

# ENCEPHALARTOS

JOURNAL OF THE  
CYCAD SOCIETY OF  
SOUTHERN AFRICA

NO. 10

TYDSKRIF VAN DIE  
BROODBOOMVERENIGING  
VAN SUIDELIKE AFRIKA

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## EDITOR/REDAKTEUR

Maans Kemp  
51 Constance Road/Constanceweg 51  
Broadwood  
PORT ELIZABETH 6065  
Tel. no. 041-323344 (H)  
533121, Ext./Uitbr. 245 (W)

## VOORBLAD/COVER

**Encephalartos villosus**

## EDITORIAL

It is a fact that cycads in their natural environment are not only endangered and destroyed by collectors and speculators. Thousands of cycads have already been destroyed during the building of roads and dams, as well as during the "clearing" of areas for the establishment of cultivated lands, forest plantations and urban areas. Some South African species have to such an extent been wiped out or restricted to inaccessible places that they are hardly susceptible to any further threat of this nature. There are still some species, however, that are threatened in this way, including probably Stangeria eriopus, Encephalartos horridus, E. arenarius, E. caffer, E. villosus, E. altensteinii, E. ngoyanus, E. natalensis and others. It is therefore not only a problem of the past, but also of the present and the future.

The question arises: What can be done to prevent our shrinking cycad heritage from being further endangered by

## REDAKSIONEEL

Dit is 'n feit dat broodbome in hulle natuurlike staat nie net deur versamelaars en spekulante bedreig en uitgewis word nie. Duisende broodbome is al vernietig tydens die bou van paaie en damme, asook gedurende die "skoonmaak" van gebiede vir die aanlê van landerye, bosbouplantasies en dorpsgebiede. Sommige Suid-Afrikaanse spesies is al tot so'n mate uitgeroei of tot onherbergsame plekke beperk, dat hulle kwalik verder deur hierdie soort bedreiging geraak word. Daar is egter nog spesies wat op hierdie manier bedreig word, insluitende waarskynlik Stangeria eriopus, Encephalartos horridus, E. arenarius, E. caffer, E. villosus, E. altensteinii, E. ngoyanus, E. natalensis en andere. Dit is dus nie net 'n probleem van die verlede nie, maar ook van die hede en die toekoms.

Die vraag ontstaan: Wat kan gedoen word om te verhoed dat ons krimpemde broodboomerfenis verder deur "ontwikkelingsprojekte" bedreig word?

EDITORIAL  
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REDAKSIONEEL  
- VERVOLG -

"development projects"? Perhaps asking a few questions concerning the past could help us: Were nature conservation bodies and authorities aware of proposed developments which would affect cycads (and other endangered plants and animals)? If they were aware, or even if they found out afterwards, did they do anything about it? What happened to the cycads which were removed during such developments? If it was inevitable that cycads would be removed, were attempts made to re-establish them in "safe" areas? If such re-establishment was impossible, how many of these cycads found their way into botanical gardens and other public parks?

In the light of these questions, we would like to make the following submissions:

- It should be compulsory for any institution or person who contemplates developments which would result in the destruction of any natural areas, to notify the relevant nature conservation authority.
- Nature conservation and other authorities should, in co-operation with bodies such as the Cycad Society, launch ecological surveys before developments are approved.
- Even if the above-mentioned two steps are not taken, nature conservation authorities should continuously be on the look-out for developments which threaten the habitat. Where they become aware of such developments, effective inspections should be carried out to prevent malpractices.

Miskien kan dit help om 'n paar vrae ten opsigte van die verlede te vra: Het natuurbewaringsliggame en -owerhede kennis gedra van beoogde ontwikkelings wat broodbome (en ander bedreigde plante en diere) sou raak? Indien hulle wel daarvan kennis gedra het of dit selfs later uitgevind het, het hulle iets daaraan gedoen? Wat het van die broodbome geword wat tydens sulke ontwikkelings verwyder is? Indien dit onvermydelik was dat broodbome in die slag sou bly, is pogings aangewend om hulle op ander "veilige" gebiede te hervestig? Indien sodanige hervestiging nie moontlik was nie, hoeveel van hierdie broodbome het hulle weg na botaniese tuine en ander openbare parke gevind?

In die lig van hierdie vrae, stel ons graag die volgende standpunte:

- Dit behoort verpligtend te wees dat enige instansie of persoon wat ontwikkelings beoog wat die vernietiging van enige natuurlike gebiede tot gevolg sal hê, die toepaslike natuurbewaringsowerhede daarvan moet verwittig.
- Natuurbewarings- en ander owerhede behoort, in samewerking met liggame soos die Broodboomvereniging, ekologiese opnames te maak voordat ontwikkelings goedgekeur word.
- Selfs as bogenoemde twee stappe nie gedoen word nie, behoort natuurbewaringsowerhede voortdurend op die uitkyk te wees vir ontwikkelings wat die habitat bedreig. Waar hulle van sodanige ontwikkelings bewus word, behoort doeltreffende inspeksies gedoen te word om wanpraktyke te verhoed.

EDITORIAL  
- CONTINUED -

- Members of the Cycad Society should inform the relevant nature conservation authorities of developments of which they are aware. The distribution areas of South African cycads are fairly well known and it should not be difficult to know when cycads are threatened.
- If the removal of cycads should be inevitable, attempts should be made to re-establish them in conservation areas. The nature conservation authorities, the developer concerned and the Cycad Society should co-operate in such a project.
- If re-establishment in nature is not possible or feasible, the cycads should be re-established in botanical gardens, where they would be available for reproduction and research purposes.

One thing is certain: we can no longer afford to allow one single cycad to be lost. It is worth our while to all work together to prevent this.

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.

REDAKSIONEEL  
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- Lede van die Broodboomvereniging behoort die toepaslike natuurbewaringsowerhede te laat weet van ontwikkelings waarvan hulle bewus is. Die verspreidingsgebiede van Suid-Afrikaanse broodbome is redelik goed bekend en dit behoort nie moeilik te wees om te weet wanneer broodbome moontlik bedreig word nie.
- Indien die verwydering van broodbome onvermydelik is, moet pogings aangewend word om hulle in bewaringsgebiede te hervestig. Die natuurbewaringsowerhede, die betrokke ontwikkelaar en die Broodboomvereniging behoort saam te werk in so'n projek.
- Indien hervestiging in die natuur nie moontlik of wenslik is nie, behoort die broodbome in botaniese tuine hervestig te word, waar hulle vir voortplantings- en navorsingsdoeleindes beskikbaar sal wees.

Een ding is seker: ons kan dit nie verder bekostig om toe te laat dat een enkele broodboom verlore gaan nie. Dit is die moeite werd om almal saam te werk om dit te verhoed.

Menings wat in die redaksionele artikel uitgespreek word, is dié van die Redakteur en verteenwoordig nie noodwendig die beleid van die Broodboomvereniging nie. In-gelyks 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.

# CYCAD 87

by Roy Osborne

The First International Conference on Cycad Biology was held at the picturesque town of Beaulieu-sur-Mer on the French Riviera over the period 18 to 22 April 1987. Amongst the delegates and invited speakers were 15 members from our Society. In the welcoming address, it was said that this was one of the most distinguished gatherings of botanists to have been held in France this century! Certainly principal organisers Jean-Pierre Sclavo, Paolo de Luca and Aldo Moretti are to be congratulated on a superb programme which included a major exhibition (live plants, museum specimens, photographs and posters), a series of 18 lectures on cycad biology (biogeography, taxonomy, conservation, reproduction, physiology, phytochemistry, etc.) and tours to several fascinating local gardens (The Exotic Garden at Monaco, the 'Les Cedres' garden of the Marnier family at St. Jean-Cap-Ferrat and the historically-famous Thuret Garden at Antibes).



Cycad colleagues Dennis Stevenson, Aldo Moretti and Paolo de Luca. The trunk behind them belongs to an impressive Chilean palm, *Jubaea spectabilis*.

The venue for Cycad 87, La Rotonde, with its graceful turn-of-the-century architecture.





Many of the world's leading cycad taxonomists attended the conference. Pictured here are, from left to right: Jean-Pierre Sclavo (France), Mario Vasquez-Torres (Mexico), Paolo de Luca, Sergio Sabato, Gesualdo Siniscalco Gigliano, Aldo Moretti (all from Italy) and Dennis Stevenson (USA).

It was very pleasing to hear so many good reports on our journal ENCEPHALARTOS. Without exception the surprisingly large number of delegates who had seen previous issues had nothing but praise to offer and I am delighted to pass these comments back to Maans Kemp.

Exciting news at the conference was the report of new cycad discoveries in Columbia, reported by Dennis Stevenson. The plants, with distinctive midribs in the leaflets, differ so much from other cycads that a new genus, Chiqua, has been created. So far two species,

Chiqua bernalii and C. restrepoi have been reported. It is also possible that yet another genus, somewhat similar to Encephalartos, may await discovery in Columbia. Evidence for this comes from the unearthing of certain documents and paintings in a castle in Madrid, which report on an expedition led by one Celastino Matis in the late 1700's to central America, where a most unusual cycad seems to have been seen. Dennis also presented cladistic diagrams which showed possible relationships within and between the four families and the eleven genera in the Cycadales (see diagram).

An impressive display of posters and photographs formed a popular part of the exhibition.

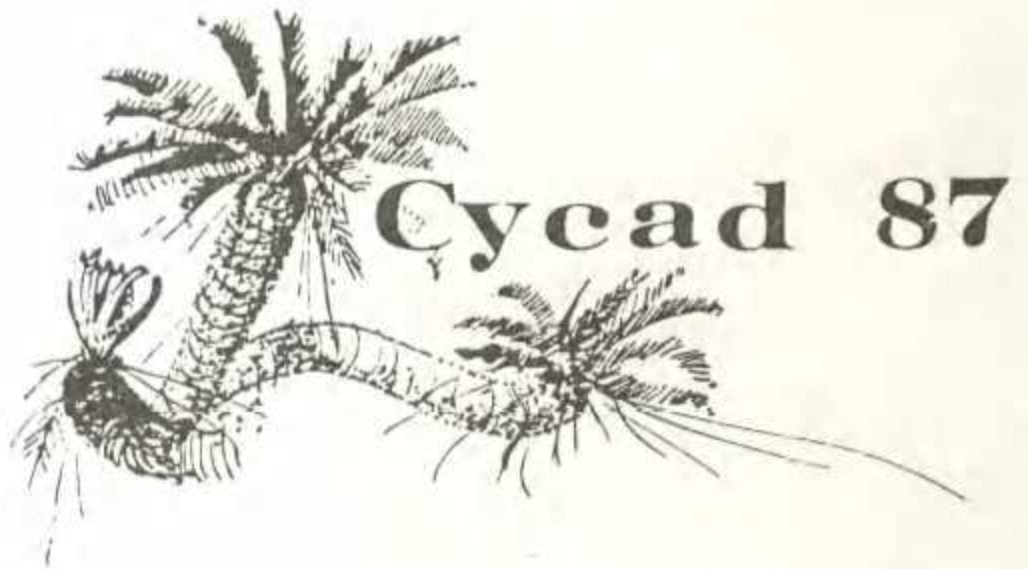




Delegates during a visit to the Monaco Exotic Garden. In the foreground, from left to right: Mrs and Prof. Paolo de Luca, the Director of the Gardens and the highly-efficient General Factotum, Marianne.

