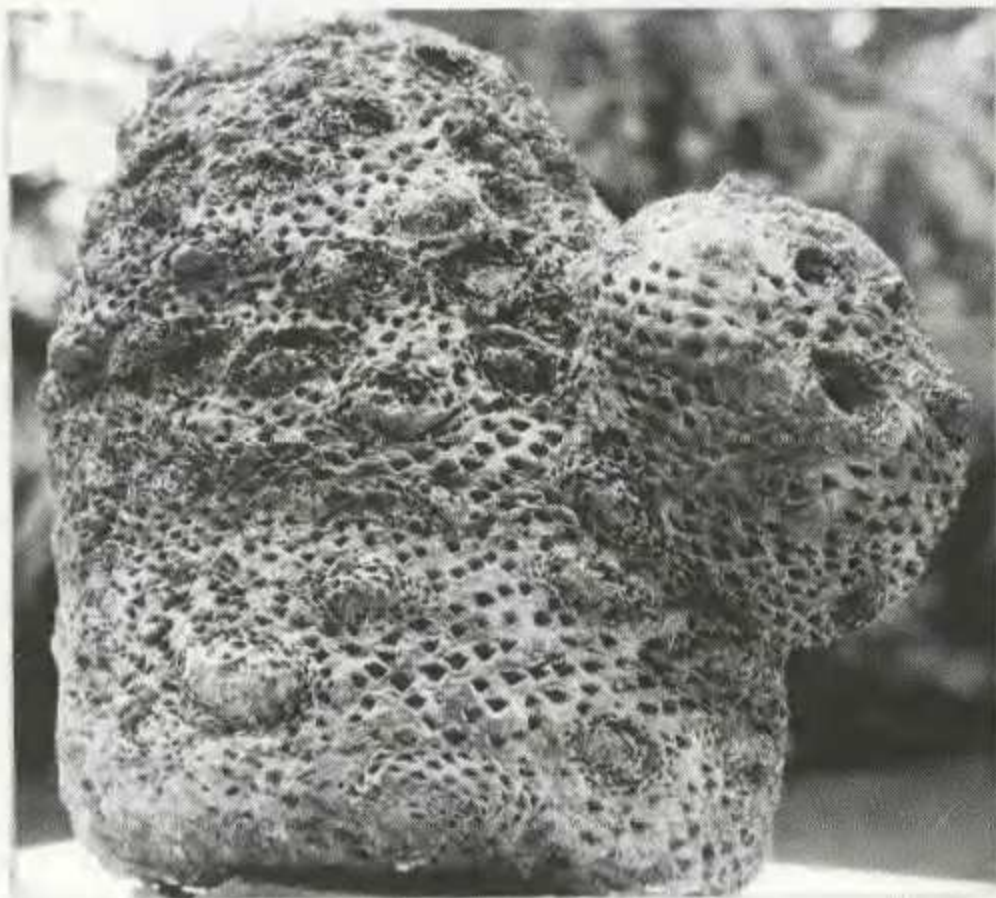


Figure 1 A close-up of the fossil *Cycadeoidea dakotensis* taken from the side.

The highlight of the exhibition was the approximately 140 million year old fossil of *Cycadeoidea dakotensis* (Figures 1, 2, 4), which weighs about 400 kilogrammes and had also been loaned to this exhibition by the Museum of Natural History. This plant was preserved by *Silicium*, which makes it look as if it were still living. It belonged to a group called BENETTITEAE which existed approximately 230 million to 65 million years ago and then became extinct. BENETTITEAE were seed plants (spermatophytes). They were the first to have hermaphrodite blossoms, i.e. blossoms which have both male and female sex characteristics. They are supposed to have been pollinated by insects. The cycads known to us are the most primitive forms of seed plants still living in our time and are therefore close relatives of this fossil plant.

Another interesting item shown in our exhibition was the utilization of *Cycas circinalis*, for extracting sago flour.

But the flour presented there had been bought at an Oriental shop and originated from a less valuable palm.



Figure 2 A close-up of the fossil *Cycadeoidea dakotensis* taken from below.



Figure 3 Part of the exhibition: a specimen of *Encephalartos horridus*.

Unfortunately, the exhibition did not attract as many visitors as had been expected. Apparently, people are impervious to the beauty of cycads with all these orchids and other impressive exotic flowers imported by the thousands and displayed in almost every shop window nowadays. It is obvious why. Will any lover be able to reach the heart of his beloved when bringing her a cycad? What a pity that only members of "Encephalartos" are thrilled by the view of a cycad.



Figure 4 Part of the exhibition with the fossilized remains of *Cycadeoidea dakotensis* in the cage.



Figure 5 Part of the exhibition which contained mainly *Cycas* species.



Figure 6 Part of the exhibition: specimens of the families Cycadaceae and Zamiaceae.

Photos by Walter Wechsberg who was also in charge of the exhibition.

HYBRID *ENCEPHALARTOS LONGIFOLIUS* OR NATURAL GENETIC DIVERSITY?

Martin R. Schwellnus

P.O. Box 7045, Newton Park, 6055 Port Elizabeth

Hybrid plants of the genus *Encephalartos* is no uncommon sight in garden collections. Natural hybrids tended to attract the attention of collectors in the days that mature plants could still be removed from nature, resulting in many rare specimens ending up in gardens. Many of these plants have lost their botanical value as plants changed hands and collection localities of plants became unknown. In the majority of cases, however, collectors gathered plants for the sole purpose of either status or financial gain, disregarding the maintenance of locality records.

Given the explosion of the number of cycad nurserymen, and the little attention that is commonly paid by the average owner of cycads, we are entering a period in which literally hundreds of thousands of hybrid

specimens are coming onto the market. These artificially created hybrids are going to complicate the identification of specimens and cast doubt over authenticity of natural hybrids in future. It is therefore imperative that cycad owners should make a concerted effort to mark these natural hybrid plants in some way and to keep a record thereof, if the plants are to retain botanical value.

