ENCEPHALARTOS

JOURNAL OF THE CYCAD SOCIETY OF SOUTH AFRICA

TYDSKRIF VAN DIE BROODBOOM VERENIGING VAN SUID-AFRIKA

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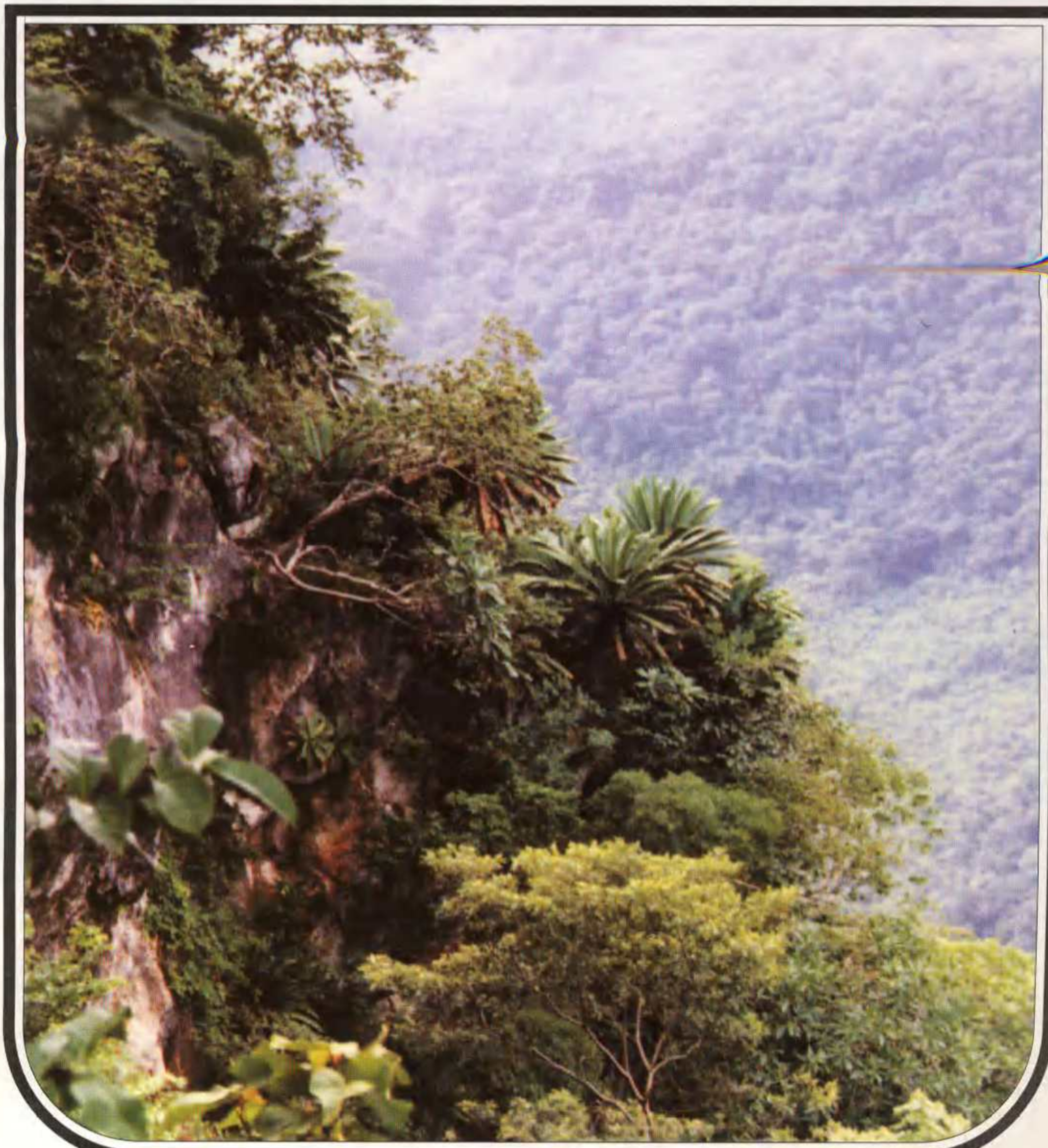

