

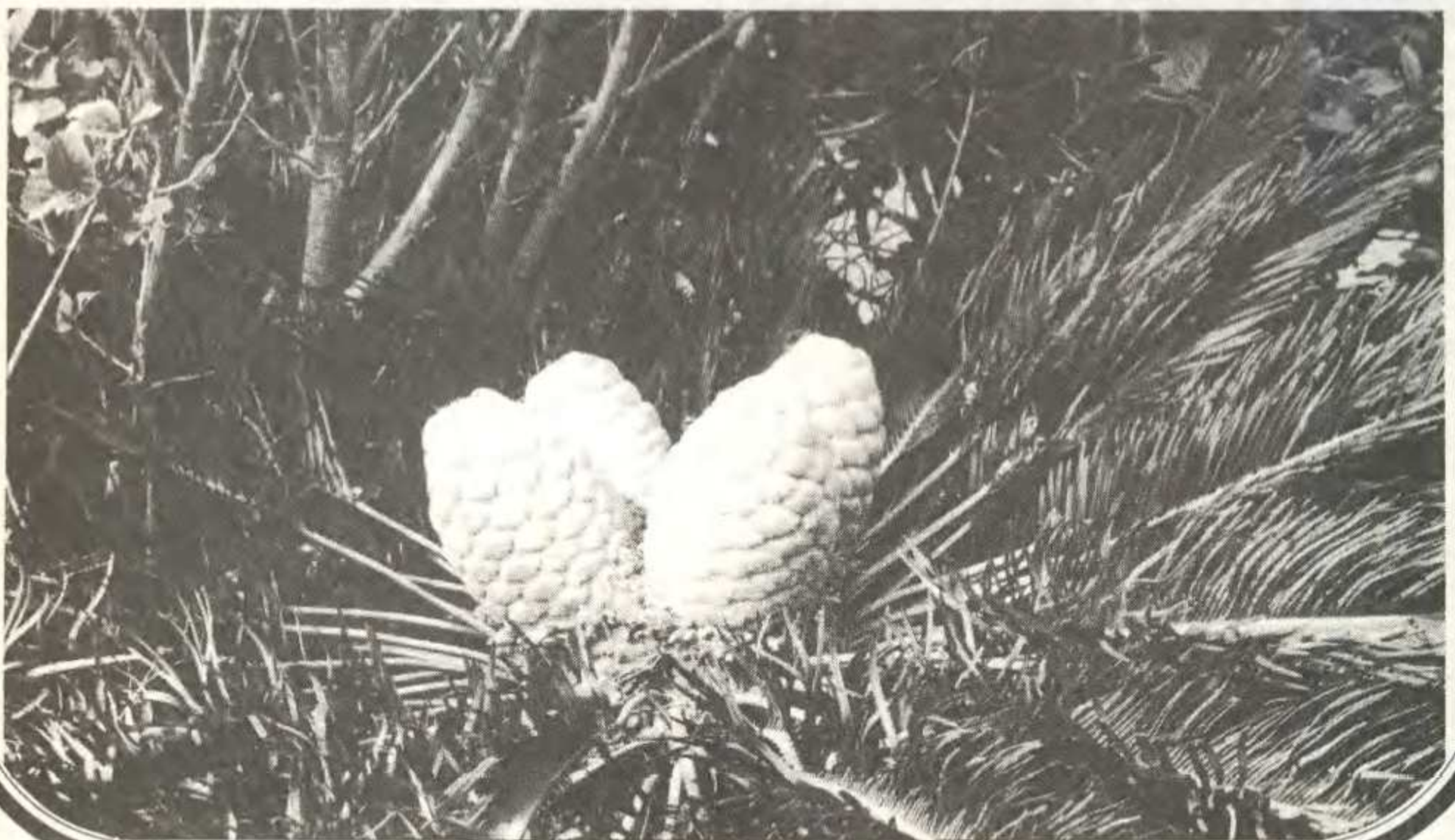
# ENCEPHALARTOS

JOURNAL OF THE  
CYCAD SOCIETY OF  
SOUTHERN AFRICA

TYDSKRIF VAN DIE  
BROODBOOMVERENIGING  
VAN SUIDELIKE AFRIKA

NO. 18

JUNE / JUNIE 1989



# ENCEPHALARTOS

JOURNAL OF THE  
CYCAD SOCIETY OF  
SOUTHERN AFRICA

NO. 18

TYDSKRIF VAN DIE  
BROODBOOMVERENIGING  
VAN SUIDELIKE AFRIKA

JUNE / JUNIE 1989

EDITOR/REDAKTEUR

NEIL MUNRO / BUNNY WENTZEL  
P.O. Box 89101  
Lyndhurst  
2106

VOORBLAD/COVER

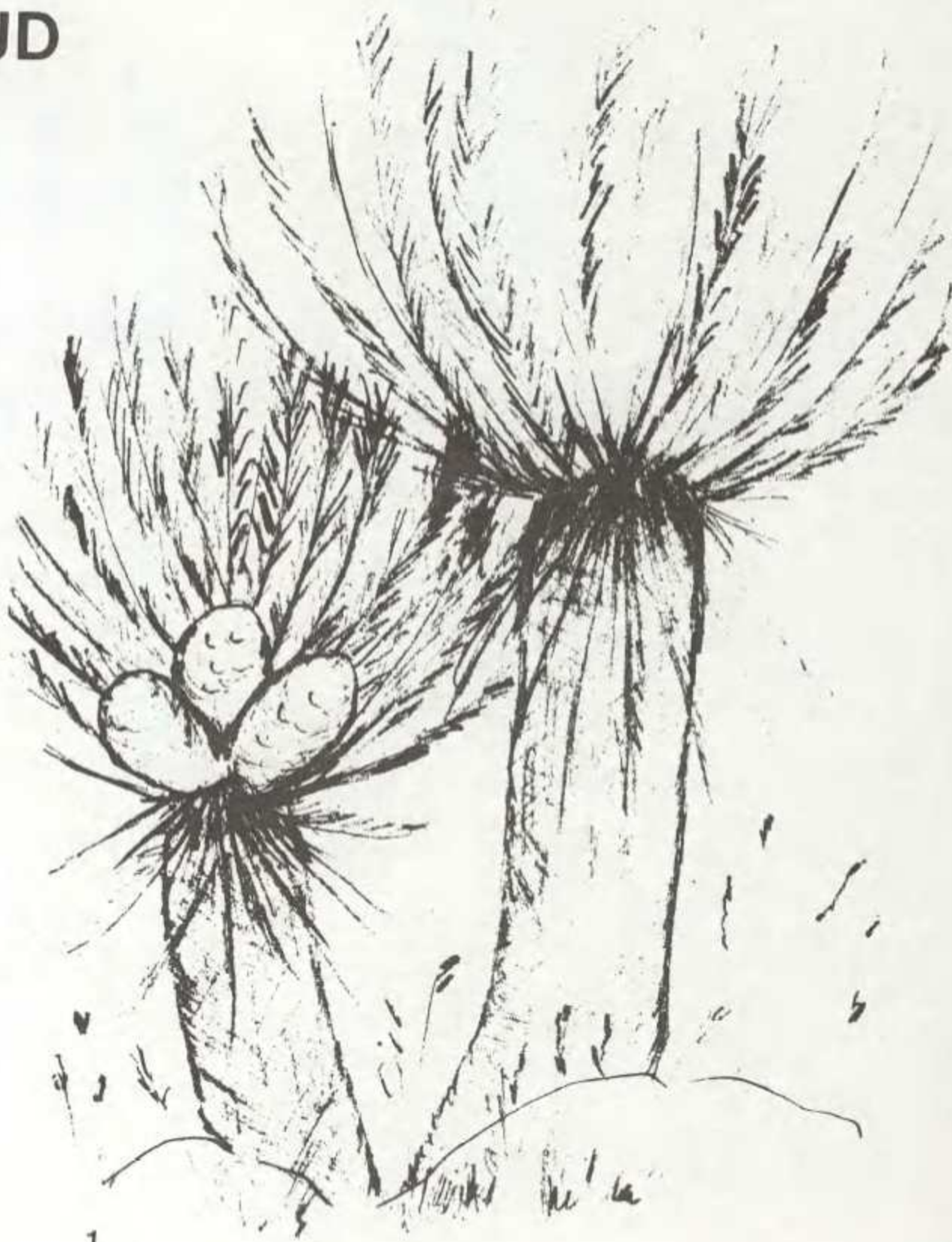
## ENCEPHALARTOS

friderici-guilielmi  
male & female

(Photograph: Maans Kemp)

## CONTENTS·INHOUD

Editorial/Redaksioneel	2
Focus On/Fokus Op	4
From the President/ Van die President	10
Lotusland	12
Cycads of Australia	19
The Hungtinton	22
Obituary/Doodsberig Dr. I.C. Verdoorn	24
Evolutionary Patterns	26
Regional News/Streeknuus	32
Bits and Pieces/ Stukkies en Brokkies	34
Letters/Briewe	40
Press Cuttings	43
Seed Bank/Saadbank	47
Balance Sheet	48



## EDITORIAL

## REDAKSIONEEL

This editorial has been compiled in a mood of anguish, sadness and disappointment!

The recent exposure by the media of the illegal export of endangered cycads out of South Africa has caused indignation and disgust amongst responsible and dedicated members of the Cycad Society of Southern Africa and amongst nature conservationists. This dastardly deed has cast a severe blemish on our image locally and abroad.

On the other hand, why should the Cycad Society be immune from unscrupulous individuals that have the same criminal morals and selfish gains as that of a rhino horn or ivory poacher? We deal with endangered species and a sacred heritage that has an inevitable price tag on it for those with weak characters. It is unfortunately a recipe for corruption. Our precious plants are in enough trouble without the destructive rumours abounded by people of this calibre. One of the most serious causes for concern seems to be that our cycads are more endangered and threatened by "members" of our Society and our so-called "curators" of conservation. We are experiencing an identical crisis as the wildlife conservationists had 10 years ago when it was rumoured that certain individuals flew over the Koakoveld in helicopters and brought the desert rhino and elephant to the brink of extinction. Although it is all relative there has to be a chain gang of corruption: an external buyer, a corrupt official in high places, an avaricious nature conservation authority or a member of our Society who is myopic, selfish and completely

Die huidige openbaarmaking van die media in verband met die onwettige uitvoer van bedreigde broodbome uit Suid-Afrika het groot verontwaardiging en afkeur tussen verantwoordelike en toegewyde lede van die Broodboomvereniging van Suid-Afrika, sowel as natuurbewaringsgesindes veroorsaak. Hierdie lafhartige daad het 'n veelvuldige merk op ons beeld plaaslik, sowel as oorsee gelaat.

Aan die ander kant, waarom moet die Broodboomvereniging immuun wees van individue wat dieselfde kriminele moraliteit en selfsugtige doel het as die renosterhoringdief of ivoor dief? Ons het te doen met bedreigde spesies en 'n heilige erfenis wat 'n onvermydelike prys vir diegene met 'n swak karakter het. Ongelukkig is dit die resep vir korrupsie. Ons waardevolle plante het reeds moeilike omstandighede, sonder nog die vernielende bydrae van mense van hierdie tipe kaliber.

Een van die mees ernstige oorsake vir kommer is dat ons Broodbome ook bedreig word deur "Lede" van ons Vereniging asook die sogenaamde "kurators" van konservasie.

Ons ondervind 'n krisis identies aan dié wat die wildelewe bewaringsgesindes 10 jaar gelede gehad het toe sekere individue oor die Koakoveld in helikopters gevlieg het om sodoende die woestynrenoster en olifant gered het van die randjie van uitsterwing. Alhoewel taamlik onlangs, moet daar 'n kettingbende van korrupsie

EDITORIAL  
- CONTINUED -

REDAKSIONEEL  
- VERVOLG -

lacking in pride. If certain personalities of our Society could be proved to be involved as recent press articles have alleged, then the necessary steps should be taken to discourage any further incidents of this nature taking place and so protect the very heritage for which all genuine conservationists are concerned.

Whatever the outcome of any investigation we cannot reverse the shock situation. What members must institute is a serious prophylactic measure in the interests of our cycads and for the security of our members. Perhaps this tragedy will be a stimulus to set up a strict code of ethics backed by a disciplinary and ethics committee.

The irony of it all is that if you are caught poaching an endangered species the fine may be easily settled from poaching profits but if you contravene foreign exchange control regulations then a ten year prison sentence may be imposed. Where is the justice? It is hoped that with the new legislation to be passed in parliament the fines for dealing with endangered species will be heavy enough to become an unattractive venture.

All in all what will our children have to look forward to if we prostitute our sacred heritage?

wees: 'n koper, 'n korrupte regeringsbeampte, 'n gierige natuurbewaringsoutoriteit of hoof en 'n lid van ons Vereniging wat bysiende, selfsugtig en geheel en al gestroop is van enige trots. Indien lede van ons Vereniging bewys kan word as betrokkenes soos wat sekere "Persoonlikhede" in die pers beweer, sal en moet teen hulle opgetree word.

Wat ookal die uitslag van enige ondersoek, ons kan die skoktoestand nie uit die weg ruim nie. Lede moet ernstige en voorbehoedende maatreëls instel vir die behoud van ons heilige erfenis, die broodboom, asook die sekuriteit van ons lede. Moontlik sal hierdie tragedie 'n aansporing wees vir 'n streng etiese kode gesteun deur tuguitoefening en 'n etiese komitee.

Die ironie van alles is die feit dat indien persone betrap word vir wilddiefstal van 'n bewaarde spesie, die boete baie gemaklik vereffen kan word van diefstal-winste, maar indien buitelandse valuta kontroleregulasies oortree word, word 'n 10 jaar gevangenisstraf opgelê.

Waar kom geregtigheid dan tot reg? Die hoop is wel dat met die nuwe wetgewing wat by die parlement ingedien sal word, die boetes vir handeldrywing met bewaarde spesies hoog genoeg gaan wees dat dit 'n onaantreklike waagstuk sal word.

Om alles op te som, wat sal ons nageslag hê om na uit te sien as ons heilige erfenis so misbruik word?

---

**FOCUS ON...**

---

---

**FOKUS OP...**

---

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

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

---

**ENCEPHALARTOS friderici-guilielmi**

---

by Maans Kemp



Lehmann's illustration of E.  
friderici-guilielmi in 1834

## INTRODUCTION

Anyone who has seen a clump of sturdy E. friderici-guilielmi specimens on a rocky hill, etched against the clear blue Karoo sky, will readily agree that this species is undoubtedly one of South Africa's finest, most attractive and impressive cycad species.

## DISCOVERY AND NAME

E. friderici-guilielmi was named and described for the first time in 1834 by Professor Johann Georg Christian Lehmann of Hamburg in the publication "Novarum et Minus Cognitarum Stirpium Pugillus Sextus". He named the species after Friedrich Wilhelm, King of Prussia, who was a patron of botany in his time. Lehmann's description of the species was based on material and specimens collected in habitat by Christian Friedrich Ecklon and Karl Ludwig Zeyher (see ENCEPHALARTOS no. 13, page 8 for more information about these two plant collectors).

Controversy and confusion surrounded the naming and description of the species for the next century. The uncertainty arose from the description of a species, Zamia cycadifolia, by Professor Nikolaus Jacquin in 1801 from material collected in the Cape Colony by Georg Scholl. Lehmann renamed this species Encephalartos cycadifolius in 1834 and distinguished it from his new species, E. friderici-guilielmi. This separation was not accepted by authors such as A. De Candolle (1868), Hutchinson and Rattray (1933) and Henderson (1945), who regarded the two species as synonymous. Others such as Miquel (1842),

Thiselton-Dyer (1878), Marloth (1913) and Pearson (1916) accepted them as distinct species. After a careful study of all available literature and early herbarium material, Dr R.A. Dyer confirmed the validity of the separation in 1965.

The confusion of E. friderici-guilielmi with E. cycadifolius is quite understandable if one considers the fact that most of the original descriptions were apparently based solely on herbarium material. It is surprising, however, that an authority such as Professor C.J. Chamberlain, after a visit in 1912 to an area in the vicinity of Cathcart where he found E. friderici-guilielmi and E. princeps specimens (the latter was then still classified as E. lehmannii) growing together, could write: "E. lehmannii as it occurs on Junction Farm, looks so much like E. Friderici-Guilielmi (sic) that even a botanist might not notice that there are two species, ..."

## DISTRIBUTION

E. friderici-guilielmi occurs on mountains and rocky hill-slopes in the districts of Queenstown and Cathcart, extending eastwards at intervals to the vicinity of Kokstad. Records of plants from further west and references such as that of Marloth (1913) to the species occurring "near Willowmore", and by Hutchinson and Rattray (1933) to "Klipplaat in the Jansenville division" being in its geographical range, must be regarded as incorrect.

In its habitat the species is associated with grassland and other low-growing plants. The temperature ranges from very high

in summer to very low in winter, with snow and frost. The rainfall occurs in summer and ranges from 375 to 500 mm per year.

## DESCRIPTION

### 1. STEM

The stems of E. friderici-guilielmi are quite thick - 35 to 60 cm in diameter - and up to 4 m tall. Stems may be unbranched but many are branched from the base. Tall stems usually lean over and may even lie flat on the ground, in which case the top part is usually curved upwards. The flattish crown of the stem is open and covered with brown wool.

### 2. LEAVES

The leaves are 1 to 1,5 m long, including a petiole of 30 cm, and are fairly straight, although many are curved downwards. Mature leaves are held at an angle of approximately 45 degrees to the stem. When cones appear, the leaves may be pushed down to below the crown. Young leaves are very soft and light green or blueish green in colour, with the leaflets tightly packed together, while mature leaves become yellowish with age.

The leaflets at the middle of the leaf are 10 to 18 cm long and 7 to 8 mm broad, with a number of prominent veins on the lower surface. The leaflets are closely spaced and overlap upwards in the top third of the leaf. They are attached to the leaf stalk in the form of a V.

The lower leaflets are reduced in size but not to prickles.

### 3. CONES

E. friderici-guilielmi bears the largest number of cones in the genus. Male plants may produce as many as twelve cones and female plants up to six. The cones are densely-woolly with a yellowish colour at first, darkening to a brownish or beige colour at maturity.

Male cones are 20 to 40 cm long and 6 to 10 cm in diameter. They are cylindrical and curved, tapering towards the tips. The cone scales at the middle of the cone are 2,5 to 2,8 cm long and 2 cm broad, with a beak projecting about 5 mm.

Female cones are barrel-shaped, with rounded tips. They are 25 to 30 cm long and 15 to 20 cm in diameter. The median scales are 4,5 to 5 cm long, 4,5 cm broad and 2,5 cm thick. The face of the scale under the wool is yellow and fairly smooth, with lateral ridges. The seeds are pale yellow to orange-yellow in colour, about 3 cm long and 2 cm in diameter.