A particular plant, with a 0.75 meter long trunk, in a Port Elizabeth garden collection attracted my attention recently, stressing the above statement, as it would most definitely be suspect in future as probably being an artificially propagated specimen.

The plant under discussion was originally collected in an area which is a typical *E. longifolius* locality on the



Figure 1 Apex of an *E. longifolius* rachis displaying pronounced recurving as is commonly found in *E. latifrons* and *E. arenarius*.

southern slopes of the Suurberg mountain range, approximately 100 kilometers north-east of Port Elizabeth. The plant has a typical *E. longifolius* appearance if the thornless petiole, leaf colour and stem are considered. Closer inspection of the leaflets and apex of the rachis, however, shows considerable deviation from the normal *E. longifolius* characteristics.

The terminal end of the rachis, in a large number of leaves of this plant, has a very pronounced curl (Figure 1) similar to that found in *E. arenarius* and *E. latifrons*. The leaflets are attached to the rachis forming a very deep V shape in the top third, flattening out to approximately 45 degrees at the bottom. The top third of the leaflets almost interweave to form a near single row of densely packed leaflets. The major peculiarity of this particular plant is, however, found in the leaflets which showed extreme diversity in form, size and teeth. The teeth are all situated on the bottom margin of the leaflets and vary in number from zero to three.



Figure 2 *E. longifolius* rachis showing extreme teeth that appear as smaller leaflets preceding normal sized leaflets. Note the common leaflet bases on the rachis.

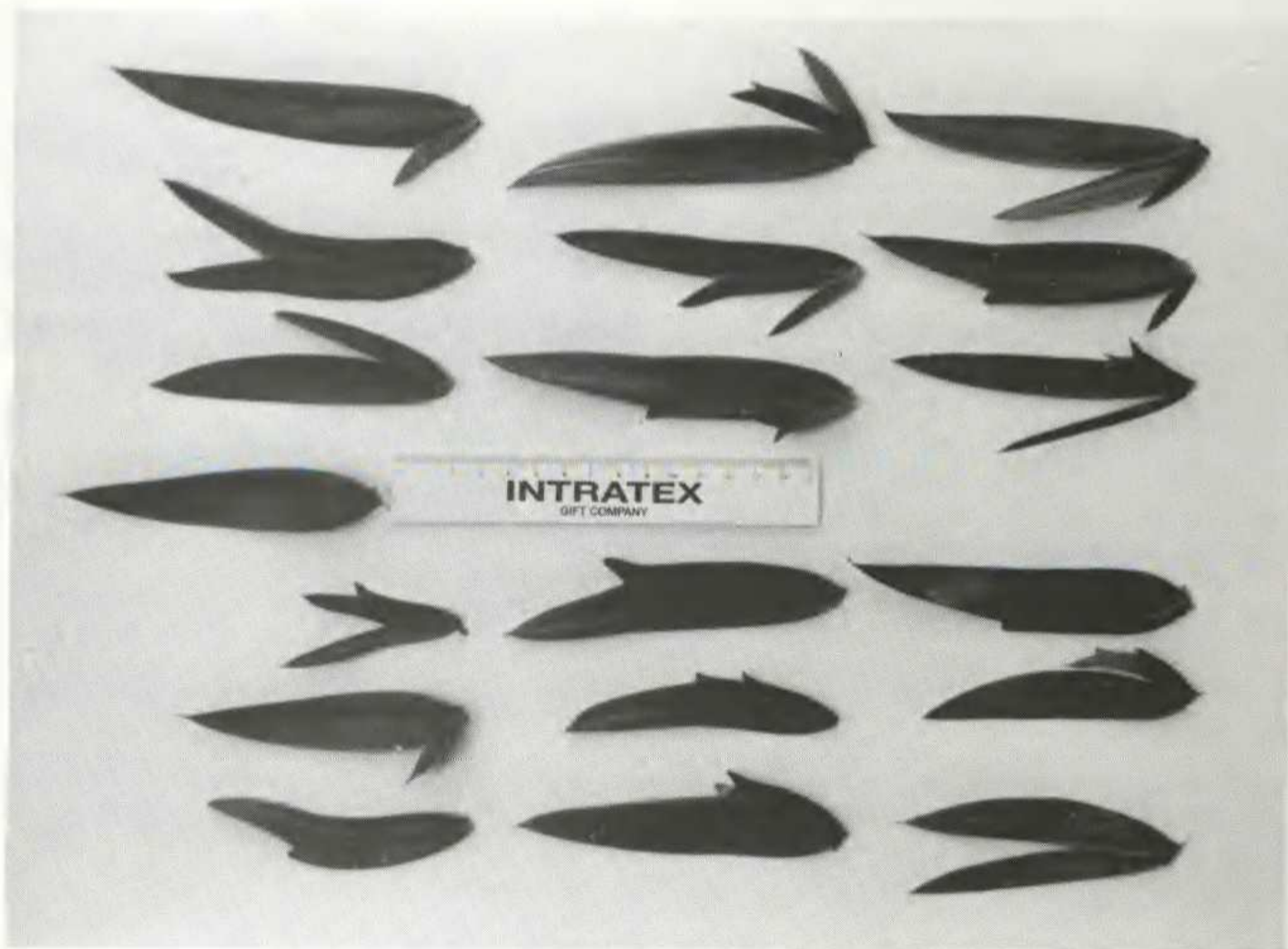


Figure 3 Leaflets removed from a single rachis of *E. longifolius* showing the extreme diversity in shape, size and teeth.

Teeth size differs from a mere small sharp point to large rounded indentations or to total division of a leaflet into virtually two, and even three, separate leaflets with a common leaflet base on the rachis (Figure 2). These separate leaflets (but for the base on the rachis) in some cases even have teeth of their own. The arrangement of these smaller leaflets in relation to the normal sized leaflets creates the impression of an *E. caffer* leaf. The width of leaflets varies from 10 mm to as much as 30 mm. The most extraordinary of it all is the leaflet diversity that is found on one and the same rachis (Figure 3).