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COVER / VOORBLAD : ***Dioon rzedowskii*** **on limestone cliffs near Otjitlan, Mexico.**

Photo / Foto: Piet Vorster

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FROM THE PRESIDENT

Much as was the case until recently with the ***National Geographic Society***, the management of the ***Cycad Society*** is to a large extent a family affair. Roy Osborne was associated with the University of Natal in Durban, and Frederick de Jager with the Rand Afrikaans University in Johannesburg; whereas both Nat Grobbelaar and Hannes Robbertse were botanists at the University of Pretoria. Isabella Claassen and Guillaume Theron, of whom I will say something below, also were lecturers in the same department, and I was a student of all four of them. Plants, and especially indigenous plants, have always been close to our hearts; but for cycads we have a special soft spot.

All our Council members are indispensable, but nevertheless I wish to highlight two of them. Firstly there is our Editor, Isabella Claassen, who since October 1992 all on her own has set and made ready for the printer every issue of ***ENCEPHALARTOS***. Apart from the fact that this is an enormous task, it is not easy when the deadline gets closer and there are not enough articles for the next issue. Please help her, and send her contributions for ***ENCEPHALARTOS***. Secondly there is our Secretary-Treasurer, Guillaume Theron. When he joined our team, he was not even a member of the Society, and he does not possess a single cycad because he has no garden in which to keep these spiny monsters. When we could not find anyone in the Society to take up these duties, he agreed immediately to help us, little knowing what a strenuous and time-consuming task it would turn out to be. Since then our administration, including finances, is on a sturdier footing than ever before in the existence of the Society. If you fail to pay your subscription, he is definitely going to remove your name from the address list of ***ENCEPHALARTOS***; not because he wants to do you in, but because it is unfair to expect that other members pay for your privileges.

Then there are our regional office bearers, including those who run our pollen- and seedbanks. I won't now mention them by name, but they are really very important in keeping our Society doing those things for which we joined in the first place. Without them, our endeavours would loose their practical aspect.

Lastly, our two overseas correspondents, Paul Kennedy in Australia and Willie Tang in the U.S.A., make life a lot easier. It is a pain, and quite expensive, to send money overseas to pay subscriptions. What these two people do, is to collect the subscriptions from their countrymen, and then send it to us in a lump sum. They

VAN DIE PRESIDENT

Baie soos die geval tot onlangs was met die ***National Geographic Society***, is die bestuur van die ***Broodboomvereniging*** tot 'n groot mate 'n familiesaak. Roy Osborne was verbonde aan die Universiteit van Natal in Durban, en Frederick de Jager aan die Randse Afrikaanse Universiteit; maar beide Nat Grobbelaar en Hannes Robbertse was plantkundiges by die Universiteit van Pretoria. Isabella Claassen en Guillaume Theron, oor wie ek hieronder iets sal sê, was ook dosente in dieselfde departement, en ek was 'n student van al vier van hulle. Plante, en veral inheemse plante, het ons nog altyd na aan die hart gelê; maar vir broodbome het ons 'n baie sagte plekkie.