### AFFINITIES

E. friderici-guilielmi is closest related to E. cycadifolius and E. ghellinckii, and possibly also to E. lanatus and E. humilis. It can be distinguished from E. cycadifolius by means of the following differences:

- It has a tall stout stem compared to the low-growing and clustered stem of E. cycadifolius.

- Its leaves are fairly straight and held at a 45 degree angle to the stem, whereas the leaf-crown of E. cycadifolius is cup-shaped.
- Its crown is open and densely woolly at all times, while E. cycadifolius has almost no wool in the crown.
- Its leaflets are longer and broader than those of E. cycadifolius which are up to 12 cm long and 6 mm broad,
- Their distribution areas do not overlap.

Apart from the fact that their areas of distribution are far apart, E. friderici-guilielmi can be distinguished from E. ghellinckii by its leaflets which are much broader than the 2 to 4 mm of those of E. ghellinckii, and which are not rolled in like those of the latter species.

E. friderici-guilielmi is sufficiently distinct in appearance from E. lanatus and E. humilis to make confusion very unlikely.

#### HYBRIDISATION

As far as I know, the distribution area of E. friderici-guilielmi does not currently overlap with that of any other species. In earlier times it was reported to be growing with E. princeps near the junction of the White and Black Kei Rivers near Cathcart. Professor C.J. Chamberlain visited the area in 1912 and reported that three species were "abundant" there: E. friderici-guilielmi, E. princeps (still classified as E. lehmannii then) and E. villosus.

No natural hybrids of E. friderici-guilielmi with either of these two other species have been reported and no artificial hybrids are known.

#### CONSERVATION

E. friderici-guilielmi was once very abundant, especially in the vicinity of Queenstown and Cathcart, where it could be seen alongside the roads in numerous places. There were once large numbers growing on the mountainsides around the town of Queenstown, but none of these are left. Many specimens are still left in habitat but large numbers have been removed by collectors.

Although the species does not appear to be in danger of extinction at the moment, it is in need of protection, like all other South African cycads. In places there are sufficient numbers of plants to make natural reproduction possible. This position should be safe guarded. As far as I know, no specimens are specifically protected in conservation areas.

As this species grows almost exclusively in rocky places, it is not really threatened by farming activities or by the building of roads or dams. If left alone, we should be assured of the sight of these impressive, attractive cycads in their natural habitat in years to come.

#### CULTIVATION

E. friderici-guilielmi grows well in cultivation and appears to be adaptable to climatic conditions which differ from those in its natural habitat.

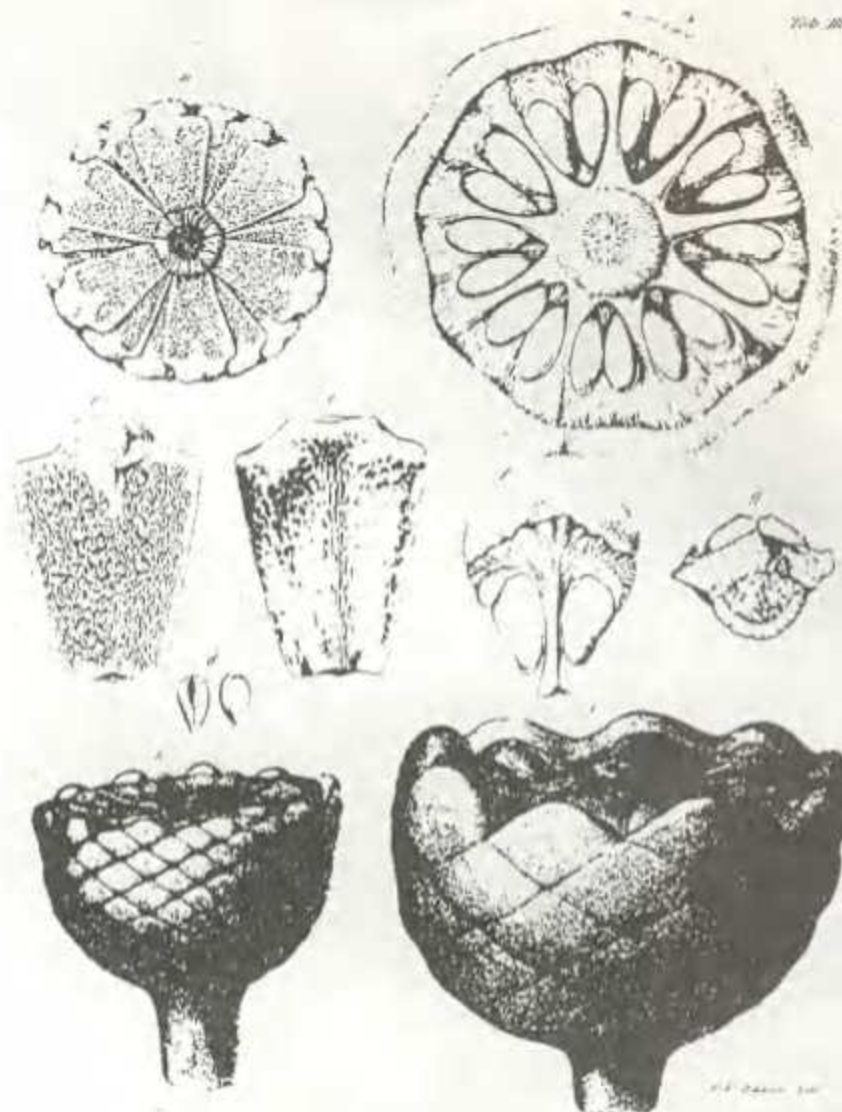
The thriving plants at Kirstenbosch in Cape Town and in the Lowveld Botanic Gardens in Nelspruit testify to this fact.

Plants in cultivation cone regularly and seedlings are freely available. Seedlings do not grow as fast as some other species and may take a few years to become sizeable plants. They do well in containers. However, suckers are formed on many plants in cultivation and provide another means of cultivation. Full sun and good drainage are essential when growing this species, which is frost-hardy.

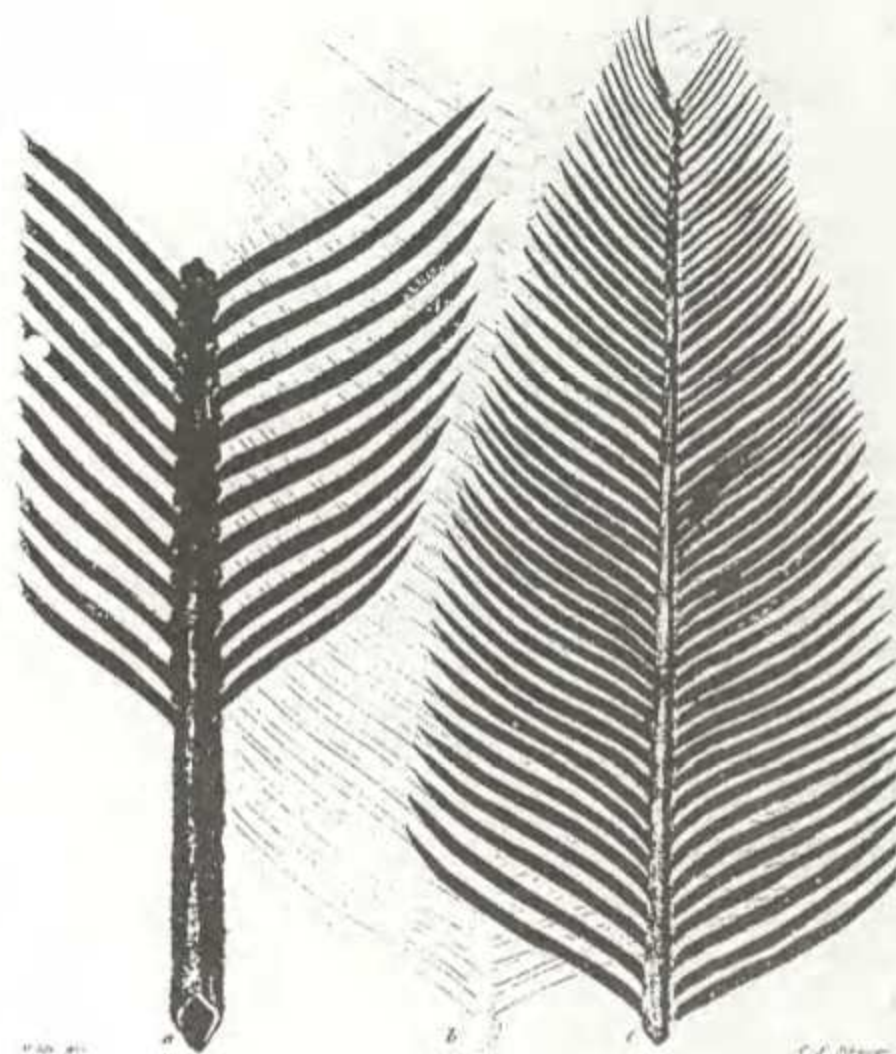


Young leaves of E. friderici-guilielmi

(Photograph: Roy Osborne)



Lehmann's illustrations of different parts of male and female cones of E. friderici-guilielmi in 1834



Lehmann's illustration of an E. friderici-guilielmi leaf in 1834



Healthy specimens of  
E. friderici-guilielmi  
in the Lowveld  
Botanic Gardens,  
Nelspruit.

(Photograph: Roy  
Osborne)

Plants in habitat.  
Note the female  
cones in the process  
of breaking up on  
the plant on the  
left.

(Photograph: Maans  
Kemp)



Male plants in habitat

(Photograph: Maans Kemp)

## FROM THE PRESIDENT

At the time of writing membership of the Society stood at a total of 680, being 554 southern African and 126 overseas members. As usual we extend a warm welcome to all new members - amongst whom we are especially pleased to see the British Museum of Natural History. It is my sad duty to record the passing of dear cycad friends Inez Verdoorn, Sally Geldenhuys and Brian Mann (details are recorded elsewhere). I am also obliged to report that the membership of 154 persons must be withdrawn due to non-payment of subscriptions for 1989.

Since nearly all our overseas members have requested an "airmail" delivery of **Encephalartos**, we have decided to withdraw the offer of a "surface-mail" delivery, a move which will also simplify the administrative load of hard-working membership officer Pieter Stroebel.

This is the second issue of **Encephalartos** produced by our "new" editors, Neil Munro and Bunny Wentzel. The very positive comments after circulation of **Encephalartos** No. 17 testify to the success of their efforts. Planning continues for future issues and we hope these meet with your approval and interest (and perhaps even your response for publication?).

Your Executive and Regional Committees continue to do good work, the occasional element of controversy adding spice to the routine administrative chores. Several major projects are under consideration at this time and details will be announced in due course.

## VAN DIE PRESIDENT

By die skrywe hiervan het die ledetal van ons Vereniging 680 beloop: 554 Suid-Afrikane en 126 uit die buiteland. Hartlik welkom aan al die nuwe lede, waaronder - tot ons genoë - die British Museum of Natural History. Tot my innige spyt moet ek hier melding maak van die heengaan van ons goeie broodboomvriende Inez Verdoorn, Sally Geldenhuys en Brian Mann (besonderhede verskyn verderaan). Ongelukkig moet ook daarvan melding maak dat die lidmaatskap van 154 lede beëindig word weens hulle versuim om ledegeld vir 1989 te vereffen.

Aangesien bykans al ons buitelandse lede versending van **Encephalartos** per "lugpos" versoek het, het ons besluit om lewering per "landpos" te staak, waardeur die administratiewe las van Pieter Stroebel, ons ywerige ledebeampte, verlig behoort te word.

Hierdie nommer is die tweede uitgawe van **Encephalartos** wat deur ons "nuwe" redakteurs, Neil Munro en Bunny Wentzel, behartig word. Die uiters gunstige kommentaar op **Encephalartos** No. 17 bevestig hulle welslae. Aan die beplanning van toekomstige uitgawes word steeds gewerk, en ons vertrou dat dit by u byval sal vind (en u selfs sal aanspoor om bydraes te lewer?).

U Bestuur en Streekbesture lewer steeds goeie werk, nie altyd sonder geskilletjies nie, dog dit vrolik die administratiewe sleurwerkies op. Verskeie groot projekte word tans oorweeg, waarvan besonderhede mettertied bekend gemaak sal word.

## NEW EXECUTIVE

The term of office of the present Executive Committee of our Society expires at the end of 1989. According to the Constitution, a President and two Executive Committee members are to be elected directly by members. The regional branches must also elect their office-bearers, as well as a representative on the Executive Committee.

The present directly-elected Executive Committee members are Roy Osborne (President), Maans Kemp and Piet Vorster. Piet is willing to serve for another term but Roy has indicated that he would prefer to retire from the position of President, and due to circumstances Maans does not see his way open to serve for another term.

We therefore call for nominations for the positions of President and for two Executive Committee members for the 1990-91 term of office. Nominations may be submitted only by fully paid-up members of the Society, must be submitted in writing, and must include a statement that the nominee has agreed to accept your nomination. Nominations should reach the undersigned within 30 days of distribution of this issue of ENCEPHALARTOS.

Roy Osborne, President 1988/90.

Opinions which are expressed in the editorial are those of the Editor and do not necessarily represent the policy of the Cycad Society. Likewise are opinions expressed in articles published in ENCEPHALARTOS those of the authors and not necessarily those of the Cycad Society or the Editor.

## NUWE HOOFBESTUUR

Die dienstermyn van die Hoofbestuur van ons Vereniging verstryk ann die einde van 1989. Volgens die grondwet moet 'n **President en twee Hoofbestuurlede** direk deur die lede verkies word. Die streektakke moet ook hulle ampsdraers verkies asook 'n verteenwoordiger op die Hoofbestuur.

Die huidige direk verkose Hoofbestuurslede is Roy Osborne (President), Maans Kemp en Piet Vorster. Piet is bereid om vir 'n verdere termyn te dien; **maar** Roy het te kenne gegee dat hy sou verkies om as President uit te tree, en Maans kan weens omstandighede nie langer op die Bestuur dien nie.

Ons vra u derhalwe om nominasies vir die ampte van **President en twee Hoofbestuurlede** vir die 1990-1991-termyn. Nominasies kan slegs deur lede voorgelê word wie se ledegeld ten volle vereffen is. Dit moet skriftelik ingedien word, met 'n verklaring daarby dat die genomineerde die nominasie aanvaar. Nominasies moet ondergetekende asb. bereik binne 30 dae na die verspreiding van hierdie uitgawe van ENCEPHALARTOS.

Roy Osborne, President 1988/1990.

Menings wat in die redaksionele artikel uitgespreek word, is dié van die Redakteur en verteenwoordig nie noodwendig die beleid van die Broodboomvereniging nie. Ingelyks is menings uitgespreek in artikels wat in ENCEPHALARTOS gepubliseer word, dié van die skrywers en nie noodwendig dié van die Broodboomvereniging of die Redakteur nie.

# THE CYCAD GARDEN

## AT MADAME GANNA WALSKA'S LOTUSLAND

By Douglas Atwater

Lotusland is a thirty-seven acre estate located in Montecito, California. This estate's botanic gardens may bear a close resemblance to the Biblical garden of Eden. Madame Walska acquired the estate in 1941 and then spent the next forty years creating this botanical wonderland. The estate is sectioned into a number of distinct gardens which are called the aloe, blue, bromeliad, cactus and succulent, cycad, fern, Japanese and water lily gardens. Each garden is a unique work of art in itself. Madame Walska chose the name Lotusland in honour of the lotus flower that filled a very large pond that is now part of the Japanese garden.

The cycad garden contains one of the most complete collections of mature plants in the world. It is composed of about six hundred plants representing ninety species. All of the cycad genera are present except Microcycas. The original cycad garden was started in the late 1960's when Madame Walska purchased an Encephalartos lehmannii that she believed to be a palm because of the blue colour of its leaves. By the early 1970's, she had a collection of forty seven plants that were planted on top of mounds made of volcanic rock.

In 1975, plans were made to build a new cycad garden at a different location on the estate. Several hundred cubic yards of sand and top soil were brought in to create a rolling hills effect over most of the

one and a quarter acre site. Once the new layout was completed four hundred and thirty two cycads were planted. Forty seven of these plants were from the original garden and the rest were obtained from various sources. The garden development was under the guidance of Charles Glass, director of Lotusland, and Loran Whitelock who is one of the foremost authorities on cycads in the world. The garden officially opened on May 21st 1979 with a tour for the Cactus and Succulent Society.

The garden is divided into different areas which are Cycas, Ceratozamia and Zamia, Dioon, Encephalartos and Stangeria, Lepidozamia, and Macrozamia sections. There is also a greenhouse with a number of cold sensitive Cycas, Zamia and seedlings of several genera. The Cycas section, shown in figure 1, contains a number of large specimens of Cycas revoluta. Both the typical and crested forms are present. There are also several other Cycas species of questionable identity. In the greenhouse there is a nice size Cycas thouarsii. In the Dioon section there are group plantings of Dioon spinulosum (figure 2) and Dioon edule. One Dioon edule has a trunk length of 1.5 meters and may be two hundred years old given the slow growing nature of this plant (figure 3). Also found there are Dioon califanoi, D. holmgrenii, D. merolae, D. purpusii, and the rare D. tomasellii var. tomasellii shown in figure 4. Both the Cycas and Dioon sections are located in semi-sunny areas



Figure 1.

Cycas section



Figure 2.

Dioon section - group  
planting of Dioon  
spinulosum



Figure 3.

Dioon edule - approx.  
200 years old

with Eucalyptus trees growing on the perimeter.

The Ceratozamia section is shaded all day long by Acacia, Eucalyptus and Solanum trees and this environment appears favourable for Ceratozamia growth. Cycads found growing here are Ceratozamia kuesteriana (figure 5), C. mexicana, C. microstrobila, C. norstogii, several undescribed Ceratozamia species, Zamia fischeri and Zamia furfuracea.

The Encephalartos section is the main emphasis of the cycad garden. It contains twenty eight South African and ten Central African species. The majority of these plants are mature specimens. Most of this area is rolling hills and is in full sun. Some Acacia, Eucalyptus and Pinus trees are also found growing here. This section's main focal point is three Encephalartos woodii on top of a hill overlooking a koi pond as pictured in figure 6. The species from Central Africa are Encephalartos barteri, E. bubalinus, E. concinnus, E. gratus, E. hildebrandtii, E. manikensis, E. munchii, E. pterogonus, E. tegulaneus and E. species "archeri" from Voi. (Encephalartos concinnus, E. gratus, and E. species "archeri" from Voi are pictured in figures 7 to 9 respectively). Even though these Central African plants come from a tropical region, they seem to do fine here in the Santa Barbara area where the temperature can drop to  $-1.1^{\circ}$  C in the winter time.

