ENCEPHALARTOS

JOURNAL OF THE CYCAD SOCIETY OF SOUTHERN AFRICA

TYDSKRIF VAN DIE BROODBOOMVERENIGING VAN SUIDELIKE AFRIKA

NO. 32

DECEMBER / DESEMBER 1992

CYCAD SOCIETY OF SOUTH AFRICA

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COVER / VOORBLAD : Female cone of *Encephalartos cerinus*

Photo: Cynthia Giddy

CONTENTS/INHOUD

CONTENTS/INHOUD (continued/vervolg)

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FROM THE PRESIDENT

In the first place I would like to welcome Isabella Claassen most sincerely as new editor of 'ENCEPHALARTOS' and as Council Member. We are most grateful that she agreed to succeed Neil Munro in this regard. There is no doubt that she will discharge her duties with great distinction and we can only hope that she will be able to do so for many years. You can ensure that cycad enthusiasts retain their interest in 'ENCEPHALARTOS' by providing a steady stream of interesting material to Isabella.

In order to provide the magazine with a more professional appearance, Isabella decided to personally retype most of the material to ensure a uniform lettertype in the text. On the inside of the back cover, a set of 'Instructions to Authors' has been introduced by Isabella to which I would like to draw the attention of authors. You will assist Isabella especially by adhering to the instructions relating to figures and tables.

In response to requests from some of our overseas members, COUNCIL agreed to the introduction of two membership fees for foreign members from the beginning of 1993. Foreign members can now choose between air mail and surface mail delivery of 'ENCEPHALARTOS'. Although the delivery by surface mail will take several months to certain countries, members that opt for this type of delivery will save R28 on their membership fee. We hope that this option will substantially boost our foreign membership.

On the inside of the front cover you will notice that Willie Tang has been appointed Overseas Correspondent for the USA and Canada from the beginning of 1993. We are very indebted to Willie for agreeing to take over this function from Douglas Atwater who has helped us for years. To Douglas we express our sincere appreciation for the conscientious way in which he served the Society as its Overseas Correspondent.

Finally, I would like to wish all our members a most pleasant Christmas and express the hope that you will enjoy good health and good fortune during 1993.

Yours sincerely

Nat Grobbelaar

VAN DIE PRESIDENT

In die eerste plek wil ek Isabella Claassen, ons nuwe redaktrise van 'ENCEPHALARTOS' en Raadslid bai hartlik verwelkom en bedank dat sy bereid was om die redakteurspos by Neil Munro oor te neem. Ek weet da sy die pos met groot onderskeiding sal beklee en hoop dat sy dit vir baie jare sal kan doen. Deur haa deurentyd van interessante materiaal te voorsien kan u verseker dat die tydskrif steeds 'n gesogde blad onde broodboomliefhebbers sal wees.

Teneinde 'ENCEPHALARTOS' 'n meer professionele voorkoms te gee tik Isabella eiehandig meeste van die bydraes oor om te verseker dat die lettertipe deurgaans eenvormig sal wees. Isabella het dit ook goed gedink om op die binnekant van die agterblad 'n ste 'Voorskrifte aan outeurs' aan te bied waarna ek u graag verwys. Deur veral die voorskrifte met betrekking tot figure en tabelle na te kom, kan bydraers baie help om haar werk te vergemaklik.

Op versoek van party van ons buitelandse lede, het die RAAD toegestem om vanaf begin 1993 twee lidmaatskaptariewe vir buitelandse lede toe te staan. Buitelandse lede kan nou kies of hulle 'ENCEPHALARTOS' per lugpos of per oppervlaktepos afgelewer wil hê. Alhoewel die aflewering per oppervlaktepos na sekere bestemmings verskeie maande kan neem, bespaar lede wat hierdie afleweringsmetode verkies R28 op hul lidmaatskapfooi. Hopelik sal hierdie vergunning ons buitelandse ledetal aansienlik versterk.

Op die binnekant van die voorblad sal u ook oplet dat Willie Tang vanaf begin 1993 as ons Skakelbeampte vir die VSA en Kanada aangestel is. Ons is baie dank aan Willie verskuldig dat hy bereid is om hierdie funksie van Douglas Atwater oor te neem. Aan Douglas Atwater sê ons baie dankie vir die onbaatsugtige wyse waarop hy as Skakelbeampte vir jare en met groot nougesetheid die Vereniging bygestaan het.

Laastens wil ek u almal 'n besonder vreugdevolle Kersfees toewens en die hoop uitspreek dat u in 1993 goeie gesondheid en groot voorspoed sal ervaar.

Die uwe

Nat Grobbelaar

FOCUS ON ...

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

FOKUS OP ...

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

ENCEPHALARTOS CERINUS Lavranos & Goode

by Cynthia Giddy

INTRODUCTION

Although this species has been known to collectors for almost 20 years, it was only described in 1989. Credit for the discovery of this species must go to Reinwald Dedekind who saw it growing at an African kraal and recognized that it was different to the other cycads in the area and that it was possibly a new species of *Encephalartos*. On enquiring as to the origin of the plant he was told that it grew on a sheer sandstone cliff above a river in the Tugela Ferry area of kwaZulu. Less than a dozen plants were growing at this locality and for several years this was the only known locality.

Extensive searches by botanists and cycad collectors failed to locate more plants until in 1987 a large thriving colony was discovered a few kilometres away from the original site. Substantial numbers of mature coning plants, juvenile as well as seedling plants, were found growing among rock crevices and boulders in a rocky ravine. Regrettably the news soon spread and the entire colony has since been wiped out by unscrupulous collectors.

Figure 1 A thriving colony of *E. cerinus* was found growing on these sheer sandstone cliffs above the river. Photo: R.L. Dedekind.

DISTRIBUTION

Encephalartos cerinus is restricted to a single rocky gorge in the Tugela Ferry area of kwaZulu in Natal at an altitude of 900 m. The locality is both hot and dry. Plants were scattered along an almost vertical rock face (see photo of habitat, Figure 1).

DESCRIPTION

1. STEM

E. cerinus is a dwarf plant with a subterranean stem

Figure 2 Plants occurred in full sun as well as among the trees at the base of the cliff. Photo: R.L. Dedekind.

Figure 3 More than 150 holes were counted in the wild after reports were received that plants were offered in the trade. Freshly cut leaves could still be seen. Photo: D. Strydom.

which may be partly exposed if growing in a rock crevice. Mature stems are 300 mm long and 200 to 250 mm in diameter. It suckers or branches sparingly from the base.

2. LEAVES

Eight to ten leaves, 0.9 to 1.2 m long with the median leaflets 13 to 15 mm long and 10 to 12 mm broad. The leaves are held almost vertical to the crown (Figure 6). The petiole or leaf stalk is 120 to 180 mm long and bare. The leaflets are entire with occasionally one to two teeth on the lower margin of juvenile or seedling leaflets. The leaflets overlap from the middle of the leaf towards the top. The leaflets are blue green in colour and quite distinctive with a thick waxy covering. The latter fact gave rise to the specific epithet '*cerinus*' meaning waxy.

Figure 4 120 plants of *E. cerinus* were confiscated from one illegal nursery. These plants will now be used by the conservation authorities to establish an artificial breeding program. Photo: C. Giddy.

3. CONES

The cones of both sexes are solitary (Figures 6, 8) although males in cultivation occasionally produce two or three together (Figure 7). The cones are blue green in colour, turning yellow at maturity. The cones likewise are covered with the thick waxy bloom so characteristic of this species. Male cones are 550 to 600 mm long and 80 to 100 mm in diameter. The median cone scales have a flattened terminal facet. The male cones are borne on an 80 mm peduncle. The female cones are egg shaped, 300 to 350 mm long and 150 to 180 mm in diameter. The face of the female cone scales is smooth with a fringed lower edge.

4. SEEDS

25 mm long and 15 mm in diameter and deep red.

Figure 5 Herbarium sheet of mature leaves of *E. cerinus*. Photo: C. Giddy.

AFFINITIES AND DIFFERENCES

E. cerinus may be distinguished from the other closely related subterranean species *E. villosus*, *E. ngoyanus* and *E. umbeluziensis* as follows:

E. cerinus is found growing on rockfaces whilst the other three species occur in grassland and lightly forested areas.

E. cerinus differs from its closest relative *E. umbeluziensis* by its much shorter blue green leaves, the leaflets which are entire, its solitary orange to yellow cones and by the waxy bloom that covers both the leaves and cones. *E. umbeluziensis* has 1 to 2 m long leaves with dark green leaflets which are sparingly toothed on the lower margin. The petiole is 200 to 250 mm long. The cones may be up to four in number and the female cone scales have a flattened central facet which is not overlapping and fringed.

E. cerinus differs from *E. ngoyanus* by its longer blue green leaves which are held almost vertical to the crown while the shorter dark green leaves of *E. ngoyanus* are held horizontally to the crown. The leaflets of *E. cerinus* are thick and have almost a plastic texture while those of *E. ngoyanus* are soft and thin to the touch. Unlike those of *E. cerinus* the leaves of *E. ngoyanus* are usually deciduous. Both species have solitary cones and the female cones of both species are remarkably similar (see female cone of *E. ngoyanus* in ENCEPHALARTOS 23: 6). The 550 to 600 mm long male cones of *E. cerinus* are twice the length of those of *E. ngoyanus* which are 200-250 mm long.

E. cerinus differs from *E. villosus* in that the leaves are shorter and blue green with a bare 120 to 180 mm long petiole or leaf stalk whereas the leaves of *E. villosus* are 1.5 to 2 m long, dark green and heavily toothed with the leaflets reducing in size to a series of prickles right into the crown.

Figure 6 Mature male cone of *E. cerinus* Note how the leaves are held almost vertical to the crown. Photo: R.L. Dedekind.

CULTIVATION

The fact that the species occurs mainly on sheer rock faces and steep rocky slopes means that good drainage and full sun are the prime cultural requirements. The leaf colour of plants in cultivation that have been grown in semi shade is green rather than blue.

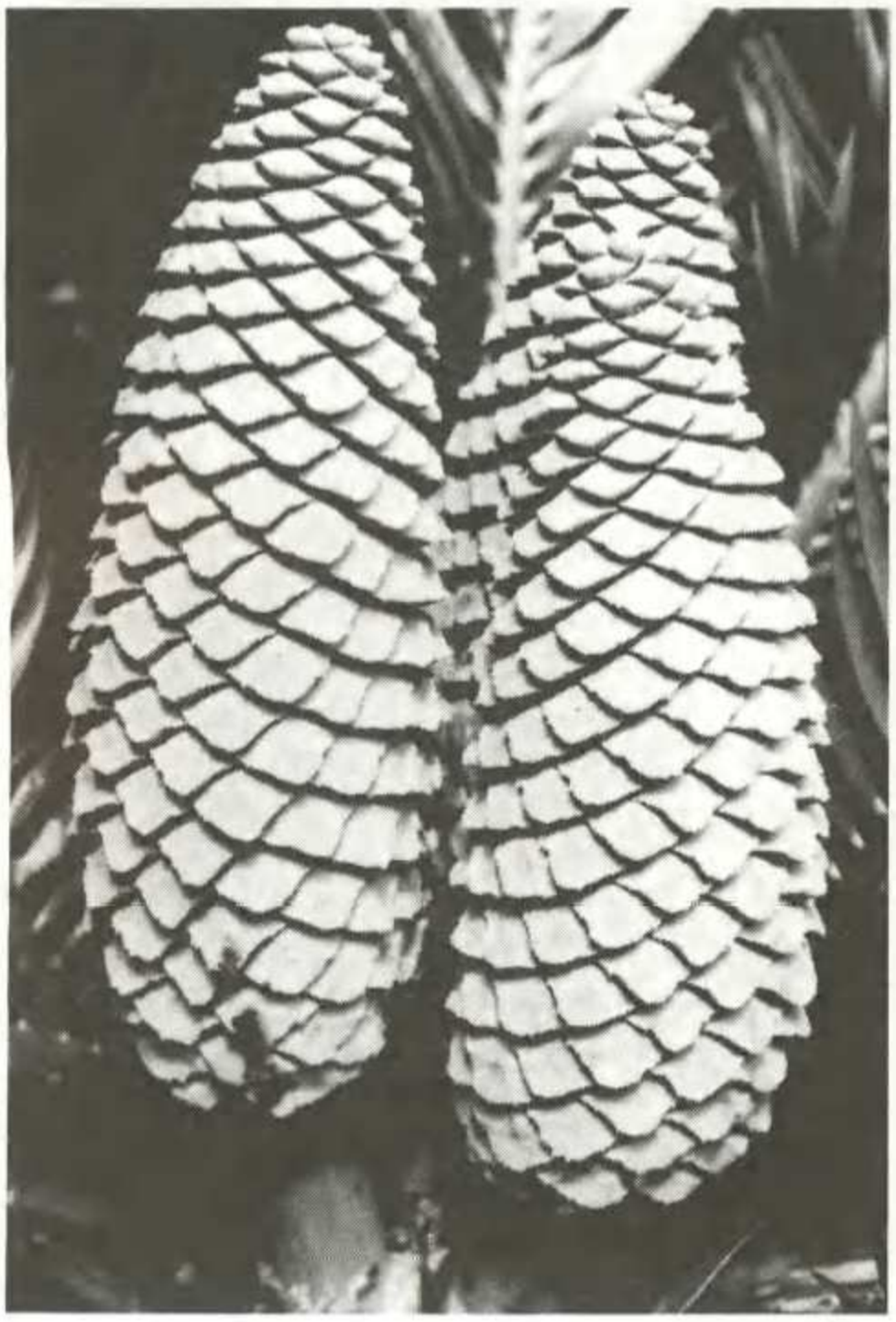

Figure 7 Immature male cones of *E. cerinus*. Photo: C. Giddy.