Al ons Raadslede is onontbeerlik, maar tog wil ek graag twee van hulle uitsonder. Eerste is daar ons Redaktrise, Isabella Claassen, wat reeds sedert Oktober 1992 man-alleen elke uitgawe van ***ENCEPHALARTOS*** set en persgereed maak. Afgesien daarvan dat dit 'n reuse taak is, is dit nie maklik as die sperdatum nader kom en daar is nog nie genoeg artikels vir die volgende uitgawe nie. Help haar asb., en stuur vir haar bydraes vir ***ENCEPHALARTOS***. Tweedens is daar ons Sekretaris-Tesourier, Guillaume Theron. Toe hy by ons span aangesluit het, was hy nie eers lid van die Vereniging nie en hy besit nie 'n enkele broodboom nie omdat hy nie 'n tuin het waarin hy hierdie stekelrige monsters kan aanhou nie. Toe ons uit verenigingsgeledere niemand kon kry om hierdie pligte te vervul nie, het hy sonder om te aarsel ingewillig om ons te help, minwetende hoe 'n veeleisende en tydrowende taak dit sou wees. Sedertdien is ons administrasie, insluitend finansies, op 'n stewiger voet as nog ooit tevore in die bestaan van die Vereniging. As u nie u ledegeld betaal nie, gaan hy definitief u naam van ***ENCEPHALARTOS*** se adreslys afhaal; nie omdat hy u wil te na kom nie, maar omdat dit onregverdig is om te verwag dat ander lede vir u voordele moet betaal.

Dan is daar ons streeksbeamptes, insluitend die bestuurders van die stuifmeel- en saadbanke. Ek sal hulle nie nou by name noem nie, maar hulle is werklik baie belangrik om te verseker dat ons Vereniging daardie dinge doen waarvoor ons in die eerste plek aangesluit het. Sonder hulle sal ons werksaamhede hulle praktiese sy verloor.

Laastens, ons twee buitelandse korrespondente, Paul Kennedy in Australië en Willie Tang in die V.S.A., maak die lewe baie draagliker. Dit is 'n klomp moeite, en nogal duur, om geld oorsee te stuur om lidmaatskappe te betaal. Wat hierdie twee mense doen, is om ledegeld van hulle landsgenote in te samel, en dit dan as een

are also on the ground to solve any Society-related problems which their countrymen may have.

I wish to ask members to play a more active part in the Society. If you feel that there is anything on which we can improve, don't just let us know, but also offer to help in the attainment thereof.

Piet Vorster

bedrag na ons te stuur. Hulle is ook plaaslik beskikbaar om enige probleme wat buitelandse lede in Verenigingsverband mag hê, op te los.

Graag wil ek vra dat lede 'n meer aktiewe rol speel in die Vereniging. As u voel dat daar iets is waarop ons kan verbeter, moenie net vir ons laat weet nie, maar bied ook aan om self te help met die uitvoering daarvan.

Piet Vorster

FOCUS ON / FOKUS OP

We regret that no FOCUS ON article appears in this issue. Roy Osborne kindly wrote one on *Lepidozamia hopei*, but unfortunately the original set of photographs which he posted to us by airmail on 27 January 2000 got lost in the post, and the second set that he posted to us on 5 April 2000, also by airmail, hasn't turned up as yet. - Editor, 25 April 2000.

SHORT COMMUNICATIONS / KORT MEDEDELINGS

ENCEPHALARTOS: HOW DOES ONE PRONOUNCE IT?

Piet Vorster
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Received 7 April 2000

The scientific names of plants, in all ramifications, are governed by the ***International Code of Botanical Nomenclature***. Principle no. 5 of this ***Code*** reads: "Scientific names of taxonomic groups are treated as Latin regardless of their derivation". *Encephalartos* is derived from Greek [*en-* (in), *kephale* (head), *artos* (bread)] (Jackson 1990: 14), but is treated as Latin with regard to its grammar as well as its pronunciation.

One hears both the pronunciations "*Enkefalartos*" and "*Ensefalartos*", as well as more rarely a few others. As to which of these is correct, has often been the subject of heated debate. People with knowledge of Latin are quite adamant: it should be "*Enkefalartos*".