On the genus Encephalartos, Prof. Francois Malaisse (Belgium) told us of the state of work on the central African species. Three new taxa are in the process of being described: E. iturien-sis, E. voiensis and E. sclavoi. A curious story told by Prof. Malaisse is that elephants seem fond of the female cones of several Encephalartos species and viable seeds are often found in elephant excrement, which seems to provide the germinating seeds with a healthy start in life. The position of some Encephalartos taxa remains uncertain: it is possible that E. "Jinga", E. "Toro", E. "turneri", E. "reinwaldii/cerinus" and E. "Msinga" may eventually constitute new species. No decision has yet been made on the botanical status of E. "Piet-retiefii" and the divisions within E. eugene-maraisii. Many delegates at the congress were of the opinion that taxonomists should no longer work on cycad genera in isolation, but that a uniform taxonomic philosophy must be applied to all genera in the Cycadales. Surely an intelligent compromise between the 'splitters' and the 'lumpers' must result from this approach. The importance of biochemical and enzymological data, as a supplement to morphological criteria in determining taxonomic relationships, was noted.

Prof. Divya Darshan Pant from India inspects a specimen of Encephalartos lehmannii in the Thuret Garden at Antibes



Delegates were pleased to hear that the name Dion has now been dropped in favour of the original Dioon spelling.

Further interesting news was the discovery in Argentina of a fossil cycad which seems unusually similar to Stangeria. Other fossils of non-American genera seem to be present and may well contribute to our knowledge of early cycads.

Amongst the delegates at the conference, we were especially honoured to meet Prof. Divya Pant from Allahabad, who is busy with a new edition of his book "Cycads and the Cycadales" (see review in ENCEPHALARTOS no. 7, page 19). With respect to Cycas, a stimulating presentation by Dr Zhou Cheng detailed the discovery of Cycas panzhihuaensis in China and the means used to propagate this species with reintroduction of plants to the habitat area.

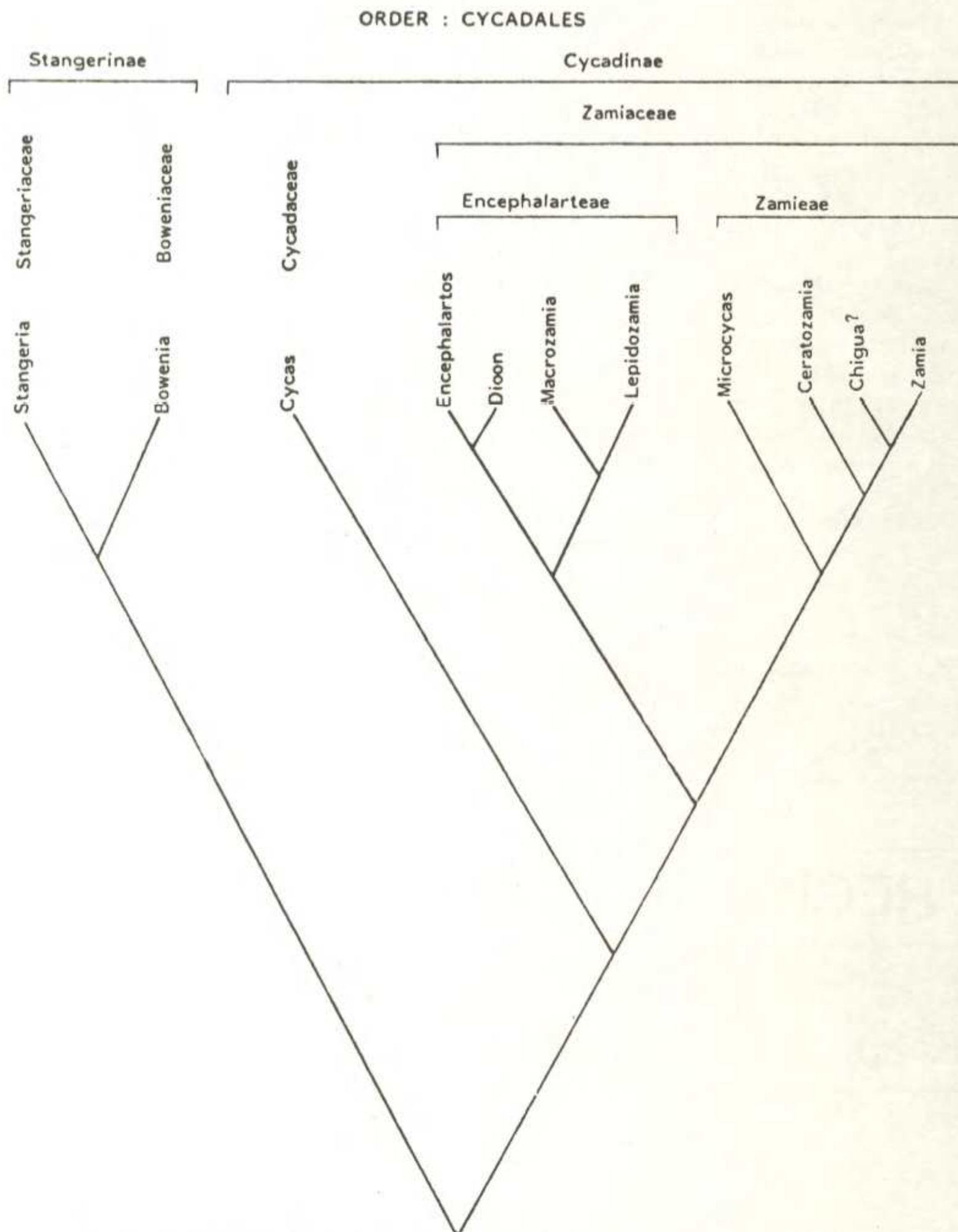


Figure 1 : One of the current cladistic diagrams showing possible relationships within and between the four families and eleven genera in the Cycadales. (Stevenson, pers. comm.)

Our own committee contributed to the proceedings with addresses by Cynthia Giddy on "Conservation through Cultivation" and Roy Osborne's lecture on cycad tissue culture work. The question of sex chromosomes and sex reversals was debated at length and it is clear that research into these topics is urgently needed to answer many of the questions raised. Knut Norstog has illustrated that carefully-controlled intertaxon breeding experiments can provide useful information in taxonomic research.

We were pleased to see Pat and David Coutts from Australia and also to see the magnificent specimen of *Cycas* "Glen Idle Blue" (see ENCEPHALARTOS no. 5, page 29) which they had brought with them. The status of this plant, and also of the *Cycas* "Marlboro Blue" and *C.* "Cox Peninsula" remains to be fully investigated. A decision was taken that the next conference would be held at Bramston Beach, some 50 km south of Cairns, Australia, probably in July 1989. Roy Osborne has been appointed to the organising committee and will thus be able to keep local members fully informed of developments.

In view of the importance of the Nice Conference, the papers are to be published in full by kind arrangement with the New York Botanical Garden. Members will be informed in due course how to obtain a copy of this volume and selected reprints will also be published in future editions of ENCEPHALARTOS.



Roy Osborne admires a specimen of *Encephalartos longifolius* in the Thuret Gardens at Antibes

## REGIONAL NEWS      STREEKNUUS

### Oos-Kaap / Eastern Cape

Ongeveer twintig lede van die Vereniging se Oos-Kaapse tak het op 9 April 'n byeenkoms in Port Elizabeth bygewoon. By die geleentheid het mnr. Ron van Pletzen 'n baie interessante praatjie gelewer oor broodbome in die algemeen en oor sy jarelange ondervinding van broodbome in hulle natuurlike habitat, sowel as in parke en tuine. Mnr. Van Pletzen, wat nou afgetree is, was onder andere verbonde aan die munisipale parkedepartemente van Durban, Uitenhage en Port Elizabeth.

# FAMILY TREE

A North-eastern Transvaal member of the Society has kindly sent us the following series of photographs which depicts the growth of a specimen of Encephalartos transvenosus in a fascinating way. The plant, a female, started its life history as a seedling in 1966 and, was planted in the

member's garden, where it has since been dependent on rainfall only. In 20 years' time it has grown to a stem height of 1,2 m and a stem diameter of 68,5 cm. It coned for the first time in 1981, at the age of 15 years, and subsequently at regular two-year intervals (1983, 1985 and 1987).

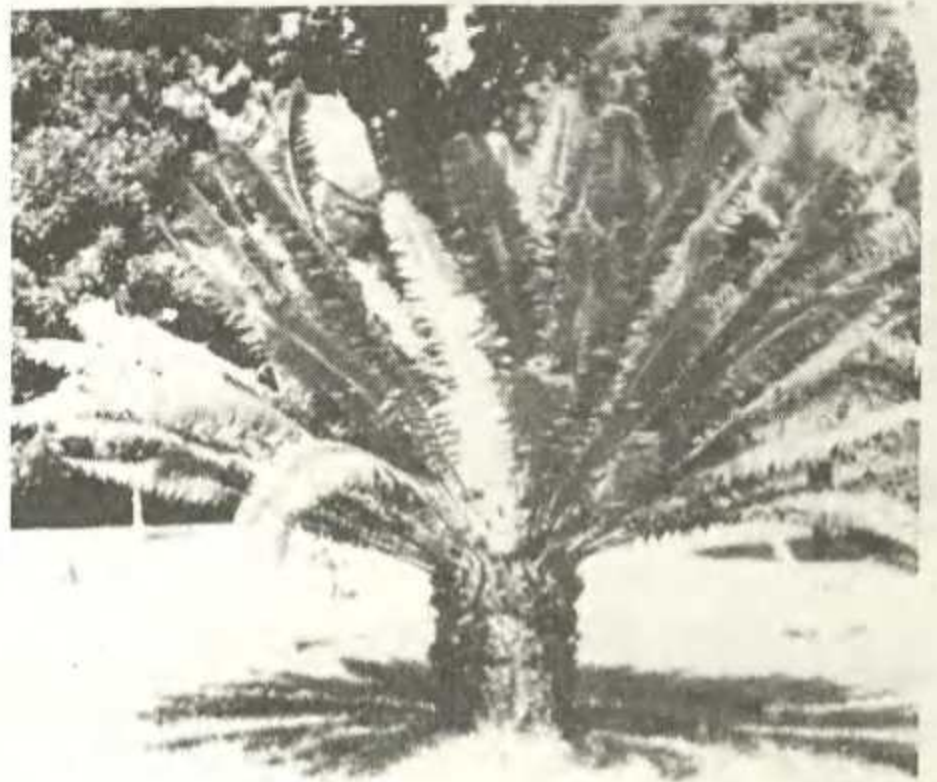


1972

Six year old E. transvenosus female, with pregnant young mother

1983

Seventeen year old plant, eleven years later, with three cones



1986

Same plant, twenty years old, with daughter at age fourteen

# HYBRIDIZATION IN ENCEPHALARTOS

by Piet Vorster

## SUMMARY

Known natural and artificial hybrids in Encephalartos (fam. Zamiaceae) are listed and briefly described. Suggestions are proffered on the production of horticulturally desirable hybrids.

## INTRODUCTION

Although hybridization has in the past played a major part in the development of agricultural crops and ornamental plants, relatively little has yet been done with African plants. Readers will be familiar with the spectacular hybrids produced in the genus Aloe which were nevertheless the results of limited and rather superficial hybridization.

Hybrids are interesting, firstly because the degree of ease with which species can be hybridized provides an indication of how closely they are related to each other. Hybridization can thus be an aid in classification. Often, especially if the two parents were not very closely related to each other, hybrid offspring are sterile or at least less fertile than their parents were. The degree of sterility of a hybrid plant is therefore also an indication of how closely the two parents were related to each other - generally the more fertile the hybrid, the more closely the two parent species were related to each other. A second reason why hybrids are of interest, is because of the phenomenon of hybrid vigour. When two somewhat distantly related species are hybridized, the offspring often exhibits a vigorous growth, far in excess of that of either parent. In slow growing plants such as cycads, this trait would be particularly useful, enabling the production of fair-sized plants within a reasonably short time. A third reason for producing hybrids in cycads is that it offers almost unlimited possibilities to produce plants of a desired size with fronds of a particular length, spi-

niness, fineness and colour. The beauty of a cycad garden lies in the subtle interplay of variants of these characteristics and it is an attractive prospect to be able to breed plants to meet a particular need. For instance, the author has always thought that a plant like Encephalartos horridus, but with bright green glossy fronds, would be particularly attractive. In landscaping with cycads there is also a definite need for really small plants, like E. caffer or even smaller, with dense crowns of fronds.