CONSERVATION STATUS

Recent field work indicates that with the exception of a few plants growing on an inaccessibly rock face there are no plants left in the wild. The conservation status of *E. cerinus* is presently given by the conservation authorities as PE 'possibly extinct' which is a bitter indictment of the avar' e of cycad collectors. In less than 20 years a new species has been collected to extinction in the wild. Given that the kwaZulu Bureau of Natural Resources has never given permission for a single plant to be removed from the wild, all wild collected mature specimens in cultivation are illegal.

The original plants from this gene pool are now scattered throughout private collections. Due to the exorbitant prices asked on the Black Market (R1200 to R1500 per plant) few collectors own more than one mature plant and the production of pure viable seed is unlikely as a means of conserving the species. Likewise the presence of other species coning at the same time in the garden or neighbouring gardens, increases the likelihood of hybridization. *Ex situ* conservation is in many cases merely the preservation of a specimen but is not a viable option for the conservation of a species. Habitat protection alone will ensure the survival of a species.

Figure 8 Female cone of *E. cerinus*. Photo: C. Giddy.

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THE MAGICAL AND MEDICINAL USAGE OF *STANGERIA ERIOPUS* IN NATAL

Roy Osborne and Andrew Grove
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INTRODUCTION

Despite questionable benefits of westernization and urbanization, the use of herbal medicines in South Africa appears to be accelerating (Cunningham 1988). Bulbous plants and those with large fleshy roots are particularly sought after for both magical and medicinal purposes and, in this respect, the large subterranean caudex of *Stangeria eriopus* (Kunze) Baillon is a prime example.

A number of mainly anecdotal and largely unreferenced reports on the use of *Stangeria* are found in literature. Our findings are the Zulu usage of *Stangeria* extend and generally confirm the literature reports. Watt and Breyer-Brandwijk (1962) write that the tuberous root of the plant is used 'to treat a variety of conditions' while Pujol (1988) states that the tuber, as an *intelezi* ingredient, is used for the relief of 'stomach winds, pain of the big bones and aches and pains of the spinal cord'. Hutchings (1992) adds the information that *Stangeria* ash was once used to protect raiding Zulu parties and that the burnt root powder is used to treat headaches.

The literature references on the Xhosa usage of *Stangeria* also indicate both the magical and the medicinal applications. The caudices and seeds are used as purgatives and to induce vomiting in children who have ingested poison (Watt and Breyer-Brandwijk 1962, Batten and Bokelmann 1966). The latter authors tell that Xhosa women with young infants wear a necklace of root pieces as a good luck charm. One Xhosa traditional healer uses *Stangeria* as an ingredient in a decoction to treat an illness commencing with a headache (Broster and Bourn 1982).

We regard with doubt the unreferenced report by Schuster (1932) that 'the nut' of *Stangeria* is applied by natives to the integument of the penis, for a purpose on which the author does not speculate.

The vernacular names for *Stangeria* add further testimony to its importance in tribal society. In Zulu, the tuber is called *inFingo* or *imFingo* while in southern Natal it is called *finguane* or *juma*. The Xhosa people call the whole plant *umFingwani* and the cone *umNcuma* (Vorster and Vorster 1985). A list of ten vernacular names for *Stangeria* in Madagascar (Whiting 1963) must be regarded with circumspection; the plant does not occur there in the wild and, as far as is known, only a few specimens are present in the botanical garden at Antananarivo.

Phytochemical studies on *Stangeria* are limited in extreme. Lebreton (1980) detected proanthocynanins, prodelphinidins and C-glycoflavones in leaves while Moretti *et al.* (1983) report the unusually high figure of 4.70% for the toxin macrozamin and 0.02% for the related substance cycasin, both with reference to the fresh weight of ripe seeds.

QUANTITY OF *STANGERIA* USED

In his extensive investigation into the herbal medicine trade in Natal, Cunningham (1988) estimated that the annual sales of *inFingo* by 54 herb traders amounted to 233 bags, each possibly containing 25 kg of tubers, and that this estimate may account for about one-quarter of the total yearly *Stangeria* sales in Natal. The report emphasizes the concern for this and other plant species which are becoming increasingly threatened by over-exploitation by the herbal gatherers. This continues despite its being in contravention of the Nature Conservation Ordinance (No. 15 of 1974) which applies in both Natal and kwaZulu and in which all Zamiaceae and *Stangeria eriopus* are listed as specially protected indigenous plants. The threatened status of *Stangeria* is further exacerbated by the loss of large populations in the development of agricultural lands, especially pineapple farms in the Eastern Cape and the sugar cane industry in Natal (Dyer 1965).

In order to quantify the current sales of *inFingo* in Natal, we surveyed 170 gatherer-vendors operating at the two largest herbal markets in Natal, one at Victoria Street in central Durban and the other at Isipingo, some 10 km to the south. Our results for July 1992 indicated that 3410 plants, or 2380 kg mass of *Stangeria*, were sold that month through these two outlets alone (Table 1). The quantity moving through other markets and via the herbalists' retail outlets must surely add considerably to this volume. The plants are said to be gathered from areas in the Transkei, southern and northern Natal and in kwaZulu.

Table 1 An assessment of the monthly sales of *Stangeria* caudices at the Victoria Street and Isipingo "Muthi Markets in July 1992

	Victoria Street	Isipingo	Total
Number of vendors offering *Stangeria*	17	11	28
Average mass of the caudices on sale	589 g	972 g	739 g
Mass sold per month by each vendor	85 kg	85 kg	85 kg
Number of plants sold per month by each vendor	144	87	122
Total mass sold per month	1445 kg	935 kg	2380 kg
Total number of plants sold per month	2453	957	3410

Figure 1 Part of the Isipingo Muthi Market. Many of the goods offered are endangered plants and animals and most are sold for magical rather than medicinal usage.

USES OF *STANGERIA*

Our interviews with gatherer vendors and with several herbalists were also aimed to find out the uses of *Stangeria*, with results as follows:

The main usage is magical, rather than medicinal. Th *inFingo* tubers are chopped up and admixed wit similarly prepared proportions of other plant materia (principally *Haworthia limifolia* Marloth, *uMathithibal Gasteria croucheri* Bak., *iMpundu; Albuca fastigiat* Dryand, *uMaphipha* and *Clivia miniata* Reg., *uMayime* A cold water infusion is prepared from this mixture ove a 24-hour period. This mixture, known as *intelezi* i scattered around one's property to ward off evil spirits It is said that the *intelezi* barrier effectively repels a such spirits and that any evildoers crossing the protecte circumference will become weakened. The *intelez* mixture is extremely popular and appears to account fo a very substantial proportion of the herbal trade i Natal. Whilst its efficacy will be doubted by Westerners the process is deeply entrenched in Zulu culture and i would be arrogant to condemn it.

Figure 2 Josiah Ngcobo and Andrew Grove interviewin herbal gatherer-vendors at the Isipingo Muthi Market, Jul 1992.

A second important usage of *Stangeria* is more medicinal. A cold water infusion of the chopped-up tuber, either alone or in admixture, is taken either orally or as a suppository, to induce vomiting. This emetic process, to *phalazo*, achieves a cleansing of the body and renders the person 'invisible to harmful spirits'.

Figure 3 A selection of wares available from one of the vendors. *Stangeria eriopus* tubers are seen in the centre foreground.

Other, less common, applications of *inFingo* were again both magical and medicinal. An example of the former is seen in the claim that a portion of the root, buried near one's home, will prevent lightning while the medicinal applications are found in use of the powdered tuber as a snuff to relieve congestion in infants, and as an agent to reduce blood pressure.

CHEMICAL INVESTIGATION

We plan to determine the chemical composition of *Stangeria* tubers as fully as possible. An initial analysis will determine the proximate composition in terms of moisture, fat, fibre, protein, minerals and carbohydrates. Further work will then address the amino-acid profile, the toxin levels and other secondary plant metabolites, both organic and inorganic. This project will take about 12 months to complete.

THE CONSERVATION ASPECT

It is clear that the present rate of exploitation will lead to a rapid and total extinction of *Stangeria* in the wild. Nature conservation authorities are reluctant to enforce the legislation with respect to the herbalists' activities and prefer to concentrate on prosecuting those supplying the demands of the conventional cycad collectors. To

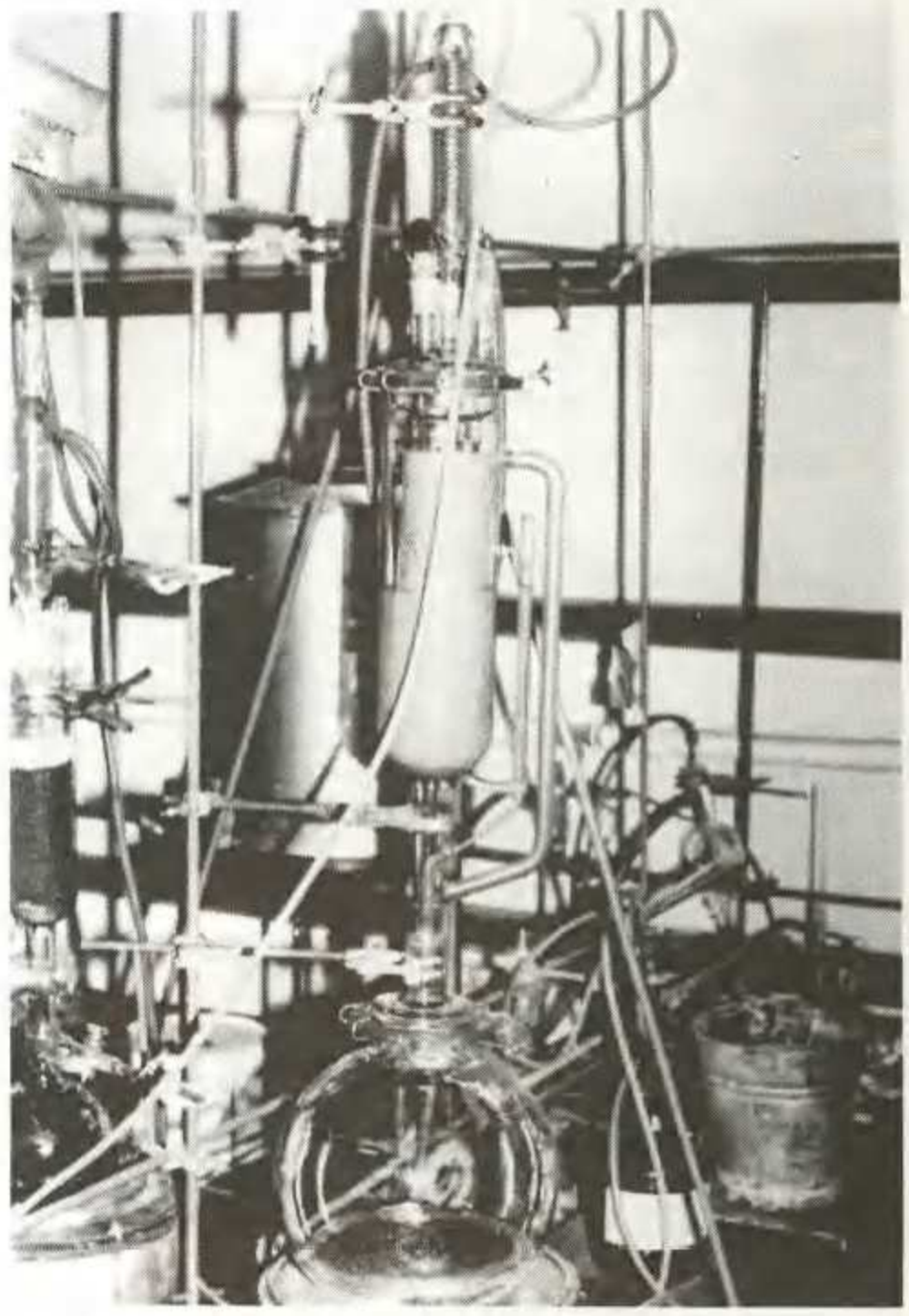

Figure 4 The extraction apparatus in the natural products research laboratory at the University of Natal, Durban, where the chemical contents of *Stangeria* are being determined.