However, it is not quite so simple. We are not here dealing with classical Roman Latin, but with botanical Latin which is a special jargon developed over several centuries, and which has its own rules. To help us through this minefield, is a marvelous book to be found on the desk of every plant taxonomist. It was written by a great botanist and classical scholar, William Stearn, and is called *Botanical Latin*. I quote from this book: "Botanical Latin is essentially a written language, but the scientific names of plants often occur in speech. How they are pronounced really matters little provided they sound pleasant and are understood by all concerned. This is most likely to be attained by pronouncing them in accordance with the rules of classical Latin pronunciation. There are, however, several systems, since people tend to pronounce Latin words by analogy with words of their own language. Even within the Roman Empire when Latin displaced native languages having different speech rhythms there must have been

great regional diversities of pronunciation, as indeed is evident from the different Romance languages, Spanish, Italian, etc., descended from it. ... In English-speaking countries there exist two main systems, the traditional English pronunciation generally used by gardeners and botanists, and the 'reformed' or 'restored' academic pronunciation adopted by classical scholars as presenting 'a reasonably close approximation to the actual sounds of the language as spoken by educated Romans'. This academic pronunciation comes closer to the usual Latin pronunciation of Continental people than does the conventional English pronunciation." Being British, Stearn says nothing about American pronuciation, much less South African pronunciation. He then gives, in tabular form, the differences in pronunciation of consonants in "reformed academic" and "traditional English" Latin respectively. What concerns us here, is the pronuciation of "c": in "reformed academic" it is always as in *cat*, in "traditional English" it is as in *cat* before, a, o, or u; but as in *centre* if before e, i, or y.

It is worth keeping in mind that the modern scientific language is English. Therefore, if you wish to sound like an educated Roman, by all means speak of "Enkefalartos"; but if you want to be recognised as a botanist, I would recommend "Ensefalartos" instead.

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GREUTER, W. *et al.* 1994. International Code of Botanical nomenclature. Königstein: Koeltz Scientific Books.

"FOCUS ON ...." SERIES: INDEX / "FOKUS OP ...." REEKS: INDEKS

Isabella Claassen
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For those readers who particularly wish to refer to the features on particular species, we list below the species (alphabetically), authors, and issues and dates of ***ENCEPHALARTOS*** in which the various "Focus on ...." articles have been published up to now.

Ter wille van daardie lesers wie graag besonderhede van spesifieke spesies wil naslaan, verskyn hier onder 'n lys van die spesies (alfabeties), outeurs, asook uitgawes en datums van ***ENCEPHALARTOS*** waarin die verskillende "Fokus op ...."-artikels tot dusver verskyn het.

SPECIES / SPESIE	AUTHOR / OUTEUR	ISSUE AND DATE UITGAWE EN DATUM
Cycas hainanensis	William Tang	**54**: 4–10, June 1998
Cycas revoluta	Roy Osborne & Hajime Tomiyama	**41**: 5–15, March 1995
Cycas siamensis	William Tang & Si-Lin Yang	**43**: 4–11, September 1995
Cycas tansachana	William Tang	**60**: 4–7, 9, 10, December 1999
Cycas thouarsii	Piet & Elsa Vorster	**6**: 3–10, June 1986
Dioon spinulosum	William Tang	**50**: 4–11, June 1997
Encephalartos aemulans	Piet Vorster	**28**: 4–8, December 1991
Encephalartos altensteinii	Maans Kemp	**13**: 8–17, March 1988
Encephalartos aplanatus	Piet Vorster	**46**: 4–8, June 1996
Encephalartos arenarius	Maans Kemp	**11**: 4–7, September 1987
Encephalartos barteri	Roy Osborne	**14**: 8–16, June 1988
Encephalartos brevifoliolatus	Piet Vorster	**47**: 4–8, September 1996
Encephalartos caffer	Maans Kemp	**3**: 6–11, September 1985
Encephalartos cerinus	Cynthia Giddy	**32**: 4–7, December 1992
Encephalartos concinnus	Roy Osborne	**34**: 4–11, June 1993
Encephalartos cupidus	Riekie Slabbert & Johan Hurter	**36**: 5–10, December 1993
Encephalartos cycadifolius	Maans Kemp	**26**: 3–7, June 1991
Encephalartos dolomiticus	Piet Vorster	**30**: 3–7, June 1992
Encephalartos dyerianus	Piet Vorster	**29**: 3–7, March 1992
Encephalartos equatorialis	Johan Hurter, Hugh Glen & Isabella Claassen	**44**: 4–9, December 1995