The owner of the specimen assures me that it was the only plant in the locality that showed the diversity as the

area was thoroughly searched for more than a kilometer around the plant, with no success, for other plants with the same diversity. I have also been assured that no other species of *Encephalartos* but *E. longifolius* was present in the searched area. Other specimens of *E. longifolius* originally removed from the same locality and inspected by me did not show any signs of as much as a single tooth on the leaflets. This poses the question if this specimen is actually a natural hybrid, a rare exhibition of the natural genetic diversity that is present in *E. longifolius* and unlocked by chance, or a mere mutation.

Once this plant cones it may disclose further information on its true origin.

RECENT WORK IN CYCAD TISSUE CULTURE

Knut J. Norstog

5925 J. Road, Waterloo, IL 62298, U.S.A.

It is probably not "kosher" for a coauthor to review his own research papers, but at Roy Osborne's request I will do so anyway. I am after all the "tail end Charlies" of each article and my own contributions to them were relatively small.

Victor Chavez began culturing cycad tissues in Miami in the mid-1980's while on a research fellowship in Litz's lab at Homestead, just a few miles south of our lab at Fairchild Tropical Garden. During several years, Victor and I worked together designing some cycad tissue culture experiments based in part on our personal experiences and in part on the literature, including Osborne's successes in obtain *in vitro*-regenerated shoots of *Stangeria*. We had, therefore, some basis for our experimentation, but eventual success is largely due to Victor's perseverance.

My mentor years ago at the University of Michigan was Carl LaRue who, I think, was the first person ever to obtain plantlets from cultured cycad megagametophytes. Carl was really not sure just what the "magic formula" was for growing cycads *in vitro*, but he urged patience. "Don't ever throw out old cultures because you think nothing is happening in them. Even after a year or two, you may be surprised" was one of his maxims. Victor's cultures of megagametophytes obeyed "LaRue's law". Callus was produced quickly in cultures of leaf primordia, zygotic embryos, and/or megagametophytes of *Zamia fischeri*, *Z. furfuracea*, *Z. pumila*, *Ceratozamia hildae*, and *C. mexicana* but differentiated elements were very slow in appearing. Eventually, after months and sometimes a year later, somatic embryos began to

appear in a number of the cultures, details of which are described in the papers.

Having seen some of the cultures and knowing something of the problems encountered in attempts to culture cycad tissues, I think it is safe to say that this work is an important step toward routine mass-production of cycad plantlets via tissue culture. The methods and media described are not especially different from those others have used, but the sequential use of proliferative and inductive media probably plays an important part in the results. Of course, many problems remain. A major difficulty with all somatic embryo cultures is to get them to "germinate". They tend just to go on and on making more embryos. I look forward to ensuing chapters in the further development of cycad tissue culture methods by Chavez, Litz and Moon.

This is a review of three recent cycad tissue culture articles, namely:

1. CHAVEZ, V.M., LITZ, R.E. & NORSTOG, K. 1992a. *In vitro* morphogenesis of *Ceratozamia hildae* and *C. mexicana* from megagametophytes and zygotic embryos. *Plant Cell, Tissue and Organ Culture* 30: 93-98.
2. CHAVEZ, V.M., LITZ, R.E. & NORSTOG, K. 1992b. Somatic embryogenesis in *Zamia fischeri*, *Z. furfuracea* and *Z. pumila*. *Plant Cell, Tissue and Organ Culture* 30: 99-105.
3. CHAVEZ, V.M., LITZ, R.E., MOON, P.A. & NORSTOG, K. 1992. Somatic embryogenesis from leaf callus of mature plants of the gymnosperm *Ceratozamia mexicana* var. *robusta* (Miq.) Dyer (Cycadales). *In Vitro Cell Developmental Biology* 28: 59-63.

CONSERVATION OF CYCADS IN NATAL

Rob Scott-Shaw

P.O. Box 662, 3200 Pietermaritzburg

- Adapted from a lecture given to the Natal Section of the Cycad Society of South Africa on 18 June 1992.

INTRODUCTION

Dr R.A. Dyer's coinage of the specific epithet for *Encephalartos inopinus* refers to its highly desirable status. This epithet can be applied to almost any member of the genus where the avarice of the collectors

has reached almost epidemic proportions, despite the protective laws which are set out to maintain the integrity of wild cycad populations. With respect to nearly all species in Natal (Table 1), reports of removals from the wild continue. Other threats exist which are also important in directing conservation effort.

Table 1 A synopsis of *Encephalartos* protection and conservation status in Natal

Species	% Occurring in Natal	% Within Reserves	Conservation status
<i>E. aemulans</i>	100	50	Vulnerable
<i>E. cerinus</i>	100	0	Endangered
<i>E. ferox</i>	30	30	Vulnerable
<i>E. friderici-guilielmi</i>	5	30	Vulnerable
<i>E. ghellinckii</i>	95	30	Vulnerable
<i>E. laevifolius</i>	0.1	90	Vulnerable
<i>E. lebomboensis</i>	70	30	Vulnerable
<i>E. natalensis</i>	99	50	Rare
<i>E. ngoyanus</i>	60	40	Rare
<i>E. villosus</i>	70	35	Rare
<i>E. woodii</i>	100	0	Extinct in the wild

GOALS OF THE NATAL PARKS BOARD

The Natal Parks Board has identified three key goals with respect to cycads in Natal, viz.

1. To secure representative populations of all species in the wild.
2. To promote an abundance of all species in cultivation.
3. To strive for a situation where there is no necessity for protective legislation.