Figure 5 *Stangeria* plants at Silverglen Nature Reserve, Durban. These plants may form the nucleus for a large-scale cultivation project to help meet the demands of the herbalists' trade.

fine a member of the 'white' community R12 500 for trading in cycads (Port Shepstone Magistrate's Court, July 1992) while to turn a blind eye to the monthly and openly-displayed street sale of 3410 plants by 'black' vendors is an enigma of the South African situation to which it is difficult to find a solution.

There is no doubt that the herbal medicine trade will continue to expand and that the demand on indigenous plants will increase still further. Of the few available courses of action, it seems sensible to promote the large scale 'artificial' cultivation of these plants so as to cater for future demands from the herbalists. In this respect the efforts of the staff at Durban Municipality's Silverglen Nature Reserve deserve our wholehearted support. At the very least it is important to have these plants conserved *ex situ* in botanic gardens to maintain at least part of the genetic material for posterity.

ACKNOWLEDGEMENTS

We thank Josiah Ngcobo for assistance in interviewing the gatherer-vendors. Enver Buckas and Erasmus Cele provided much useful information. This project is supported by a research grant (to RO) from the University of Natal's Faculty of Medicine.

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CYCAD PHENOLOGY

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The timing of periodically recurring events in the lives of organisms, known generally as phenology, has been of interest to many of us though certain aspects have remained rather mysterious. Most of us have an understanding of the approximate timing of such annual or biennial events as the first appearance of leaf flushes, of cones, of pollination and of seed production in the lives of cycads. Some of us have kept records of these events and that information may help explain the phenology of cycad reproduction.

Many organisms display a clock-like and calender-like faithfulness in their timing of reproduction, commonly termed their 'biological clock'. One can often count on cones appearing on one's cycads each year when expected.

Interestingly this happens on schedule whether the specimens are outside in Miami or in Townsville, or in a glasshouse in St. Louis or at Kew. However, different genera and species do not all reproduce at the same time each year. The two species of *Zamia* and one of *Microcycas* which have occupied my attention for some years are each on a different schedule. *Zamia pumila*, in its native locale in south Florida begin to show its cones in early autumn and to shed pollen and be pollinated in December, but *Z. furfuracea* is on a cycle almost 6 months removed, with cones appearing in late April and May and pollination beginning usually in mid-July. *Microcycas* in Miami, only a couple hundred kilometres south-east of its natural habitat in Cuba, first displays its cones in June and is pollinated in late September. Each of these species, then, keeps to its own calender.

Study of cyclic events in plants, especially flowering in angiosperms, reveals that the plant species have internal 'clocks', which we refer to as endogenous or 'circadian' rhythms. These endogenous rhythms also exist in human lives, as in the oestrous cycle. So, granted that both plants and people have internal clocks, what we should like to know more about is what events, factors and forces synchronize them and if necessary reset them on different schedules.

We really cannot be sure of many aspects of such cyclic phenomena in animals and plants. Women who live together, as in a college dormitory, will apparently in a few months find that they tend to become synchronized in oestrous, perhaps because of pheromonal influences of individual upon individual. Plants in tropical rain forests flower and fruit in synchrony over large blocks, but not necessarily in synchrony with other more remote blocks of individuals of the same species. Possibly this form of intercommunication between neighbouring plants also is pheromonal. On the other hand, the hundreds of individuals of dozens or more species of cycads in a botanical garden seem to go about their reproduction according to their own calendar, irrespective of what other species may be doing at any particular time. *Dioon*, *Cycas,* and *Macrozamia*, for example, maintain their own cycles as though they were still at home in Mexico, Guam, or Australia. Why should this be the case since, in captivity, they are all subject to the same environmental factors?

My interest in reproductive periodicity of cycads was first sparked by observations of Stanley Keim and myself that *Zamia roezlii* we saw in habitat in Colombia, about 4° N latitude, seemed to have female cones in all stages of maturation. I found cones with mature seeds and cones in which pollen tubes contained swimming sperm, events surely separated by several months of developmental time. Compared with *Z. pumila* in Florida, in which one cannot hope to find swimming sperm in pollen tubes if one is more than a week or so early or late, it seemed that the reproduction of *Z. roezlii* apparently was on a very loose schedule, if any. And why have our specimens of *Z. roezlii*, some quite mature, not produced cones at Fairchild Garden in 15 years? Do they need even more time to become sexually mature or does this cycad need approximately equal day-lengths throughout the year to develop cones?

In angiosperms, the phenomenon of photoperiodicity has received a great deal of attention and a very complex scenario has resulted. Simply, plants vary considerably in their relation to photoperiod, generally being classified as 'long-day, short-day' and 'day-neutral' forms, requiring, respectively, a period of relatively long days, relatively short days (actually long nights), or neither long or short days, to induce flowering. In photoperiodic forms, the actual total length of the day is of less importance than whether the day is longer or shorter than some species-specific 'critical' photoperiod. What this implies is that the plant has the means to distinguish a specific light-dark ratio which occurs just once per annum. It is known that the photoperceptive mechanisms of plants can be very sensitive; in fact, they are able to discern differences in day-length as short as 15 minutes. It also is known that the 'antennae' receiving the photoperiod information are the leaves, and the way this information is transmitted in the plant is by a photosensitive pigment called 'phytochrome' which is 'switched on by daylight' and slowly switches itself off at night. The amount of 'switched-on phytochrome' still remaining at the end of the night is translated differently depending on the sensitivity of the particular plant species and results in formation of a rather mysterious flower-inducing hormone (referred to as 'florigen'). Although a 'flowering hormone' has been shown to exist in plants, its nature is still speculative and recent theory is that there may be more than one working in harmony. If so, one of these may be the well-known growth stimulator, gibberellin; the others may consist of a flowering inducer and a flowering inhibitor. Time, no doubt, will tell us if the theory is correct and what these substances are.

Much of what we know about plant photoperiodicity has come from research on only a handful of plants, notably tobacco, soybean, sugar cane, henbane, and cocklebur. Virtually nothing is known about the control of cone initiation in cycads, and it is rather unlikely that the subject will ever receive the amount of highly skilled, very expensive research that it has received in crop plants. Still, we should be able to learn something about the subject on our own. We might begin by asking if cycad reproduction is controlled by day-length.

To initiate this investigation, I wrote to Roy Osborne to ask if he could tell me how Northern Hemisphere cycads behave with respect to the dates of cone initiation when grown in the Southern Hemisphere. If, for example, *Zamia furfuracea* were to produce visible cones in May when grown in South Africa at 20-25° S, as it does at that date in about the same latitude in the Northern Hemisphere, then I think we might eliminate photoperiodicity and concentrate on other factors such as temperature, rainfall, and endogenous rhythms. Actually, however, Roy's information indicates that *Z. furfuracea* produces cone in Dec-Jan (pollen in Feb). This differs by about a half-year from its occurrence in Miami, but, of course, day-length in Durban in January is about the same length as that of Miami in June. This may just be coincidence but it also may indicate that cone initiation in this cycad is controlled by photoperiod. One might even assume that since the cones appear in the long days of late spring or early summer, *Z. furfuracea* is a long-day plant. However, assuming that the actual induction of the cone occurs at the cellular level some months before it emerges and is visible to the eye, this species could actually be a short-day plant.

Information on other exotic cycads grown in South Africa and elsewhere is not too informative, simply because we don't have enough data. Roy has suggested we ask the readers of ENCEPHALARTOS to help us out in this matter. Information will be greatly appreciated on the following questions:

1. Do you have information on the time of year when cones of species originating at or near the Equator first become visible in your area? If they produce cones, do they do so at the same time each year? Is the time-period of cone initiation narrow or broad with respect to timing; that is, are the plants precise or imprecise in cone production?

2. Do you have information when species, from the opposite hemisphere from where you live, produce cones in your locality?

3. Perhaps most importantly, can you supply information on the precise timing of reproduction of your own native cycads?

4. Many cycads initiate cones quite infrequently in the wild so data relative to coning phenology are scarce, but if you have this information, we would like to get it. Because we are approaching this in a scientific manner, we would like to minimize as many variables as possible. Since most cultivated cycads are grown under optimal conditions, we would expect that cyclic phenomena such as photoperiodicity and endogenous cycles would be less obscured by local climatic effects which have their greatest impact on cycads in the wild.

5. We also would appreciate information on the timing of leaf production, specifying whether in the wild or in cultivation.

To help assemble our information, would you tabulate your data more-or-less as follows and send your data to **Roy Osborne**, 20 Maryvale Road, Westville 3630, South Africa, or to **Knut Norstog** (U.S.A. address). We will acknowledge your contributions in the printed summaries which we will publish in these pages from time-to-time.

SPECIES	CONING DETAILS	DATE	SITE

A PASSING GLANCE AT CENTRAL AFRICAN CYCADS

Maans Kemp
51 Constance Road, Broadwood, 6070 Port Elizabeth

During June 1991, I conducted a study tour which included visits to universities, polytechnics and other educational institutions in Zambia, Zimbabwe, Kenya and Malawi. My schedule was very tight and I knew I would not have time to visit any cycad localities in these countries, or even botanical gardens. I decided to stay on the look-out for any cycads in public places in these countries however. I was pleasantly surprised when I was able to see four cycad species on my way through.

Perhaps some other traveller may one day find himself or herself in a similar situation, for example on a holiday or business visit, and may be interested in hearing where to find cycad specimens 'on the beaten track'.

In Zambia I visited Lusaka and the Victoria Falls at Livingstone, but did not come across any cycads. In Harare in Zimbabwe, which was the only place I visited, I could not miss them. There were some fine specimens of *Encephalartos manikensis* planted in front of the Sheraton Hotel, where I was staying. Some of these were in cone (Figure 1) and added to the pleasant surroundings of this fine hotel.

In Kenya I visited Nairobi and Mombasa, and was fortunate to see two cycad species in this very special country. In Nairobi there are some fine specimens of *E. hildebrandtii* growing along City Hall Way, amongst others. Next to the Law Courts there were male and female plants (Figure 2) in cone at the time. One of the major tourist attractions in Mombasa is the fascinating Fort Jesus, which dates back to 1593. Inside the fort, next to one of the ancient walls, there stand, side by side, two magnificent specimens of *E. hildebrandtii* and *Cycas thouarsii* respectively, looking very much at home in their historical environment. Many large specimens of

C. thouarsii can also be seen near the road between the Mombasa city centre and the luxurious coastal resorts east of the city.

Figure 1 A specimen of *E. manikensis*, with female cone, in front of the Sheraton Hotel in Harare.

Figure 2 *E. hildebrandtii* specimens, with female cones, next to the law courts in Nairobi.

In Malawi I visited Lilongwe, Blantyre and Zomba, the lake resorts at Livistonia Beach and Monkey Bay, and the beautiful Liwonde River area. I was fortunate to see very fine specimens of *E. gratus* in Blantyre. There were some smaller ones in front of the Malawi Polytechnic, one of which had a large female cone growing almost horizontally from its stem (Figure 3). There were three well-developed leaves growing from the top of this cone. In the beautiful, lush garden of the Mount Soche Hotel, I came across a splendid, tall specimen, bearing four bright orange female cones (Figure 4).