The Lepidozamia and Macrozamia sections are both located in semi-sunny level terrain areas. In the Lepidozamia section there are several large specimens of L. peroffskyana (figure 10) and one plant of L. hopei. The Macrozamia section houses all fourteen of the described species. A picture of a female Macrozamia diplomera is shown in figure 11.

One interesting note about this cycad garden is the number of mature hybrid plants present. They are Encephalartos altensteinii X E. latifrons, E. arenarius X E. latifrons, E. gratus X E. woodii, E. horridus X E. longifolius (figure 12), and E. lehmannii X E. trispinosus. Because of the problem of obtaining both male and female plants of the same species, a number of hybrid seedlings have been generated over the years so little pollen is ever wasted.

The garden's environmental statistics are summarised in Table 1.

TABLE 1

ENVIRONMENT STATISTICS OF LOTUSLAND'S BOTANIC GARDEN

Latitude	34° 25 'N
Longitude	119° 41 'W
Height above sea level	140.2m
Temperature	
mean daily	16.1°C
mean daily min.	6.2°C Jan
mean daily max.	27.1°C July
lowest	-2.2°C
highest	42.8°C
Annual precipitation	53.3cm
Soil pH	6.45
Soil type	Sandy loam

At the present time Lotusland garden tours are available for garden clubs, horticultural societies and similar organization. These tours help educate the public to the rarity of these plants and hopefully will generate an interest in saving them from extinction.



Figure 4.

Dioon tomasellii var.  
tomasellii



Figure 5.

Ceratozamia kuesteriana



Figure 6.

Three Encephalartos  
woodii overlooking  
a koi pond.

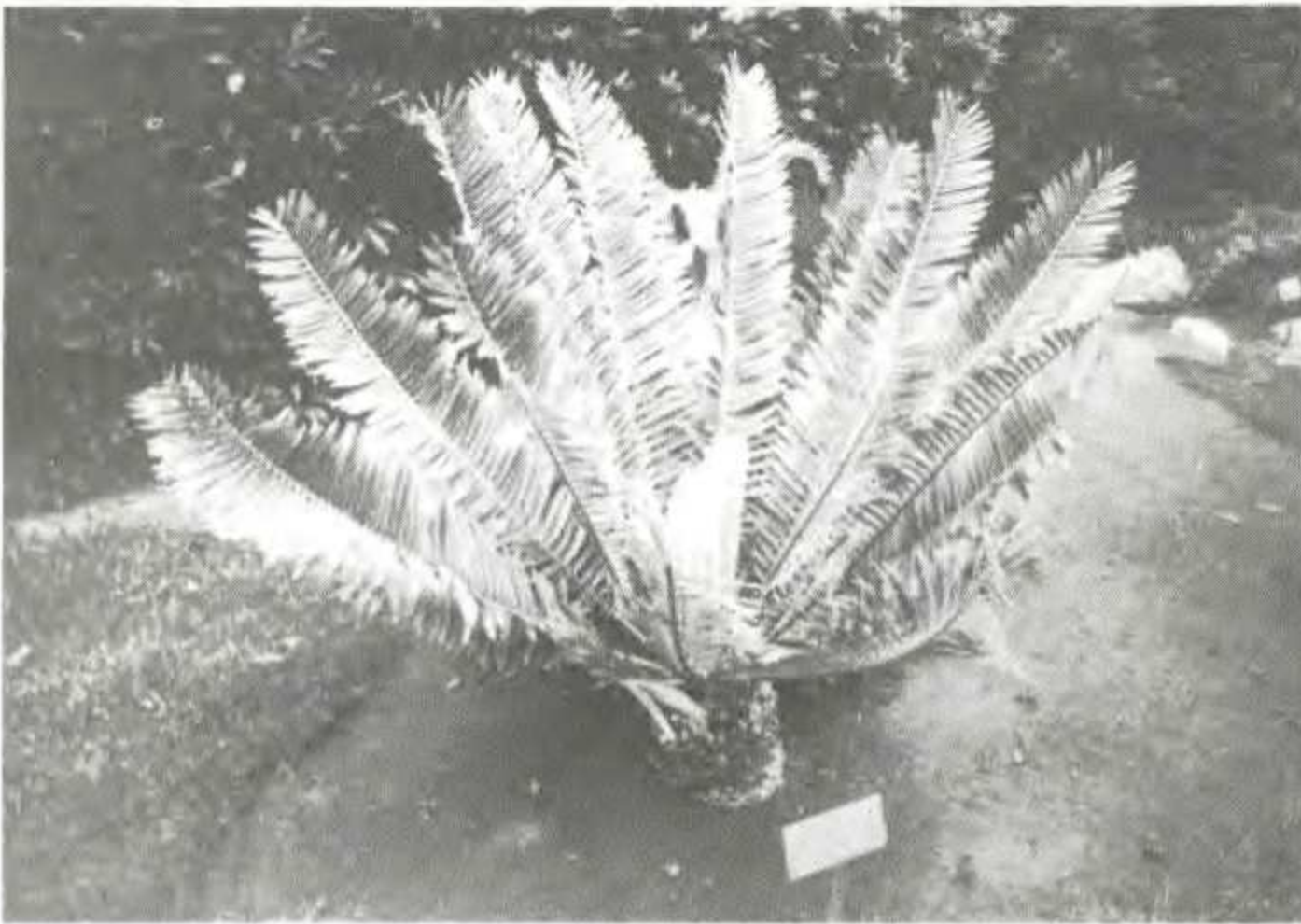


Figure 7.

Encephalartos  
concinnus



Figure 8.

Encephalartos  
gratus



Figure 9.

Encephalartos species  
"archeri" from Voi



Figure 10.

Lepidozamia  
peroffskyana



Figure 11.

Macrozamia diplomera



Figure 12.

Encephalartos  
horridus X  
Encephalartos  
longifolius

## ACKNOWLEDGEMENTS

A number of people assisted in providing the information for the preparation of this article. I wish to thank Mr. Earl Nydam (former head gardener at Lotusland), Dr. Steven Timbrook (Director of Lotusland) and Mr. Loran Whitelock. I would especially like to thank Chris Enright (Curator of the Living Collection at Lotusland) for her endless work in preparation of this paper.

## AUTHOR

Douglas Atwater's address is P. O. Box 3524 San Luis Obispo, California 93403, U.S.A.

## CYCAD POLLEN PROGRESS

A comprehensive investigation of both the surface detail and the wall anatomy of cycad pollen grains has been published by Bijan and Nancy Dehgan from the Department of Ornamental Horticulture of the University of Florida at Gainesville. Titled "Comparative pollen morphology and taxonomic affinities in Cycadales", the paper appears in the *American Journal of Botany* Vol. 75 No. 10, pp. 1501-1516 of 1988. The authors show a correlation between pollen characters gross morphology, micro-morphology, chromosome numbers, distribution and methods of pollination. A close affinity between *Encephalartos*, *Lepidozamia* and *Macrozamia* is apparent, shared somewhat with *Bowenia*. Another related group comprises *Zamia*, *Ceratozamia* and to a lesser extent, *Microcycas*. The pollen of *Dioon*, *Stangeria* and *Cycas* shows distinctive characters for each genus. Furthermore, within the genus *Cycas*, the pollen of the *C. revoluta* complex and the *C. circinalis* complex was recognizably different. The authors speculate that, in terms of pollen characters, the genus *Dioon* is the most primitive genus of the Cycadales. Requests for reprints of the paper should be directed to Prof B. Dehgan, Horticultural Systematics Laboratory, Dept. of Ornamental Horticulture, University of Florida, Gainesville, Florida 32611, USA.

## BMAA "NO PROBLEM"

According to a report in the medical journal LANCET (2(8611), pp. 631-632, of 1988), work by Dr. Mark Duncan and associates at U.S. National Health Institute has shown that the toxin 2-amino-3(methylamino)-propionic acid, or BMAA, which occurs in seeds of *Cycas circinalis*, is not as serious a problem as first thought. In nearly all samples analysed, the routine processing of the cycad flour removes just about all the toxin. The report concludes that it is unlikely that this toxin is the cause of the high incidence of amyotrophic lateral sclerosis of Parkinsonism on the island of Guam.

## S.A. CYCAD RESEARCH REPORT

The first comprehensive review on cycad research to appear in the "official" scientific literature has been published in the SOUTH AFRICAN JOURNAL OF SCIENCE, Volume 84 No. 11, of Nov/Dec. 1988, pp. 891-896. Written jointly by Roy Osborne, Nat Grobbelaar and Piet Vorster, this report details the current resurgence of research interest in the taxonomy, morphology, propagation and biochemistry of cycads, particularly with respect to the work on South African species. The paper is illustrated by 3 figures and lists 84 references. A photocopy is obtainable from the President.

# CYCADS OF AUSTRALIA

by Len Butt

## Lepidozamia

### LEPIDOZAMIA - THE SCALY ZAMIA

The huge cones of the female plant of Lepidozamia have quite different sporophyll ends to Macrozamia species and the cone entirely encloses the seed so that the red seed cannot be seen until the cone bursts at maturity. There is no spine-like projection present on the cones as there is Macrozamia. The oval cones can be 60 cm long and 30 to 40 cm diameter at the middle. The cone is generally solitary and is terminal on the trunk in the centre of fronds. When the cone bursts two bright red seeds can be seen attached to every sporophyll, sitting side by side. The seed can be 6 cm long by 4 cm thick and a rich red flesh coats all seed. The highly polished gloss of the pinnae develops as soon as the frond hardens. Before this new fronds are soft brownish-green and pubescent.

Lepidozamia species have a further peculiarity in the way the pinnae emerge from the rachis, or more specifically, the margins of its upper surface. This is noticeable, particularly at the maturity of each frond, when the margins come closer together as the diameter of the rachis increases. The tender young fronds are very similar to those of Macrozamia in the initial stages, but unlike Macrozamia have no serrations at the tips of the pinnae.

### Lepidozamia peroffskyana

This "Scaly Zamia" is a subtropical palm-like plant found in northern New South Wales in coastal districts, on rainforest edges, through Lamington National Park and surrounding countryside to areas west and northwest of Brisbane. I have found it also around Peachester, Mount Glorious, Maleny and vicinity. The thick stem enclosed by a smoothly patterned armour of old leaf basis is generally about three metres high in situations where it appears in large groves, like the park on the heights of Tamborine Mountain, or the slopes of eucalypt rainforest in the "Shipstern" Binna-Burra track. There have been reports of plants with trunks up to six metres in height. Press reports of the great age of the living cycads seem to have originated in Australia with this species, where one specimen in Tamborine is accredited with the age of over one thousand years. However, since several of the Zamiaceae have been grown to maturity in a period of one hundred years at botanical gardens, it would seem far more likely that the largest of the known plants of Lepidozamia peroffskyana would not be more than five hundred years old. It is, of course, possible that some few have reached the thousand year stage. The known antiquity of the cycads as a group and the amount of curiosity about them at various times seems to serve to embellish the stories of their great individual age.

Of all the indigenous cycads in Australia Lepidozamia stands out for the sheer beauty of its hard glossy fronds. In L. peroffskyana they first arise from the apex of the trunk, appearing soft, brown and pubescent, the pinnae curled and unfolding, fernlike. Initially, they are semi-erect, but as the pinnae harden the fronds flatten out in a big circle. Each year's circle of new fronds forms a new "hat" to the thickening crown already there. There are usually about six layers at any one time with the basal layer dying back and leaving only their bases, and so the caudex grows. Each beautiful frond is about two metres long, but the largest specimens would be three metres. As in Macrozamia male cones are longer and narrower. I find quite a similarity in actual appearance of the female cone of L. peroffskyana and L. hopei to those of the African cycad genus, Encephalartos.



Lepidozamia peroffskyana

Above is the male pollen cone. It would be 50-60cm long. As it reaches maturity the **scales** (sporophylls) separate into a spiral pattern as shown - a feature of Lepidozamia species.

### Lepidozamia hopei

A palm-like plant from northern Queensland, Lepidozamia hopei is reputed to be the tallest living cycad. There are reports of specimens reaching twenty metres - more than sixty feet. In appearance, this giant of the Zamiaceae is equally dominating where it occurs. On specimens I examined, the caudex was more slender than that of L. peroffskyana at similar heights. The most distinguishing feature of difference would be the width of the pinnae which is twice as wide as in L. peroffskyana.

It is worth noting here that the ancient fossil L. hopeites found in Victorian coal fields could be most closely related to this species. What a great change of tropical climate this signifies. Although in botanical descriptions the cycads are always featured as single trunked plants, obviously this does not mean on all occasions this is so. One giant plant of L. hopei, growing near the base of a stairway at Paronella Park, Innisfail, had branched twice and has fronds of at least three metres in length. The branching trunks were about four metres high. This is the largest L. hopei I have seen. Other specimens in the Mission Beach and Babinda areas all had great length of fronds but were unbranched.

The species occurs in and around rainforests from the Rockingham Bay area (Cardwell) to north of the Daintree River, usually in rainforests or protected by overhead canopies of trees. Good stands of L. hopei are reported along the banks of the

Photographed by : Tony Rudd

Dallachy and Bilyana Creeks, in Cardwell area. They are ideal subjects for horticulture. A small National Park near Bingil Bay contains quite a number of very tall Lepidozamia hopei. The interesting part about this information from Mrs. Bosworth, a member of the S.G.A.P. zamiad study group, is that quite a few of these plants are branched and at about the same height. She suggests that perhaps the huge cyclone of 1918 which devastated this area may have caused this.

A key to the two species (published by L.A.S. Johnson "Families of Cycads and Zamiaceae of Australia", 1959) describes "Lepidozamia hopei as broadest pinnae 17-30mm broad, 20-40cm long, 17-30 nerved. Habitat-Northern Queensland and Lepidozamia peroffskyana, broadest pinnae 7-14mm broad, 10-32cm long, 7-14cm nerved. Habitat - South Queensland and Northern South Wales. Lepidozamia will yellow in the foliage and sometimes burn slightly in exposed sunlight - an indication of their preferred habitat".



### Lepidozamia hopei

A palm-like plant from northern Queensland, Lepidozamia hopei is reputed to be the tallest living cycad. There are reports of specimens reaching twenty metres high.

Photographed By : Bill Snewin

(Reprinted from "Australian Plants", Volume 13, no. 101, December 1984, with the kind permission of the author and the editor).

### TWO NEW ZAMIAS

Bart Schutzman from the University of Florida, in collaboration with Bijan Dehgan from the same campus and Andrew Vovides working in Mexico, have described two new *Zamia* species from southern Mexico. *Zamia soconuscensis* occurs in the Sierra del Soconusco and is an arborescent cycad related to *Zamia inermis*. *Zamia cremnophila* is a cliff-dwelling species with pendent leaves from Tabasco. It is regrettable that precise localities cannot be published for fear of commercial collecting; both are regarded as endangered species. The publication also includes details of chromosome morphology and a discussion of the species delimitations in *Zamia*. The text appears in the BOTANICAL GAZETTE (Vol. 149, pp. 347-360 of 1988). Reprint requests may be sent to Bart Schutzman, Horticultural Systematics Laboratory, Dept. of Ornamental Horticulture, 2522 W M Fifield Hall, University of Florida, Gainesville, Florida 32611, U.S.A.

### In Memoriam

The President, Committee and members of the Society express condolences to our member Mr. Solly Sacks of Kew, Johannesburg on the sad loss of his wife in January this year.

# CYCADS AT THE HUNTINGTON

By Kathy Musial

Adapted from a contribution to  
Huntington Calendar, March/  
April 1984.

The cycad collections at the Huntington Botanical Garden in San Marino, California, is one of the largest in the United States and includes representatives of all ten genera and about half of the roughly one hundred species of modern cycads. Most can be seen in the Jungle Garden, and the courtyard and circle northeast of the art gallery; others are in the Desert, Japanese and Palm Gardens.

The collection was started in 1910 with a few plants of Dioon edule and Ceratozamia mexicana, collected in Mexico by William Hertrich, then superintendent of the ranch. In 1913 some exceptional specimens arrived from Japan, some of which were said to be 300 to 400 years old. Among these may have been the large clumps of Cycas revoluta near the art gallery and in the Japanese Garden, some of which are quite likely the oldest plants on the grounds, older even than the large oak by the library. The next acquisitions have an interesting history. About the time Henry Huntington's house (now the art gallery) was built, Hertrich suggested planting cycads in the courtyard, believing the rarity of these plants would kindle Huntington's interest in them. Soon a shipment of fifteen choice specimens was on the way from a nursery in New Jersey and the collection began to grow. But two other collectors had a head start on Huntington - Louis Bradbury and Edward Doheny. Hertrich spurred Huntington on with reports of

the increasing size of Bradbury's collection and the huge conservatory that Doheny was building. Bradbury soon decided to drop out of the competition and offered to sell his plants to Doheny. Hertrich, disliked by Bradbury, was reluctantly asked to evaluate the collection, as he was the only person qualified to do so. A price of \$15,000 was set and sent off to Doheny, who, not knowing the value of the plants, had at the same time sent an offer of \$3,000. This so incensed Bradbury that, according to Hertrich, he "would have burnt the plants before selling them at that price". Hertrich seized the opportunity to call on Bradbury and negotiate, bringing with him two wagons and six men to guard against the possibility that Bradbury might settle and later change his mind. When a price of \$8,000 was finally agreed upon, the wagons were brought up and the plants were sent on their way to the ranch, fifteen loads in all. With this purchase, in September 1913, Mr Huntington's contributions to the collection were complete.

Since that time there have been considerable additions, and today the Huntington collection includes five species of Ceratozamia, about fifteen species of Cycas, six species of Dioon, twenty species of Encephalartos, two species of Lepidozamia, twelve species of Macrozamia, one Microcycas, six species of Zamia, and two species of Bowena, as well as several unnamed plants in some of the genera. There are also large collections at Los Angeles State

and County Arboretum in Arcadia and at Lotusland in Montecito.

Their usual form and beauty has made cycads popular as ornamentals and collector's items. Unfortunately, their desirability has made them even more rare in their native habitats; for example, in South Africa there are probably more cycads in private gardens than are left in the wild. Most species are endangered, and some measures are being taken to protect the natural populations. In Australia, where macrozamias were destroyed in great numbers for decades by ranchers because of their toxicity to livestock, there is now a Macrozamia National Park, and South Africans are required to have a permit to own cycads. It is hoped that public collections like the Huntington's will help to preserve these fascinating plants for future generations.