Few chromosome counts have been made on Encephalartos, but what are available point to a number of  $2n = 18$ . This in turn suggests that all species of Encephalartos are genetically compatible, though this seems unbelievable in the light of the variation in external morphology.

Unlike the species of tropical Africa, those of Southern Africa are relatively well-known. Judging by the external morphology of the fronds and cones, the latter can be classified into a number of groups of closer related species, e.g. E. horridus, E. lehmannii and E. trispinosus; possibly E. arenarius and E. latifrons; E. altensteinii, E. leomboensis, E. natalensis and E. woodii; E. villosus, E. umbeluziensis and perhaps E. hildebrandtii; E. eugene-mairisii (in all its variations) and E. cupidus; E. paucidentatus and E. transvenosus; E. chimanimaniensis, E. concinnus, E. gratus, E. manikensis and E. pterogonus; E. marunguensis, E. poggei and E. schmitzii; E. cycadifolius and E. ghellinckii; E. humilis, E. laevifolius and E. lanatus.

Southern African species of uncertain affinities are E. caffer, E. ferox, E. heenanii, E. inopinus, E. munchii, E. ngoyanus and E. princeps. E. longifo-

lius probably belongs in either the group of E. horridus, E. lehmannii and E. trispinosus, or in the E. arenarius/E. latifrons group. The reasons for assigning the species to these respective groups are unfortunately outside the scope of the present article. Significantly the species are geographically distributed in such a way that in several places species within the same group occur quite close together. Under such conditions one would expect a reproductive barrier to be in operation in order to prevent hybridization and subsequent breakdown of the respective species in the eventuality of the species expanding their distribution range and coming into contact with each other. As the species within each group are thought to have evolved from common ancestors, the existence of such reproductive barriers is almost a foregone conclusion. Yet such barriers do not seem to be genetical in nature, as the following inventory suggests, but should rather be sought in characteristics such as different habit preferences and different flowering times. Though undoubtedly true, it nevertheless is amazing that plant species which in cultivation are so tolerant of a wide range of environmental conditions, are in nature confined to habitats which hardly appear to differ from others where the species are absent.

#### NATURAL HYBRIDS

A number of suspected natural hybrids have been recorded, but they are relatively rare, for the simple reason that two or more species are seldom found intermingled in nature and, if they do occur together, it is rare for their cones to reach maturity at the same time. The following natural hybrids have been reported:

E. altensteinii x E. trispinosus - this is perhaps the best-known hybrid. The two parent species occur together in places and appear to hybridize freely. A quite bewildering range of intermediate forms occur which suggests backcrossing with the parent species, but the influence of cytoplasmic inheritance (i.e. which species constituted the female parent) should be kept in mind. In their typical form these hybrids have somewhat longer fronds than E. trispinosus, or else they are grey with small teeth. The so-called green-leaved form of E. trispinosus is in fact such a hybrid.

E. altensteinii x E. villosus - almost completely intermediate between the parent species in respect of their frond and cone characteristics, and with a short exposed stem. The reduction of the lower leaflets to a number of prickles along the petiole in a plant with an exposed stem is often an indication of this hybrid. Male and female plants are exhibited in the garden of the Botanical Research Institute in Pretoria, and illustrations can be seen in Giddy (1984, p. 109).

E. altensteinii x E. latifrons - a rare hybrid, understandably so since E. latifrons is itself so rare. It is intermediate between the two parent species and, in the specimens seen, the overlapping leaflets of E. latifrons were inherited to a remarkable degree. Illustrated by Giddy (1984, p. 109).

E. altensteinii x E. arenarius - hybrids have been reported by some collectors as well as by Giddy (1984, p. 29), but were not seen by the author.

E. horridus x E. longifolius - these two species occur together in at least one locality, where a number of hybrids have been found. The plants seen had blue-green fronds, greener than in E. horridus and more or less intermediate in colour between the two parent species. The fronds are slightly longer than those of E. horridus and toothed more or less as heavily as in E. horridus. Illustrated by Giddy (1984, p. 109).

E. lebomboensis x E. villosus - reported by Giddy (1984, p. 29). In the National Herbarium in Pretoria there is a herbarium specimen from the Josini area which is thought to represent this hybrid. It has long and wide leaflets, somewhat sickle-shaped as in E. villosus, and must have been a beautiful plant in life.

In this article, cone characteristics will not be discussed, because very few cones of hybrids have been seen. The author would be grateful for the loan of photographs depicting cones of hybrids.

#### HYBRIDS EXPECTED BUT NOT CONFIRMED

In a number of instances two species occur close together and one would expect hybridization to take place under such conditions. Examples of hybrids which could be expected but have not been confirmed, include:

E. caffer x E. longifolius - when first discovered, these two species were apparently found growing close together and were considered to represent juvenile and adult stages respectively of the same species (Dyer, 1965, p. 477). It could not, however, be confirmed by the author that the two species do in fact grow close enough to each other to permit hybridization, and no putative hybrids are known.

E. friderici-guilielmii x E. princeps - in the vicinity of Cathcart these two species approach each other fairly closely, but the author has not seen them within sight of each other. No apparent hybrids were seen, and their coning times are suspected to differ.

E. lanatus x E. eugene-maraisii - in the Middelburg area of the Transvaal, these two species occur so closely together that one would expect hybrids to occur, yet none have been recorded. Once again different coning times are suspected to prevent hybridization.

E. laevifolius x E. paucidentatus, and E. laevifolius x E. heenanii - these three species are known to occur fairly close together in places, so that hybrids between E. laevifolius and the other two species may be expected. No such hybrids are however known to the author. A suspicion that E. heenanii is a hybrid between E. laevifolius and E. paucidentatus is unsubstantiated. Here also differences in coning time and habitat preferences should suffice to isolate the species from each other.

E. lehmannii x E. horridus - plants from about 50 km north of Uitenhage appear to be intermediate between E. horridus and E. lehmannii in respect of their outward appearance. These plants are geographically situated where one would expect E. lehmannii and E. horridus to occur closely together. Field work would be necessary to establish the respective distribution patterns of E. lehmannii and E. horridus in relation to the morphological intermediates, and to study variation in the fronds and cones of the supposed intermediates.

E. lehmannii x E. longifolius - these two species occur together in at least one site. Dyer (1955, p. 477) stated that "no question of inter-specific hybridization has been raised so far", while an

other botanist emphatically told the author that hybrids do occur. Again field work is needed to resolve the question.

#### ARTIFICIAL HYBRIDS

The compilation of large collections of living cycad plants have opened up avenues for creating artificial hybrids unlikely to occur in nature. Most individuals involved in artificial propagation of cycads have concentrated on producing seedlings of natural species as a means of supplying an existing demand or to alleviate pressure on wild populations. Even so, some remarkable hybrids must have been created accidentally on occasion. By contrast, only a very small band of enthusiasts have been producing hybrids intentionally, either because they do not have sufficient numbers of parent plants available to produce pure species, or just out of sheer adventurism. In the following list of known artificial hybrids, the female parents are named first. This is because of the phenomenon of cytoplasmic inheritance whereby a hybrid inherits more characteristics from its female than from its male parent. This phenomenon is dramatically operative in the genus Aloe and, though it cannot yet be stated with certainty that it is also a factor in Encephalartos, it is as well that prospective hybridizers should take it into account.

(E. altensteinii x E. arenarius) x E. lehmannii - a female plant, considered by its owner to be a natural hybrid of E. altensteinii and E. arenarius, was pollinated with E. lehmannii which was the only male plant in cone in his garden at the time. The resulting seedlings have dark green fronds and, though still very young, the leaflets are impressively heavily toothed.

E. eugene-maraisii x E. concinnus - seedlings reputed to be this cross were recently offered for sale in the USA. No further information is available, nor is it known which species constituted the female parent.

E. lebomboensis x E. arenarius - the fronds are dark green as in E. arenarius, but more glossy, and the leaflets are seemingly narrower than in E. arenarius but carry big teeth.

E. leomboensis x E. ngoyanus - the fronds are pale green with perhaps a very slight waxy bloom, and surprisingly long: at maturity this plant may be nearly as big as E. leomboensis. The leaflets are virtually entire and have been so since an early age. As in E. ngoyanus, the lower leaflets are not reduced to prickles. From its appearance one would never guess its ancestry. One would expect this hybrid to occur in nature as well.

E. leomboensis x E. trispinosus - not dissimilar to the familiar E. altensteinii x E. trispinosus hybrid (see above under "natural hybrids", and below under E. trispinosus x E. altensteinii). The fronds are bright green as in E. leomboensis, and the leaflets are strongly toothed but nevertheless less strongly than in E. trispinosus.

E. longifolius x E. arenarius - a spontaneous hybrid in Kirstenbosch Botanic Garden appears to be of this parentage. It is morphologically intermediate between the two supposed parent species.

E. longifolius x E. transvenosus - this unlikely-sounding hybrid, unfortunately still very young, should grow into a very nice plant. Though at first glance the two parent species are so thoroughly dissimilar, they nevertheless share some very desirable characteristics: large and robust, with many dark green fronds and wide overlapping leaflets, and the ability to withstand hot sunny conditions without damage to the fronds. Even at its present tender age it has the "look" of both parents.

E. natalensis x E. woodii - this far-sighted hybrid has been produced with the aim of backcrossing the hybrid with E. woodii. It is hoped that, after two or three generations of back-crossing, plants will be produced which should be virtually indistinguishable from E. woodii, but of both sexes and thus ensuring the future of E. woodii. The seedlings produced so far are intermediate between the two parents, with bright green fronds and wide leaflets, toothed in a way strongly reminiscent of E. woodii. They are hearteningly vigorous.

E. trispinosus x E. altensteinii - this is a recreation of the naturally occurring hybrid described above. All the hybrids produced so far have bright green fronds

but surprisingly (in the light of experience with other species) the leaflets are often not strongly toothed. In fact, sometimes the teeth on the leaflets are so small that a sharp perception is needed to detect the characteristic pattern of E. trispinosus in their make-up.

(E. trispinosus x E. altensteinii) x E. horridus - produced by pollinating a presumed natural hybrid between E. trispinosus and E. altensteinii, with green fronds, with E. horridus. In accordance with Mendel's laws, two types of progeny were obtained, viz. plants with bright green heavily-toothed leaflets, and plants with grey scarcely-toothed leaflets.

E. trispinosus x E. ferox - the fronds are dark dull green as in E. ferox and unlike E. ferox, the leaflets have numerous large teeth on the lower margin only.

E. trispinosus x E. villosus - intermediate between the parent species, reminiscent of E. villosus with long and narrow, widely-spaced leaflets, but with a few big teeth as in E. trispinosus. Unlike the other hybrids produced with E. trispinosus as female parent, the fronds of this one are grey; not the silvery grey of E. horridus or E. lehmannii, but rather with a waxy bloom as in the grey form of E. arenarius or in Dioon edule.

E. umbeluziensis x E. lehmannii - this cross has the grey fronds of E. lehmannii. At this early stage it has the general appearance of a grey-leaved E. umbeluziensis-like plant.

E. umbeluziensis x E. villosus - this hybrid was produced by the author, not to obtain any strange or spectacular plants, but rather in response to Giddy's (1984, pp. 29, 109 & 110) suggestion of a natural hybrid between these two species. In their present immature state it would be difficult to say positively that they resemble one of their not dissimilar parents more than the other. It is however noteworthy that, of the two plants kept for myself, one has the lower leaflets reduced to a series of prickles just as in E. villosus, whereas in the other there are no petiolar prickles, like in E. umbeluziensis. Due to lack of space, almost 50 more seedlings of this batch were shared out and lost track of. This hybrid was created in the total absence of male E. umbeluziensis so that there

is no question of an accidental pollination by E. umbeluziensis.