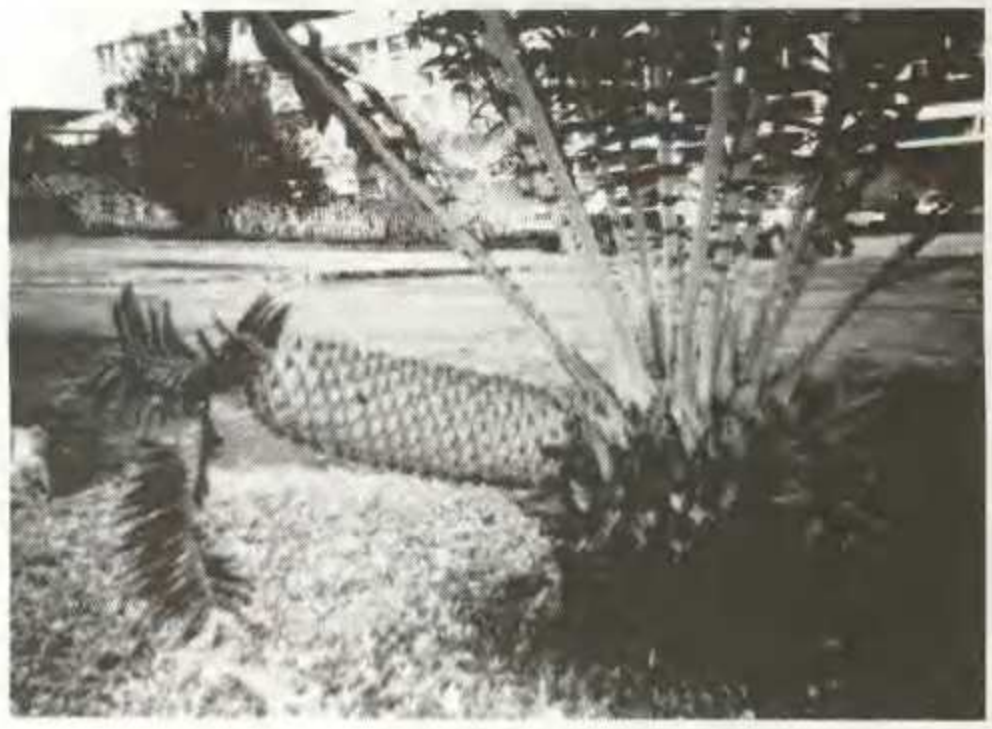

Figure 3 Female *E. gratus* in front of the polytechnic in Blantyre.

Figure 4 Maans Kemp admiring the tall specimen of *E. gratus* at the Mount Soche Hotel in Blantyre.

The encounters with these lovely cycads, although away from their natural habitats, added greatly to my memories of a very interesting and worthwhile tour.

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A MORE REALISTIC CONSERVATION STRATEGY FOR THE SOUTH AFRICAN CYCADS

Professor N. Grobbelaar, Department of Botany, University of Pretoria, 0002 Pretoria

The present popularity of cycads amongst the general public can be attributed to a combination of factors: the ornamental beauty of many species in garden landscaping; the hardiness of the plants; their relative rarity; the fact that they are relatively free of disease problems; the often over-emphasized value of the plants as a monetary investment; and man's innate desire to build complete collections of particular objects.

Encephalartos paucidentatus (female cones)

The extant cycads are scientifically interesting because they represent the relics of an ancient flora which dominated the earth's vegetation during the latter half of the Mesozoic Era (250 to 65 million years ago) when dinosaurs roamed the planet. Unlike the dinosaurs, which disappeared completely at the end of the Mesozoic as the mammals took over, a small number of cycad species managed to survive, in spite of competition with highly successful evolving flowering plants. Cycads represent one of the early stages in the evolution of seed plants from the more primitive seedless plants such a ferns. Primitive characteristics of the cycads include th presence of both large motile male gametes an recalcitrant seed.

Although between 160 and 180 different cycad specie exist on the earth today, they represent less than 0.1% o the diversity of the extant seed plant species. Many o the present cycad species are in danger of extinctio because only one or a few small populations exist in th wild; the scarcer these species become, the stronger th urge becomes for collectors to acquire them Consequently, these plants fetch exorbitant prices on th open and black markets. While some collectors tak pride in growing their cycads from seed and observin the various stages of development of the plants, it i unfortunately also true that some collectors ar interested only in acquiring mature and often very larg specimens. Because of their slow growth rates, such plants can only be obtained directly from the wild, o indirectly when cycad collections are sold. Th unscrupulous removal of plants from the wild can not b condoned by any sensible person. On the other hand, i must be difficult for a cycad collector to refrain from buying a particularly desirable cycad on the black marke when it is obvious that existing measures to stop thi trade are ineffectual. Indeed, those cycad enthusiast who take pains to hand-pollinate garden plants and propagate the species through seed and suckers would argue that, by buying plants on the black market and caring for them, they are helping to conserve the species They point out that, all too often, inexperienced person remove entire colonies of plants from the wild only to le most of the plants die through careless management. In the wild it is also common to find dense stands o seedlings below the canopy of female plants. It i obvious that, through competition, few of these seedling will survive *in situ* and, although it is illegal to remove seedlings, many could be saved by so doing.

Cycads are relatively slow-growing and the South Africa species have a juvenile phase of more than ten years Because all cycads are dioecious and since mature individuals generally do not cone on an annual basis several mature individuals must usually be present to ensure successful sexual reproduction. Although many species appear to be insect pollinated, it is probable tha some species are exclusively wind pollinated. Because o the inefficiency of wind pollination, mature individuals in these populations have to be closely spaced to ensure successful pollination. Therefore a small number o specimens of a given species in a cycad enthusiast's collection will usually not reproduce sexually unless artificial pollination is carried out. Because many cycad species hybridize readily, the progeny of garden plants

must also be suspect unless special precautions have been taken by the breeder to prevent interspecific hybridization.

For the sake of their beauty, uniqueness, and scientific value (which has thus far been explored only superficially), all right-minded and informed people will agree that adequate steps should be taken to prevent the extinction of any extant cycad species. The problem is to find a suitable strategy by which means the future of the cycads can be ensured for posterity.

Past and present strategies

Education of the masses, with the aim of inculcating an appreciation of these plants, is a sound long-term strategy which must be continued. Amongst all the important objectives of a nation, this facet realistically will, however, always be accorded a low priority and must therefore be augmented with other steps.

The creation of a nature reserve around a natural population of each cycad species is a much sought-after ideal. A few nature reserves have been created specifically to protect cycad species whilst many others contain one or more species of cycad within their boundaries. Unfortunately the populations in the latter case are sometimes small and non-viable from a conservation viewpoint. According to Osborne (1990) 24 of the 33 southern African cycad species are found in one or more of the existing nature reserves (Table 1). Apart from the cost involved in creating nature reserves for representative populations of all our cycad species, the problem of policing them effectively contributes largely to the relegation of this policy to that of a supplementary measure. Large sums of money are often involved in the illicit cycad trade and when the supervision of a whole reserve depends on the efforts of a few often poorly-paid individuals, the inefficiency of the effort may be compounded by the possibility of corruption and bribery.

The third aim of the present strategy entails the implementation of legislation enabling various authorities to apprehend and prosecute poachers and illegal traders in cycads. Most of these control measures have proved to be difficult to administer successfully and the punishment meted out in our law courts has often been so inadequate that it has failed as a deterrent for future similar crimes. South Africa is also a signatory to the international *Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)*.

Our nature conservation authorities have been very successful in apprehending and prosecuting persons who have openly traded in truckloads of mature plants. Unfortunately they are not as successful in dealing with the more insidious poaching by the local indigenous people in response to high prices paid by black market racketeers. Because the law-enforcing agencies in such cases often experience immense problems in proving that such material comes from the wild, the tendency is increasing to make it so difficult to export or trade in indigenous cycads so as to virtually prohibit all such actions. At present, for instance, at least some nature conservation authorities refuse to provide permits for the export of seeds of indigenous cycad species even when the seed has been derived from garden plants through artificial pollination. There is no doubt that such unilateral action by the authorities antagonizes cycad enthusiasts who are genuinely interested in and actively contributing towards the conservation of cycads. This is a sad state of affairs as both parties have similar ideals. The legislation on cycads also varies in the different provinces, which makes it difficult for the law-abiding cycad enthusiast to pursue his interest without inadvertently falling foul of the law.

For several years the Transvaal Nature Conservation Department, attempted to help satisfy the public demand for cycads by hand-pollinating many garden plants in Pretoria, germinating the seeds at their nursery and selling 5-year old plants on a more-or-less cost price basis. This laudable activity was, however, terminated a few years ago since it was considered to *represent unfair* competition to private cycad nurseries.

Despite the diverse cycad conservation strategies presently followed by the various nature conservation Departments, and notwithstanding the introduction of harsher legislation, the authorities seem to be failing in their objectives. It is my conviction that this will continue to be the case unless they revise some of the basic premises on which their present strategies are founded.

A more realistic approach

The first priority of our nature conservation authorities must be to prevent the extinction of our indigenous cycads, even if this means growing them under semi-artificial conditions. The present policy of leaving plants in their natural habitat even when it is obvious that suitable protection against poachers is impossible, should be reconsidered. Many of the existing natural cycad populations occur in remote areas where it is difficult to protect the plants from the insidious poaching by the local residents. It also makes it virtually impossible for the general public to view and appreciate them. Breeding colonies of those cycad species that are not effectively protected in their natural habitats should be established in suitable existing nature reserves. If a colony of more than one cycad species is established in the same reserve, the plantings should be spaced sufficiently far apart to preclude hybridization. It is well known that our cycads thrive well in a wide variety of environments and there is no reason why all our species can not be accommodated successfully in existing nature

reserves. Because a viable cycad population can be established on a relatively small area, the introduction of such an 'artificial' colony in an existing nature reserve should not have any greater environmental impact than the rest camps and other facilities that are commonly provided in such reserves. Although such colonies should be established mainly through the introduction of seedling plants from a given natural habitat, the simultaneous introduction of several mature plants from the same locality should ensure sufficient genetic diversity and the transfer of possible mutualistic insects and micro-organisms. The 'artificial' colony could be laid out in an aesthetic pleasing way and should be placed where it can be supervised effectively and where it will be readily accessible to the general public for appreciation, and to scientists for study.

With the future of all our species and ecotypes thus safeguarded, much of the restrictive legislation and prosecution activities could be reduced. Instead, efforts should be made to increase the propagation of the more threatened species by artificial means until such time as the species are no longer endangered. To this end, the authorities in the nature reserve should actively promote the pollination of the female cones of the plants and take special precautions to protect and collect the seed. This seed should be germinated under nursery conditions which will normally ensure that almost 100% of the fertile seed will yield healthy seedlings. Initially, well-established plants derived from these seedlings should be used to strengthen the 'artificial' colony and/or used to establish additional colonies in other nature reserves. As soon as possible, some of the seeds and/or seedlings should be made available to botanical gardens, the public and especially to recognized groups such as the Cycad Society.

The canalization of seed and seedlings to the public is important despite the existence of private nurseries because the serious cycad enthusiast will always like to be sure that his plants are unquestionably representative of a given original natural locality. Indeed such certified seeds and seedlings could command substantial prices.

The concept of having nature conservation authorities grow cycad species under 'artificial' conditions and treating them as horticultural plants is not a novel or unacceptable policy. The Transvaal nature conservation authorities grew certain endangered cycad species from seed and attempted to establish colonies of plants on selected private properties in remote areas. After transplantation into the wild, the plants were apparently not well cared for and consequently the project was only partially successful. As far as endangered animals are concerned, the nature conservation authorities have for many years been stocking nature reserves with species that have become locally extinct. Some animal species that have become almost extinct in the wild have been carefully kept and bred in captivity and ultimately returned to the wild. Why the same can not be do with plants such as cycads, is not clear.

Naturally, the **ideal** must be to maintain populations each cycad in their natural habitat but when this cann be guaranteed, one should not wait until only one or tw specimens remain in the natural habitat before a rescu operation is attempted.

Encephalartos middelburgensis

Just as a very serious obligation rests on all of us t conserve our flora and fauna for posterity, th authorities must also concede that it is an admirable an normal human trait to admire, collect and study plant and animals. In addition to conserving plants an animals, the authorities must also make it easy for th public to see and acquire specimens of such plants an animals. Restrictive legislation should be kept to th minimum and the co-operation of like-minded group should more often be sought. The Cycad Society o South Africa, which attempts to mobilize the interests o cycad lovers into actively participating in cyca conservation projects, is an as yet untapped source o manpower and expertise on which the nature conservation authorities should feel free to call on fo practical assistance when dealing with the identificatio and transplanting of plants, the pollination of cones an the growing of plants from seeds. Although any such society might unwittingly include a criminal elemen amongst its members (as indeed one even finds within a respectable police force), one should not shun the

goodwill and sincerity of the great majority of the members of such a society but one should rather provide them with the challenge to prove their worth and sincerity in upholding the aims of their Society.