THREATS TO SURVIVAL OF WILD CYCAD POPULATIONS

Seven factors are identified as threats to the existing wild cycad populations in Natal; these are:

1. Removal by man for personal gain.
2. Habitat mismanagement (e.g. inappropriate burning cycles).
3. Habitat degradation (e.g. forest clearing; loss of fruit dispersing animals; overgrazing).
4. Destruction by man as a result of major land transformations (e.g. dam construction).
5. Damage of plants for magio-medicinal purposes.
6. Genetic contamination (e.g. hybridization with artificial populations).
7. Intrinsic factors (e.g. the inability to compete with natural vegetation).

Only recently has the concept of a minimum viable

population size become recognized as a key factor in conservation. The concept of a "species" is an artificial construction of man and proper understanding of the conservation issues also requires a working knowledge of geno-species, varieties, specific populations and even colonies within populations. This is especially true in Natal's cycads where for instance *E. ngoyanus* exists as two discreet populations (Ngoye area and Ubombo area) separated by 100 km. The widespread collection of *E. ferox* in the coastal area of Maputaland appears to be causing fragmentation of the original population into isolated colonies. The restricted gene flow and other ecological factors may now threaten the viability of these disjunct groups. Little is yet known about proper fire management, especially important to grassland species. For example, the populations of *E. ghellinckii* appear to be producing seeds regularly and there is an abundance of young seedlings. However, juvenile plants are absent and this may be a consequence of inappropriate fire regimes. The interrelationships with animals are often overlooked. Is the decrease in numbers and ranging areas of baboons a possible negative factor on cycads, in the sense that baboons are important natural seed-dispersing agents?

WHAT CAN BE DONE ABOUT THE PROBLEMS?

Clearly an extension of ecological research would provide answers to some of the problems raised above and would give important clues as to better management strategies. The situation can be assessed to some extent in terms of supply-and-demand economics. An increase in protective legislation may be necessary to halt the demand on wild plants while a massive propagation effort would assist in the supply factor. Public awareness and education are considered vital and here the efforts of the Cycad Society and the journal "*Encephalartos*" are recognized as valuable contributors. Cycad Society members are assisting with the propagation efforts and this too must be regarded as positive.

CYCADS AND THE LAW IN NATAL

The Natal Parks Board has the responsibility for administering the Natal Nature Conservation Ordinance (No. 15 of 1974) and the CITES International legislation on trade in endangered species. In terms of the legislation a cycad plant includes seeds, offsets and suckers. All *Zamiaceae* and *Stangeria eriopus* are listed as Specially Protected plants in the Provincial Ordinance

and all of our local cycads are on the CITES Appendix 1. The legislation empowers the Natal Parks Board to control the gathering, possession, sale, purchase, moving, donation and exchange of cycads.*

Rob Scott-Shaw is the Nature Conservation Scientist of the Natal Parks Board. The address for correspondence is P.O. Box 662, Pietermaritzburg 3200.

*[Details of the law are provided in a useful pamphlet "Indigenous Plants and the Law in Natal", obtainable from the Natal Parks Board (P.O. Box 662, Pietermaritzburg 3200) or from the Cycad Centre (P.O. Box 4726, Durban 4000).]

CYCADS AT ASWAN, EGYPT

Nat Grobbelaar

P.O. Box 15357, 0039 Lynn East

During September 1992 my wife, youngest son and I visited Egypt. Our tour took us all the way up the Nile River to Aswan; the only site in Egypt from which granite can be obtained.

Lord Horatio Herbert Kitchener who was commander-in-chief of the British troops which constituted the Egyptian army, had his headquarters at Aswan before he was called upon to serve under Lord Roberts in South Africa as chief of staff after the British defeats in December 1899.

At Aswan, the Nile River contains several small islands. Lord Roberts had his official residence constructed on one of them whilst another, now called Kitchener Island, was developed by him for recreational purposes. The latter now constitutes the Aswan Botanic Garden and is open to the public. Although the splendid formal gardens are not very well kept nowadays, it nevertheless is a popular tourist attraction. The island is said to have a surface area of 17 feddans and a maximum width of 115 metres. The gardens were started in 1898 and to my delight I found it to contain several specimens of two Asian cycad species. Although it could not be established when and by whom the cycads were planted in the gardens, they are quite old and of about the same age. Although those specimens which bore labels were all said to be *Cycas circinalis* (Figure 1), it was quite obvious that some were specimens of *Cycas revoluta* (Figure 2.)



Figure 1 Plant labelled *Cycas circinalis* with my son, Nat junior, alongside.