#### DOMINANT AND RECESSIVE CHARACTERISTICS

In a hybridizing programme, the most urgently required information would be on which characteristics are genetically dominant. Regrettably the currently available data are more confusing than helpful in this respect:

Size - one would expect size to be non-dominant, with hybrids being intermediate between the parents in size. This seems to be confirmed by mature specimens of E. longifolius x E. horridus and E. trispinosus x E. altensteinii. It would be a boon indeed if the small size of E. caffer would prove to be dominant, but the already large size of an immature plant of E. lebomboensis x E. ngoyanus suggests that there is not much hope for this wish to come true.

Colour -variation in the colour of the fronds of presumed hybrids of E. trispinosus with E. altensteinii raised the hope that the colour of the female parent may be important, but the results obtained with the various artificial hybrids involving E. trispinosus as female parent are confusing. Much more research remains to be done on this aspect. The occurrence of both green and grey-leaved individuals in the hybrid (E. trispinosus x E. altensteinii) x E. horridus suggests that green frond colour is dominant over grey.

Toothed margins of leaflets - in the case of E. horridus, the arrangement, size and presence of teeth seem to be dominant, as manifested by the hybrid E. longifolius x E. horridus. In the hybrids involving E. trispinosus this is not necessarily borne out, but it should be remembered that in some individuals of this species the teeth are not very prominent. The observation that the teeth on the upper margin of the leaflets of E. ferox were absent in the hybrid with E. trispinosus, suggests that this characteristic is recessive.

Width of leaflets -indications are that there is a lack of dominance, i.e. the hybrid progeny have leaflets intermediate in width between the parent species. However, as most of the hybrid plants at the author's disposal are still immature, conclusions are premature.

Reduction of lower leaflets to prickles - again there appears to be a lack of dominance, but the observations on the hybrid E. umbeluziensis x E. villosus should be borne in mind. Once again the available hybrids are immature and one should be extremely cautious in one's interpretations, as this characteristic only manifests itself fully in mature plants.

#### DAUNTING PROSPECTS FOR HYBRIDIZATION

Hybrids within Encephalartos - Hybrids of E. inopinus, especially with E. villosus and E. paucidentatus, should be particularly striking. A characteristic unusual in Encephalartos is present in both E. inopinus and E. paucidentatus, namely that the angle between the upper surfaces of opposing leaflets is more than 180°, whereas in most species it is considerably less. This lends to the fronds of these two species a very open and relaxed appearance.

Hybrids between E. horridus and E. transvenosus should be attempted with the aim of producing both a large and a small plant with many fronds and wide, heavily toothed, bright green leaflets. The existence of hybrids between E. longifolius and E. horridus, and between E. longifolius and E. transvenosus, is an indication that E. horridus and E. transvenosus should be genetically compatible.

Hybridizing E. horridus with E. woodii should produce a medium-sized to large plant with wide and heavily toothed leaflets of hopefully a bright green colour. A not dissimilar prospect is offered by crossing E. latifrons with E. woodii.

Hybrids between E. horridus and E. latifrons may yield a plant not much larger than E. horridus, but hopefully with bright green leaves and ferocious teeth on the leaflets. When breeding for a bright green colour, E. horridus x E. arenarius is unlikely to give the desired result, as E. arenarius shows a definite tendency towards glaucousness (greyish leaves).

E. caffer has rare characteristics in its diminutive size, its many fronds and densely-spaced leaflets. The difficulty would be to retain its small size while breeding in other properties. Interesting results may be obtained by

breeding for broader, perhaps heavily-toothed leaflets and a grey colour - here obvious partner species would be E. horridus or E. cupidus. Hybrids with E. longifolius may have wider leaflets, but would probably be too big.

Hybrids with other genera - Marchant (1968) listed the following chromosome numbers for cycads, though recent research by Dr K. Norstog suggests that the situation in Zamia is somewhat more complex:

2n = 16 - Stangeria, Ceratozamia, some Zamia, including Z. fischeri and Z. floridana.

2n = 18 - Bowenia, Encephalartos, Dioon, Lepidozamia, Macrozamia, some Zamia, including Z. loddigesii.

2n = 22 - Cycas.

2n = 26 - Microcycas.

One may expect genera with the same chromosome numbers to be potentially compatible with each other, though differences in reproductive physiology may constitute an insurmountable stumbling block. Only one intergeneric hybrid is known to the author, viz. Ceratozamia mexicana (female parent) x Zamia monticola, produced by Chamberlain in 1924 (Chamberlain 1926, 1937). Strangely, no-one seems to have repeated this cross successfully, though many collectors should be in a position to do so. It would yield fascinating results indeed if the genera Dioon, Encephalartos, Lepidozamia and Macrozamia could be hybridized amongst each other.

Hybrids within other genera - disappointingly few hybrids have been recorded in other genera. Johnson (1963) reported hybrid swarms involving Macrozamia communis and M. secunda, and M. communis x M. pauliguilielmii subsp. flexuosa. No natural hybrids in Zamia are known to the author, but his collection includes plants reputed to be artificial hybrids between Zamia debilis and Z. media, Z. pumila and Z. furfuracea, and Z. pumila and Z. latifoliolata. Chamberlain (1926, 1937) reported that he had produced a number of artificial hybrids in Zamia and, more recently, some hybridizing involving unnamed species of Zamia was done at the Fairchild Tropical Garden. Unfortunately the taxonomy of Zamia is in a state of flux, and the very names used above are in dispute. To a large extent the same is true for Cycas and to some extent for

Ceratozamia and Dioon in which no hybrids are known. On two occasions dealers in the USA have offered hybrids of Cycas revoluta with C. circinalis, but the author has not seen these plants. One would expect such hybrids to be common and easily produced, as practically every established cycad garden has coning plants of C. revoluta and C. circinalis-like species. Hybrids between C. revoluta and C. taiwaniana have also been recorded.

In conclusion it is clear that very little has yet been done on hybridizing cycads; but the possibilities for creating artificial interspecific hybrids are endless, and the tantalizing prospect of producing intergeneric hybrids is an exciting challenge.

#### ACKNOWLEDGEMENT

Most of the hybrids listed in this article were produced by persons other than the author. In order to protect their privacy, their names are not given.

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- (Reprinted from EXCELSA, no. 12, August 1986, with kind permission from the author and the editor, Mr Michael J. Kimberley. EXCELSA is a publication of The Aloe, Cactus and Succulent Society of Zimbabwe. Dr Vorster's address is: Department of Botany, University of Stellenbosch, Stellenbosch, 7600, Republic of South Africa.)

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# FOCUS ON... FOKUS OP...

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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 broodboomspezie, in die vorm van 'n in-diepte-artikel in leketaal. In hierdie uitgawe val die kollig op:

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## ENCEPHALARTOS VILLOSUS

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by Roy Osborne

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### INTRODUCTION

Encephalartos villosus Lem. is one of the most naturally-common and wide-spread members of the genus. Because of its ready availability and the ease with which it is grown (certainly in Natal and the Eastern Cape), E. villosus is often the plant which initiates an interest in cycads. For the same reasons, this species is often not appreciated as much as some of its less common relatives. However, a well-maintained specimen of E. villosus responds admirably to attention and can well be considered one of our most graceful indigenous plants.

### DISCOVERY

As early as 1788, the European botanist, Gaertner, described a cycad cone under the name Zamia villosa. It is now almost certain that this description was based on cone material from Encephalartos caffer - hence the name Zamia villosa has no botanical validity. (There is thus no justification for the views of Schuster (1932) and Hutchinson and Rattray (1933) that Lemaire's name was an adoption from Gaertner's.)

Proper credit for the name E. villosus goes to Charles A. Lemaire, professor of classical literature in Paris, who was a keen naturalist with a passion for cacti. Lemaire was appointed editor of the horticultural journal "Illustration Horticole" - a post which he held for 16 years. In 1867 he published a description in that journal of E. villosus and E. ghellinckii "in order to appreciate the merit and superior beauty of these two species". But how did he obtain the material? Early records from the Durban Botanic Gardens indicate that Mr M.J. McKen, its first curator, sent a large number of cycad specimens to public gardens in Hong Kong, Mauritius, Australia and Europe during his term of office. In particular, on 22 February 1867, he sent 25 plants, collected near Umtwalume on the Natal South Coast, to one Ambroise Verschaffelt in Ghent, Belgium. Verschaffelt was a botanically-minded nurseryman and a close friend of Lemaire's and it seems likely that the Natal consignment contained the E. villosus material on which Lemaire based his botanical text. Curiously, McKen later dropped the name E. villosus in favour of E. mackenii, a name which was never accepted in view of the precedence of Lemaire's published work.

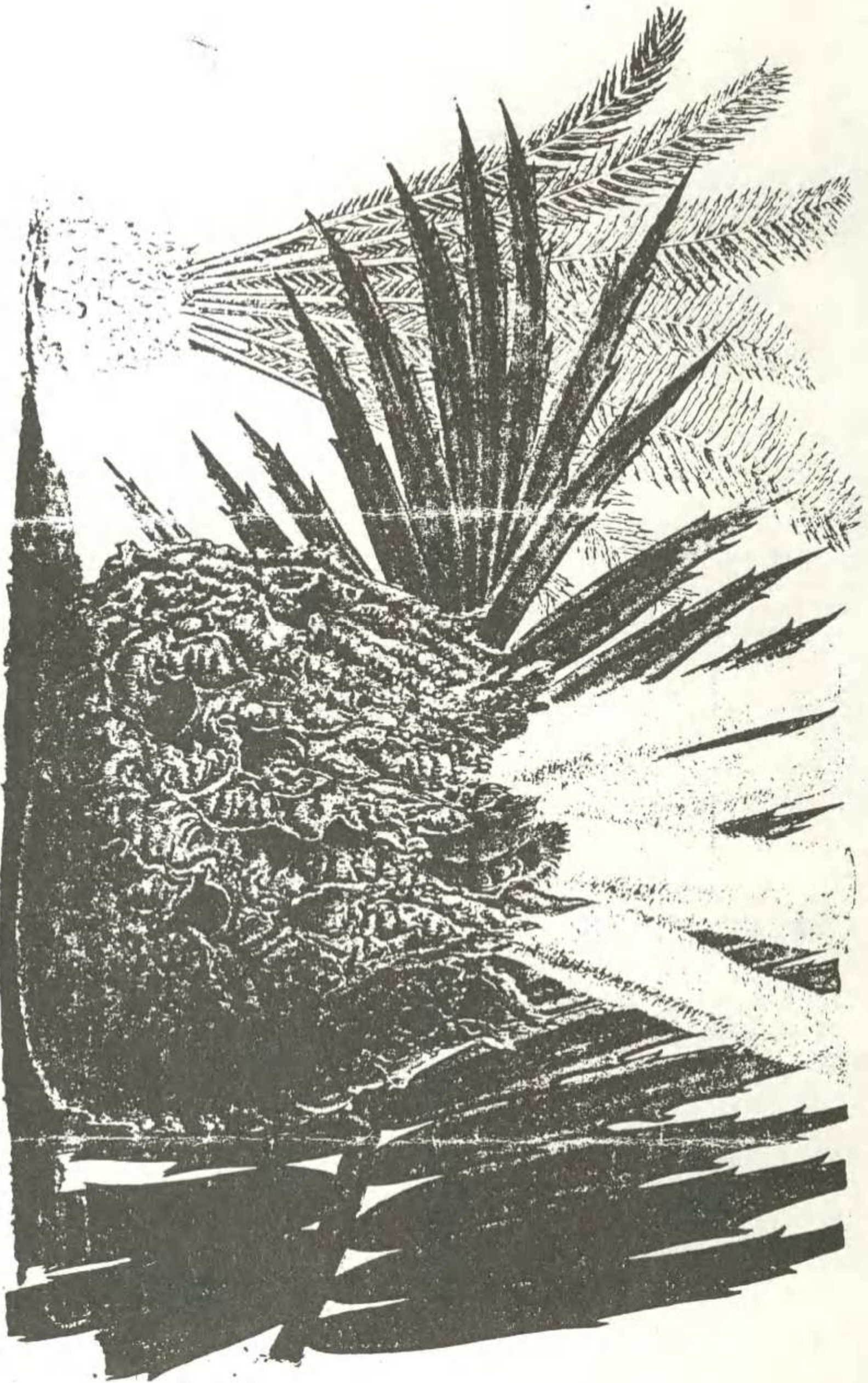


Figure 1

Copy of the original painting by P. Stroobant on which Lemaire based his description of *E. villosus*



Figure 2

A relatively young specimen of E. villosus which already has its crown split into six heads

PRESENT DISTRIBUTION

E. villosus occurs in relative abundance along the sub-tropical eastern coastal belt from near East London, through the Transkei, Natal and Kwazulu, up into the south-eastern tip of the Transvaal and Swaziland. It is usually associated with low forest in relatively temperate areas with a summer rainfall of 1000 to 1250 mm per year and a mild, dry winter. Within this fairly broad distribution, a substantial amount of variation is seen in the species (see later).