*Encephalartos ferox*

Photo : Kathy Musial



THE HUNTINGTON

BOTANICAL GARDENS

LIBRARY ART COLLECTIONS

1151 Oxford Road, San Marino, California 91108

(818) 405-2100

*Encephalartos altensteinii*

Photo : Kathy Musial

# OBITUARY

## DR. I.C. VERDOORN



Dr. Inez C. Verdoorn, honorary life member of this Society, passed away on Sunday the 2nd April, two and a half months before her 93rd birthday.

She was born on the 15th June, 1986 in Pretoria, where she lived and worked practically all her life. She never had a formal university training, and after matriculation in 1916 joined the Civil Service. Later in the same year, 1917, she was appointed to the Division of Botany and Plant Pathology (the forerunner of the present National Botanical Institute) as herbarium assistant. Soon enough she caught the attention of the Chief, Dr I.B. Pole Evans, and during the years 1925 to 1927 she represented the National Herbarium as Liaison Officer at Kew Herbarium. After her return to Pretoria she was put in charge of the National Herbarium, which role she fulfilled until her retirement in 1951.

Like so many plant taxonomists, retirement by no means spelled the end of her botanical activities, and up to the early 1980's she still regularly worked at the National Herbarium.

Her association with cycads goes back to the early 1940's, and it seems probable that it was triggered by Marloth's dismissal of Encephalartos material sent to him from the Transvaal Waterberg in 1925 by her uncle, the poet Eugene Marais. Her perserverance led to the re-discovery, and scientific description of Encephalartos eugene-maraisii in 1945. Subsequently she was closely associated with Dr. Dyer's research on Encephalartos, and was involved in the description of E. humilis, E. lebomboensis, E. natalensis, and E. ngoyanus.

Her interest in cycads never waned, and she had strong views on matters taxonomical. As late as the 1970's she still delivered a fascinating address to the South African Association of Botanists in Pretoria; and whenever anything of interest came to his attention, Dr. Dyer always asked her opinion.

As a botanist Dr. Verdoorn (the doctorate was honorary, bestowed by the University of Natal in 1967) was amazingly versatile, and she published on the most diverse plant groups. Her country-wide collections number more than 4000, and numerous new species were described by her. She is commemorated in the genus Inezia Phillips (a monotypic genus in the family Asteraceae, from eastern Transvaal and Swaziland), and not a few species were named after her.

As a person she was always very quiet and humble, and few of the younger generation ever really got to know her well. Yet she was kind and helpful whenever we asked her opinion or assistance. She was deeply religious, and especially in her later years she

---

At the time of going to press the obituary for Sally Geldenhuys had not been received. It will be published in the September issue of "Encephalartos"

increasingly gave her free time to her church. In spite of their long association, the relationship between her and Dr. Dyer was always amusingly formal - I never heard him calling her by any name other than "Miss Verdoorn".

Her death leaves Miss M.D. Gunn as the sole survivor of what the younger staff used to call "the oldies" - a formidable team consisting of Dr. Dyer and Miss Verdoorn as taxonomists, Miss Gunn as librarian/historian, and **Cythna** Letty as artist. We always held them in great awe, not only because of their enormous contribution to South African botany, but also because of their very long association with the National Herbarium - all of them served under the legendary Dr. Pole Evans.

Her publications number more than 200, of which the following are the principal ones dealing with cycads:

- 1945 A new species of Encephalartos from the Waterberg [E. eugene-maraisii]. Jl S. Afr. Bot. 11: 1-3.
- 1947 Encephalartos villosus. Flowering Plants of Africa 26: tt. 1001 & 1002.
- 1948 STEYN, D.; VAN DER WALT, S; VERDOORN, I.C. : The seeds of some species of Encephalartos. A report on their toxicity. S. Afr. Medical J. 22: 758.
- 1949a Encephalartos ngoyanus. Flowering Plants of Africa 27 : tt. 1053 & 1054.
- 1949b Encephalartos lebomboensis. Flowering Plants of Africa 27: tt. 1078 & 1079.
- 1951a DYER, R.A. ; & VERDOORN, I.C. : Encephalartos natalensis. Bothalia 6: 205 - 211, 3 plates.
- 1951b Newly described species. Encephalartos humilis. Bothalia 6: 220 - 221, t. 3 (p. 241).
- 1951c A cycad tour of the Eastern Cape. African Wild Life 5: 153 - 159.
- 1951d Encephalartos natalensis, the cycad of the Valley of a Thousand Hills. S. Afr. J. Sci. 48: 162.
- 1954 Newly described species. Encephalartos eximius [E. cycadifolius]. Bothalia No. 6 426--428, tt. 2-4 (pp. 448--449).
- 1956 Cycads in the Transvaal province. Trees in South Africa 8 (2) : 3 - 9.
- 1962 Encephalartos species in Natal. Trees in South Africa 14 (3) : 50 - 55.
- 1966 DYER, R.A.; & VERDOORN, I.C. : Zamiaceae. In Flora of southern Africa 1: 3 - 34.
- 1969 DYER, R.A.; & VERDOORN, I.C. : Encephalartos manikensis and its near allies. Kirkia 7: 147 - 158.
- 1974 Our cycads in perspective. Aloe 12: 101 - 106.

By P. Vorster

Botany Department,  
University of Stellenbosch,  
7600 Stellenbosch.

#### CONDOLENCES

The President, Committee and members of the Society record with sadness the tragic death in a ski-boat accident of Natal member Brian Mann of Pennington on the Natal South Coast. Our sincere condolences are expressed to his family and friends.

## Evolutionary Patterns in Cycad Cone Size and Shape

By Willie Tang

### Introduction

Among flowering plants reproductive organs are indispensable as tools in identification and in discerning evolutionary relationships. Indeed, flowers are the basis of much of angiosperm taxonomy. Among cycads, however, cones have received relatively less attention and cycad taxonomy is disproportionately based on vegetative characters. In this paper I examine some patterns in cycad cone evolution and their implications for taxonomy.

### Cone Size

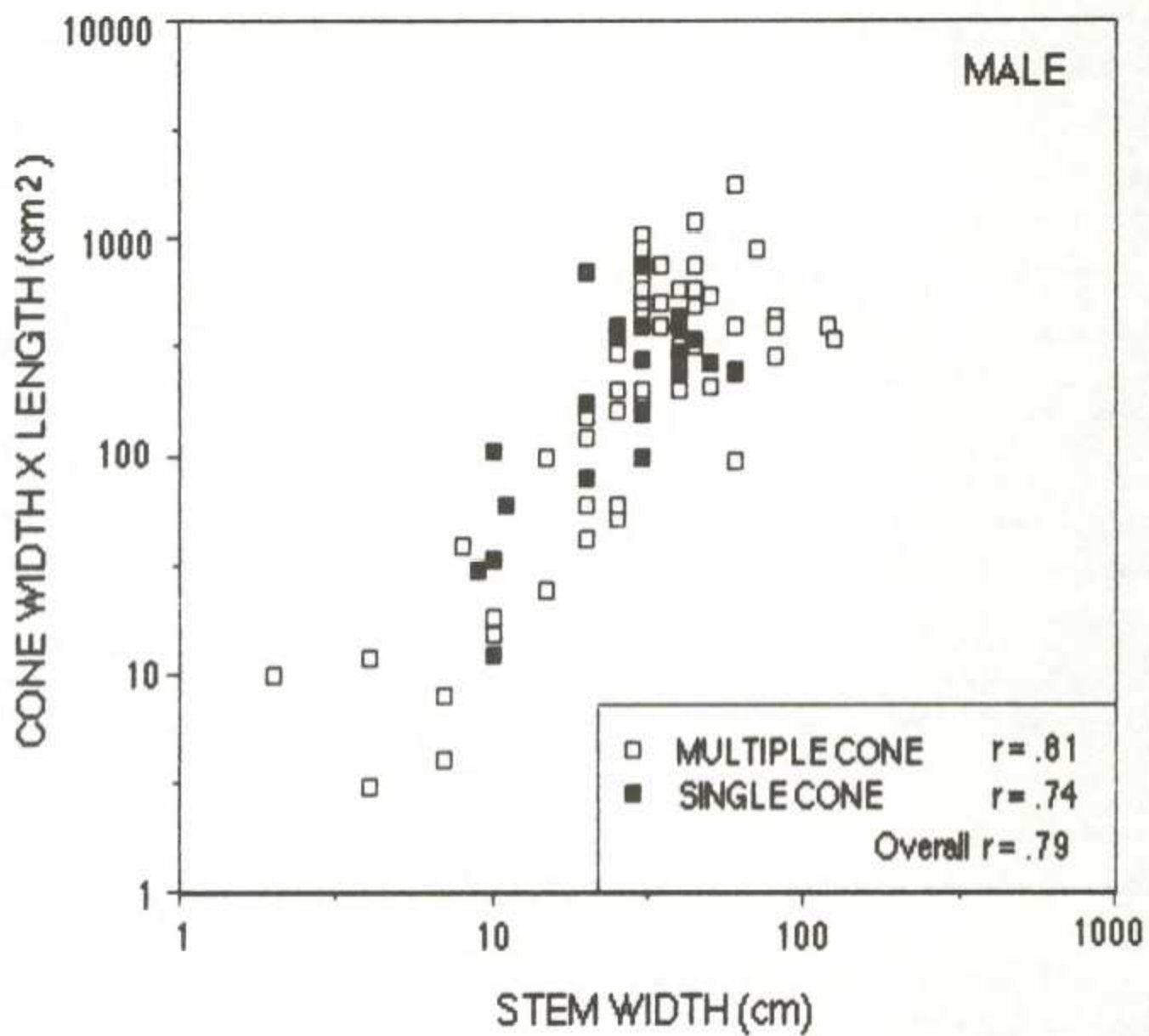
Cone size would appear at casual consideration to be linked to plant size. Choosing width x length as a measure of cone size and stem width as a measure of plant size we find that this impression is correct (Fig. 1a & b). Cycad cones develop rapidly, suggesting that the material used for their making comes mainly from reserves in their stems. This may explain the strong relationship between cone and stem size. There is, however, a lot of scatter to this relationship. What other factor may influence cone size? Instead of producing one cone many species invest their resources on a number of smaller-sized cones. Multiple cones give the male plants the advantage of being able to shed pollen and female plants the ability

to be receptive to pollination for longer periods than a plant with a single cone, thus ensuring greater success at reproduction (see 1). If species that produce solitary cones are considered separately from those with multiple cones we find that for female cones, stem and cone size is more tightly correlated and species with single cones tend to produce larger ones as would be expected (Fig. 1b).

These patterns of size among cycad cones suggest that cone size evolution has been constrained by resource limitation - by the amount of nutrients stored in the stem. Modifying this trend has been selection for multiple coning in *Encephalartos*, *Macrozamia* and *Zamia*. Multiple coning has been achieved in *Bowenia* and *Stangeria* and to an extent in female *Zamia* by stem branching. In the genera *Ceratozamia*, *Cycas*, *Dioon*, *Lepidozamia*, and *Microcycas* multiple cones are absent except in the occasional branched plant.

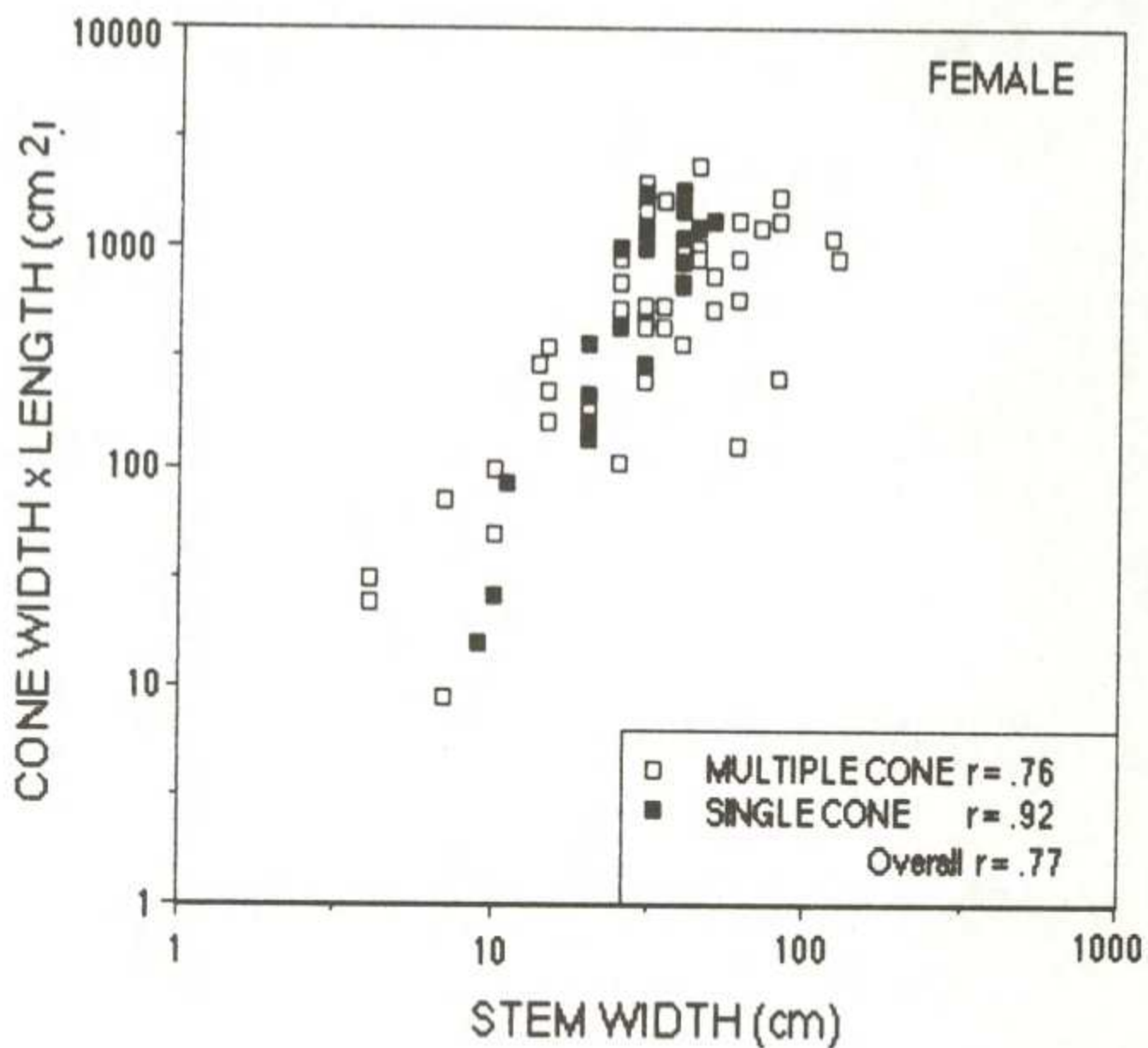
### Cone Geometry

What determines the geometry of cycad cones? In female cones three factors constrain geometry: pollination, production of seeds, and protection of seeds. The tightly packed structure of the female cone of most species strongly suggests that protection of seeds from insects and marauding vertebrates is important (see 2). At pollination time narrow crevices form on female cones, often only on particular parts of the cone, to allow in pollen (3). Entranceways for pollen are specialized structures in some



a

**Fig. 1.** Maximum cone size as a function of maximum stem width for 7 genera of cycad: (a) male cones (79 species), (b) female cone (73 species). Black squares represent species that produce solitary cones and white squares represent species that produce one or more cones. Most data from (6,10).



b

species. In *Encephalartos ferox* the upper third of the cone is sterile and tapers to an apex; its only function appears to be as an entrance for pollen and insect pollinators (3). The base of female *Dioon* cones consist of special sterile sporophylls that open only during pollination time (3, 4, & Fig. 2).

The third factor influencing cone shape is the problem of how to pack a limited number of seeds, of a particular size, into a limited space. Seed packing is determined by sporophyll arrangement on the cone. Except for *Cycas* all genera normally produce only two seeds per sporophyll. A species living in a harsh habitat, such as *Macrozamia macdonnellii* requires large seeds for the successful establishment of their seedlings. Due to a limited reserve of nutrients in the stem, this means the plant must produce fewer seeds in a cone with fewer but larger sporophylls. A species that lives in a habitat with abundant light and water, on the other hand, can produce smaller seeds in greater numbers by having a cone that is divided into a greater number of sporophylls. The number of sporophylls on a cone and therefore the potential number of seeds the cone can produce is determined at the time of cone inception in the meristem. Sporophyll number is therefore determined by a combination of plant health/reserves and genetic programming months before cone maturity