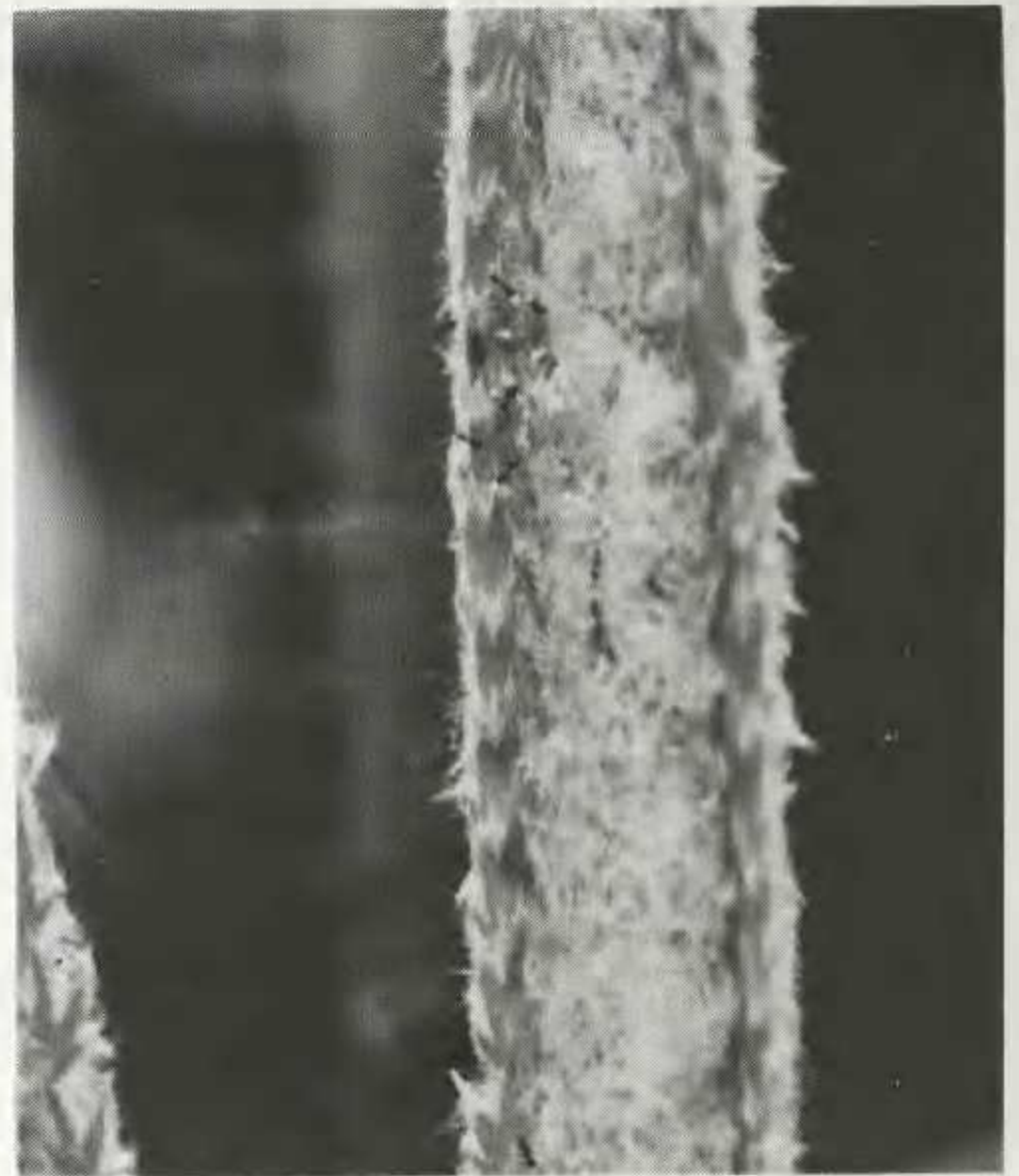
Figure 2 Plant also labelled *Cycas circinalis* but obviously a specimen of *Cycas revoluta*. The two Japanese ladies that posed for the photograph are Mami Shimizu (left) and Yoko Yamaji (right).

ANTIBODIES TO THE RESCUE

Roy Osborne

Department of Chemistry, University of Natal,
4001 Durban

The accompanying photograph illustrates that there is something which control the Leopard moth - ordinary red garden ants. They are pictured here in the process of removing eggs, one at a time, from a newly-emerging leaf of *Encephalartos villosus*.



Ants feeding on the Leopard moth eggs on an emergent *E. villosus* leaf.

ENCEPHALARTOS PLANTS IN CULTIVATION: UNUSUAL CONE NUMBER

Isabella Claassen

P.O.Box 11322, 0011 Brooklyn

With reference to the previous communication on this topic ("*Encephalartos*" 32: 21), additional information is herewith provided for another three *Encephalartos* species.

Both male and female plants of *E. arenarius* (Giddy 1984: 103, Kemp 1987: 5, Goode 1989: 94) and *E. ngoyanus* (Giddy 1984: 55, Goode 1989: 158, Giddy 1990: 6) are known to produce a single cone per stem. In December 1992 one *E. arenarius* male (Figure 1) and one *E. ngoyanus* male (Figure 2), at the University of Pretoria, each produced three cones.

In *E. princeps*, cones may number up to three (Giddy 1984: 79, Goode 1989: 78, Kemp 1990: 5). Between January 1988 and January 1993 one male *E. princeps* in the Pretoria Botanical Garden once produced five cones



Figure 1 *E. arenarius* male with three cones on the same stem (6 January 1993).



Figure 2 *E. ngoyanus* male with three cones on the same stem (6 January 1993).

on a single stem whilst four other plants each produced four cones per stem. One of the latter repeated the performance twice.

Recently, whilst updating my computer file on the phenology of *Encephalartos* species in some Pretoria gardens, I noticed that a male *E. trispinosus*, at the University of Pretoria, produced three cones in November 1991, one cone more than previously recorded. A photograph of this plant can be seen in "*Encephalartos*" 33: 10, Figure 16.

So far this phenomenon has been noted mainly in male plants in cultivation. It should be interesting to know if it also occurs in female plants other than *E. eugene-maraisii*, *E. middelburgensis*, *E. dolomiticus* and *E. heenanii* (Goode 1989: 58, 62, 66, 128).

REFERENCES

- GIDDY, C. 1984. Cycads of South Africa. Second Revised Edition. C. Struik (Pty) Ltd, Cape Town.
- GIDDY, C. 1990. Focus on ... *Encephalartos ngoyanus* Verdoorn. *Encephalartos* 23: 3-9.
- GOODE, D. 1989. Cycads of Africa. Struik Winchester, Cape Town.
- KEMP, M. 1987. Focus on ... *Encephalartos arenarius*. *Encephalartos* 11: 4-7.
- KEMP, M. 1990. Focus on ... *Encephalartos princeps*. *Encephalartos* 24: 3-7.

NEW GOODE POSTER

Roy Osborne

Department of Chemistry, University of Natal,
4001 Durban

Cycad artist Douglas Goode has produced the fourth and final poster in the "Please Protect" series. The fourth poster, featuring "new" species such as *Encephalartos cerinus* and *E. aemulans* also illustrates *Stangeria eriopus* and the fascinating *Welwitschia mirabilis* plant from Namibia. These posters are on sale at the Durban Science Museum, the Durban Botanic Gardens or from the Cycad Centre (P.O. Box 4726, Durban 4000 or telephone 031-442505).