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SHORT COMMUNICATIONS / KORT MEDEDELINGS

VARIATION IN *ENCEPHALARTOS CAFFER*

Maans Kemp

Interesting variations sometimes occur within one cycad species. The accompanying photographs (Figures 1-4), all taken by the author, show differences between two specimens of *Encephalartos caffer*.

Figure 1 Leaf detail of the *E. caffer* specimen from the Grahamstown area, showing very close overlapping of the leaflets and a pronounced 'ruffled' effect.

Figure 2 Male cone of an *E. caffer* specimen from the Grahamstown area, showing very prominent ridges on the scales, as well as large, flat scale faces.

Figure 3 Leaf detail of the *E. caffer* specimen from the Humansdorp area, showing broader leaflets, which are more widely spaced, and which are not significantly twisted out of the plane of the leaf axis.

Figure 4 Male cone of an *E. caffer* specimen from the Humansdorp area, showing cone scales which are relatively smooth, with small scale faces.

SEED MORPHOLOGY : *CYCAS WADEI*

Roy Osborne

Despite the taxonomic value of all constant characters very little attention is paid to the shape, size and othe morphological characters in cycad seeds (se ENCEPHALARTOS 13: 26-30). One of the obviou characters in this regard is the ribbing pattern on th surface of the seed kernel. We see great variation, e.g in the highly-ribbed pattern in *Encephalartos villosus* t the more-or-less totally smooth surface of *E. horridus* There seems to be a similar variation in *Cycas* wher perhaps the most fascinating of all patterns is that see on the kernel of *Cycas wadei*, a little-known species fro the Philippines.

Seed kernels of the Pilippines cycad, *Cycas wadei*, showing th very pronounced ribbing pattern which appears to b characteristic of the species. The seeds measure 45 mm x 3 mm. Photo: Roy Osborne.

ENCEPHALARTOS PLANTS IN CULTIVATION: UNUSUAL CONE NUMBER

Isabella Claassen

It is commonly known that both male and female plants of *Encephalartos lehmanni* produce a single cone per stem. A group of *E. lehmannii* male plants in the Pretoria Botanical Garden consists of five plants with several suckers and branches (Figure 1). From 26 December 1988 to 21 January 1989 they coned as follows:

> Ten crowns with a single cone each; two crowns with two cones each, and three crowns with three cones each.

A male *E. lehmannii* at the University of Pretoria has produced two cones per crown in January 1987 and again in December 1991.

Figure 1 *E. lehmannii* male plants at the entrance to the main part of the cycad zone, Pretoria Botanical Garden. Juvenile cones of the plant on the right are depicted in Figure 2.

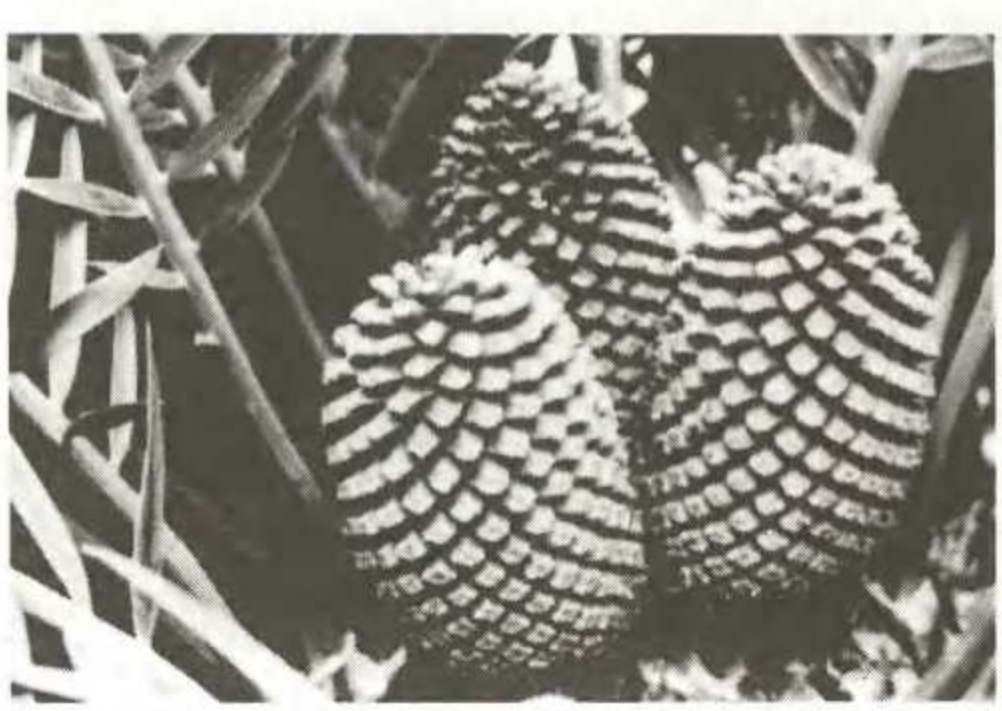


Figure 2 *E. lehmannii* with three male cones on the same stem. (21 February 1989).

In ENCEPHALARTOS 31: 6, Roy Osborne wrote tha male plants of *E. inopinus* bear up to four cones. An *E inopinus* male (Figure 3) in the Manie van der Schij Botanical Garden, University of Pretoria was grown fro a seed, several years ago, at the Hartbeeshoek Nurse of the Transvaal Nature Conservation Department. coned for the first time in November 1986 (four cones subsequently in November 1987 (three cones) and i November 1990 (five cones) (Figure 4).

Figure 3 *E. inopinus* male, University of Pretoria.

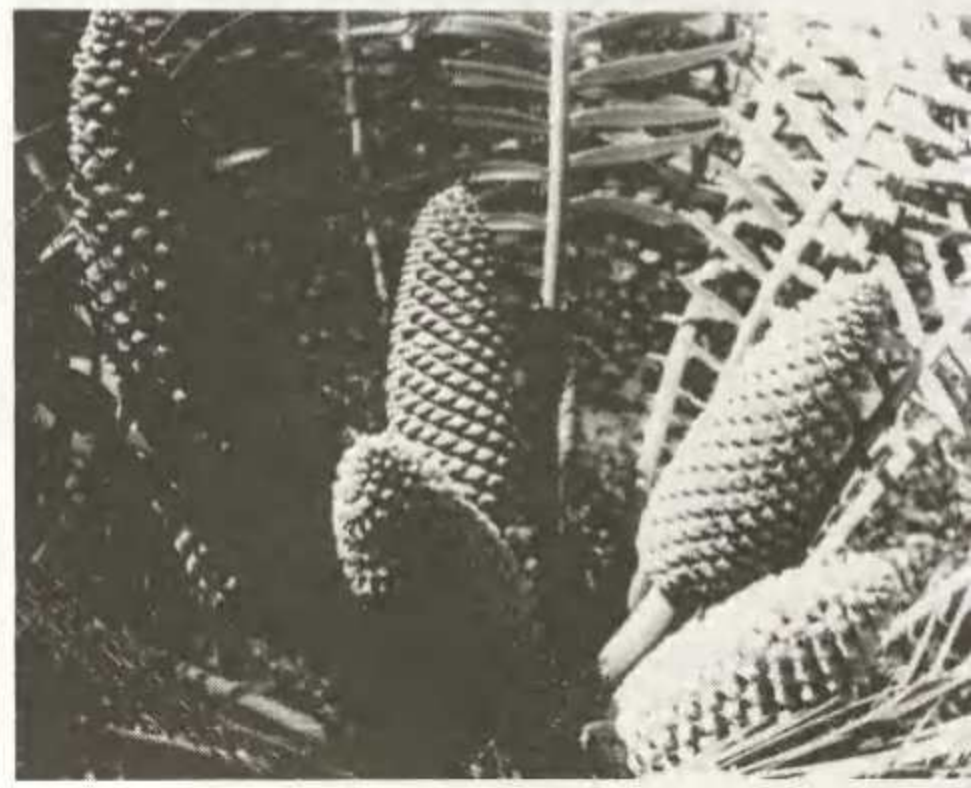


Figure 4 *E. inopinus* with five male cones on the same ste (10 January 1991).

During December 1990 four *E. trispinosus* male plants, two each in the Pretoria Botanical Garden and at the University of Pretoria, produced two cones per crown, instead of only one cone per crown.

ENCEPHALARTOS: LEAVES ON CONES

Isabella Claassen

Since the publication of 'LEAVES ON CONES' (ENCEPHALARTOS 12: 4; 1987) and 'KEËLBLARE IN *TRANSVENOSUS*' (ENCEPHALARTOS 13: 18, 19; 1988) two more cases of leaves on cones came to my attention (Figures 1, 2).

Figure 1 Leaf outgrowths on a female cone of *Encephalartos lehmannii* in the garden of Henry Nel, Queenswood, Pretoria. (April 1991). The robust central leaf had six rows of leaflets and must have been a coalescence of three leaves.

Figure 2 Leaf outgrowths on a female cone of *E. longifolius* in the garden of Mrs. S.C. Jacobs, Villieria, Pretoria. (September 1992). This plant stands next to the *E. longifolius* male that produced the cone with leaves in 1987.

THE SAFEST CYCAD IN THE COUNTRY?

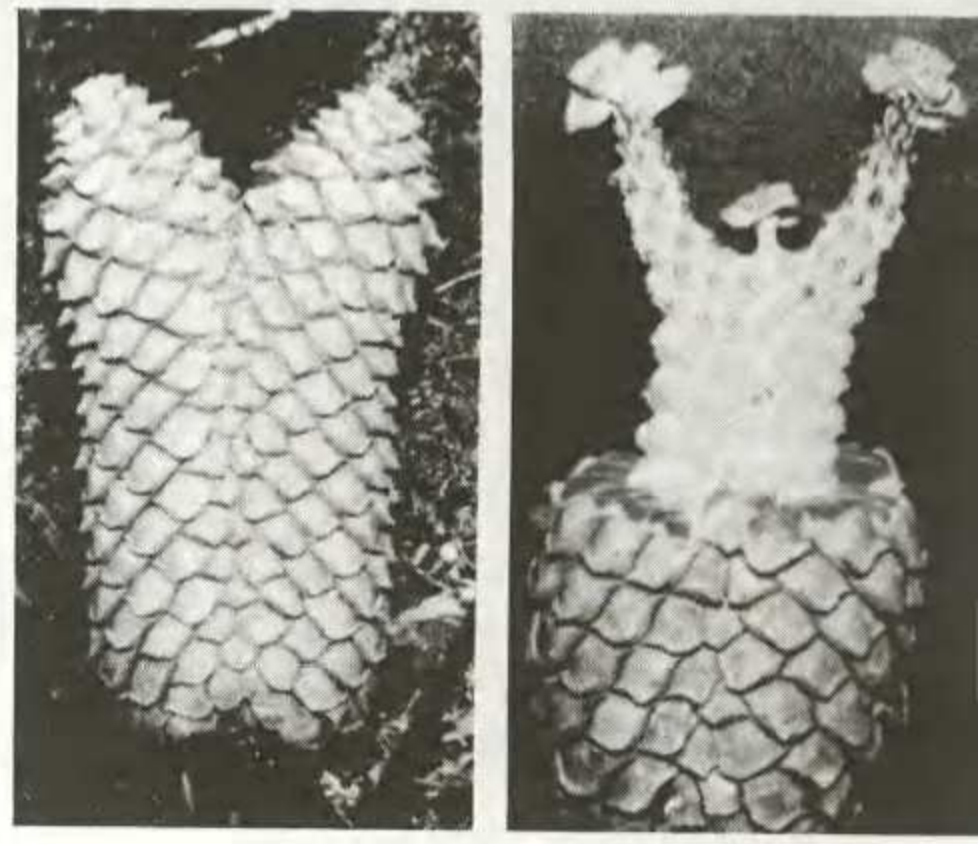
Maans Kemp

This tall specimen of *Encephalartos altensteinii* stands in the middle of the snake pit at Port Elizabeth's famous snake park, where demonstrations were held for many years. It is common to see snakes of all types sleeping or sliding amongst the leaves of this specially-protected cycad. Photograph: Maans Kemp.

SIAMESE TWINS AMONGST CYCAD CONES

Isabella Claassen

This refers to Nat Grobbelaar's contribution on the *Encephalartos villosus* plant bearing two female cones that were fused along their length (ENCEPHALARTOS 19: 53, 1989).