E. villosus is very well represented internationally. Specimens are found in most of the bigger European botanical gardens e.g. Amsterdam, Utrecht, Meise, Copenhagen, Berlin, Gottingen, Munich, Zurich, Paris, Dublin, Edinburg and Kew. The species is also found in South and North American gardens at Buenos Aires, Fairchild (Florida), Huntington (California), Ann Arbor (Michigan), New York and Foster Gardens (Honolulu) and in the Eastern Hemisphere at Bogor (Indonesia), Calcutta and Singapore.

The best specimens I have seen are those in gardens close to the habitats, i.e. the Durban Botanic Gardens and the nearby Old Fort Gardens. Here these cycads are used to great effect in the shady areas below large trees. Many of the plants date back to Curator McKen's time and have developed into very substantial multi-headed clumps.



Figure 3

Young leaves of E. villosus grow remarkably quickly. This 'crop' of leaves grew 12 cm in 24 hours

northern localities have longer leaflets with fewer or no teeth. However, this variation seems continuous and there seems little reason to separate the species into varietal groups. The earlier proposal by Stapf and Burtt Davy to call plants from Swaziland under the name "E. striatus", although favoured by Henderson, was not supported by Hutchinson, Rattray or Dyer and has since been abandoned.

### 3. CONES

Male cones of E. villosus are pale yellow to yellow-green and supported on a well-developed peduncle. They are slender, cylindrical and taper slightly towards the apex, measurements of 60 cm in length and 10 cm in diameter being typical. At the time of pollen shedding, the cone emits a powerful odour which attracts large numbers of the curculionid weevil, Antliarhinus zamiae, which seems to be an important or even essential pollination vector for the species.

Female cones are a deeper yellow (cadmium yellow to apricot) and also borne on a well-developed peduncle. They are shorter and thicker than their male



Figure 6  
Male cones of E. villosus. The largest cone shows separation of the scales to facilitate the release of pollen.

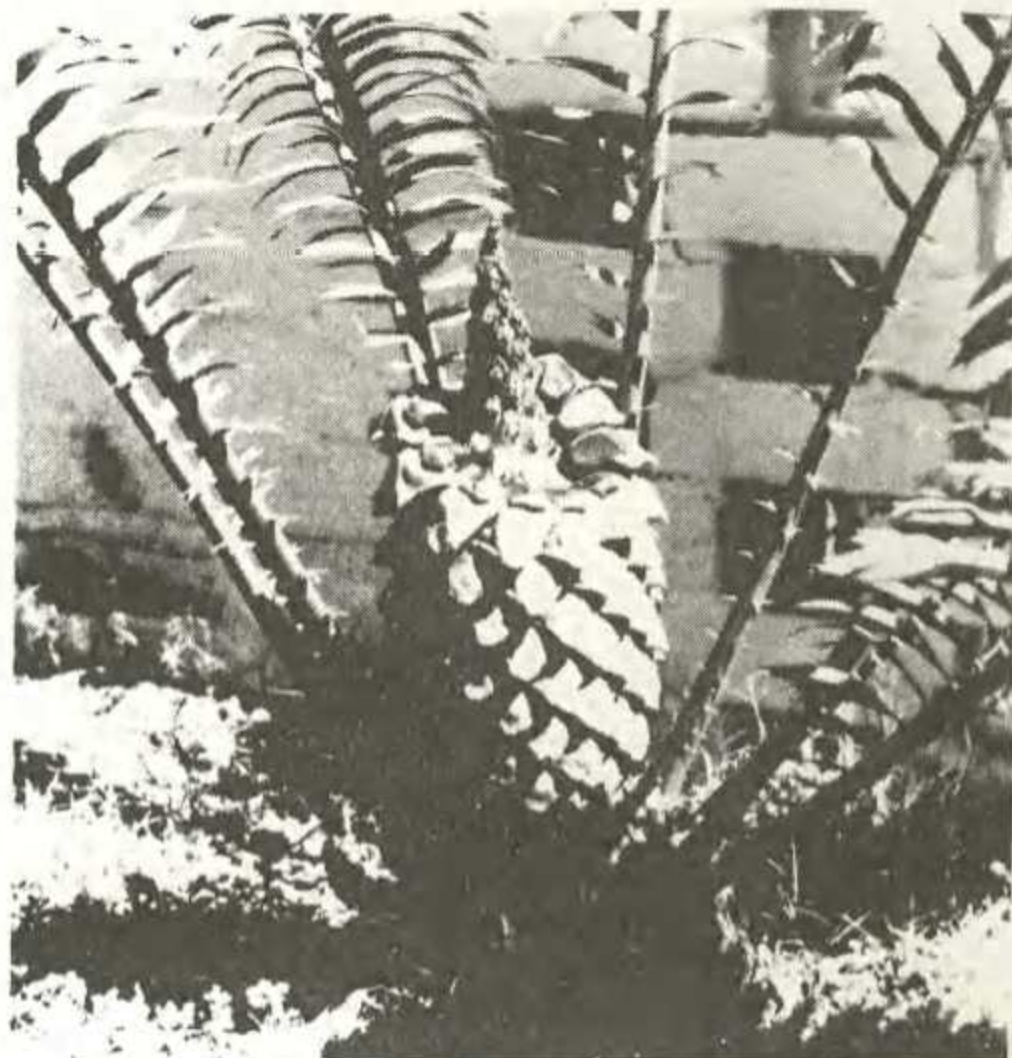


Figure 7  
Female cone of E. villosus in the process of breaking up.

counterparts, measurements of 40 cm x 20 cm being typical. A character used to distinguish E. villosus cones from those of other species is the presence on each cone scale facet of a wedge-like protruberance which overlaps the cone scale immediately beneath it.

Garden-grown plants in Natal are often heavily parasitised with the Antliarhinus weevil, which may destroy every seed in a developing female cone. (One hopes that the cost-benefit pollination system is more towards the plants' favour in natural conditions.) The seeds have a scarlet outer covering and are usually about 2,5 cm long and 2 cm in diameter.

### AFFINITIES AND HYBRIDS

The species most closely related to E. villosus appears to be E. umbeluziensis, which has a distribution restricted to hotter and drier areas to the north of the localities in which E. villosus is found. Both species occur in Swaziland but their respective habitats do not overlap. However, plants of intermediate character have been reported and recently Piet Vorster has produced a hybrid by crossing the two species artificially. Near Pongola Poort,



Figure 8  
E. villosus is easily grown from seed. This seedling is 3 years old.

E. villosus and E. lebomboensis grow together and natural hybrids of these two species are relatively well-known. Similarly, in the southern areas of its distribution, E. villosus co-exists with E. altensteinii and again intermediate type plants are not uncommon.

Figure 9  
 Old specimens of E. villosus usually develop into sizeable multi-headed clumps.



Besides the artificial hybrid mentioned above, Vorster also reports a cross between E. trispinosus and E. villosus. The progeny have long narrow leaves like E. villosus but with the prominent teeth and greyish-bloom leaves of E. trispinosus. An extreme in the hybridisation possibilities seems to be the instance reported by Prof. Charles J. Chamberlain (1926) who apparently managed to fertilise a female cone of Zamia pumila with pollen from E. villosus. Seeds of intermediate character were formed in the cone, but none of these ever germinated.

There are certain characters of E. villosus which are seen in some of the Central and East African species (e.g. E. hildebrandtii). This may give rise to speculation that E. villosus is one of the older members of the genus and is a source from which other species may have been derived. An extensive study is needed to explore this suggestion.

#### CULTIVATION AND CONSERVATION

E. villosus makes an excellent garden subject, especially effective in groupings under large trees. It responds well to good soil, warmth and moisture and is tender to frost. Older plants which have formed multi-headed clumps are easily divided and plants thus obtained soon re-establish themselves. Like most cycads, E. villosus is also a rewarding container plant.



Figure 10

The gracefully curved leaves of E. villosus create an attractive effect in any garden.

Although the species is not classified as rare, endangered and threatened in terms of I.U.C.N. listings, it is clear that many hundreds of plants have been taken from habitats and the supply is not inexhaustible. Members of this Society saw evidence of what seemed like organised wide-scale theft of habitat plants during a recent excursion to the Shongweni area (see ENCEPHALARTOS no. 4, December 1985, page 20). In the Eastern Cape, large habitat areas have been cleared for pineapple plantings and in Natal many of the E. villosus areas have been sacrificed to banana crops and afforestation projects. However, large

populations are relatively well-protected in reserves (e.g. Krantzkloof, near Durban) and it is hoped that these will remain for posterity. Relative commonness in a cycad species can never justify complacency in the conservation effort.

#### ACKNOWLEDGEMENTS

I wish to record my thanks to Brian Schrire, presently at Kew Gardens, for his help in some of the historical details and to Piet Vorster for his criticism of the first draft of this text.