PHOTO COMPETITION

Nat Grobbelaar

Box 15357, 0039 Lynn East, Pretoria

We had 12 entries for the colour photo competition. In the final round of adjudication it was very difficult to decide between an entry submitted by J.F. Tomlinson of Western Australia and one submitted by Isabella Claassen of Pretoria. Eventually it was decided to award the prize to Isabella Claassen.

We would like to thank all the competitors for taking part in the competition and compliment them on the high standard of their entries. A special word of congratulations goes to Isabella to whom the book by D.L. Jones on the Cycads of the World will be mailed as soon as it appears.

NOMINATIONS FOR COUNCIL

Nat Grobbelaar

A new COUNCIL for the next two years has to be elected at the end of this year. Apart from the Representatives from the Regional Branches, which is a Regional Branch affair, you are requested to nominate and elect members specifically for the posts of **President; Secretary-Treasurer; Editor of "Encephalartos"; Printing and Dispatch Officer, and Back Copies Officer.**

It is important that competent persons that are willing to devote a lot of time to the affairs of the Society be nominated and elected to these posts. Consequently you should please give the matter your earnest attention and active support by nominating members to one or more of the posts at your earliest convenience.

The proposer must provide the name and address or membership number of his/her nominee(s) together with a written undertaking by the nominee that he/she is willing to stand for the post for which he/she is being nominated. A nominee can make himself/herself available for more than one post simultaneously. Of the five present incumbents, the following three are available for re-election: Dr Isabella Claassen, Mr Roy Shooter and Dr Piet Vorster.

Please send your nominations to the Nominations Officer, P.O. Box 15357, 0039 Lynn East, South Africa, to reach him not later than July 26, 1993. The ballots will then be included in the September issue of "Encephalartos" and the new Council announced in the December issue.

NATAL SECTION NEWS

Natal Section Committee

45 Anleno Road, Montclair, 4001 Durban

A capacity audience attended the first 1993 meeting of the Natal Section of the Society on 25 February. Chris Dalzell, Special Collections Officer of the Durban Botanic Gardens presented an illustrated lecture on cycad collections of the major USA gardens - including Fairchild, Marie Selby, Huntington, Longwood, Atlanta and Lotusland. He followed this presentation with a description of the progress made in replanning the cycad collection of the Durban Botanic Gardens into the new "regional zone" collections and the present initiatives of the Gardens in respect of pollen collection, artificial pollination and seed harvesting. It was fitting that the **Durban Botanic Gardens** was awarded the Natal Section's 1993 **Conservation Award** for the efforts made in respect of *ex situ* cycad cultivation.

LETTERS TO THE EDITOR / BRIEWE AAN DIE REDAKTEUR

Dear Editor

THE CONSEQUENCES OF COLLECTING CYCAD SEED FROM WILD POPULATIONS

In two recent articles, Roy Osborne *et al.* ("Encephalartos" 29: 36) and Cynthia Giddy ("Encephalartos" 31: 32-33) have argued for and against

trade in wild collected cycad seed. Both articles seek to promote cycad conservation, but Osborne *et al.* believe that the controlled harvesting of cycad seed will promote this end whereas Giddy regards any level of harvesting as being detrimental to the survival of cycads in the wild.

This debate is an important one because it influences our approach to cycad conservation; do we regard cycads

as untouchable assets and promote their conservation via traditional methods or do we regard cycads as a resource that can be sustainably harvested and conserved via appropriate management programmes? In the latter case, the emphasis is on *sustainability* (i.e. can cycad populations sustain any level of harvesting) and it is basically at this level that Osborne *et al.* and Giddy appear to differ in their opinions on the collection of seeds from wild populations (although Giddy also has misgivings about the monitoring of any seed harvesting). However, Osborne *et al.* and Giddy have arrived at different conclusions largely because they have made different assumptions about cycad population dynamics. I believe that it is essential to identify and evaluate these assumptions so that the potential for harvesting can be assessed as objectively as possible.

Osborne *et al.* note that there is considerable mortality of cycad seeds in wild populations and assume that the removal of seeds which are destined to die will have a negligible effect on cycad population dynamics. By contrast, Giddy adopts a more conservative approach and assumes that all seeds play a rôle in cycad population dynamics despite the observation that many seeds die before germination.

In essence, the validity of either of these assumptions depends on whether recruitment in cycad populations is seed limited, i.e. does the addition or removal of seeds from a population influence the number of seedlings that successfully establish in that population. Although it may seem to be intuitively obvious that the number of seeds in a population will influence the number of adults, it is not necessary for this to be a linear relationship.

For instance, if individuals in a population experience some form of density dependent mortality during their life history, then there may be an excess of seeds in the population. This typically occurs when there is self-thinning in a population. It is possible that density dependent factors operate in some cycad populations, e.g. *Encephalartos transvenosus* in which the seedlings appear to far outnumber adults.

Similarly, recruitment may occur in discrete episodes, e.g. when environmental conditions are most favourable, so that seeds produced between recruitment episodes make no contribution to the population. Episodic recruitment may be common in some South African cycad populations in which successful seed germination and seedling establishment appear to occur in discrete events at a lower frequency than coning events.

In the case of both density regulated populations and those with episodic recruitment, the removal of seeds in appropriate numbers and at the right time (for episodic

populations) may have no negative impact on cycad population dynamics. It is, therefore, not always necessary to indulge in "fancy footwork" to justify seed harvesting. However, if cycad populations do not experience density dependent mortality or episodic recruitment, then the removal of any seeds may have direct consequences for population dynamics, influencing the number of individuals recruited to the population as well as the dispersal distance of propagules. It is therefore essential that the population dynamics of cycads must be well known before any seed harvesting takes place.

Staff from the Conservation Biology Unit of the National Botanical Institute are currently studying cycad population dynamics in an attempt to resolve this problem. However, for the present, Cynthia Giddy is correct in adopting a conservative attitude and for the moment a total ban on trade in wild collected seed appears to be the best option for cycad conservation.