The Siamese twins (left) with part of the cone scales removed (right) rather resembled a child's body with upraised arms and an extremely small head.

ARTIFICIAL PROPAGATION PROJECT: RESULTS OF A RECENT SURVEY

Roy Osborne

Doris Francis, student horticulturist at Kew Botanic Gardens has just completed a project on 'Artificial Propagation of Cycads within Botanic Gardens' and we were pleased to receive a copy of her report, from which the following highlights have been abstracted. The data was obtained by means of a survey sent out to 25 leading 'cycad' botanic gardens, 20 of which responded.

The South African botanic gardens (Durban, Kirstenbosch, Lowveld and Pretoria) actively and

regularly pollinate female plants in their collections for the purposes of seed production, as do Fairchild Tropical Garden in Miami and, more recently, the Jardin Botanico at Xalapa in Mexico. The other gardens which responded positively in this regard had performed 'occasional' pollinations when the material was available and often only when a staff member had a particular enthusiasm for cycads, Several of the Australian gardens which had previously taken cycads more-or-less for granted, were now taking a more active interest. Many of the responses indicated a willingness to form or extend relationships with the various cycad societies (South Africa, Australia and United States of America) to mutual benefit.

The occasional disappointing statement also emerged, e.g. one of the well-known Californian botanic gardens stated '*Although we have a large collection of cycad species, there is currently no interest in propagation or in exchange with other gardens*.' And perhaps only an Australian garden could get away with '*we do not have a pollination program in order to obtain seed; however we do make a point of collecting male and female plants in the wild*.' A sense of despair comes out in one respondee's reply to a question as to whether their artificial pollination resulted on a cone with viable seeds - it says simply '*No - stolen*.'

Congratulations are probably in order to those European gardens where artificial pollination has been done, e.g. to Kew for producing viable *Encephalartos ferox* seeds, to Edinburgh for being successful with *Stangeria eriopus*, to Portici, Italy for growing crops of *Cycas revoluta*.

To conclude, we can't resist quoting advice from one of the American correspondents who suggested Ms Francis read our magazine: '*ENCEPHALARTOS is an excellent place of find info. The [Cycad] Society [of South Africa] is well organized and very upbeat in their search for information and research, a real fun bunch of devoted people*.'

Ms Francis' address for correspondence is: c/o School of Horticulture, Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AB, England.

NATAL SECTION NEWS

Natal Section Committee

A record attendance of 54 members was evidence of the interest of Natal Section in matters of conservation and law enforcement at the meeting on 18 June 1992. **Rob Scott Shaw**, Nature Conservation Scientist of the Natal Parks Board addressed the meeting, a full report will follow in a future issue of this magazine. A lively question-and-answer session followed and a clear message from the floor was that members objected to the criminal status with which cycad collectors were viewed by the media and the authorities.

TROPHY FOR DANIE NEL

Natal Section Committee

The Natal Section of the Cycad Society has announced a new Conservation Award, symbolized by a floating trophy kindly donated to the section. The first winner of the award is **Danie Nel**, past seedbank officer of the Society. During his term of office Danie distributed an impressive total of 32 655 seeds to Society members. In presenting the award on 18 June 1992, Natal Chairman **Harry Gerber** explained that 'if only a half of these grew to maturity, it means more than 16 thousand new cycads in the world. It is fitting that Danie Nel is the first recipient of the award.'

Danie Nel (centre) receiving the 1992 Natal Section Conservation Award. With him are Rob Scott Shaw (left), (Natal Parks Board) and Harry Gerber (right), (Natal Section Chairman).

WELCOME TO OUR NEW EDITOR

Nat Grobbelaar

Martha Isabella Claassen (affectionately known to friends as Isabella) hails from the Western Transvaal. She received her secondary schooling in Bloemfontein whereafter she studied at the University of Pretoria for the BSc degree. She majored in three subjects namely Botany, Zoology and Geography.

After working in the civil service for a year, she resumed her studies in Botany at the University of Pretoria. She was appointed to the Botany staff after a few years whilst pursuing her post graduate studies of the freshwater algae of the Transvaal. After obtaining her MSc degree with distinction, the thesis won her the Junior Captain Scott Memorial Medal from the South African Biological Society. A monumental taxonomic work on the freshwater algae of the Transvaal qualified her for a doctorate in 1983.

Isabella is a member of several learned societies and h several professional publications to her credit.

For many years now, Isabella has been interested cycads and over the years she has built up a splend private collection of South African species. Until h retirement from the staff of the University of Pretoria the end of 1991, Isabella was a leading expert in t Botany Department on South African Cycads. She ke careful records on the growth of the cycads in t department's extensive collection and she has also be responsible for the artificial pollination of the sa collection for several years.

The cycad Society of South Africa can indeed consid itself very fortunate to have such a highly respecte knowledgeable and conscientious person as Isabella as Council Member and as the Editor 'ENCEPHALARTOS'.

HURRICANE ANDREW

Terrence Walters
Fairchild Tropical Garden, Miami, U.S.A.

Knut and Priscilla Norstog were at FTG for three da helping with the aftermath of Hurricane ANDRE The hurricane devastated the garden and foundatio Over 160 mile per hour winds came through the garde Seven employees lost their homes and nine lost larg portions of their roof. The Garden looks like a wa zone. The few trees that were left standing have n leaves on them. The Tropical Rain Forest is no mor most of the flowering tree collection is gone, and t Rare Plant House's roof was taken off. Overall, t native pines, native palms, and cycads fared the best.

OBITUARY

DR AMY FRANCES MAY GORDON JACOT-GUILLARMOD passed away in Grahamstown on Friday, May 7, 1992.

Dr Jacot, as she was affectionately known, would have celebrated her 81st birthday on May 23, a birthdate sh was proud to share with Linnaeus.

She leaves her son, Francois, his wife, Sandra and fou grandchildren.

Dr Jacot was born at Hillcrest, Natal in 1911. She spent much of her childhood in Durban and Cape Town. Her mother taught her at home until she was 11, when she began formal schooling in Scotland. She spent the last four years of her schooling at Durban Girl's High School.

She went on to St Andrews University, Scotland, where she read for an MA in English and History. Having completed this, she realized that Science was her natural bent and she read for a BSc in Botany and Zoology. Her DSc was awarded by the same University in the 1960's for her work on the flora of Lesotho.

On her return to South Africa, she taught in Durban before becoming a researcher in the Plant Pathology Division of the Department of Agriculture in Pretoria, until her marriage, when she moved to Lesotho.

In 1940 she began a survey of what was then Basutoland. During the 20 years spent in that country she also lectured at the University College of Basutoland and was, briefly, head of the Department of Botany. Her intensive study of the flora of Lesotho culminated, in 1971, in the publication of her definitive work, *Flora of Lesotho*, which has remained a basic reference on montane flora.

In 1958, when her husband joined the staff of the Albany Museum in Grahamstown, Dr Jacot was appointed as a lecturer in the Department of Botany at Rhodes University. She later became a Senior Lecturer, and retired in 1973. In 1975 she became a Research Associate in the Department of Zoology and Entomology at Rhodes University, where she joined the research team in the Institute of Freshwater Studies, concentrating on large water plants. She was also a researcher in the Albany Museum Herbarium.

During her career, Dr Jacot wrote and co-wrote over 200 papers and collected some 10 000 plant specimens. The Botanical Research Institute of the Department of Agriculture and Water Supply dedicated Volume 50 of its journal *The Flowering Plants of Africa* to Dr Jacot in June 1988, in recognition of her immense contribution to southern African Botany.

She was a fellow of the Linnaean Society in London and an Honorary Life Member of the Limnological Society of Southern Africa.

Cycad enthusiasts will remember Dr Jacot especially for her pioneering work on heat production by *Encephalartos altensteinii* male cones at the time of pollen release.

Nat Grobbelaar.

IN MEMORIAM

It is with great regret that we record the death, after a long illness, of **ROBERT TUCKER**. Robert, previously Botanic Collections Officer of the Townsville Botanic Gardens in Australia, was a special person to many of us, even more so after his demonstrated enthusiasm at the CYCAD 90 Conference. Shortly before his death, Robert wrote to the editor of the Australian PALMS & CYCADS magazine, cautioning against misinterpretation of the '*Conservation through Cultivation*' catch-cry. In honour of his memory, we reprint his important message:

"I noticed that Cycad '93 Conference is titled 'Conservation Through Cultivation', but I wonder if this catch-cry is fully understood by those who use it. Cultivation, contrary to popular belief, does not guarantee conservation of wild plants unless certain special circumstances apply (i.e. a monotypic genus) or very strict controls are put in place.

The main problems facing *ex situ* conservation of plants are: inbreeding; lack of accommodation of infraspecific diversity; hybridism; fashion. As you may be aware, the simple cultivation of plants without careful provenance and genotype breeding programs will not produce genetically meaningful progeny that is of any value to the plant population. With dioecious plants like cycads where interspecific hybridity is a serious problem, this difficulty is magnified.

I appreciate that environmental and biological issues are now being reviewed by horticultural circles and that with careful education, some very erudite participants could result, but I am also sure the 'conservation through cultivation' claim is not often backed up by a sincere understanding of the complexities involved, and given the behaviour of some Cycad '90 participants, is merely an excuse for traditional, and sometimes grossly predatory collecting."

Robert Tucker, Townsville, Australia.

LETTERS TO/FROM THE EDITOR

I would like to draw the attention of the CYCAD 93 Organizers, and the intending participants, to the matter on which the late Robert Tucker and I, shared much in the way of common opinion. Although I am very much a fatalist when it comes to conservation and bio-diversity issues, I can appreciate the efforts and concerns of others. I simply see it as a problem too big for us humans to handle; after all we are only mere living organisms at the mercy of forces which are greater than we pretend, or may ever hope, to understand.

Nevertheless, the question at hand is 'what should be the theme of CYCAD 93?'. Clearly it is a giant step backward for the study of cycad biology if *Conservation through Cultivation* was to be the major focus of the conference. From what I understand of the role of cycads in the 'horticultural economy' of South Africa, it is very dominant. There are some high-profile players whom have made a successful operation from promoting and selling cycads using the above premise as their catch-cry, and thus appearing to have no real understanding of, or interest in, conservation and bio-diversity on a broader scale than a commercial interest.

In Australia the endangerment of our wild cycad populations is not as critical as in other parts of the world. Nevertheless, there are those who will remove the rarer species from the bush and sell them, under the guise of 'saving' the plant, but they have impoverished the population. I made reference to this practise in my *Editor's Prologue* in Len Butt's Zamiaceae booklet. My comments caused more than a few ripples amongst the cycad fraternity here in Australia.

But on the positive side, there are many informed, and not commercially orientated, people also involved in CYCAD 93. Hopefully they will be able to influence and direct the event, and somehow expose the quite ridiculous myth of *Conservation through Cultivation*, and introduce strongly and clearly those elements (protection and research) which are more appropriate and sensible themes.

John Dowe, Botanic Collections Officer, Townsville Botanic Gardens, P.O. Box 1268, Townsville Q4810, Australia.

Dear Sir

There has been much written in various issues of ENCEPHALARTOS which directly or indirectly promotes the concept of *ex situ* 'conservation' of cycads through either private or public collections. I would like to add a word of caution to this as the be-all-and-end-all of cycad conservation. Most collectors of living cycads I am acquainted with will say their primary motivation is to save cycads from extinction. Well and good, but for how long? For a human lifetime? For the lifetime of a botanical garden? A national park? Suppose a collection of a few plants of *Microcycas*, let us say, survive for a couple hundred years in a garden until it is wiped out by a) a hurricane, b) bombs, c) anarchy, d) pollution, e) disease, f) vandalism, g) development, or any such as we know have already happened to botanical collections in one or another part of the world. How well do the anticipated survival times of our collections stack up against the millions of years they had survived in nature?

I can't help remembering that Professor Chamberlain's magnificent collection at the University of Chicago and their provenance lasted intact only a few years after his death. My own collection at the University of South Florida of *Zamia pumila* from various locales of Florida was grubbed out after I left and the site is now a tennis court! On the other hand, I think the story of *Microcycas* at Fairchild Tropical Garden might be pointed out as a signal success of 'conservation through propagation' but must be qualified by pointing out that the gene pool is based on one female and two males (the female and one male recently struck by lightening and may not survive, if still alive). *Microcycas* is almost certainly insect-pollinated in the wild; at FTG it has to be hand pollinated. What kind of conservation is that?