Figure 11

E. villosus is used to great effect in the shady areas below large trees in the Durban Botanic Gardens.





Figure 12

E. villosus grows quickly enough to form an attractive pot plant only a few years after the seedling stage.

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- Photograph, figure 7 by Maans Kemp
- Other photographs by the author

# THE GONDWANAN CYCAS

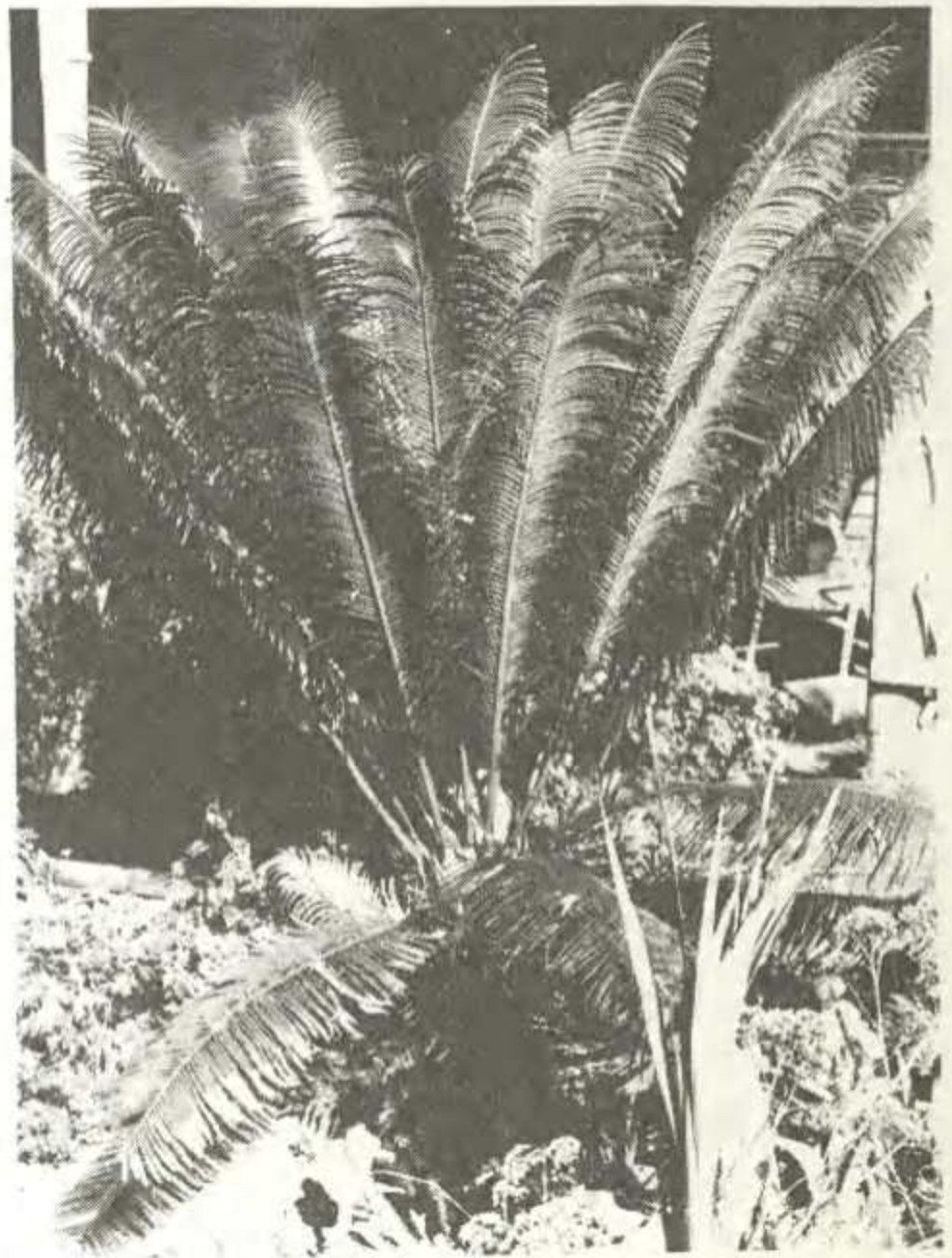
by John G. Hendricks

The African Cycas\* occupies a very special position in cycad evolution. The genus Cycas retains the most primitive conservative morphological and biochemical features of the living cycads. It is the culmination on one distinct line of evolution, separated very early from the line leading to the other living genera. It is probably, but not necessarily, the oldest genus with living representatives. Among the Cycas, C. revoluta is regarded by many as the oldest species and Asia, its habitat, as the geographic source of Cycas and the Cycadales. Recent advances suggest the feasibility of an alternative concept.

Reasonable estimates place the origin of the cycads as in the Paleozoic, some 300+ million years ago. Fossil data indicate a prodigious dispersion from Eastern Gondwana via Antarctica, reaching North America in Early Triassic and, stepwise, England and Sweden. The direction of flow is established by fossil dating, supported by biochemical data and the evolution of polyxylic stems to the monoxylic form found only in all living families of New World origin, including the Stangeriaceae which arose in Argentina and migrated to Africa before continental separation. The westward migration is believed to have been terminated by glaciation and cold, associated with the wandering of the South Pole in southernmost Africa and Australia in Mid-Permian. For much of the Paleozoic to the Permian, the South Pole remained fixed in North-West Africa. From Late Paleozoic to the Permian, the greatly expanded Tethys Sea separated South-West Gondwana from Asia. The long route of dispersion from Gondwana via the Americas to Northern Europe, rather than the much shorter distance via Asia, indicates that an effective physical barrier to cycad migration existed between Gondwana and Asia.

\*Also known as Cycas thouarsii - see article by Piet Vorster in ENCEPHALARTOS no. 6 (June 1986), page 3 - EDITOR.

The Cycas as China and Japan may well have been introduced via India before the Himalayas blocked northward passage. Indeed, C. szechuanensis of China has a megasporophyll decidedly more primitive than that of C. revoluta, in accord with such a south to north-east route. Cycas west of the Himalayas, from Nepal to the Gulf of Tonkin and south to Malaysia, can be traced in evolutionary steps to the Cycas of India. Similarly, the Cycas of Australia are found in a variety of stages of evolution. In sharp contrast, the African Cycas, under less severe conditions, seems largely unchanged.



The African Cycas in cultivation  
(Photograph: Maans Kemp)

This presumed stability seems to be corroborated by chromosome karyotypes which also are highly relevant to the direction of migration of *Cycas*.

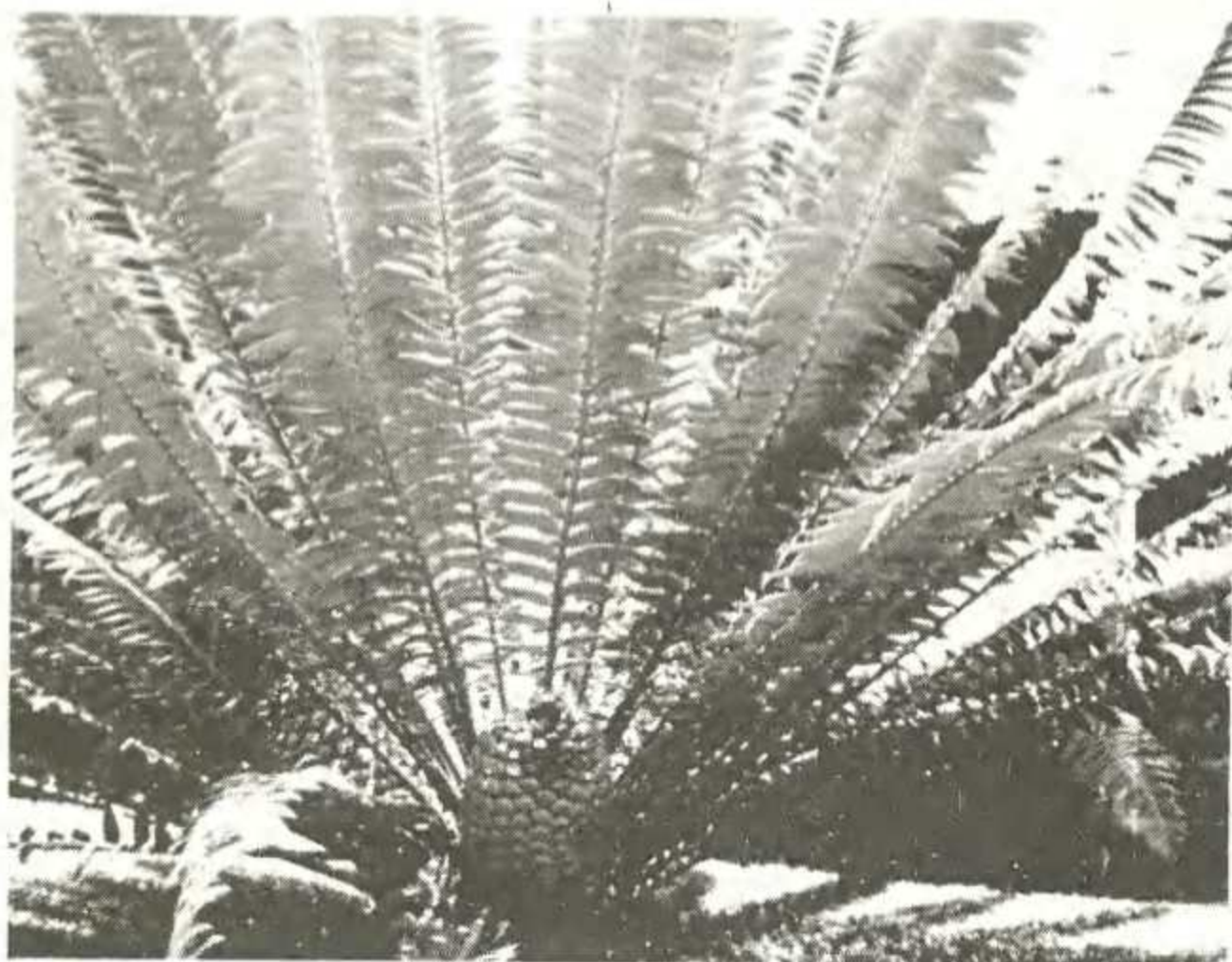
M.	SM.	ST.	A.	T	
2.	4.	14.	0.	2	<u>C. comorensis</u>
2.	4.	12.	0.	4	}
2.	4.	10.	0.	6	
2.	4.	8.	0.	8	}
2.	4.	6.	0.	10	
2.	4.	4.	0.	12	<u>C. revoluta</u> , <u>C. media</u>

Present data show the karyotype of the African *Cycas* to be the most primitive of the genus, those of Indian origin to be intermediate and those of Japanese and Australian *Cycas* to be the most modified. The extent of chromosome change seems related to climatic extremes encountered during/after continental transport. Karyotype determination of other relevant species is needed; nevertheless, these data indicate that an Asian origin for the *Cycas* is unlikely. The primitive form of *C. revoluta* appears to have been retained despite major chromosomal changes, in a manner similar to the evolution to *Macrozamia* after continental drift and to the apparent morphological identity of *E. hildebrandtii* and its pseudotriploid.

The African *Cycas* is a member of the *C. circinalis* group, identifiable by the thick, leathery porous membrane between the seed shell and endosperm and distinguished from the *C. rumphii* group by the absence of a keel-like protuberance at the microphyle. This group is represented in Africa, India, the Philippines and, in highly modified form, Eastern Australia. Its established presence on three adjacent land masses of Gondwana proves that it was present and well dispersed when India separated from Gondwana. This marks the age of the African *Cycas* as being in the range of 140 million years. If the trend indicated by the chromosome karyotypes of *Cycas* is valid, the African *Cycas* is the oldest living species of *Cycas* and perhaps of the living Cycadales.

(John Hendricks' address is: 110 Brookmeade Drive, Statesville, NC 28677, USA)

## CYCADS FROM SEED



This specimen of *Encephalartos transvenosus* was planted as a seedling in 1976 and is therefore now approximately twelve years old. It has a stem height of approximately 23 cm and coned for the first time in 1986, at an age of approximately eleven years.

## FROM THE PRESIDENT

The total membership of the Society at the end of April this year was 416, reflecting a slight drop in numbers arising from persons who failed to renew their 1987 subscriptions. The present distribution of members is: Transvaal 160, Natal 87, Cape Province 69, Orange Free State 15, Other, African 5, USA and Canada 31, Australia and New Zealand 31, Europe 13, Other 5.

The Society records with regret the death of a member, Mr H. Havenga of Koffiefontein, and we express our condolences to his relatives and friends.

Interest in the Society continues to grow and I anticipate a membership figure of about 600 by year ending. The trend of increasing overseas interest will undoubtedly continue, particularly after our strong representation at the Nice Conference (see the report elsewhere in this issue). ENCEPHALARTOS has now attained an excellent reputation at an international level. Only recently, for example, have we received a membership request from the Royal Botanic Gardens at Kew. In addition, local interest has been generated by the cycad feature in the "50/50" television show (April 1987) and Cynthia Giddy's article "Computer Dating for Lonely Cycads" in the April issue of "S.A. Garden and Home".

Financially the Society is sound and no difficulties are anticipated this year. Our finances have been substantially boosted by the many generous donations made to the Society, both directly and through the seed bank.

Negotiations are under way with respect to the formation of a Southern Transvaal branch and possibly also an O.F.S. group. Members will be kept informed of developments by post or via ENCEPHALARTOS.