In closing, I would like to stress that these opinions are based only on the scientific assessment of cycad population dynamics. The monitoring of a permit system that controls sustainable harvesting of cycad seeds is likely to present its own problems.

John Donaldson, Conservation Biology Unit, National Botanical Institute, Kirstenbosch, P/Bag X7, 7735 Claremont.

Dear Editor

MACROZAMIA JOHNSONII AND CYCAS IN NEW SOUTH WALES

Since writing to ask Mrs Giddy to enlighten us about aspects touched upon in her article "Australian cycads - a worthwhile challenge" in "Encephalartos" 31: 12-17, I have received a reprint of Mr Jones' article explaining that *Macrozamia johnsonii* is in fact not a new species, but that it is merely a new name for the so-called New South Wales form of *M. moorei*. I am sure that anyone who has ever grown the two so-called forms from seed, will agree with this change in status.

Allow me to remind Mrs Giddy that she has not yet given us more information about the occurrence of *Cycas* in New South Wales, mentioned in her article.

Piet Vorster, Botany Department, University of Stellenbosch, Private Bag X5018, 7599 Stellenbosch.

Dear Editor

NEW APPROACH TO CYCAD CONSERVATION

I quite enjoyed reading the latest issue of "Encephalartos" (No. 32, December 1992). Of special interest to me was Nat Grobbelaar's article "A more realistic conservation strategy for the South African cycads" (pp. 15-18). This new approach to conservation is what I have been trying to accomplish at National Tropical Botanical Gardens, Hawaii.

As you'll probably know, we have experienced the worst Hurricane to hit Hawaii in a century. I was lucky: I put my cycads inside my house - wall to wall, after throwing out my furniture. Unfortunately I have a small house and was only able to save 50%, the rest were washed away by ocean waves which rolled under my house and through my nursery.

Greg Holzman, P.O. Box 764, Kekaha Hi, 96752 U.S.A.

NEW SCIENTIFIC REPORTS

Recently published, cycad-orientated reports in the scientific literature are:

Charlton, T.S.*, Marini, A.M., Markey, S.P., Norstog, K. & Duncan, M.W. 1992. Quantification of the neurotoxin 2-amino-3-(methylamino)-propanoic acid (BMAA) in Cycadales. *Phytochemistry* 31: 3429-3432. [GC-MS techniques were used to determine BMAA content of cycad leaves and seeds. The genus *Cycas* gave the highest concentrations, but in general the low concentrations exclude BMAA as detrimental to grazing animals.]

*Author's address: Biomedical Mass Spectrometry Unit, University of New South Wales, P.O. Box 1, Kensington, New South Wales 2033, Australia.

Foster, P.I. & Jones, D.L.* 1992. Neotypification of *Macrozamia moutperriensis* (Zamiaceae), with notes on its distribution. *Telopea* 5: 289-290. [The neotype is designated from a collection made by D.L. Jones and B.E. Jones from the Mt. Perry locality.]

*Author's address: Australian National Botanic Gardens, GPO Box 1777, Canberra, ACT 2601, Australia.

Hill, K.D. 1992. A preliminary account of *Cycas* (Cycadaceae) in Queensland. *Telopea*: 5: 177-205. [See report in *Encephalartos* 33: 29, 30.]

Author's address: National Herbarium of New South Wales, Royal Botanic Gardens Sydney, Mrs Macquaries Road, N.S.W. 2000, Australia.

Jones, D.L.* & Hill, K.D. 1992. *Macrozamia johnsonii*, a new species of *Macrozamia* section *Macrozamia* (Zamiaceae) from northern New South Wales. [This

new species was previously confused with *Macrozamia moorei*.]

*Author's address: Australian National Botanic Gardens, GPO Box 1777, Canberra, ACT 2601, Australia.

Kisby, G.E.*, Ellison, M. & Spencer, P.S. 1992. Content of the neurotoxins cycasin (methylazoxymethanol β -D-glucoside) and BMAA (β -N-methylamino-L-alanine) in cycad flour prepared by Guam Chamorros. *Neurology* 42: 1336-1340. [HPLC techniques were used to determine BMAA and cycasin content of cycad-derived flour. On average the cycasin content was ten times that of the BMAA.]

*Author's address: Center for Research on Occupational and Environmental Toxicology, Oregon Health Sciences University, 3181 S.W. Sam Jackson Park Rd., L606, Portland, OR 97201, U.S.A.

Malaise, F., Sclavo, J.P. & Crosiers, C. 1992. Recherches sur les *Encephalartos* Lehm. (Zamiaceae) d'Afrique Centrale. 1. Un nouvel *Encephalartos* de Tanzanie. *Annales de Gembloux* 98: 153-157. [A new species, *Encephalartos delucanus*, honouring Prof. Paolo De Luca, is described from the Mpanda District of Tanzania. This species, related to *E. poggei*, *E. schmitzii* and *E. marunguensis*, corresponds to Denis Heenan's "Species C".]

Moretti, A.* & Norstog, K. 1992. Eredità uniparentale dei plastici in *Encephalartos* Lehm. (Zamiaceae, Cycadales). *Giornale Botanico Italiano* 126: 15. [DNA analyses from chloroplasts of *E. natalensis* and *E. woodii* are used to distinguish these species.]

*Author's address: Dipartimento di Biologia vegetale, Università Federico II, Via Foria 223, 80139 Napoli, Italia.