In the Miami area, a cycad collector has assiduously 'rescued' cycads from the wild for years. He has them all lumped together in his garden and introgression between some species has occurred in this cycad patch and the miscegenous progenies have been dispatched far and wide to other gardens. I think we have to be very cautious and very, very realistic when it comes to the preservation of cycads.

Finally, I think we must concede that *Cycas revoluta*, like *Ginkgo biloba*, will never go extinct. The same could be said for a dozen or more other species. But what I fear is that we allow ourselves to be persuaded that as long as we keep a few as pets, we don't really need to worry about them in the wild. I'm sure it will be your intention to address these problems realistically at the forthcoming Conference, CYCAD 93.

Knut Norstog, 5925 J. Road, Waterloo Il 62298, U.S.A.

In reply to the criticism of the CYCAD '93 motto, **Conservation through cultivation**, levelled by Mr. John Dowe, Dr. Knut Norstog, and a few others, I wish to explain the reasoning behind it, as I don't think this is understood by our critics.

I would be the first to agree that 'conservation' in private or public gardens is a false religion. Regrettably there is no guarantee that even in scientific institutions the plants will not suffer sooner or later through lack of funding, change of emphasis, or other all-too-well known factors detrimental to their permanent well-being.

The truth is that in the case of most of the South African species of *Encephalartos*, it simply is not practical to conserve them *in situ*. The individuals often occur thinly spread, so that it is extremely expensive to fence in a significant number of plants. Furthermore the plants tend to occur in locations remote from towns and roads so that effective policing is out of the question. Lastly, in a difficult economic climate where there is severe competition for public and private funds, there is simply no money to protect single species, however valuable us cycad enthusiasts may consider them to be. Our conservation authorities have much more to attend to than cycads only, but have only limited funds at their disposal.

Which brings us back to cultivation. It would be unfair and unnecessary to deny citizens the right to grow these beautiful plants for pleasure or profit. Due to the scarcity of plants in nature, it has become expensive and risky to acquire them from nature, and a much more attractive proposition is to buy nursery-grown seedlings. It would be preferable and quite practical to grow these from artificially pollinated seed produced in existing gardens; but I am not against the conservation authorities making seed from the wild populations available to the public. We know that in nature few seeds germinate and survive to reproductive age - a plant with a 2 meter tall stem may have produced as many as 27 000 seeds by the time it reaches that size, yet on average only two seedlings mature in order to maintain the numbers of that species. On the other hand, under nursery conditions the survival rate can be close to 100%, and every seedling raised reduces pressure on the wild plants and thus aids the conservation effort.

Both **cultivation** and **conservation** are important aims of our Society, but so is **research** on various practical and altruse aspects of cycads. Like most people, scientists also experience a perpetual shortage of funds, and it is very expensive to study plants in nature. For scientific purposes cultivated plants can be very useful - for my research my own modest collection, mostly grown from seed, comes in very handy. In turn such research can only be of benefit to conservation efforts - here one needs only think of correct understanding of the taxonomy when considering captive breeding or re-introduction into nature. Let me remind the reader that Dr. Norstog and Mr. Willie Tang's pioneering research on insect pollination and reproduction in *Zamia* was made possible by cultivated rather than wild plants; and that their discoveries have a far-reaching influence on the approach to captive breeding, re-introduction into nature, and conservation *in situ*.

It has been suggested that we should extend our motto to include the aspects **protection** and **research**. I am not in favour of this, because a motto can only be effective if it is short and lyrical. As I tried to show above, the concept of **cultivation** is in fact pregnant with meaning, and encompasses the aspects of **protection** and **research**.

Therefore, dear critics, I urge you to see our motto **Conservation through cultivation** in its broad sense. Even if the end may seem obscure, cultivation offers a way of making sufficient plants available for pleasure, business, and science; while indirectly in the short run and hopefully more directly in the long run benefiting the remaining wild plants.

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

Dear Editor

Referring to Cynthia Giddy's article *Australian cycads - a worthwhile challenge* in ENCEPHALARTOS 31: 12, 13, I would like to ask her to tell us something more about *Macrozamia johnsonii*: where and under what conditions does it grow, where was it described, and in what publication.

She also mentions that the seeds of *Macrozamia macdonnellii* 'are the largest of any cycad'. While they are certainly enormous, I would like to point out that the seeds of *Dioon mejiae* and species in the *Cycas rumphii* group are equally large.

Lastly, I was interested to read of the occurrence of *Cycas media* and *C. kennedyana* in New South Wales. To the best of my knowledge these species were previously only known from Queensland, fully 700 km north of the New South Wales border.

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

Thank you, Mr. President, for your kind words of welcome. I sincerely hope that I will be able to cope as I have much to learn about editing.

Thank you Neil Munro, Roy Osborne, Maans Kemp and Piet Vorster for wishing me well with my new role.

Lastly, thank you to all the contributors whose contributions made the publication of this number of ENCEPHALARTOS possible. To all the readers of our magazine: I need your support in the form of contributions of text and photographs, letters-to-the-editor and suggestions for material that you would like to see in ENCEPHALARTOS.

Yours sincerely

Isabella Claassen, P.O. Box 11322, 0011 Brooklyn.

NEW SCIENTIFIC REPORTS

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

Chavez, V.M.*, Litz, R.E., Moon, P.A. & Norstog, K. 1992. Somatic embryogenesis from leaf callus of mature plants of the gymnosperm *Ceratozamia mexicana* var. *robusta* (Miq.) Dyer (Cycadales). *In Vitro Cell. Dev. Biol.* (in press).
**Author's address: Jardin Botanico, Instituto de Biologia, Universidad National Autonome de Mexico, D.F. 04510, Mexico.*

Chavez, V.M.*, Litz, R.E. & Norstog, K. 1992. Somatic embryogenesis and organogenesis of *Zamia fischeri, Z. furfuracea* and *Z. pumila*. *Plant Cell, Tissue and Organ Culture* (in press).
**Author's address: as above.*

Chavez, V.M.*, Litz, R.E. & Norstog, K. 1992. *In vitro* morphogenesis of *Ceratozamia hildae* and *C. mexicana* from megagametophytes and zygotic embryos. *Plant Cell, Tissue and Organ Culture* (in press).
**Author's address: as above.*

Clark, D.B. & Clark, D.A. 1991. Herbivores, herbivory, and plant phenology: patterns and consequences in a tropical rain forest cycad. In: Plant-animal interactions: evolutionary ecology in tropical and temperate regions, edited by P.W. Price, T.M. Lewinsohn, G.W. Fernandes & W.W. Benson. John Wiley & Sons, Inc., New York.

Clark, D.B.*, Clark, D.A. & Grayum, M.H. 1992. Leaf demography of a neotropical rain forest cycad, *Zamia skinneri* (Zamiaceae). *American Journal of Botany* 79(1): 28-33. [It is suggested that leaf longevity in the circumstances is determined by the inevitable deterioration in leaf carbon balance due to leaf aging and increasing epiphyll coverage, and by loss due to physical damage and attacks by the specialist herbivore.]
**Author's address: Organization for Tropical Studies, Apartado 676, 2050 San Pedro, Costa Rica.*

Duncan, M.W. 1991. Role of the cycad neurotoxin BMAA in the amyotrophic lateral sclerosis-parkinsonism dementia complex of the Western Pacific. In: Advances in Neurology 56: 301-310, Amyotrophic lateral sclerosis and other motor neuron diseases, edited by L.P. Rowland. Raven Press, Ltd.
Author's address: Biomedical Mass Spectrometry Unit, The University of New South Wales, Australia 2033.

Duncan, M.W.*, Marini, A.M., Watters, R., Kopin, I.J. & Markey, S.P. 1992. Zinc, a neurotoxin to cultured neurons, contaminates cycad flour prepared by traditional Guamanian methods. *Journal of Neuroscience* 12: 1523-1537. [Sliced seeds of *Cycas circinalis* are processed by soaking them in water in a galvanized container from which the material absorbs zinc. This is a quite different explanation to the toxicity based on MAM-glucosides and BMAA.]
**Author's address: as above.*

Nash, R.J., Bell, E.A. & Ackery, P.R.*. 1992. The protective role of cycasin in cycad-feeding Lepidoptera. *Phytochemistry* 31: 1955-1957. [The cycad toxin cycasin was detected in dried museum specimens of certain cycad-feeding butterflies from New Guinea, but was absent from a butterfly known to feed on Australian *Cycas*.]
**Author's address: The Natural History Museum, Cromwell Rd, London SW7 5BD, U.K.*

Osborne, R.*, Robbertse, P.J. & Claassen, M.I. 1992. The longevity of cycad pollen in storage. *South African Journal of Botany* 58(4): 250-254. [*Encephalartos* pollen rapidly lost germinability at ambient temperatures but retained 50% germinability for approximately two years

at 0°C and three years at -15°C. Pollen of *Cycas thouarsii* stored at reduced temperatures exhibited a pronounced seasonal variation in germinability with reduction in maxima over a 3-year period, implying the operation of a hitherto undocumented biological clock.]
**Author's address: Department of Chemistry, University of Natal, King George V Avenue, 4001 Durban, Republic of South Africa.*

Rothschild, M. 1992. Egg protection by the Atala Hairstreak butterfly (*Eumaeus atala florida*). *Phytochemistry* 31: 1959, 1960. [It is speculated, on the basis of their rejection by ants, that the eggs of the Atala Hairstreak butterfly, which feeds on *Zamia floridana*, contain cycasin as a defense against predation.]
Author's address: Ashton Wold, Peterborough PE8 52Z, U.K.

Stevenson, D.W. 1992. A formal classification of the extant cycads. *Brittonia* 44: 220-223. [The order is divided into 3 families; Cycadaceae with *Cycas;* Stangeriaceae with *Stangeria* and *Bowenia*; Zamiaceae with all other genera. The author wishes to announce that, since publication of this paper, he has discovered that priority for the name Cycadales is not Pfitzer, 1898, but Dumortier, Analyse des Familles des Plantes, p. 65, 1829. This correction should be made to the first line under the heading 'Classification of the Cycadales'.]
Author's address: New York Botanical Garden, Bronx, New York, 10458-5126, U.S.A.

Stevenson, D.W. 1992. The Zamiaceae in Panama. *Brittonia* 44(4): (in press). [11 species of *Zamia* occur in Panama, including 4 species described in this paper. Discussion centres on distribution and consideration of relationships based on derived characters. The species dealt with are *Z. skinneri*, *Z. dressleri* (sp. nov.), *Z. neurophyllidia* (sp. nov.), *Z. manicata*, *Z. pseudoparasitica*, *Z. chigua*, *Z. acuminata*, *Z. obliqua*, *Z. fairchildiana*, *Z. cunaria* (sp. nov.) and *Z. ipetiensis* (sp. nov.)]
Author's address: as above.

Vovides, A.P., Resslar, P.M. & Pérez-López, R. 1992. The Cycads of Veracruz, Mexico, 40 pp. [A translated and revised version of the Zamiaceae section of the Flora de Veracruz.]
Publisher: El Eco de Virginia Bilingual Publishers, 7510 Granby St., Norfolk, Virginia 23505, U.S.A.

ADVERTISEMENTS / ADVERTENSIES

WANTED: SEED COATS OF CYCADS

We have found indications that the anatomy of the outer skin of the fleshy layer covering the seeds of cycads, is different in different species. We would like to investigate this phenomenon, for which reason we need seeds of as many species as possible to sample. We require seeds, with the fleshy layer still intact, of as many indigenous and foreign species as possible. A single seed per species is sufficient, and we can use floating seeds. In the case of rare seeds we are prepared to return the seeds to the sender after removing a portion of the outer skin. Seeds should be wrapped in dry cotton wool or newspaper to prevent them from going mouldy in the post.
Piet Vorster, Botany Department, University of Stellenbosch, Private Bag X5018, 7599 Stellenbosch. Tel. (02231)-773056.

DURBAN BOTANIC GARDEN NEEDS PLANTS

In striving to become the world's leading cycad garden, the Durban Botanic Garden has commenced a complete reorganization and replanting of the cycad collection. The collection is being reorganized into seven geographical sections: Natal, Cape, Transvaal and Central African *Encephalartos* sections and Australian, Mexican and Asian cycad gardens. To complete the project, the garden urgently requires donations of mature specimens of *Encephalartos caffer, E. cupidus, E. cycadifolius, E. dolomiticus, E. dyerianus, E. lanatus, E. umbeluziensis, E. 'Piet Retiefii'* and any Central African species. Any person willing to make a donation of one or more such plants should contact the Curator's Office - Tel. Durban (031)-211303.