Encephalartos eugene-maraisii (incl. *E. middelburgensis*)	Roy Osborne	**17**: 3–13, March 1989
Encephalartos ferox	Roy Osborne	**9**: 14–21, March 1987
Encephalartos friderici-guilielmi	Maans Kemp	**18**: 4–9, June 1989
Encephalartos ghellinckii	Roy Osborne	**12**: 16–23, December 1987
Encephalartos gratus	Roy Osborne	**25**: 4–9, March 1991
Encephalartos heenanii	Johan Hurter	**40**: 4–7, December 1994
Encephalartos hildebrandtii	Roy Osborne	**22**: 6–12, June 1990
Encephalartos hirsutus	Johan Hurter & Isabella Claassen	**52**: 4–7, December 1997
Encephalartos horridus	Maans Kemp	**7**: 8–13, September 1986
Encephalartos inopinus	Roy Osborne	**31**: 4–8, September 1992
Encephalartos kisambo	Johan Hurter	**39**: 4–8, September 1994
Encephalartos laevifolius	Roy Osborne	**19**: 2–8, September 1989
Encephalartos lanatus	Roy Osborne	**16**: 3–9, December 1988
Encephalartos latifrons	Maans Kemp	**8**: 8–15, December 1986
Encephalartos lebomboensis	Roy Osborne	**15**: 6–15, September 1988
Encephalartos lehmannii	Maans Kemp	**4**: 12–17, December 1985
Encephalartos longifolius	Maans Kemp	**1**: 6–13, March 1985
Encephalartos manikensis	Roy Osborne	**38**: 4–11, June 1994
Encephalartos msinganus	Piet Vorster	**51**: 4–9, September 1997
Encephalartos munchii	Roy Osborne	**35**: 4–9, September 1993
Encephalartos ngoyanus	Cynthia Giddy	**23**: 3–9, September 1990
Encephalartos nubimontanus	Johan Hurter & Isabella Claassen	**45**: 4–11, March 1996
Encephalartos paucidentatus	Roy Osborne	**27**: 3–9, September 1991
Encephalartos princeps	Maans Kemp	**24**: 3–7, December 1990
Encephalartos schmitzii	Johan Hurter & Loran Whitelock	**55**: 4–8, September 1998
Encephalartos sclavoi	Riekie Slabbert & Johan Hurter	**37**: 4–8, March 1994
Encephalartos transvenosus	Roy Osborne	**20**: 10–18, December 1989
Encephalartos trispinosus	Maans Kemp	**33**: 4–12, March 1993
Encephalartos umbeluziensis	Roy Osborne	**21**: 3–9, March 1990
Encephalartos villosus	Roy Osborne	**10**: 16–23, June 1987
Encephalartos whitelockii	Johan Hurter & Isabella Claassen	**48**: 4–9, December 1996
Encephalartos woodii	Roy Osborne	**5**: 4–10, March 1986
Lepidozamia peroffskyana	Roy Osborne	**58**: 4–11, June 1999
Macrozamia lucida	Roy Osborne	**56**: 4–9, December 1998
Macrozamia macdonnellii	Roy Osborne	**59**: 4–7, 17–19, September 1999
Macrozamia moorei	Roy Osborne	**49**: 4–9, March 1997
Macrozamia platyrachis	Roy Osborne	**61**: 4–8, March 2000
Microcycas calocoma	Roy Osborne & Rafael Milanés Santana	**42**: 4–11, June 1995
Stangeria eriopus	Piet & Elsa Vorster	**2**: 8–17, June 1985
Zamia sp. "The Coontie of Florida"	Tom Broome	**57**: 4–9, March 1999

HONORARY MEMBERS OF THE SOCIETY

Piet Vorster, President of the Cycad Society of South Africa

Received 7 April 2000

Honorary membership of this Society is not bestowed lightly. Our Constitution requires that honorary membership can only be awarded to members of the Society who have rendered ***exceptional*** services to the Society, or who materially advanced our knowledge of [preferably South African] cycads.