FINANCIAL STATEMENT / FINANSIËLE STAAT

THE CYCAD SOCIETY OF SOUTH AFRICA

CONSOLIDATED INCOME AND EXPENDITURE STATEMENT FOR THE YEAR ENDING 1992-12-31

	<u>Notes</u>	<u>1992</u> Rand	<u>1991</u> Rand
INCOME		33957	32320
Subscriptions		25780	23615
Donations		2304	1299
Interest received		2759	2993
Donations - Seedbank		150	3909
<i>Encephalartos</i> - Back copies		1939	504
Sundry income	1	1025	-
EXPENDITURE		25461	25478
Bank Charges		475	273
Depreciation		-	11
<i>Encephalartos</i> - Printing & postage		17020	17994
General expenses	2	5261	4859
Seedbank expenses		15	1523
Postage	3	2077	426
Stationary		348	126
Telephone		265	266
NET SURPLUS FOR THE YEAR		8496	6842
Unappropriated surplus - Beginning of year		29595	22753
Unappropriated surplus - End of year		38091	29595

CONSOLIDATED BALANCE SHEET AS AT 1992-12-31

CAPITAL			
Capital fund account		38091	29595
EMPLOYMENT OF CAPITAL			
Fixed assets		1	1
Educational equipment			
Net current assets		38090	29594
Current assets		38571	30222
Bank	4	19512	11709
Bank deposit		15000	15000
Petty cash		5	5
Debtors		812	266
Stock		3242	3242

Current liabilities	481	628
Prepaid subscriptions	141	608
Creditors	340	20

NOTES TO THE CONSOLIDATED STATEMENTS FOR THE YEAR ENDING 1992-12-31

1. Sundry income

Sundry income represents the net receipts from fundraising functions by the Natal and Transvaal Branches

Natal	R729
Transvaal	R296

2. General expenses

For 1992 general expenses include an amount of R2500 in respect of the 1993 Cycad conference.

3. Postage

Postage includes an amount of R1352 for postage of back copies sold.

4. Bank

Head Office	R18707
Eastern Cape Branch	90
Transvaal Branch	715
	<u>R19512</u>

HEAD OFFICE: INCOME AND EXPENDITURE STATEMENT FOR THE YEAR ENDING 1992-12-31

	<u>1992</u> Rand	<u>1991</u> Rand
INCOME	32690	32320
Subscriptions	25780	23615
Donations	2215	1299
Interest received	2756	2993
Donations - Seedbank	-	3909
<i>Encephalartos</i> - Back copies	1939	504
EXPENDITURE	24999	25478
Bank charges	450	273
Depreciation	-	11
<i>Encephalartos</i> - Printing & postage	17020	17994
General expenses	5097	4859
Seedbank expenses	-	1523
Postage	1933	426
Stationary	234	126
Telephone	265	266

NET SURPLUS FOR THE YEAR	7691	6842
Unappropriated surplus - Beginning of year	29595	22753
Unappropriated surplus - End of year	37286	29595

HEAD OFFICE: BALANCE SHEET AS AT 1992-12-31

	<u>1992</u> Rand	<u>1991</u> Rand
CAPITAL		
Capital fund account	37286	29595
EMPLOYMENT OF CAPITAL		
Fixed assets	1	1
Educational Equipment		
Net current assets	37285	29594
Current assets	37766	30222
Bank	18707	11709
Bank deposit	15000	15000
Petty cash	5	5
Debtors	812	266
Stock	3242	3242
Current liabilities	481	628
Prepaid subscriptions	141	608
Creditors	340	20

I hereby declare that I am not a member of the Society and that I have no interest in its financial affairs. The Cash Book and the Ledger of the Society has been written up from documents and information provided by the President and Officials of the Society. I therefore certify that the attached Income and Expenditure Statements and the Balance Sheets are in accordance with the information provided and reflect a true and fair representation of the income and expenditure and the financial position of the Society as at 31st December 1992.

Pretoria, 18th March, 1993.

Signed: L.M.D. Vorster.



News

THE DAILY NEWS, WEDNESDAY.

FEBRUARY 3, 1993



Picture: JAMES BRENNAN

BIG HOLE: Peter Hyatt shows just one of the spots from where a cycad was removed.

R5 000 reward for return of stolen cycads

A DURBAN businessman is offering a R5 000 reward for information leading to the return of 18 stolen cycads, taken last week from property adjacent to the Hillcrest Hotel.

Mr Peter Hyatt, director of development for the Russell, Marriott and Boyd Trust, the property consultants for the owners of the land, is offering the reward.

"The cycads were part of the package when this land was

Daily News Reporter

bought and were estimated to have a total value of R30 000," he said.

He said that it was early last week that his company was informed of the missing cycads by Mr Ray de Vries, proprietor of the Hillcrest Hotel.

"The exact date when they were

removed is not known," he added.

He said that judging by the size of the biggest hole left behind, it appeared as if the cycads were removed by a mechanical machine.

He said that most of them were fully grown.

"I ask all nursery-owners to be suspicious of people offering to sell them fully grown cycads at bargain prices," he said.

A docket has been opened by Hillcrest police.



Conservation award for Botanic Gardens

Dr Roy Osborne, past president of the Cycad Society of SA presents the award for conservation, Natal Section, to Errol Scarr (right), Director: Parks. On the left, Ken Wyman, Curator Botanic Gardens. The award was given to the Botanic Gardens for their far-sightedness in replanting and reorganising the fine cycad collection, one of the most important in the world in terms of number and diversity.

THE PRETORIA NEWS Wednesday February 24 1993

Plot owner awarded damages

Staff Reporter

A MULDERSDRIFT plot owner has been awarded R15 000 in damages in a civil claim against the Administrator of the Transvaal and two nature conservation officials.

Pretoria Supreme Court judge Mr Justice van der Walt found in favour of Mr Gerald James Wilson of Plot 42, Muldersdrift.

Mr Wilson claimed R100 000 in damages for being unlawfully arrested in May 1991 when the two officials, Mr Marthinus Jacobs and Mr Abel Pienaar, confiscated tree ferns and cycads from his garden.

He said Mr Jacobs and Mr Pienaar unlawfully assaulted him and sprayed him with teargas.

Mr Wilson said he did not know that one needed a permit to possess the plants.

He had found the plants on his farm when he bought it 10 years ago.