The Natal Mercury Monday July 20, 1992

Former nursery owner fined R12 500 for cycad possession

Mercury Reporter

A PORT Shepstone magistrate has fined a former Umtentweni nursery owner a total of R12 500 (or six months) on several counts involving the illegal possession of cycads — which is believed to be the highest fine ever imposed in a case involving specially protected plants.

Leon Scholtz, whose address was given as formerly of Henry Green Place, Umtentweni, but now residing in Bloemfontein, was fined R2 000 (or one year) on each of six counts involving unlawful trade in cycads.

Magistrate Mr PA Coetzer also fined Scholtz R500 (or six months) for the unlawful possession of 680 seedling cycads.

In addition, 1 079 cycads were forfeit to the Natal Parks Board, and Sholtz will be ineligible for a licence to run a nursery for three years.

Scholtz, represented by Mr L van Tonder, pleaded guilty.

The Saturday News, July 25, 1992

No permit needed for cycads

THE Natal Parks Board has announced that no permit is necessary for the possession of cycads and other protected plants, following the confusion caused by the conviction of a South Coast man for the unlawful possession and sale of cycads.

The permit is required only for import or export *out of* the province. But owners were warned that they could be called on to substantiate their ownership by producing the receipt or letter of donation from the source of the plants.

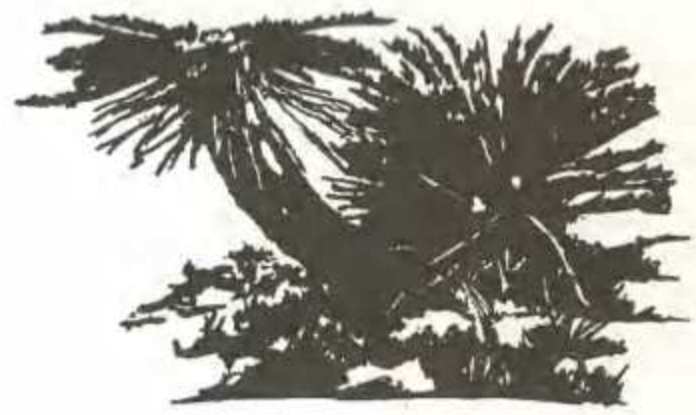
Natal Parks Board chief executive Dr George Hughes said: "Private citizens who grow any indigenous plants are making a very valuable contribution to the conservation of our local plants and we welcome their efforts."

He warned buyers to check that the seller was a registered nursery. He also issued a reminder that there was a moratorium on the export of large plants across provincial as well as international borders.— Saturday News Reporter

Saturday Star WEEKEND September 12 1992

GO TO POT: Local potter and artist Sue Annandale created th
containers for cycads.

Go potty with containers



Cycads geharde plante

BAIE mense, veral Afrikaanssprekendes, gebruik die naam broodboom wanneer gepraat word van cycads, min wetende dat die broodboom eintlik 'n spesie is van die oeroue cycadplant.

Die broodboom (*Encephalartos longifolius*) se kern is deur die Hottentotte in die Oos-Kaap uitgehaal, in die grond begrawe en vir twee maande laat lê om te verrot.

Daarna is dit geknie en in 'n koekvorm in warm as gebak. Vandaar die naam broodboom.

Dit is maar 'n paar van die interessanthede omtrent cycads wat mev Magriet Smit 'n mens kan vertel.

Mev Smit het sowat 20 jaar gelede haar eerste cycad as geskenk gekry. Dit het haar belangstelling onmiddellik geprikkel en het sy 'n groot liefde vir die plantspesie ontwikkel. Sedertdien het sy 'n magdom cycads versamel wat van haar pragtuin teen die noordelike hange van die Magaliesberg 'n ware lushof maak.

Sy bied nou 'n unieke geleentheid aan versamelaars, voornemende versamelaars en mense wat begin om tuin te maak of net hul tuin wil verfraai, om gesonde en goed versorgde cycads (manlik en vroulik) by haar aan te skaf.

Sy het sowat 200 plante, insluitend saailinge gekweek van die plante in haar tuin, wat bestaan uit 27 inheemse spesies asook 'n paar uitheemse spesies om van te kies.

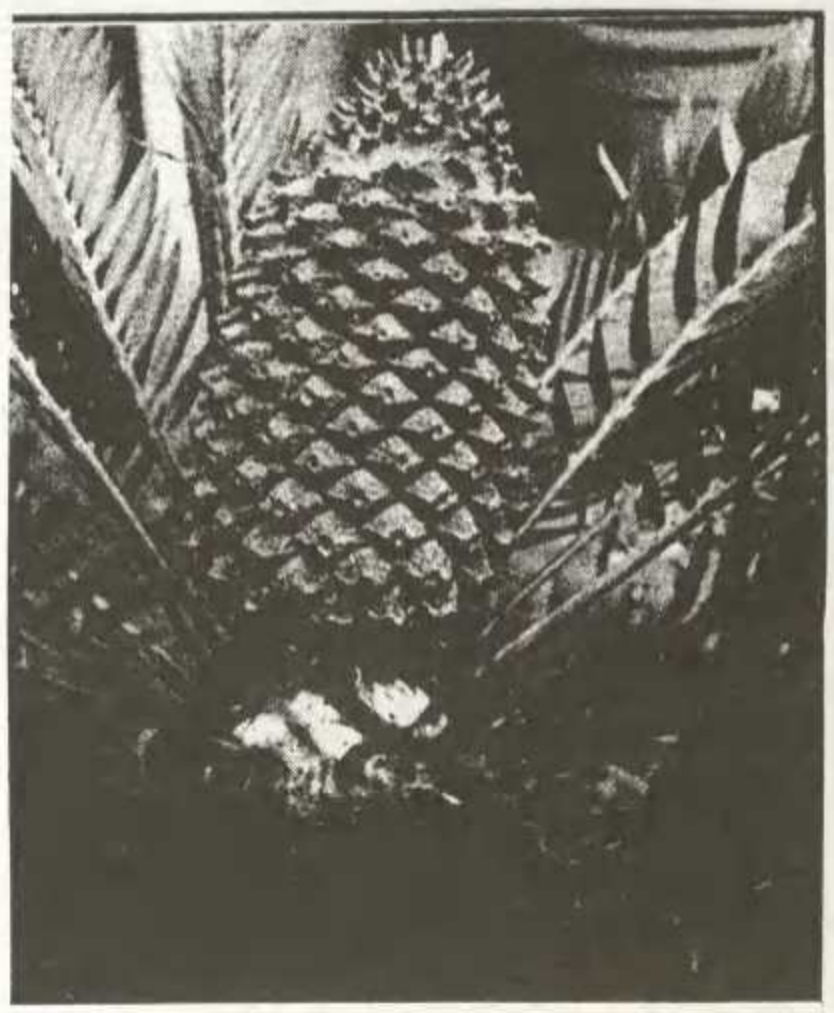
Die groottes verskil en plante van so hoog soos 1,7 m en 1,8 m in omtrek (Altensteinii) is beskikbaar.

Die cycad is een van die mees primitiewe lewende, saaddraende plante en behoort tot die antieke orde, die Cycadales wat in die steentydperk 50 tot 60 miljoen jaar gelede gefloreer het.

"Omdat dit so 'n geharde plant is, is dit baie maklik om te onderhou. Met goeie sorg, bemesting en water is dit 'n baie mooi en geil plant," sê mev Smit.

Mev Smit sal kopers waardevolle inligting en raad gee oor die plant en die versorging daarvan.

Sy kan alle ure gebel word by 546-4906.



'N pragtige keël van die vroulike Encephalartos Longifolius (broodboom) in mev Magriet Smit se cycad-ryke tuin.

DONATIONS RECEIVED / DONASIES ONTVANG

JANUARY / JANUARIE 1992 TO / TOT SEPTEMBER 1992

THE FOLLOWING DONATIONS TO THE CYCAD SOCIETY OF SOUTHERN AFRICA ARE ACKNOWLEDGED WITH THANKS: / DIE VOLGENDE DONASIES AAN DIE BROODBOOMVERENIGING VAN SUIDELIKE AFRIKA WORD MET DANK ERKEN:

Number Nommer	NAME/NAAM	Amount Bedrag	Number Nommer	NAME/NAAM	Amount Bedrag
173	P.S. Vorster	R100.00	242	D.J. Cochrane-Murray	R 14.00
1144	A.M.P. Vandenheede	100.00	823	P.S. Knox-Davis	14.00
830	J.H.P. Hattingh	72.00	836	Z. Baird	14.00
1185	H.G. van Heerden	72.00	1326	J.F. Allan	13.00
223	N.J. Kachelhoffer	72.00	139	J. Swanepoel	12.00
1441	D.L. Wiggill	72.00	159	J.D. Loubser	12.00
584	S. Srikum	64.00	168	N. Munro	12.00
1382	W.D.De V. Basson	50.00	433	N.C.C. Henning	12.00
1393	D. Silveman	38.00	923	J.A. de Beer	12.00
906	J. Brummer	33.00	271	I. Freeman	12.00
1060	F.V. Wilson	33.00	1379	H.J. van Aswegen	12.00
1079	P.J. Gelderblom	32.00	1039	D. McKinley	12.00
876	A.M. Bradford	30.00	1197	N. Reinach	12.00
1434	J. Clemitson	30.00	1237	M. & A. Hepplewhite	12.00
374	J.J. van Niekerk	28.00	538	W.H.J. de Beer	12.00
1296	A.J. Weiss	26.98	1227	H.M. Besseling	12.00
829	C.F. Nieuwoudt	26.00	1264	M. Subroyen	12.00
1112	M.J. Rautenbach	26.00	1428	D. du Rand	12.00
681	F.F.C. Venter	26.00	1443	F.J. DEB Soares	12.00
1016	A.S. Breytenbach	22.00	1353	J.J. Brummer	12.00
1190	H.P.J. Fouche	22.00	1359	S.J. Fouche	12.00
1239	B.A. Sergay	22.00	224	R.J. Campbell	12.00
719	P.A. van Niekerk	22.00	893	P. Badenhorst	12.00
1035	M.C. Cian	22.00	1002	J.M. Janse van Rensburg	12.00
1047	J. Begley	22.00	399	K. Bischofberger	12.00
1280	A.M. Draper	22.00	1037	A.H. Stander	12.00
710	J.N. de Bruin	22.00	237	J.M. Nell	12.00
1117	C. Strang	22.00	1211	L.B. Raymakers	12.00
1186	G. Delhowe	22.00	1201	A. Roos	12.00
1370	M.P. Richter	22.00	1350	A.G. McVea	12.00
1374	K.N. de Kock	22.00	242	D.J. Cochrane-Murray	11.00
448	F.H. Wessels	22.00	796	G.D. Hogewind	10.00
780	W.J. van Jaarsveld	22.00	1056	C.L. Visser	10.00
1275	G.A. Meyer	22.00	112	J.H. du Plessis	10.00
847	J.W. Walters	22.00	265	A.A. Tarr	10.00
1271	H.X.N. du Toit	22.00	817	C.S. Erasmus	10.00
947	J.J. Booysen	22.00	914	D.G. Baleta	10.00
47	S.W. Wentzel	22.00	1366	P.L.F. Verwey	10.00
946	C.J. Muller	20.00	109	M. Lasnitzki	10.00
1125	S.J. van Dyk	20.00	991	C. van der Linde	10.00
146	S. Jordaan	20.00	311	C.M. Schimmer	8.00
397	J.S. Myburgh	20.00	80	J.J. de Jong	7.00

Number Nommer	NAME/NAAM	Amount Bedrag	Number Nommer	NAME/NAAM	Amount Bedrag
43	V.L. Pringle	R 7.00	458	G.A. Johannes	R 6.00
359	E.N. Bronkhorst	7.00	1383	C.W.J. Nieuwoudt	6.00
1403	P.W. Doddemeade	7.00	525	P.H. Gore	6.00
276	T.J.R. Botha	6.00	156	M.I. Claassen	6.00
316	C. Campbell	6.00	594	H.O. Ryder	6.00
832	E. Rademeyer	6.00	1176	J. Zietsman	5.00
969	B.L. Matthee	6.00	34	I. van der Walt	4.00
645	W.J. Lotter	6.00	834	G.K. Ekland	3.00
1252	F.J. van Heerden	6.00	166	G.C. Prinsloo	3.00
964	P.G. de Villiers	6.00