## VAN DIE PRESIDENT

Die totale lidmaatskap van die Vereniging was 416 aan die einde van April vanjaar, wat 'n effense afname in getalle verteenwoordig as gevolg van persone wat nie hulle lidmaatskap vir 1987 hernu het nie. Die huidige verspreiding van lede is as volg: Transvaal 160, Natal 87, Kaapprovinsie 69, Oranje-Vrystaat 15, Ander, Afrika 5, VSA en Kanada 31, Australië en Nieu-Seeland 31, Europa 13, Ander 5.

Die Vereniging meld met leedwese die dood van 'n lid, mnr. H. Havenga van Koffiefontein, en ons dra graag ons meegevoel oor aan sy familie en vriende.

Belangstelling in die Vereniging groei steeds en ek voorsien 'n ledetal van ongeveer 600 teen die einde van die jaar. Die toename in oorsese belangstelling sal ongetwyfeld voortduur, veral na ons sterk verteenwoordiging by die Nice-konferensie (sien die verslag elders in hierdie uitgawe). ENCEPHALARTOS het nou 'n uitstekende reputasie op internasionale vlak verwerf. Slegs onlangs het ons byvoorbeeld 'n lidmaatskapaansoek ontvang van die Koninklike Botaniese Tuine te Kew. Daarby is plaaslike belangstelling gewek deur die broodboom-item in die "50/50"-televisieprogram (April 1987) en Cynthia Giddy se artikel "Computer Dating for Lonely Cycads" in die April-uitgawe van "S.A. Garden and Home".

Die Vereniging is finansieel gesond en geen probleme word vanjaar voorsien nie. Ons finansies is aansienlik aangevul deur die baie ruim donasies wat aan die Vereniging gemaak is, beide direk en deur die saadbank.

Onderhandelings is aan die gang oor die vorming van 'n Suid-Transvaalse tak en moontlik ook 'n O.V.S.-groep. Lede sal oor ontwikkelings ingelig word, óf oor die pos óf deur middel van ENCEPHALARTOS.

A slight reorganisation has taken place with respect to the workload in producing ENCEPHALARTOS: Maans Kemp retains his overall editorial responsibilities, but is now assisted by Piet Vorster, who will take over the printing and mailing tasks, and Roy Shooter, who will maintain and issue back-copies. The names and contact addresses of the Society's office-bearers will appear in this and subsequent issues of ENCEPHALARTOS for handy reference.

Please continue to participate actively in your Society by becoming involved with your local branch, by utilising the seed bank and pollen exchange facilities and by contributing articles, notes and photographs to ENCEPHALARTOS. The sustained health of the Society depends on your support.

ROY OSBORNE

'n Geringe reorganisasie het plaasgevind wat die werklading ten opsigte van ENCEPHALARTOS betref: Maans Kemp behou sy oorhoofse redaksionele verantwoordelikhede, maar word nou bygestaan deur Piet Vorster, wat die druk- en versendingtake sal oorneem, en Roy Shooter, wat kopieë van vorige uitgawes sal beheer en beskikbaar sal stel. Die name en kontak-adresse van die Vereniging se ampsdraers sal in hierdie en toekomstige uitgawes van ENCEPHALARTOS verskyn, vir maklike verwysing.

Gaan asseblief voort om aktief in te skakel by u Vereniging deur in u plaaslike tak betrokke te raak, deur die saadbank- en stuifmeelruilfasiliteite te benut en deur artikels, inligting en foto's tot ENCEPHALARTOS by te dra. Die volgehoue welsyn van die Vereniging is afhanklik van u ondersteuning.

ROY OSBORNE

## EX PRESS

### Policemen to appear over theft of cycads

Crime Reporter

FOUR Richards Bay policemen, including a lieutenant, are due to appear in court in connection with the theft of 18 cycads from the KwaZulu Coastal Forest Reserve in Ingwavuma.

They will appear in the Emanguze Magistrate's Court on Wednesday next week.

The theft of cycads — a rare and specially protected plant — is viewed by conservationists in a 'very' serious light.

The plants were believed to have been removed on July 30 last year.

They include seven large specimens and 11 smaller ones.

The director of the KwaZulu Bureau for Natural Resources, Mr Nick Steele, said theft of cycads 'is a very serious problem in KwaZulu'.

'People are stealing the plants from the forestry areas and smuggling them from KwaZulu into the Transvaal and other areas,' he said.

A senior police spokesman for the Northern Natal division, Maj Fanie Brand, confirmed that four S A P members would appear in court next week in connection with the alleged theft of cycads.

### Cycads: four acquitted

FOUR Richards Bay narcotics policemen have been acquitted by a KwaNgwane magistrate on a charge of taking 18 protected cycads.

They pleaded not guilty, saying that they had come across six men removing the cycads and confiscated them before they themselves were arrested by a KwaZulu Bureau of Natural Resources officer.

The magistrate, Mr S. Kunene, said it had not been proved that they took the cycads.

The men are Lieutenant L. E. Liebenberg (27), Detective Sergeant C. C. Dunn (31), Detective Sergeant S. P. Turketti (31) and Reserve Constable W. C. Ariow.—Pietermaritzburg bureau

DAILY NEWS 15 April 1987

NATAL MERCURY 18 March 1987

# BITS AND PIECES STUKKIES EN BROKKIES

## DEATH OF MR JOHN WILEY

The President and Committee wish to record their sadness at the tragic death in March this year of Mr John Wiley, Minister of Environment and Water Affairs. The Society entered into correspondence with Mr Wiley (see ENCEPHALARTOS no. 7, page 20) on the subject of creating a uniform policy on cycad conservation, and our representations were dealt with promptly and courteously by Mr Wiley's office. We are sure that all members will join us in expressing sincere condolences to Mr Wiley's family and friends.

## NUWE MINISTER

Die Vereniging wens mnr. Gert Kotzé, wat in mnr. John Wiley se plek as Minister van Omgewingsake en Waterwese aangestel is, geluk met sy aanstelling en wens hom alle sukses toe.

## JEYES FLUID AND GARDENING

Many of our members have heard of the use of Jeyes Fluid in gardening applications but no-one has been quite certain of its efficacy. A new publication written by Malcolm Kitt, a Westville horticulturist, has just been issued by Adcock-Ingram Laboratories Ltd (manufacturers of Jeyes Fluid) and answers many of the questions raised.

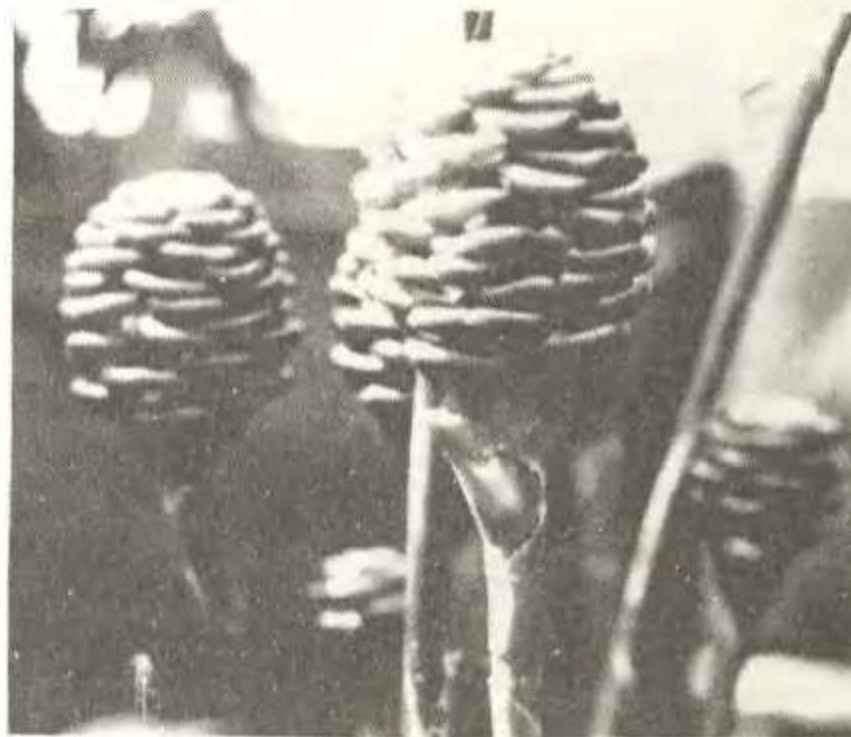
Jeyes Fluid in various formulations has applications against insects, algae, fungi, eelworms and ants. It can be applied either as a foliar spray or as a soil drench to live plants, both in the ground and in pots. A concentration of 25 ml Jeyes Fluid to 5 l water is generally recommended. Furthermore, potting soil or seed-raising compost mixtures can be sanitised by treatment with 60 ml Jeyes Fluid to 5 l of water applied per cubic meter of soil a few days prior to use.

A copy of the leaflet on horticultural uses of Jeyes Fluid may be obtained from Frank Cohen, Product Manager, Adcock-Ingram Laboratories Ltd, Private Bag 1, INDUSTRIA 2042.

## TEST YOUR KNOWLEDGE

Who can identify the objects in the accompanying photograph? Are they

- The cones of yet another new cycad recently discovered in the Columbian rain forests by Dennis Stevenson?
- A highly decorated chocolate ice-cream much favoured by the staff of the Naples Botanical Garden?
- The results of one of Roy Osborne's cycad tissue culture experiments?
- The male cones of a hybrid which resulted when Piet Vorster crossed a cross between Encephalartos transvenosus and Stangeria eriopus with a cross between Zamia pumila and Cycas media?
- The results of a sex change in Encephalartos woodii?
- A cycad species discovered by Prof. Chamberlain through a train window during a journey through Southern Africa in 1913?



The photograph shows the unusual flowering structures of a type of ginger plant, Zingiber spectabile, photographed by Roy Osborne in the Tropical Plant House at Kew Gardens in April 1987.

Answer to the mystery picture quiz:

## 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 R10,00 each for overseas members. The overseas price covers airmail postage (which at present amounts to more than R5,00 to Australia, for example). Please contact our Back Copies Officer, Roy Shooter (16 Benjamin Road, Fynnlans, 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 R10,00 elk vir oorsese lede. Die oorsese prys sluit lugposgeld in (wat byvoorbeeld tans meer as R5,00 na Australië beloop). Tree asseblief in verbinding met ons Vorige Uitgawes-beampte, Roy Shooter (Benjaminweg 16, Fynnlans, 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.

## GIDDY IN GARDEN AND HOME

The readers of the South African Garden



## ROSE TUSSEN DIE DORINGS

Prof. Nat Grobbelaar, Roy Osborne en Dr. Piet Vorster in die Durbanse Botaniese Tuine ten tye van 'n onlangse Botaniese Kongres.

(Foto: Erwin Schroeder)

and Home magazine were recently introduced to the Society and its activities through a very interesting and informative article by Cynthia Giddy in the April 1987 edition. The Pollen Exchange scheme, in particular, was highlighted in the article, entitled "Computer Dating for Lonely Cycads". Also included was an explanation of the hand-pollination technique. Cynthia reports that she has received numerous telephone calls and letters from interested readers after the appearance of the article.

## BROODBOME EN DIE WET

Na aanleiding van die talle navrae wat ENCEPHALARTOS, en die Vereniging in die algemeen, ontvang ten opsigte van die wette en ordonnansies wat op broodbome betrekking het, beoog ons 'n artikel oor hierdie onderwerp in ENCEPHALARTOS. Ons het reeds verlede jaar aan die Departemente van Natuurbewaring in die drie "broodboomprovinsies" (Kaap, Natal en Transvaal) geskryf en hulle gevra om 'n reeks toepaslike vrae te beantwoord. Ons sê solank baie dankie aan hulle vir hulle vinnige reaksie en vriendelike samewerking. Die rede waarom die artikel nog nie verskyn het nie, is dat belangrike veranderings aan die Kaapse ordonnansie aangebring is, wat nog op finale ondertekening wag. Sodra inligting oor hierdie veranderings ontvang is, sal die artikel verskyn.