## Sporophyll Number and Seed Shape

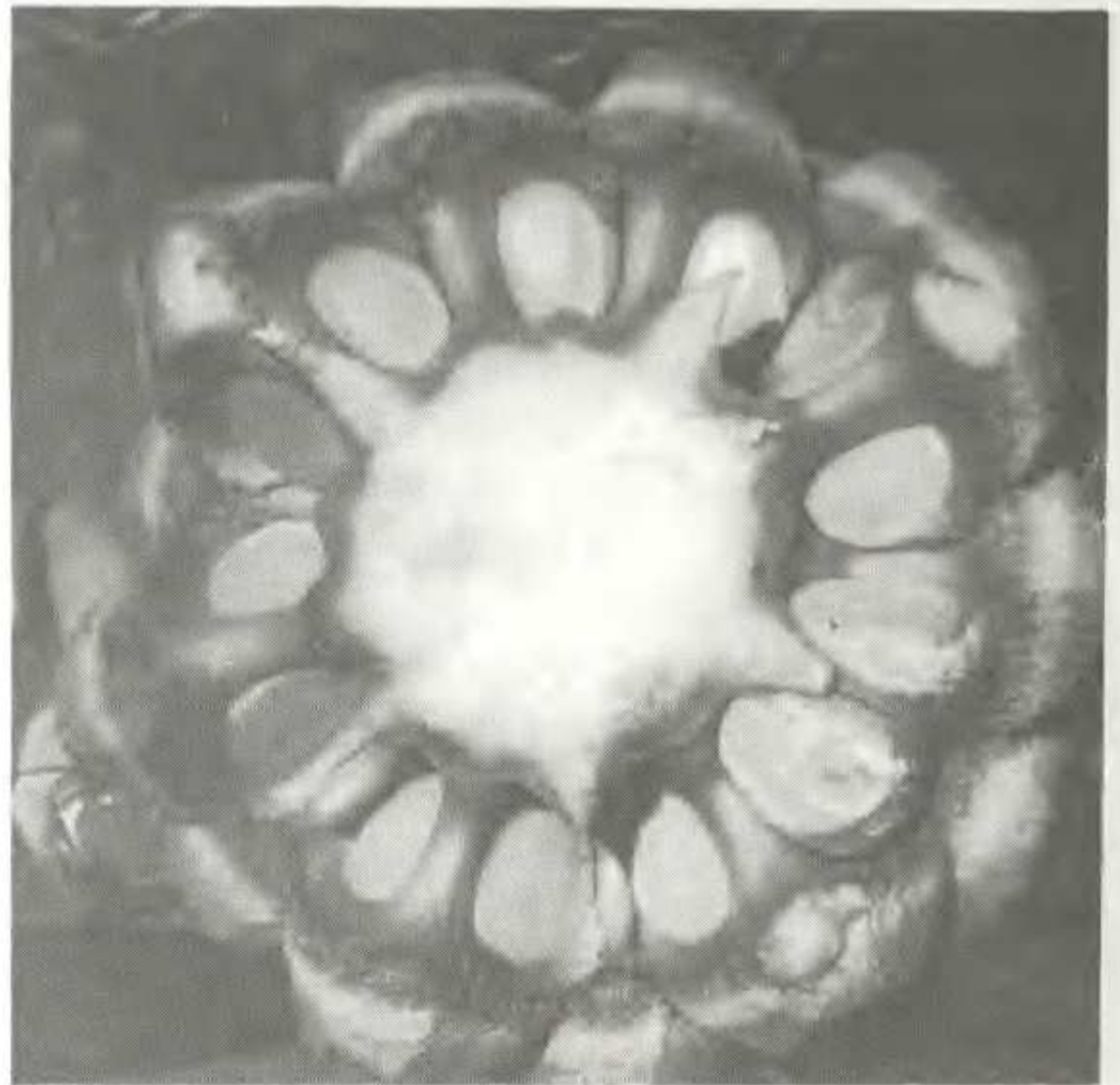
Sporophylls are arranged vertically (columns) and horizontally (rows) across cones. Sporophyll number per row will strongly influence the size and shape of seeds. The greater the number of columns in a cone of a given size, the smaller its seeds will be. A wide cone with only a few columns of sporophylls will produce large round seeds (see Fig. 3a). In a cone that is more divided, as in the female of *Encephalartos ferox*, the seeds will be compressed because "elbow room" in the cone is in short supply. If there is selective pressure to enlarge seeds, the only space available for expansion is toward the center of the cone (Fig. 3b). The elongation of seeds due to crowding is most pronounced in *Encephalartos*. In *E. ferox* fresh seeds with their pulpy coat intact may be nearly three times longer than wide. Seed crowding also results in the formation of 3 to 4 flat sides on the seed as seeds press against the sporophylls and one another (see 5 for examples). Thus, much of the variation that we see in cycad seeds is tied to cone geometry. In contrast to changes in number of columns, increases in number of rows per cone has almost no affect on seed shape and size. Its affect is to produce taller, more cylindrical cones. Species of *Encephalartos* appear to demonstrate this pattern (see 6). We may expect that within a given species seed size is fairly constant and that a plant that "decides" to produce more seeds will produce a cone with more rows. As a consequence we would expect greater variation in cone height than width.

Willie Tang's address is:

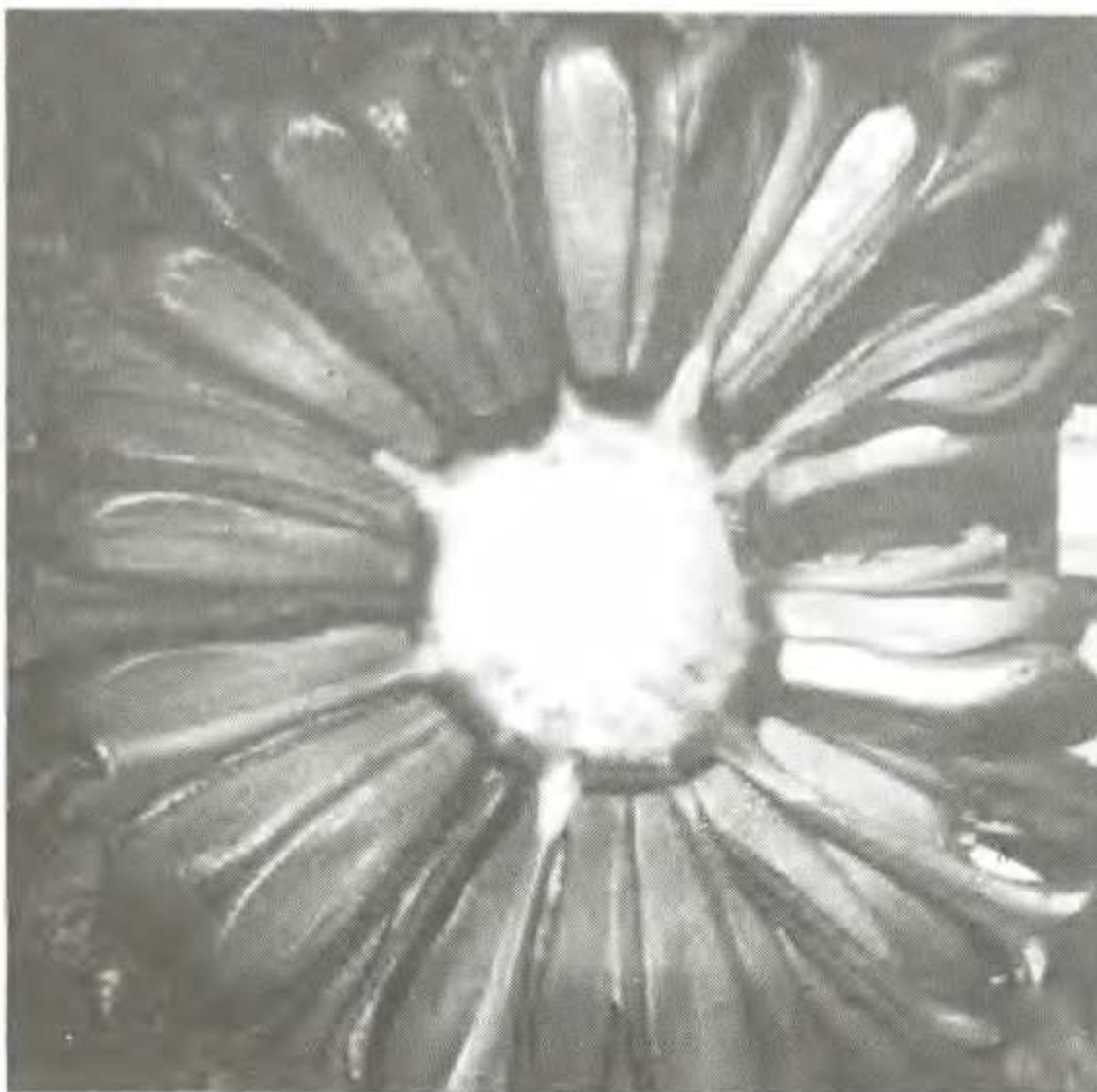
Fairchild Tropical Garden  
10901 Old Cutter Road  
Miami Florida  
33156 U.S.A.



**Fig. 2.** Female *Dioon edule* cone at receptivity to pollination. Notice the opening at the base of the cone.



**a**



**Fig. 3.** Cross-section of female cones revealing one row of sporophylls and seeds: (a) *Encephalartos hildebrandtii* cone with 13 columns. (b) *E. ferox* cone with 22 columns. Although the cones are of similar width, seed size and shape are different.

**b**

In *Cycas*, the female has retained an arrangement of independent sporophylls. This arrangement decouples the constraints of pollination and seed packing, spatial constraints that impose themselves at different times in cone development. For instance in *Cycas rumphii* the sporophylls at the time of pollination are tightly packed and together they form a functional "cone" much like that of other cycads (ovules are not loosely exposed to the air as once presumed) (7). After pollination the sporophylls become loose and the seeds that develop are rounder than in other genera and without flattened sides. Without the crowding that occurs in cones, up to eight or more seeds can be produced per sporophyll.

Male cones are subject to fewer functional constraints than female cones and as a result are simpler in structure. It is not surprising then that male cones are different from female cones in size and appearance in most species. Two exceptions to this pattern are *Encephalartos heenanii* and *E. manikensis*. The similarity of male and female cones in these species may be tied to an insect pollination mechanism in which pollination occurs because pollinators can't distinguish the male and female. Such a pollination mechanism is known in the papaya family.



*E. heenanii* cone  
Photo: Neil Munro

## Cone Morphology and Taxonomy

Cycad cones display a great deal of size and shape variation among species. This variation is interpretable through the constraints of resource limitation and the functional requirements of pollination, seed production, and seed protection. Different cone morphologies result because constraints differ from species to species. Form follows function in cycad cones.

Cone characters that are involved in pollination have direct implications for taxonomy because of the importance of pollination in the reproductive isolation of a species, the most crucial element of the biological species concept. In *Encephalartos ferox*, for instance, the particular pattern of receptivity in female cones may effectively isolate it reproductively from other species and this in itself may distinguish it as a species under the biological species concept.

Because seed size varies with habitat type (8) and seed size is reflected in cone size and geometry, cone morphology can be used as a tool when applying the niche concept of species (9). Because many of these cone features can be measured quantitatively they can be used and readily interpreted as taxonomic tools.

## References

- (1) Clark, D. A., Clark, D. B. 1987. Temporal and environmental patterns of reproduction in *Zamia skinneri*, a tropical rain forest cycad. *Journal of Ecology* 75: 135-149.
- (2) Tang, W. 1988. Seed displays in cycads. *Encephalartos* 14: 30-33.

(3) Norstog, K., Niklas, K. 1984. Aerodynamics and pollen grain depositional patterns on cycad megastrobili: implications on the reproduction of three cycad genera (*Cycas*, *Dioon*, and *Zamia*). Botanical Gazette 145: 92-104.

(4) Tang, W. 1986. Pollinating cycads. *Encephalartos* 8: 16-19.

(5) Osborne, R. 1988. Cycad seed kernel morphology. *Encephalartos* 13: 26-30.

(6) Giddy, C. 1974. Cycads of South Africa. Purnell & sons, Capetown.

(7) Tang, W. unpublished data.

(8) Baker, H.G. 1972. Seed weight in relation to environmental conditions in California. *Ecology* 53: 997-1010.

(9) MacArthur, R. 1972. Geographical Ecology. Harper Row. New York.

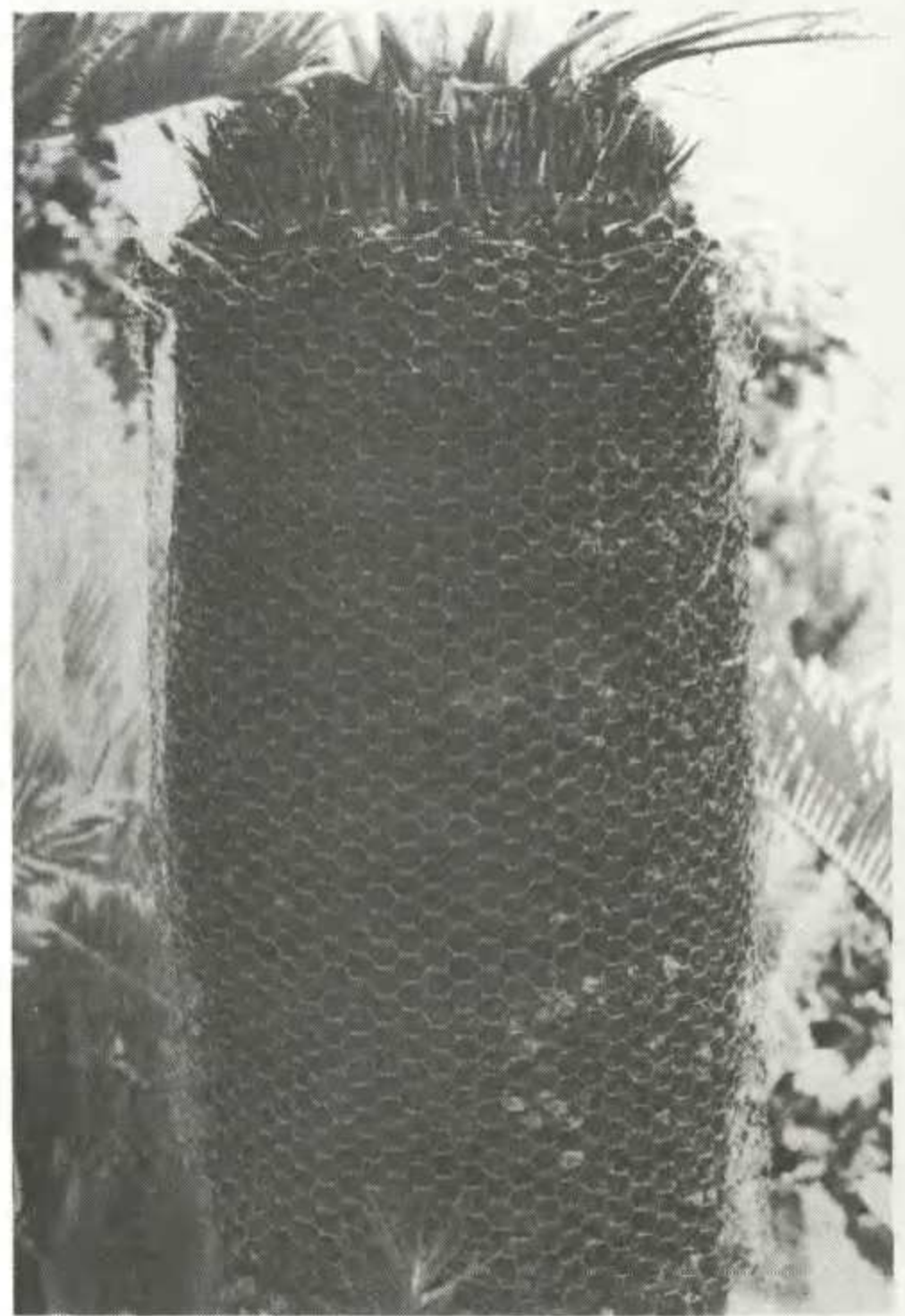
(10) Johnson, L.A.S. 1959. The families of cycads and the Zamiaceae of Australia. *Proceedings of the Linnean Society of New South Wales* 84: 64-115.

Cynthia Giddy, Roy Osborne and Piet Vorster have been appointed for the 1988-1990 triennium to the Cycad Specialist Group (Chairman Knut Norstog) of the Species Survival Commission (SSC) of the International Union for the Conservation of Nature and Natural Resources (IUCN).

HAVE YOU CHANGED YOUR ADDRESS?

Please inform:

The Membership Officer  
Pieter Stroebel  
P O Box 189  
6000 PORT ELIZABETH.



MYSTERY QUIZ

Study the photograph above and select which you believe it represents:

1. A cycad having its annual bubble-bath?
2. A new cycad anti-theft device, based on electro-mechanical impulse transmission signal?
3. A screen to prevent very large leopard moths from attacking cycad stems?
4. None of these!

(Answer on page 37.)

HET U VAN ADRES VERANDER?

Laat weet asseblief:

Die Lidmaatskapbeampte  
Pieter Stroebel  
Posbus 189  
6000 PORT ELIZABETH.

## REGIONAL NEWS

### NATAL SECTION REPORT

A record number of 46 members and guests attended a pollination workshop at Ted and Cynthia Giddy's nursery on 9 April 1989. Much was learnt by all and once again we are grateful that Cynthia shares her wealth of knowledge and experience so willingly and enthusiastically. Of special interest was a discussion on the relative merits of using "dry" pollen vs. using a suspension of pollen in water. Cynthia believes that the "dry" pollen technique is better. The morning demonstration was followed by a braai which all enjoyed.

The next function of the Natal Section is an excursion to the Ngoye Forest at a date to be arranged in July 1989.



Cynthia Giddy addressing members of the Natal section of the Society at the pollination workshop on 9 April 1989.

## STREEKNUUS

Die eerste jaarlikse ledevergadering van die Eugene Marais streektak is op 15 April by die Pretoria Nasionale - Botaniese tuin gehou. Alhoewel dit effens gereën het, is die byeenkoms deur 22 lede bygewoon. Prof. N. Grobbelaar lewer 'n praatjie oor die E. eugene-maraisii en sy "nuwe" verwante. Hy vertel ons meer oor die prosedures wat gevolg was om die nuwe spesies te laat klassifiseer, asook hoe om tussen die plante te onderskei. Daarna het Dr. Claasen van die Universiteit van Pretoria ons deur die tuin geneem. Sy hou die afgelope jaar rekord van die broodbome vir navorsingsdoeleindes i.v.m. die keëlsiklus en gevolglik besoek sy die plante weekliks. In die tuin is daar meer as 285 pragtige broodbome en 'n groot persentasie van die plante is tans in keël o.a. E. woodii. Die besoek aan die Pretoria Nasionale - Botaniese tuin was beslis die moeite werd en enige broodboom - entoesias wat Pretoria besoek kan gerus 'n draai by die tuine maak.

Verslag deur : Xander de Kock

### CYCAD 90

Members are reminded that planning is now in hand for Cycad 90, the Second International Conference on Cycad Biology (see ENCEPHALARTOS 17, page 15, for provisional details). The conference, to be held in Australia in mid-1990, will be under the auspices of the Cycad Specialist Group of the Species Survival Commission (SSC) of the International Union for Conservation of Nature and Natural Resources (IUCN). Any of our southern African readers interested in attending but who have not yet responded, should please do so as soon as possible. Contact Roy Osborne for further information.

VERSLAG DEUR STEF SCHOEMAN

---

'n Groot aantal lede van die Eugene Marais Streekstak het op 25 September 1988 'n baie genotvolle en interessante uitstappie na die Middelburg Broodboomwandelpad, Transvaal, onderneem. Die wonderlike geleentheid was moontlik gemaak deur beywering van ons Ondervoorsitter, Prof. Nat Grobbelaar, wat spesiaal teenwoordig was om die pad aan te wys en voor geloop het tot by die eerste eeue-ou E. middelburgensis. Hierdie plant het die bewondering van almal teenwoordig afgedwing. Daarna het lede verskillende roetes almal volgens hul eie uithou-en stapvermoëns, aangedurf.

Verbasend was die pragtige E. lanatus, klein en groot, wat in die gebied floreer in die rotsagtige berghange, waar talle spore van wilde diere en selfs wilde katte gevind is.

Bejammerenswaardig was egter die merkbare afwesigheid van jongere E. middelburgensis. In BOTHALIA (vol viii, deel 4 bladsy 456) was in 1965 reeds aandag gevestig op die min jong E. middelburgensis plante in hierdie omgewing en is 'n ernstige beroep toe reeds gedoen vir maatreëls om die oorlewing van hierdie spesie in sy natuurlike staat te verseker. Dit was dus ook met groot hartseer om in die pragtige natuurskone omgewing die verwaarloosde en vervalle ruskampe op die ou wandelpad te aanskou. Hierdie wandelpad is nou vir die publiek gesluit, hoofsaaklik weens die skandalige vernielsugtigheid van sommige besoekers en **gewetenlose** hebsugtige stropers.