## CYCAD IN THE MOVIES

Can anyone identify the cycad (Lepidozamia?) which stars in the film "Crocodile Dundee" in the scene just before the crocodile attack? Please write to the Editor if you have any clues.

# CYCADS OF AUSTRALIA

by Len Butt

## Macrozamia miquelii

Macrozamia miquelii is a really handsome plant with bluish-green fronds, upright initially but the lower circle of fronds soon arching outward, giving a symmetrical appearance. The trunk or caudex is nearly always subterranean and rarely evident. It probably reaches only about 60 cm tall and 50 cm thick in the oldest of plants. It occurs on the east coast from Northern New South Wales up to a little north of Rockhampton in Queensland. Well established stands we have studied are on hill slopes in the Upper Brookfield area near Brisbane, another west of Gympie and quite a hillside of this zamia in a grazier's property at Glastonbury. The large colourful cones were ripening on the female plants about the month of November. Their male counterparts had multiple cones in the axils as do all Macrozamia species.

Off the Queensland coast north from Tin Can Bay lies the tip of one of our many lovely coastal islands, Frazer Island, where the variety douglasii occurs in rich profusion. In a semi-rainforest atmosphere amid Angophora, Banksia, Eucalyptus and tea tree, it grows in groves and in single groupings. Growing on sandy wallum loam it must get quite a share of moisture from the fresh water lakes, creeks and springs that are prevalent on the island.

The largest plants we found were two metres tall at the apex of the centre fronds. Large heavy cones to 40 cm were formed but immature in the January month that we found them. At Central Station, a beauty spot about the centre of the island, several plants had thickening established trunks 30 cm high growing with some large plants of the glorious primitive fern Angiopteris.



Specimen of M. miquelii from Brookfield area, in container, with disintegrating female cone.

Macrozamia are becoming more and more well known in nurseries today, and every form of M. miquelii I have come across would make a beautiful specimen in selected home landscape features, or as a large ornamental tub plant on a patio.

On the mainland west of Bundaberg we again find M. miquelii on Mount Perry where it is referred to as the variety mountperriensis. It is small and not so prolific in its frond number. Another form, very similar to that of the Upper Brookfield areas, is found growing on Mount Archer at Rockhampton, and again at Bowen National Park north of Yeppoon

where it grows in profusion with the local Bowenia. A ripe cone of M. miquelii was given to me some years ago, and the rich beauty and form of it made me think at that time that here was the best cone type of our Australian cycads. Since then I have viewed other Macrozamia cones on various occasions and find them all to have individual merit and attractiveness. I have often thought this material would be ideal for plant exhibitors in the floral art sections. They would indeed far surpass the Banksia cones at present used in this way.

Because the variable M. miquelii grows in many types of soil and terrain, most forms will adapt well to garden culture, but those from the more arid hilly situations such as Mount Perry and Upper Brookfield require similar conditions if transplanted.

A report from a member of the Cycad Study Group, Margaret Telfer, will be of interest:

"Plants of M. miquelii that grow in the Upper Brookfield area seldom have trunks more than half a metre long. Their long slender palm-like fronds are less coarse than M. communis and give a soft tropical appearance to the landscape. They have been seen growing in a variety of environments from dry scrubland to creek banks which run through rainforest areas, but all grow in areas that have at least a small amount of shade. The cones start to mature in January and can be harvested up to May. After this time most cones have split and the seeds scattered by wild animals and only the occasional seed can be found near the parent plant.

The orange coating on the seed is eaten by possums, bandicoots, and dingoes causing the seeds to be readily distributed throughout the immediate areas. Toxic compounds are present within the seed proper, but can be removed by vigorous washing and pounding. Some seeds appear to be a light orange colour when mature, and others dark red although not fully mature.

The cones of M. miquelii are approximately the size of a double fist. Most cones are well packed and some contain as many as sixty seeds, and most would have at least thirty seeds. Occasionally some young female plants produce a very small lightly seeded cone. Some female plants have been known to produce four cones in one season. These are usually the very large plants. Most display only one or two. Female plants do not bear cones every year.

After the seeds have been harvested they are soaked in a bucket of water for two days. Those that float are supposed infertile and discarded. The remaining seeds are peeled with a sharp knife and then half buried on their sides in a mix of three parts sharp river sand to one part moss."

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

## NURSERY NEWS

Collectors in the Transvaal may be interested to learn that the WULVESKOP ESTATE NURSERY has cycad seedlings of more than 20 species for sale. The seedlings vary in age and the price

obviously depends on the species and age. The nursery also sells palms. Those who are interested can contact the nursery at telephone number 015236-3035 or 3544.

# LETTERS BRIEWE LETTERS BRIEWE

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

Lesers word genooi om aan die redakteur te skryf (sien adres elders). Waar van toepassing sal kenners gevra word om spesifieke vrae te beantwoord.

Sir

I was interested to see in ENCEPHALARTOS no. 6 that you are planning to publish a list of cycad nurseries. This will be very welcome as it is always worth knowing where to go for seedlings of specific species. Please do what you can to get this going as soon as possible.

Another point I would like to bring up is the question of a "slide library" or the sale of slides. For people like myself who live away from cycad habitats, the only way to see mature cycads, or just small specimens, is in tubs and pots at Kew Gardens or other such places.

As people are getting to know my interest in cycads, I have been asked to give talks on them. I have always said "no" to date as I felt I did not really have sufficient good slide material for an in-depth look at cycads. I am sure other people who live away from the "cycad belt" have had the same problem and would also like to acquire slides of Southern African cycads in habitat. I would be happy to co-ordinate such a collection. Possibly, as cycads are multi-national, members from overseas might also wish to contribute from their own collections.

TONY TITCHEN  
3 Portishead House  
29 Nore Road  
Portishead, Bristol  
Avon, England BS 209UN

The publication of information on cycad nurseries depends entirely on the co-operation of the nurseries. We again appeal to registered nurseries and nurserymen who are members of the Society, to provide us with information on addresses, telephone numbers, species available and prices. We will publish the information, free of charge for the benefit of our members.  
EDITOR

## SAADBANK

Saad van Encephalartos lanatus en E. natalensis is tans beskikbaar. Tree asseblief in verbinding met ons Saadbankbeampte, Danie Nel (Bowkerweg 120, Escombe, 4093; tel. no. 031-442505) as u belangstel.

## SEED BANK

Seed of Encephalartos lanatus and E. natalensis is currently available. Please contact our Seed Bank Officer, Danie Nel (120 Bowker Road, Escombe, 4093; tel. no. 031-442505) if you are interested.

## INSECT POLLINATION RESEARCH

by Roy Osborne

Member and keen supporter of our Society, Willie Tang of Florida, USA, is to be congratulated on having a scientific paper printed in the prestigious American Journal of Botany (vol. 74, no. 1, pages 90-99, 1987). The paper gives results from one of Willie's many research projects in cycad reproductive biology, dealing with an experiment he conducted to see just how the pollination of Zamia pumila occurs. The technique involved enclosing female cones in cloth covers, designed to exclude either wind or insects or both and comparing the ultimate 'crop' against naturally and artificially pollinated cones. The results show quite conclusively that this species is insect pollinated, the two insects of concern both being beetles, Pharaxonotha zamiae and Rhopalotria slossoni. An additional aspect was the analysis of the small liquid drops secreted at the micropyles of the ovules. These were found to contain simple sugars and amino acids in a mixture rather like the nectar of higher plants. Willie speculated that these droplets might serve as a reward for the visiting insect pollinators.

Another publication on insect pollination in Zamia is that by Knut Norstog, Dennis Stevenson and Karl Niklas. In a

paper in Biotropica (vol. 18, no. 4, pages 300-306, 1986) they report on an experiment conducted on a group of about 40 Zamia furfuracea plants at Fairchild Tropical Garden, where it seems that the snout weevil Rhopalotria mollis is the effective pollinator. Eggs are laid in the male cone of the cycad. These hatch into larvae which feed on the cone until the time of pupation. When the adults emerge from the pupae, they bore their way out of the cone, picking up pollen in the process. The weevils can then travel to female cycad cones, thus effecting pollination, but it seems that the insects do not destroy ovules or seeds. In the course of observations over a seven-year period, the weevils have been found in every male cone examined, as well as in pollen-receptive female cones. During this time the viability of the seed has been nearly 100%

A general conclusion apparent from these studies is that in any artificial planting of cycads (e.g. non-local species in botanic gardens), the low fertilities of seeds seem to be because of the absence of natural insect vectors for pollination. The necessity for hand-pollination in these circumstances is becoming increasingly apparent.

# GIVE AND TAKE      GEE EN NEEM

The exchange of plants is illegal in terms of the Plant Improvement Act. This act has however no bearing on the exchange of pollen and seeds and the unconditional donation of plants. Members are invited to use this column for offers and requests in this connection.

The Nature Conservation Ordinances of the various provinces may however control the exchange and donation of seeds and plants and members are advised to contact their local provincial nature conservation office for information, permits, etc.

Persons who want to arrange overseas exchanges should consult the Department of Agriculture, Division of Plant and Seed Control. In this case import and export permits are usually required and a phytosanitary certificate is generally necessary.

The 'Give and Take' column is also available for requests concerning any other items of interest to members, e.g. books, photographs, etc.

Die ruil van plante is onwettig in terme van die Plantverbeteringswet. Hierdie wet het egter geen betrekking op die ruil van stuifmeel en saad en die onvoorwaardelike skenking van plante nie. Lede word genooi om hierdie kolom te gebruik vir aanbiedings en versoeke in hierdie verband.

Die Natuurbewarings-ordonnansies van die verskillende provinsies mag egter die ruil en skenking van saad en plante beheer en lede word aangeraai om met hulle plaaslike provinsiale natuurbewaringskantoor in verbinding te tree t.o.v. inligting, permitte, ens.

Persone wat oorsese ruilings wil reël moet met die Departement van Landbou, Afdeling Plant- en Saadbeheer in verbinding tree. In hierdie geval is invoer- en uitvoerpermitte gewoonlik nodig en 'n phytosanitêre sertifikaat word algemeen vereis.

- Mrs J. Rennie of Grahamstown (tel. no. 0461-28909, evenings only) wishes to sell her cycad collection consisting of the following 33 specimens from 11 species:

11 Encephalartos altensteinii,  
 1 E. caffer, 1 E. ferox,  
 3 E. friderici-guilielmi,  
 3 E. ghellinckii, 1 E. latifrons,  
 4 E. lebomboensis, 1 E. longifolius,  
 1 E. natalensis, 2 E. princeps,  
 2 E. trispinosus, 3 E. villosus.

The plants are in a very healthy condition and a number have basal suckers. The price for the collection is R6 000,00.

- Mrs N. Scotting (White Road, RD1, Howick, New Zealand) would like to obtain seed of Cycas thouarsii. She can supply seed of Lepidozamia peroffskyana and L. hopei in return.

- Mrs R. Mc Williams (13 Short Road, Walmer, Port Elizabeth, 6070; tel. no 041-512124) has two female specimens of Encephalartos natalensis for sale. They are very healthy plants with stems approximately 1 m high. The price is R300,00 each.

- Erwin Schroeder (PO Box 3, Hermannsburg, 3508; tel. no. 03345-930) would appreciate any information on Encephalartos hybrids, for research purposes. Photographs showing cone and leaf detail, as well as a description of the plant, would be especially appreciated. If it is a natural hybrid, information on its area of origin would also be important. Should it be impossible to send photographs, portions of a leaf (top, middle, etc.) as well as cone scales would be welcome.