Hier aan die bolope van die Olifantsrivier, met sy rykdom aan flora en fauna, lê 'n nasionale bate voorwaar wat die beskerming en bewaring vir die nageslag vereis. Die lede van ons vereniging, wat volgens inligting ontvang, van die laaste persone was wat die voorreg gehad het om as 'n groep die gebied te kon besoek, sal altyd dankbaar wees teenoor die eienaar, Meneer Danie Bosman, wat goedgunstig toestemming aan Prof. Grobbelaar verleen het om ons na die afgesonderde gebied te begelei.

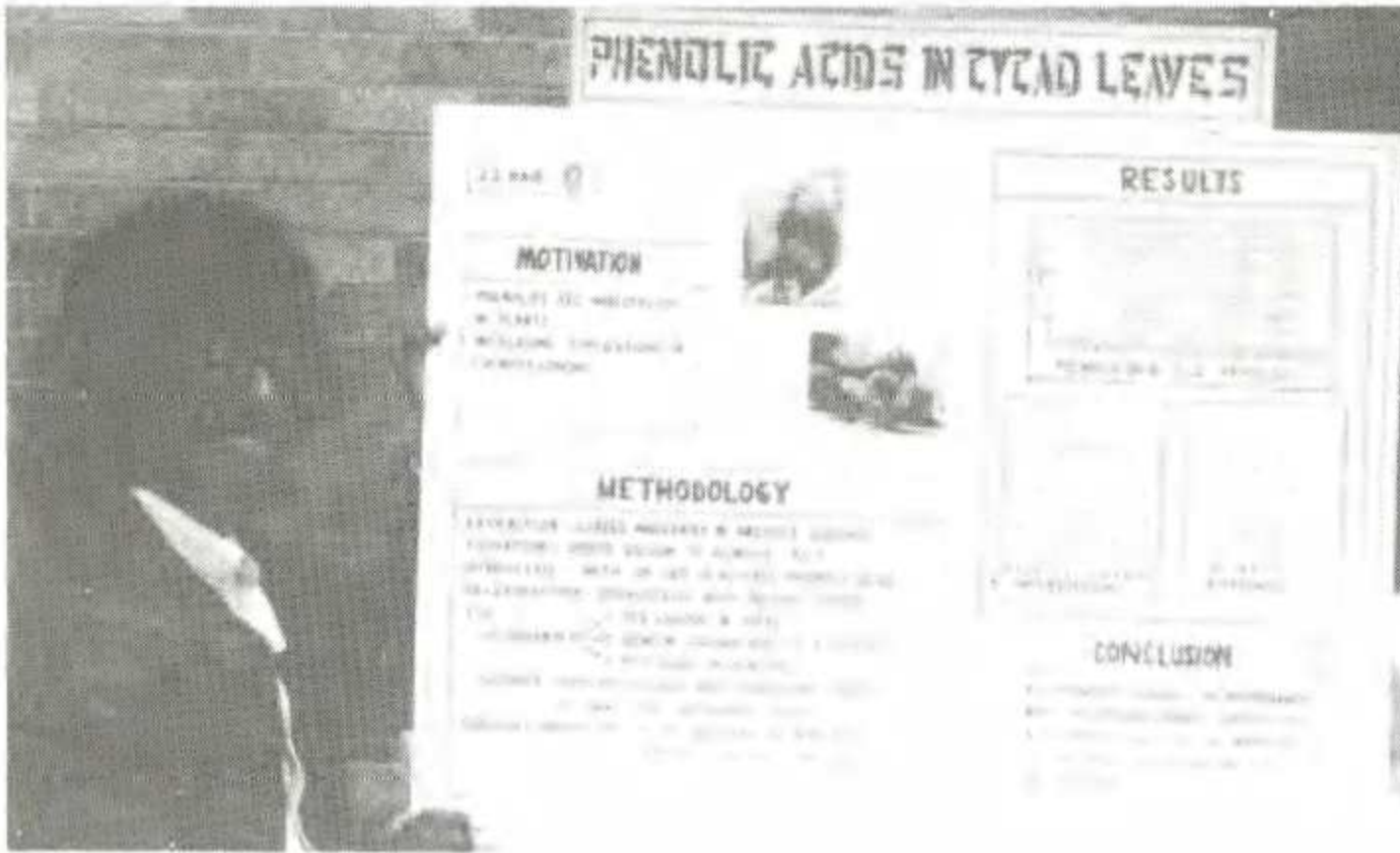
Om hierdie enkele paar oer-oue broodbome, wat deur die eeue heen droogtes, vuur en ander gevare trotseer en nog oorleef het, te kon besoek en te bewonder, was voorwaar 'n voorreg wat lank met dankbaarheid onthou sal word. Die vraag ontstaan hoe kan die E. middelburgensis na die gebied teruggebring word om die pragtige natuurpark te herstel?



# BITS AND PIECES STUKKIES EN BROKKIES

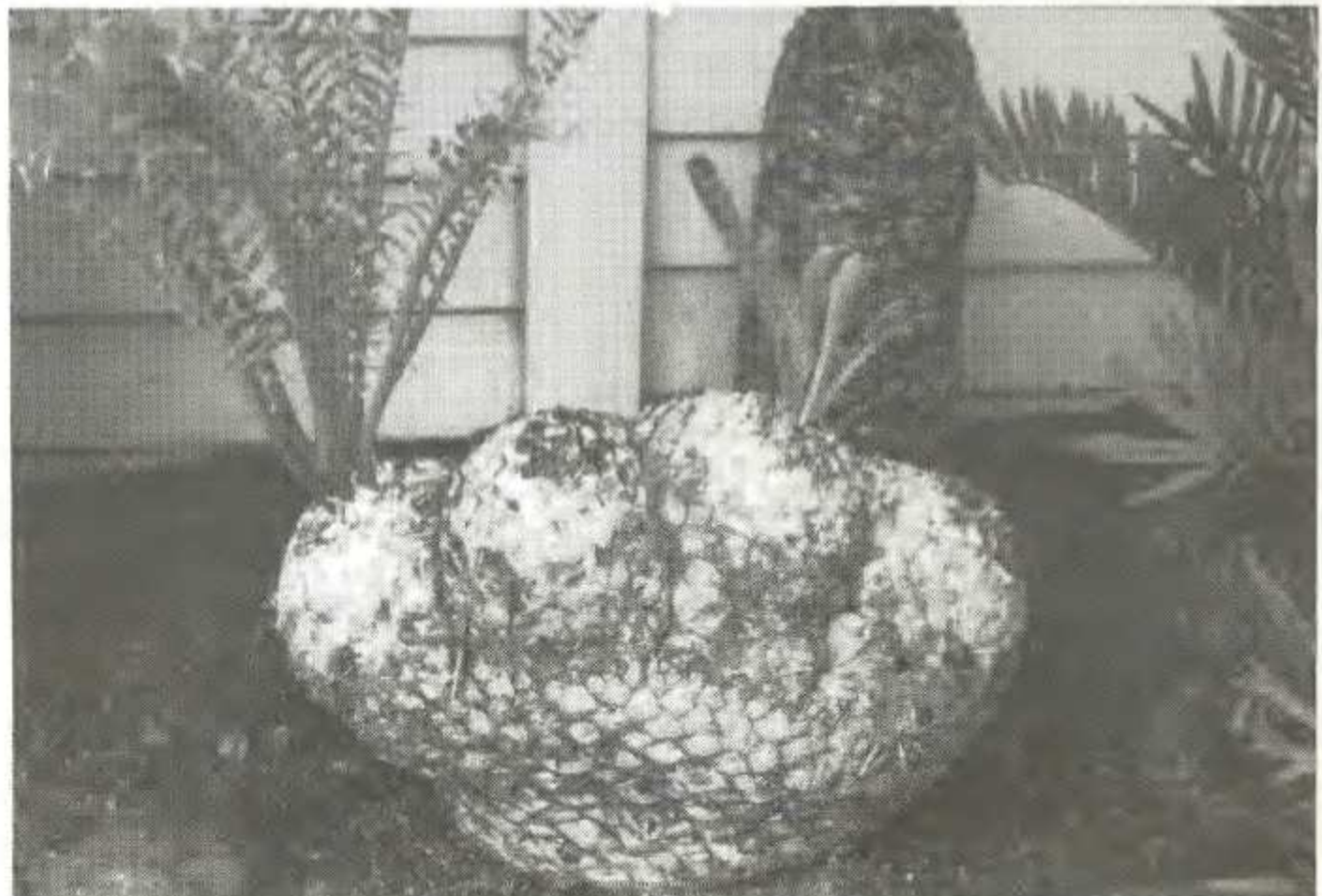
Student Jerald "J.J." Nair has commenced studies leading to the degree of Master of Science in the Department of Chemistry at the University of Natal. Mr. Nair will be studying specific aspects of the biochemistry of cycad toxins under the supervision of Roy Osborne. He has already isolated and characterised macrozamin crystals "in significant yields" from seeds of *Encephalartos transvenosus*. This project follows a 1988 chemistry honours research investigation on phenolic compounds in cycad leaves, also supervised by Dr. Osborne.

"J.J." Nair with a poster display of results from an honours project on cycad leaf phenolics.



Ever seen a double headed siamese Humpty-Dumpty?

How about this *E. trispinosus*?



## EUGENE-MARAISII COMPLEX

The plants referred to as *Encephalartos eugene-maraisii* subsp. *middelburgensis* in the article on *Encephalartos eugene-maraisii* by Roy Osborne in ENCEPHALARTOS 17 : 3-13 have now been renamed. In a taxonomic description by P.J. Robbertse, P. Vorster and S. van der Westhuizen in the *South African Journal of Botany* 55(1): 122-126 of February 1989 this population has now been given full species status and is named *E. middelburgensis*.

In summary, the plants somewhat loosely called the "Eugene-Maraisii" complex are now to be regarded as :

*E. eugene-maraisii* Verdoorn (the Waterberg population)

*E. middelburgensis* Vorster et al. (the Middelburg population)

*E. dolomiticus* Lavranos & Goode (the Wolkberg population)

*E. dyerianus* Lavranos & Goode (the Mica population).

## WYLIE INFO CENTRE

The James Wylie Information Centre in the Durban Botanic Gardens was officially opened on 22 February this year by Durban's Deputy Mayor Councillor Mrs M.E. Winter. The event commemorated the 75th Anniversary of the transfer in 1913 of the gardens from the Durban Botanic Society to the Durban Corporation. James Wylie was curator of the gardens from 1904-1916 and was responsible for a major development of the collection, notably the collection and transplanting of *Encephalartos woodii*. Several members of the Wylie family were present at the opening event where the Society was represented by the President.

[An interesting aside to this was the information that it was James Wylie who introduced the Jacaranda trees to South Africa. Whilst these trees have provided much local beauty to many of our cities, no-one could have predicted that they would "escape" - as they have now done - into our indigenous forests. In the Eastern Transvaal the Jacarandas now pose a serious threat to the indigenous flora.]



Mrs Joyce Tate, grand-daughter of James Wylie, recalls family history at the opening of the Information Centre. Seated are Errol Scarr, Durban's Director of Parks and (partially obscured) Deputy Mayor Councillor Mrs M.E. Winter.

More South African towns are using indigenous cycads to beautify their streets and parks. This photo, taken in January 1989, shows a view along Danie Joubert Street, Tzaneen where Encephalartos ferox, E. lebomboensis and E. transvenosus have been used under palms.



The South African Garden and Home flower show held an exhibition in February 1989 at the Eastgate shopping centre.

This photograph shows an exhibit centered around a female E. ferox cone, also in the display is E. lanatus leaves as well as a male cone of E. villosus. This section was aptly named "What can be conveyed can be created" and was arranged by Marie Clowes.

#### BACK COPIES OF ENCEPHALARTOS

Back copies of all issues of ENCEPHALARTOS are still available to new members who wish to complete their collections, or to anyone else who may be interested. They can be obtained at a price of R5,00 each for local and other African members, and R15,00 each for overseas members. The overseas price covers airmail postage (which at present amounts to more than R8,50 to Australia, for example). Please contact our Back Copies Officer, Roy Shooter (16 Benjamin Road, Fynlands, Durban, 4052; tel. no. 031-4662002) to obtain copies or more information. Please send the correct amount with your order. Cheques must be made out to "The Cycad Society of Southern Africa".

#### VORIGE UITGAWES VAN ENCEPHALARTOS

Eksemplare van alle vorige uitgawes van ENCEPHALARTOS is nog beskikbaar aan nuwe lede wat hulle versamelings wil voltooi, of aan enigiemand anders wat mag belangstel. Die eksemplare kan verkry word teen 'n prys van R5,00 elk vir plaaslike en ander Afrika-lede, en R15,00 elk vir oorsese lede. Die oorsese prys sluit lugposgeld in (wat byvoorbeeld tans meer as R8,50 na Australië beloop). Tree asseblief in verbinding met ons Vorige Uitgawes-beampte, Roy Shooter (Benjaminweg 16, Fynlands, Durban, 4052; tel. no. 031-4662002) om eksemplare of meer inligting te bekom. Stuur asseblief die korrekte bedrag saam met u bestelling. Tjeks moet aan "Die Broodboomvereniging van Suidelike Afrika" uitgemaak word.

STOP PRESS - WE REGRET TO ANNOUNCE THAT STOCKS OF ENCEPHALARTOS No. 8 (December 1986) ARE NOW EXHAUSTED.

Readers are invited to write to the editor (see address elsewhere). Where applicable, experts will be asked to deal with specific questions.

#### CONING AND SEX RATIO OF ENCEPHALARTOS TRANSVENOSUS

Nat Grobbelaar, J.J.M. Meyer and John Burchmore have been studying the cycad population at the Modjadji Nature Reserve for some time. The first report on their observations, "Coning and sex ratio of *Encephalartos transvenosus* at the Modjadji Nature Reserve", has been published in the February 1989 issue of the *South African Journal of Botany* 55(1) : 79-82. A sample of 638 plants in 1987 gave a male-to-female sex ratio of 2,3 to 1. For plants taller than 2,6m, the ratio was 7 males to 1 female. An increased water supply and fire in any preceding year are two factors which seem to favour production of female cones.

A limited number of reprints is available on request from Professor Grobbelaar, (Dept., of Botany, University of Pretoria, 0002 Pretoria).

#### SEED WANTED

Roy Osborne (Tel. 031-866953) urgently needs 10 representative seeds from the following *Encephalartos* species: *E. cupidus*, *E. cycadifolius*, *E. dolomiticus*, *E. friderici-guilielmi*, *E. heenanii*, *E. humilis*, *E. laevifolius*, *E. latifrons* and any non-South African *Encephalartos* species.

These are needed to complete a survey of seed morphology. They need not be fertile.

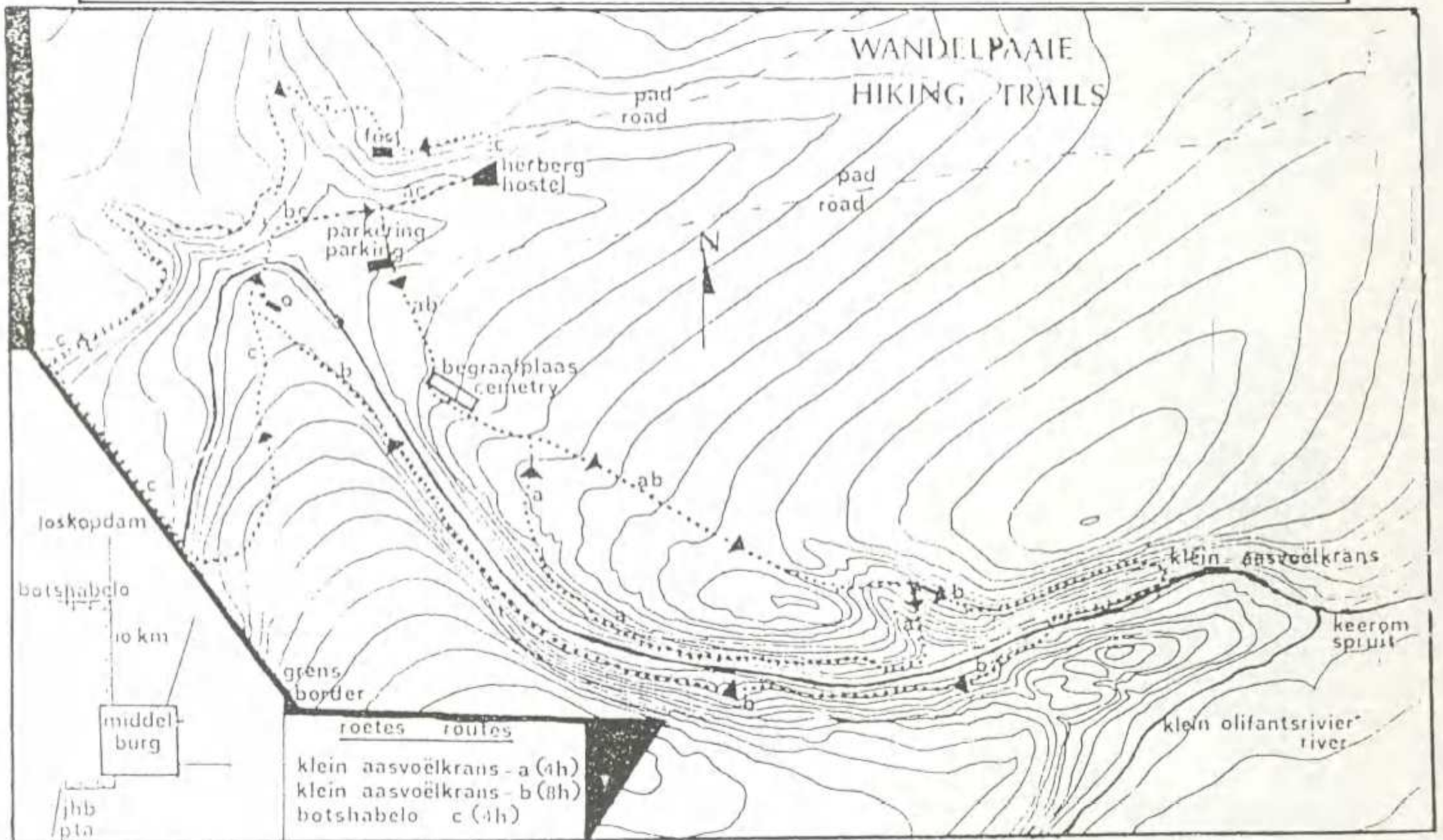
#### MYSTERY QUIZ

(See page 31...)

Answer 4 is correct!

The photograph shows the stem of a specimen of *E. lanatus* in a Pretoria garden. Apparently the woodpeckers are a real menace to large cycads, often attempting to bore out large stem sections for nesting. An effective - though unsightly - way to prevent this is to surround the stem in a wire-mesh envelope.

# BOTSHABELO HIKING TRAIL



Following the Roy Osborne article on E. lanatus a keen group of members from Johannesburg set out on Founders Day 1989 to explore Botshabelo.

This delightful area just 10 km north of Middelburg on the Loskop Dam road is an easy day trip from the P.W.V. area. The attractions there include Fort Merensky, a national monument, South Ndebele Village and an open air museum. Entrance costs a mere R5 per car.

The primary interest of the group was to enjoy the Cycads that grow so profusely in this nature reserve, their common name being Olifants river cycad.

We set off at 9 a.m. to walk the Klein Aasvoël-loop, a distance of 12 km, and what a delightful ramble it turned out to be. Along the route countless E. lanatus were seen in every size and shape, from tiny seedlings to large specimens of nearly 2m tall, most of the tall ones were growing at an angle of nearly 45° and no doubt soon to become procumbent. Very little cone activity was evident and only a few plants had spent cone stalks attached to them.

Walking back to the car park on the north side of the valley had everyone mystified. No cycads grow on the opposite side of the river. Can one of our experts tell us why?

Wildlife abounds in the nature reserve and we were lucky to see a pair of Klipspringers characteristically perched on top of some high rocks.

Back at the car park a fire was made in the braais provided and after a good lunch and a fruitful discussion we all left for home, a little weary but having spent a most enjoyable day in an area that all cycad lovers should visit.





Well known wildlife artist Bert Lewington has turned his hand to painting Cycad landscapes. He is seen here holding an enlarged photograph of E. laevifolius taken at Kaapsche Hoop.

Below is the oil painting produced by him from the photograph.

He always has some excellent wildlife studies in stock and sells direct to the public, making it most attractive for a buyer to visit his studio.

Any member who would like a landscape done either in oil or water colour can contact Bert at telephone (011) 680-4771.



The Cycad Society will be printing a set of Christmas cards for the end of the year.

The cards will be in full colour with an English/Afrikaans greeting on the inside.

Illustrations of the cards will be published in the September issue with an order form.

Die broodboomvereniging is van voorneme om 'n stel Kerskaartjies te laat druk vir die einde van die jaar.

Die Kerskaartjies sal in volle kleur wees met 'n Engels/Afrikaanse groetwense in die binnekant.

Illustrasies van die kaartjies sal gepubliseer word in die September-uitgawe tesame met 'n bestelvorm.

May I comment on the report of Gall Midge Damage in ENCEPHALARTOS No. 16 of December 1988, page 13.

Distortions of pinnae, sometimes comprising the rhachis as well, exactly like those shown in the photograph, may not invariably be caused by gall midges, but also mealy bugs (Coccina), especially, as I believe, by some species of the family Diaspididae.

My observations were with Lepidozamia peroffskyana, Encephalartos woodii X natalensis, and several Zamias of the pumila group. Deformation of new growth was less pronounced with infected Macrozamias.

In all instances the culprit was a very small and flat, oyster-like species of yellowish white colour, presumably Quadrospidiotus ostreaeformis or perniciosus, both of them inhabitants of south western Germany.

The insects were not always found at the site of deformations, but sometimes only at the base of the petiole and/or on the cataphylls, where they are partly hidden by the woolly hairs of these parts. Their noxious effect on the development of peripheral organs therefore must be working by distance.

Control was easy by means of a leaf shine spray. Success was proven by perfect growth of the following fronds.

Dr. Helmut Schlegel  
Wilh.-Haspel-Str. 30/2  
7032 Sindelfingen  
Fed. Rep. of Germany

Letter to the Editor

Sir,

May I take you to task with respect to the statement in ENCEPHALARTOS No. 15 (p.4) in connection with *E. turneri*? You state that this "occurs near Nampula in north-eastern Mocambique, a locality from which cycads have not previously been reported." In my paper "Some observations on the cycads of Central Africa" (Bot. Journ. Linn. Soc. 74: 279-288 of 1977) I reported on two populations in that Province. One was a colony of *E. gratus* which my son discovered in 1973 in the Namuli Mountains, N.E. of Vila Junqueiro and S.W. of Nampula at co-ordinates 15°25'S, 37°05'E. The other was my statement that the specimens discovered near Nampula at co-ordinates 15°10'S, 39°15'E by Ian Turner, bear a close resemblance to *Encephalartos* species "A" which was first found in N.E. Tanzania.

An interesting observation on the Namuli *E. gratus* was that in all cases the female cones had a set of about 6 apical leaves which grow out to just over 1m. The whole appearance of the plant was rather different to the typical *E. gratus* from Malawi. It is interesting to speculate on the possibility that the new species *E. turneri* might have crossed with *E. gratus* to produce the Namuli plants. An obvious question is whether *E. turneri* shows the phenomenon of apical leaves on the female cone. It is a little odd that Lavranos & Goode do not refer to my earlier publication in their text.

DENIS HEENAN, SWAZILAND.

Geagte Mnr. Redakteur

Verskeie lede van die Eugene Marais Tak van die Broodboomvereniging van S.A. asook ander privaat broodboomversamellaars en broodboomliefhebbers, ten sterkste beswaar met "Impressions at a Cycad Auction" deur Cynthia Giddy. Uitgawe No. 15 van Encephalartos verwys.

Cynthia Giddy se indrukke is in totaal eensydig. Ons as tjekboek broodboomversamellaars sou ook veel eerder 'n paar myl wou stap om 'n gesogte plant in die veld te kry in plaas daarvan om R7000,00 daarvoor te betaal. Ek wil met nadruk meld dat ons miskien baie groter broodboomliefhebbers is, omdat ons ons plante ten duurste moet aankoop en dit nie verniet in die veld kry nie. My simpatie aan Cynthia dat sy geen ander persoon die genot gun om ook volwasse plante te besit nie.

Ons maak ook beswaar teen die aanbevellings ter bevordering van broodboom-bewaring. Vir watter rede moet daar permitte vir saad-versameling in die natuur aan kwekerye uitgereik word? Die saad behoort in hul natuurlike habitat gelos te word om sodoende te verseker dat daar weer eendag groot kolonies broodbome gevind kan word. Die kweek van saailinge vir verspreiding teen billike pryse aan die publiek word aangemoedig maar moet asseblief nie die veld beroof om u doel te bereik nie.

Ons ontvang graag u kommentaar oor hierdie aangeleentheid.

Day Smuts  
Asook verskeie ander lede.

## E. eugene-maraisii uit veld gesteel

Berig van: Stef Schoeman

Volgens getuienis gelewer in die saak deur Natuurbewaring teen Meneer R J. Prinsloo van Morralettapark Pretoria, het hy arbeiders in die veld op 'n boerse plaas in Noord Transvaal gelos en hulle gewys hoe om die broodbome uit te haal.

Die arbeiders is in die veld opgemerk en vir terroriste aangesien waarop die polisie ontbied is. Dit het toe aan die lig gekom dat 27 plante uitgegrawe was waarvan 8 reeds verwyder en nou nog nie teruggevind is nie. Die res is intussen weer in die habitat teruggeplant. Die waarde van die 27 plante betrokke word op R70 000 beraam.

Een van die arbeiders het Meneer Prinsloo uitgewys as die opdraggewer. Sy vonnis was R20 000 skadevergoeding aan die grondeienaar plus 'n boete van R20 000 plus drie maande tronkstraf opgeskort vir drie jaar. Sy geluk was dat hy nie met all die plante op sy vragmotor betrap was nie indien hy ingewag sou wees het, want dan sou sy straf beslisswaarder gewees het en kon sy vragmotor ook in die slag gebly het.

Die afgelope tyd was daar ook 'n vlag van broodboomdiefstalle uit privaat tuine in Pretoria. Alhoewel 'n paar sake hangende is, bly die meeste klagtes onopgelos. Slegs die beste en **skaarsste** plante word geneem wat daarop dui dat slegs kenners daarby betrokke is en dat daar op 'n **georganiseerde** basis te werk gegaan word.

Die beveiliging van privaat tuine teen sulke vandalisme word 'n probleem. Dit bly ook nog 'n geheim hoe, waar en aan wie die plante verkwansel word.

Lede van die broodboomvereniging word gewaarsku om uiters versigtig te wees aan wie hulle **versamelings** (veral aan onbekendes) bekend stel en hoe hulle plante vertoon word en vanaf the straat sigbaar is.

## WEGLATING VAN SIKADEË UIT SKOOLLEERPLANNE

Ons ge-eerde president Dr Roy Osborne kla in die nr 17 uitgawe van "Encephalartos" oor die gebrek aan verwysings na sikadeë in die Suid-Afrikaanse skoolleerplanne. Hy kla daaroor dat daar relatief-gesproke soveel aandag aan die uitheemse denneplante bestee word terwyl sikadeë feitlik nie eens genoem word nie.

Dit is natuurlik vir ons almal mooi dat ons President so entoesiasties oor sikadeë is dat hy graag sal wil sien dat hulle op elke denkbare plek prominent moet figureer. Ek moet egter daarop wys dat 'n skoolleerplan nie sommer halsoorkop deur 'n paar amptenare saamgestel word nie. 'n Skoolleerplan word deur 'n komitee van ervare vakmanne opgestel en aan onder andere elke Universiteit in die land voorgelê vir kritiek en kommentaar. Uiteraard sal die finale produk nie almal se goedkeuring wegdra nie maar dit verteenwoordig gewoonlik die beste kompromis wat deur vakdeskundiges saamgestel kon word.

In 'n oorsig van die planteryk op skool kan daar alleen aan enkele voorbeelde van die hoofplant-groepe aandag gegee word. Elke sodanige voorbeeld moet dan so volledig moontlik behandel word eerder as om 'n groter aantal voorbeelde uit elke plantgroep oppervlakkig te behandel.

Onder die gimnosperme sou die keuse van die sikadeë as 'n voorbeeld in vele opsigte 'n veel swakker keuse as die den wees.

In die eerste plek is die denne ekonomies van ontsettend meer belang as die sikadeë; denneplante is ook baie meer algemeen in die verskillende dele van die land vir bestudering deur skoliere beskikbaar - beide in die sin dat dit voorhande is en dat groot hoeveelhede materiaal deur skoliere opgesny en bestudeer kan word sonder om in die tronk te beland; die feit dat die den uitheems is, is nie in die wetenskap van veel belang nie. Die natuur respekter nie nasionale en politieke grense nie en 'n studie van die natuur behoort insgelyks min waarde aan sulke aspekte te heg.

Alhoewel meeste van ons sikadeesoorte as bedreigde plante beskou word, geld dit eintlik net vir die plante in hulle natuurlike habitat. Sikadeë is sulke gesogte tuinplante dat talle eksemplare daarvan in tuine goed versorg word. Dit behoort grootliks tot die behoud van die plantsoorte by te dra alhoewel dit natuurlik verkieslik is dat groot bevolkings in hul natuurlike habitat behoue moet bly.

Vanuit 'n bewaringsoogpunt is daar talle ander plantsoorte in ons land wat baie meer as ons sikadeë deur uitwissing in die veld bedreig word en wat nie in tuine aangeplant word nie. As 'n mens in die skoolleerplan na al hierdie plantsoorte moet verwys soos wat skynbaar vir die sikadeë bepleit word, weet ek nie waar ons gaan uitkom nie en kry ek ons arme skoolgaande jeug jammer.

Nee, ons moet myns insiens bietjie meer realisties wees oor die relatiewe belang van ons geliefde plantsoorte voordat ons die onderwys en sy leerplanopstellers kritiseer.

Nat Grobbelaar

Professor in Plantkunde  
Universiteit van Pretoria

# Govt blessing for cycad deal

THE export of a container-load of endangered cycads to France in possible contravention of international conservation laws, but with the blessing of the Government, is being probed by the Progressive Federal Party.

PFP environment spokesman Rupert Lorimer has tabled questions in Parliament — expected to be answered this week — asking why a container full of cycads from the Transvaal and Eastern Cape was allowed to be shipped from Durban to Nice in March 1986, seemingly in contravention of the Convention on International Trade in Endangered Species.

Believed to be included in the consignment to Nice was an extremely valuable *encephalartos woodii* specimen, one of the rarest plants in the world and now extinct in the wild.

Mr Lorimer said he was investigating information that the shipment of cycads to France was connected to attempts to promote a French rugby tour to South Africa.

He will also ask why a permit was granted by the Cape Nature Conservation Department for a second container load of 698 cycads to be shipped from Durban to Madeira by Joe Berardo, chairman of Johannesburg Mining and Finance, when the Natal Parks Board had already refused to grant permission for the shipment.

Madeira-born Mr Berardo is presently at the centre of a political storm over his role in the sale of the former SAAN Building in Johannesburg to the city council, for which he is alleged to have earned R3.2 million.

Mr Lorimer said he believed Mr Berardo had paid East London nursery grower Trevor Berndt about R452 000

## World's rarest plant may have been exported in breach of law

By JANE CONYNGHAM and SAM SOLE

for the cycads.

Under the CITES regulations, cycads, as endangered species, may not be exported unless they are nursery grown or form part of a non-commercial exchange between two scientific institutions.

Following Sunday Tribune investigations, the Department of Foreign Affairs has confirmed it had recommended to the Department of Nature Conservation that it would be in South Africa's interests for cycads to be made available to the Nice Botanical Gardens, subject to the "applicable regulations", after a request from the South African Embassy in Paris.

A spokesman for Foreign Affairs said the cycad consignment was sold to Jean-Pierre Sclavo, director of the Nice Botanical Gardens, and the transaction was seen as an act of goodwill to Nice, twin city of Cape Town.

The Tribune has established that Mr Sclavo bought the cycads from nursery owners Ita van der Walt in the Transvaal and Bruce Bursey in East London.

A permit, required by the CITES agreement, was subsequently issued by both the Transvaal Provincial Administration and the Cape Department of Nature and Environmental Conservation.

However Cynthia Giddy, a South African representative for the International Union for Conservation of Nature's (IUCN) Species Survival Commission on cycads, alleges the plants export-

ed to Nice were 1m to 1.5m in size, indicating they were 80 to 100-year-old specimens, not nursery seedlings.

Mrs Giddy told the Tribune she had attended an international cycad convention in Nice in April 1987: "We were told a display of South African cycads at the convention, including the rare *woodii*, was part of Mr Sclavo's private collection."

A conservation source told the Tribune this week that a South African embassy representative in Paris, during a telephone conversation in 1986, had said should a permit for the cycads not be given, "a French rugby tour could be on the line".

However, the Minister of Foreign Affairs, Pik Botha, said he had no knowledge of any connection between a French rugby tour and the consignment of cycads.

Mr Sclavo told the Tribune that, as director of the Nice Botanical Gardens, he routinely made purchases around the world. He had distributed the cycads involved in the South African deal to various gardens around Nice.

Meanwhile, a spokesman for the Natal Parks Board confirmed this week that the Board had refused to grant a permit to Joe Berardo to export 698 big cycads to Madeira last August.

The Cape Department of Nature Conservation subsequently issued a permit for the shipment.

Dr Johan van Zyl, Deputy Director of Nature Conservation in the Cape, said a permit had been granted to Mr Berardo

after officials in his department had conducted an on-site investigation of the cycads.

"We were satisfied that the plants had been legally collected before all South African cycads were classified as endangered species," he said.

The Tribune this week established that a telefax sent from the Madeira Botanical Gardens to the Natal Parks Board requesting permission for the donation, was, in fact, sent from the offices of a tobacco company, Emp Madeira Tobaccos, of which Mr Berardo is president.

Keith Cooper, conservation director of the Wildlife Society, this week called for the matter to be fully investigated at the highest level.

# 'Pressure' may have led to export of huge cycad collection from SA

By Jane Conyngham

PROGRESSIVE Federal Party environmental spokesman Rupert Lorimer — who is conducting investigations into cycad deals — said this week he had information that pressure was put on the Cape Nature Conservation Department "at the highest level" to issue a permit to Johannesburg businessman Joe Berardo for a shipment of 698 cycads to Madeira last year.

Mr Lorimer intends asking further questions in Parliament about why the Cape Nature Conser-

vation Department allowed the huge consignment of full-grown cycads to be shipped out in "blatant contravention" of the Convention on International Trade in Endangered Species (CITES).

Madeiran-born Mr Berardo, chairman of Johannesburg Mining and Finance Corporation, and a National Party supporter, bought the cycads from the Berendt family in East London because, he said, he wished to donate them to the Madeira Botanical Gardens.

Last week the Sunday Tribune reported that two

large consignments of cycads — one to Nice, in France, in 1986, and the other to Madeira last August — were shipped from Durban.

Mr Lorimer is investigating information that the shipment to France might have been connected with attempts to promote a French rugby tour to South Africa.

In terms of the CITES agreement, signed by South Africa in 1975, cycads may not be exported unless they are nursery-grown seedlings or form part of a cultural exchange between two botanical institutions.

Dr Johan van Zyl, deputy director of the Cape Nature Conservation Department, said a permit granted for the shipments because the plants were legally collected before all South African cycads were classified as endangered.

Meanwhile, Trevor Berendt, the East London nurseryman named as the seller of the cycads to Mr Berardo, said this week the cycads were sold by his sons, GA Berendt and PD Berendt, and that the price was considerably less than the R452 000 stated by Mr Lorimer.

SUNDAY TRIBUNE, MARCH 12, 1989

## Explanation over cycads accepted

By JANE CONYNGHAM

PROGRESSIVE Federal Party MP Rupert Lorimer, investigating illegal cycad dealing, met Department of Foreign Affairs officials this week over a consignment of South African cycads shipped to Nice in 1986.

Mr Lorimer said after the meeting he was "totally satisfied" that while the Department of Foreign Affairs had supported the export of cycads to Jean-Pierre Sclavo of Nice, they had done so in good

faith "and did not exert any undue pressure for the deal to go ahead".

Mr Lorimer said he would continue investigations into why provincial nature departments issued permits for overseas cycad deals when these had contravened the Convention on International Trade on Endangered Species.

Mr Lorimer is also investigating illegal rhino horn smuggling from South Africa to the Far East. He expects a breakthrough "any time now".

THE DAILY NEWS, WEDNESDAY, DECEMBER 14, 1988

### NPB's numbers

Pietermaritzburg Bureau  
THE Natal Parks Board reminds that the telephone numbers at the NPB head office in Pietermaritzburg have changed.

The number for general inquiries is now (0331) 471961 and the reservations office 471981.

### BY GEORGE!



"Oh, I picked it up at the florist — they've got a bargain lot in from Madeira."

### Nutty con trick wins forgiveness

Crime Reporter

A CHRISTMAS conman found to his relief yesterday that even security officers have the festive spirit. The con artist hacked a cone of cycad seeds from the Durban City Hall gardens and tried to sell them as hazel-nuts to holiday-makers.

He was spotted by a member of the Durban Corporation security section while trying to convince a woman, his first customer, that the "hazel-nuts" were absolutely fresh. When the security officer approached, the woman — a foreigner — wanted to know why the nuts tasted so bitter.

"We arrested the man but later decided to release him because it is the festive season and it is a time to forgive and forget," said the officer.



Conservator Mr Frank Grobbelaar replants a cycad in its new surroundings.

The Star Friday March 31 1989

## 900 rare cycads resettled

By Clyde Johnson  
Lowveld Bureau

LYDENBURG — Nature Conservation officials recently resettled 900 rare cycad plants along the Eastern Escarpment between Lydenburg and the Sudwala Caves.

The *Encephalartos Humilis* plants, threatened by large plantations, were removed and taken to the Directorate of Nature Conservation's nursery at Pretoria.

A suitable site, with conditions identical to the region from where the cycads were removed, was found on a farm belonging to Mr John Rae whose property has been declared a natural heritage area.

The replanting was carried out under the supervision of Mr Frank

Grobbelaar, who is confident that the plants will do well in their new surroundings.

Every cycad was planted in a hole one metre square containing a fertilizer mixture designed to give the plant a good start.

The plants were each given a good watering but need not be irrigated again because of them being in a high rainfall area.

This is the second project of its kind to have been carried out in the lowveld.

During 1986, a thousand *Encephalartos Humilis* cycads were resettled in a nature forestry reserve.

Protected from would-be cycad poachers, the plants are thriving in their new surroundings.

Highway Mail March 17, 1989

# Leopard Moths 'on the prowl' for cycads

Highway Mail Reporter

IT seems that Westville cycad enthusiasts are being plagued by a tiny moth.

Dr Roy Osborne, Westville resident and president of The Cycad Society of Southern Africa said that local cycad growers are deeply concerned about the situation and the moth, known as the *Leopard Moth* is posing a real threat this summer.

"Many rare and valuable plants have been severely damaged and in some cases, totally destroyed," he explains.

The *Leopard Moth*, an attractive insect which seems to live exclusively on cycad plants, is able to seek out cycads over a distance of several kilometers.

Within minutes of finding a host plant, the moth lays between 50 and 100 tiny yellow eggs. These hatch out within 24 hours and quickly devour the young succulent foliage of newly emergent leaves.

The bigger larvae then proceed to bore down and eat the growing point of the stem.

"We have had the odd problems with the moth for

many years, but never as bad as this," said Dr Osborne.

It has been suggested by a nurseryman, Patrick Burgess that growers spray the plant with a long-life contact insecticide.

Dr Osborne is appealing to all residents in the Highway area to be on the lookout for the moth and to try and eradicate it.

"A few people who let the moth have its way will allow a whole new swarm of the insects to breed and infect plants throughout the area," he said.

# Greed pushes cycads to brink of extinction

OWN CORRESPONDENT

CAPE TOWN — Cycads — bread trees to some, living fossils to others — are being driven to extinction by sheer greed.

This is the view of conservationists who cite collection of these ancient and endangered plants for private gardens as the sole reason for their plummeting populations in the wild.

The export of cycads is subject to the severe restrictions of the international CITES agreement on the trade of rare, endangered or threatened species, and South Africa is a signatory.

Now a major political row has broken out over permission for the export of more than 700 cycads to Madeira.

## More than Kirstenbosch

The cycads are destined for the botanic gardens there. But local conservationists are demanding to know why so many are required — even the internationally-famous Kirstenbosch garden has only just over 600 specimens.

Of the 30-odd cycad species in South Africa, two have already become extinct and another four are on the brink of extinction — possibly down to as few as 10 or 15 specimens, according to Mr Douglas Goode of Durban Museum and author of a book on cycads now in production.

"Many species are endangered or threatened," he confirmed.

"And at least another 18 species are



Cycads . . . conservationists allege their export is being used extensively as a means of beating currency export regulations.

heading for the extinction list if nothing is done."

Why have these plants become so rare?

"First, because they grow in such incredibly difficult terrain. They are not your average plant — people just don't get to see them," Mr Goode replies.

"It's often a long, hard slog to get them, and sometimes they are only ac-

cessible by helicopter.

"Second, they are protected, so people want them.

"And third, there's the mystique of living fossils. They have been around with very little change for 150 million years — they are very stable."

Mr Goode said most cycads could be cultivated fairly easily. However, they are very slow-growing, and the biggest

and most desirable specimens may be hundreds of years old.

"To grow from seed to even a two-metre plant could easily take 100 years," Mr Goode said.

Conservationists also allege that the export of cycads is being used extensively as a means of beating currency export regulations.

Because the different species are very difficult to distinguish, and with sympathetic middlemen at foreign institutions, it's an easy matter to grossly undervalue cycads on export permits and to invest the balance overseas.

## Many tempted

"It's a well-known means of sending money overseas — people don't realise there's so much money that can be made," one remarked.

There is also a substantial local market for cycads — and many are tempted by the high prices offered.

In a recent case a Pretoria man was fined R20 000 or three years in jail in Nylstroom Magistrate's Court for removing 27 cycads from a farm in the Waterberg district.

Conservationist Mr John Comrie-Greig calls the exploitation of the species "a rich man's fad" which has grown in momentum over the past 20-odd years.

"Fines are laughable because the profits of stealing cycads outweigh these fines so heavily," he said.

THE DAILY NEWS, WEDNESDAY, APRIL 19, 1989

# State criticised for allowing export of cycads to Madeira

CAPE TOWN: Permission was given by the State for the export of 725 "priceless" cycads worth about R700 000 to Madeira because all conditions set out in an international conservation agreement had been met, Minister of Constitutional Development and Planning, Mr Chris Heunis, said in Parliament yesterday.

But Mr Rupert Lorimer (DP, Bryanston) said it appeared the exporter, Johannesburg businessman Mr Joe Berardo — "a friend of the National Party" who seemed to have "influence" — had apparently managed to "bend the regulations and export priceless specimens" which were classified as "endangered".

Speaking during a mini-inter-

## Parliamentary Correspondent

pellation debate on a question by Mr Lorimer, Mr Heunis said that according to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (Cites) trade in certain species of cycads was permissible if certain conditions were met.

These were that the export must not be detrimental to the species, that the State must be satisfied the specimens were not obtained illegally, that the State of export was satisfied the specimens were prepared and shipped in a way which minimised risk of damage, and that the State of export was satisfied the State of

import had issued an import permit.

Mr Heunis said: "In the case of the export of cycads to Madeira, all these requirements had been met and accordingly there was no reason not to issue the Cites permit."

Mr Lorimer said that whatever the technicalities of the argument, he could not understand how these "priceless, living fossils that were possibly starting their growth when Van Riebeeck arrived at the Cape" could have been allowed to leave South Africa.

He believed it amounted to a contravention of the spirit and probably the letter of the Cites agreement and he appealed for an urgent Government investiga-

tion.

He said he could not believe an export permit could have been granted unless "pressure was exerted by someone . . . and it must have come from high up".

"What special pull did Joe Berardo have?" He asked.

Mr Clive Derby-Lewis (CP, Nominated) asked whether it had been established that the plants had really ended up at the Madeira botanical gardens, or whether they were actually in the grounds of a new hotel being built there with South African capital.

Mr Heunis said that if Mr Lorimer had evidence of irregularities, he should set it out in an affidavit to the authorities.

## SAADBANK

Saad van die volgende broodboomspecies is nou beskikbaar of verwag:

Encephalartos natalensis  
E. villosus  
E. transvenosus  
E. friderici-quilielmi  
Stangeria eriopus  
Cycas media  
C. thouarsii  
Macrozamia miquelii

Danie Nel  
Saadbankbeampte  
Bowkerweg 120  
4093 ESCOMBE  
Tel 031-442505 na 17h00

## SEEDBANK

Seed of the following cycad species is now available or expected:

Encephalartos natalensis  
E. villosus  
E. transvenosus  
E. friderici-quilielmi  
Stangeria eriopus  
Cycas media  
C. thouarsii  
Macrozamia miquelii

Danie Nel  
Seedbank Officer  
120 Bowker Road  
4093 ESCOMBE  
Tel 031-442505 after 17h00

### FOR SALE

E. friderici-quilielmi seed @ R30.00 per 100 including postage and GST.

Delivery: June/July 1989

Apply: L Forrester  
P. O. Box 26  
Cathcart  
5310

Tel: 04562-2003

Hein Ungerer (P. O. Box 279  
Meilville 2109, tel: (011)  
837-6890 (home) is still looking  
for cycad seed in small  
quantities. Any South African  
and other Encephalartos species  
from the rest of Africa. He is  
quite prepared to make the  
necessary financial  
contributions.

### NURSERY NEWS

Members who read the Farmer's Weekly will have seen the report "Growing Demand for Indigenous Plants" which appeared in the April 14, 1989 issue, pages 49-51. The report tells of Mrs Corné Oosthuyzen's Patryshoek nursery north of Pretoria and gives details of her seed-collecting activities, germination techniques, potting mixture, watering and fertilising systems. Mrs Oosthuyzen offers 10 species of cycad for sale at the moment and several other indigenous plants including baobabs, lepelhout, wild plum, fever trees and cabbage trees.

Leonard McDowell  
3650 Bell Road  
NE Salem  
Oregon 97301  
USA

Would like to purchase seed of E. natalensis and E. villosus. He has Zamia pumila to offer.

THE CYCAD SOCIETY OF SOUTHERN AFRICA  
BALANCE SHEET AS AT THE 31st DECEMBER 1988

	<u>NOTES</u>	<u>1988</u> R	<u>1987</u> R
<u>CAPITAL EMPLOYED</u>			
CAPITAL FUND ACCOUNT	2	9672	4952
		<u>9672</u>	<u>4952</u>
<u>EMPLOYMENT OF CAPITAL</u>			
FIXED ASSETS	3	36	48
Educational Equipment			
NET CURRENT ASSETS		9639	4904
<u>CURRENT ASSETS</u>			
		15055	5726
Bank		12908	4417
Debtors		81	400
Petty Cash		5	5
Stock	4	2061	904
<u>CURRENT LIABILITIES</u>			
		5419	822
Prepaid Subscriptions		5419	579
Creditors		-	243
		<u>9672</u>	<u>4952</u>

THE CYCAD SOCIETY OF SOUTHERN AFRICA  
INCOME STATEMENT FOR THE YEAR ENDING 31 DECEMBER 1988

	<u>NOTES</u>	<u>1988</u> R	<u>1987</u> R
<u>INCOME</u>			
		17548	12346
Advertisements		-	100
Commissions		-	-
Donations		674	789
Donations - Seedbank		2036	1908
Encephalartos: Back-copies		1074	1401
Fundraising - Natal		-	145
Interest Received		382	269
Posters	8	654	-
Plantbags	7	131	-
Subscriptions		12597	7734
<u>EXPENDITURE</u>			
		12828	10158
Bank Charges		125	66
Depreciation		12	13
Encephalartos	6	9286	6599
Encephalartos: Back-copies	5	1047	1275
Entertainment		56	12
General		242	-
Postage		470	437
Printing		-	294
Seedbank	9	1155	892
Stationary		328	398
Telephone		63	62
Travelling		35	-
Typing		9	110
NET SURPLUS for the year		4720	2188
UNAPPROPRIATED SURPLUS - beginning of year		4952	2764
UNAPPROPRIATED SURPLUS - end of year		<u>9672</u>	<u>4952</u>

THE CYCAD SOCIETY OF SOUTHERN AFRICA  
NOTES TO THE FINANCIAL STATEMENTS  
FOR THE YEAR ENDING 31 DECEMBER 1988

1. ACCOUNTING POLICY  
During 1988 the accounting policy of the previous years was adhered to

	<u>1988</u> R	<u>1987</u> R
2. UNAPPROPRIATED SURPLUS		
Society	7046	3207
Seedbank	2626	1745
	<u>9672</u>	<u>4952</u>
3. FIXED ASSETS		
Educational equipment consists of cycad slides.		
Cost price	64	64
LESS: Depreciation	28	16
	<u>36</u>	<u>48</u>
4. STOCK		
Encephalartos	1996	904
Posters	5	-
Postcards	60	-
	<u>2061</u>	<u>904</u>
5. BACK COPIES		
Postage	929	1096
Printing	-	148
Stationery	118	31
	<u>1047</u>	<u>1275</u>
6. ENCEPHALARTOS - COST		
Printing	5801	3346
Postage	4063	3166
Stationery	514	507
Plus: Opening Stock	904	484
Less: Closing Stock	(1996)	(904)
	<u>9286</u>	<u>6599</u>
7. PLANT BAGS		
Sales	709	-
Purchases	578	-
	<u>131</u>	<u>-</u>
8. POSTERS		
Sales	908	-
Purchases	254	-
	<u>654</u>	<u>-</u>
9. SEEDBANK EXPENSES		
Seed purchases	434	532
Postage	710	358
Stationery	11	2
	<u>1155</u>	<u>892</u>

I hereby declare that I am not a member of the Society and that I have no interest in the financial affairs of the Society. The Cash Book and Ledger of the Society has been written-up from documents and information provided to me by the President of the Society.

I therefore certify that the attached Income and Expenditure statement and the Balance Sheet is in accordance with the information provided and reflects a true and fair representation of the income and expenditure and the financial position of the Society as at 31<sup>st</sup> December, 1988.

HERMANUS  
20<sup>th</sup> February 1989

Signed: L M D VORSTER

# CYCAD 90

## THE SECOND INTERNATIONAL CONFERENCE ON CYCAD BIOLOGY

Townsville, Queensland, Australia : 22-27 July 1990

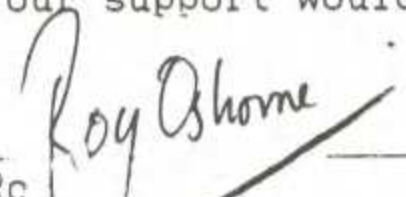
African representative on the Organising Committee :-  
Dr Roy Osborne, 20 Maryvale Road, 3630 WESTVILLE.

Dear Members of the Cycad Society of Southern Africa.

CYCAD 90, the Second International Conference on Cycad Biology will be held at Coutts' Burdekin Resort, Townsville, Queensland, Australia, over the period 22-27 July 1990. An exciting programme of lectures, panel discussions, poster presentations and social events is being planned. One or more tours of several days will be arranged for those who want to visit important cycad localities after the Conference.

We would like to see a strong representation from Southern Africa. If you are at all interested in attending, please complete the form below and return it to me as indicated.

The travel costs are unfortunately high. Several of our members who would like to participate by presenting lectures or posters at the Conference will be unable to attend without financial support. May I appeal to members to consider if they can possibly assist with *any* donation towards these costs? Your support would be truly appreciated.

  
Rc \_\_\_\_\_  
for CY 90 Organizing Committee

-----  
REPLY FORM

TO: Roy Osborne, 20 Maryvale Road, Westville. 3630.

I am interested in attending CYCAD 90. Please send me details of the Conference programme, travel costs, registration fees and accommodation expenses.

I would like to contribute towards the costs of sending delegates from Southern Africa to CYCAD 90 who will be presenting material at the Conference and who would not otherwise be able to attend. I enclose my cheque/postal order/cash to the value of R..... (Cheques to be made out to CYCAD 90).

Name: .....

Address: .....

.....  
.....Code: .....

Signed \_\_\_\_\_ Telephone No. \_\_\_\_\_ Date: \_\_\_\_\_

# OFFICE-BEARERS

# AMPSDRAERS

## PRESIDENT

Roy Osborne  
20 Maryvale Road/Maryvaleweg 20  
Westville 3630  
Tel No. 031-856953

## REGIONAL CHAIRMAN/STREEKSVOORSITTERS

### - EASTERN CAPE/OOSKAAP

Frank Marx  
20 Kurumankloof/Kurumankloof 20  
Summerstrand  
Port Elizabeth 6001  
Tel No. 041-532870

### - NATAL

Danie Nel  
120 Bowker Road/Bowkerweg 120  
Escombe 4093  
Tel No. 031-442505

### - NORTH-EASTERN TRANSVAAL/ NOORDOOS-TRANSVAAL

Vacant/Vakant  
Acting/Waarnemend:  
Loren Bronkhorst  
P O Box/Posbus 3226  
Pietersburg 0700

### - EUGENE MARAIS

Stef Schoeman  
95 Erich Mayer Street/Erich  
Mayerstraat 95  
Pretoria North/Noord 0182  
Tel No. 012-552082

## MEMBERSHIP OFFICER/LIDMAATSKAPBEAMPTE

Pieter Stroebel  
P O Box/Posbus 189  
Port Elizabeth  
600  
Tel No. 041-661816

## SEED BANK OFFICER/SAADBANKBEAMPTE

Danie Nel  
120 Bowker Road/Bowkerweg 120  
Escombe 4093  
Tel No. 031-442505

## POLLEN EXCHANGE OFFICER/ STUIFMEELRUILBEAMPTE

Cynthia Giddy  
P O. Umlaas Road/Pk. Umlaasweg  
3730  
Tel No. 03325-478

## ENCEPHALAROTS

### - EDITOR/REDAKTEUR

Neil Munro  
Bunny Wentzel  
P O Box/Posbus 89101  
Lyndhurst 2106  
Tel No. 011-7862007  
011-8823244

### - PRINTING AND DISPATCH OFFICER/ DRUKWERK EN VERSENDINGSBEAMPTE

Piet Vorster  
Department of Botany/  
Department Plantkunde  
University of Stellenbosch/  
Universiteit Stellenbosch  
Stellenbosch 7600  
Tel No. 02231-78909

### - BACK COPIES OFFICER/ VORIGE UITGAWES-BEAMPTE

Roy Shooter  
16 Benjamin Road/Benjaminweg 16  
Fynnlans  
Durban 4052  
Tel No. 031-4662002

## OVERSEAS CORRESPONDENTS/ OORSESE VERTEENWOORDIGERS

### - U.S.A./CANADA

Douglas Atwater  
P. O. Box 3524  
San Luis Obispo  
California 93403  
Tel No. 805-5498018 (H)

### - AUSTRALIA

Paul Kennedy  
21 Sierra Road  
Engadine  
N.S.W. 2233

### - NEW ZEALAND

Keith Boyer  
70 Opanuku Road  
RDI Henderson Valley  
Auckland  
Tel No. 837-0394