Over the years only a handful of members qualified for this ultimate accolade.

Knut Norstog did some fine research on the reproduction of cycads, and this eventually led to the discovery of insect pollination in *Zamia furfuracea*. This

completely re-shaped our thinking on cycad reproduction, and has profound implications for conservation efforts. There is now reason to believe that most, if not all, cycads are pollinated by very specialised and species-specific insects, rather than by wind as was believed for so long. Subsequently Knut wrote, together with Trevor Nicholls, ***The biology of the cycads***, which summarises our knowledge of cycads.

Divya Pant did much research on the reproductive processes of *Cycas*, and is also an expert on fossil cycads. He published ***Cycas and the Cycadales***, which is now out of print and a collectors' item.

Roy Osborne who founded the Society, steered it through its difficult first years as its first President, and did a great deal to expand the Society world-wide. He also did much to disseminate information on cycads, through innumerable contributions to ***ENCEPHALARTOS*** as well as personal appearances at many meetings.

Nat Grobbelaar, past President of this Society, firstly produced much useful results through his research on various aspects of South African cycads, and secondly re-organised the Society to its current efficiency.

It is now our pleasure to announce that honorary membership has been bestowed on three more members:

Maans Kemp. He edited, largely wrote, printed, and distributed ***ENCEPHALARTOS*** from its inception in March 1985 up to number **16** in December 1988. This enormous task put ***ENCEPHALARTOS*** firmly on its tracks, and without his contribution it is doubtful whether the Society would have been successful. He certainly did much to further knowledge of African cycads.

Isabella Claassen. She has been editing and typesetting ***ENCEPHALARTOS*** ever since number **32** (December 1992). Once she took over, ***ENCEPHALARTOS*** immediately underwent a dramatic transformation from a newsletter to a professional journal which is cited in such serious literature surveys as the ***Kew Record of Taxonomic Literature***. Not only is hers an extremely time-consuming and difficult task, but it is also very nerve-wracking. Many have been the times when the deadlines for printing approached without her having sufficient contributions, yet never once has she missed a deadline or produced a sub-standard issue. Certainly she did, and continues doing, much to further knowledge of all aspects of cycads.

Guillaume Theron. He hasn't been with us for very long, but his influence has been profound. When Giel Fourie suddenly resigned as secretary-treasurer early in 1997, we would have been in serious trouble had it not been for Guillaume (an old friend and ex-colleague of Isabella, Nat Grobbelaar, and Hannes Robbertse; and friend and mentor of Piet Vorster) who willingly and typically unselfishly agreed to help us out, even though he was not even a member of the Society and till today does not possess a single cycad. Surely he had no inkling of how demanding the task would be, yet he tackled it with a will and streamlined our administration, and transformed our financial situation beyond recognition. We can never pay him for what he is doing for us, but honorary membership is a way to show appreciation. Indirectly he has been instrumental in furthering ***all*** the aims of the Society, which includes conservation as well as dissipating of knowledge of cycads.

[I thank the Council of the Cycad Society of South Africa for the honorary membership bestowed on me. However, I cannot take sole credit for the transformation that our journal underwent when I took over as editor. When Prof. Nat Grobbelaar, then President of our Society, asked me if I would consider becoming editor, I was a complete novice in that respect, and I am indebted to him for helpful suggestions and valuable advice, especially in the beginning. I am also indebted to all those members/readers who contributed to the success of our journal by means of articles, letters, etc. Without your contributions there wouldn't have been a journal. Many thanks to all of you. - **Editor.**]

WEB PAGE FOR SOCIETY: CALL FOR VOLUNTEERS

Piet Vorster, President of the Cycad Society of South Africa

Member ***John Kloppers*** has made a generous donation of R500 to the Society, to enable us to establish a Society Web Page.

We invite members to volunteer to design and place this web page, including its maintenance and updating. If you can assist, please contact Guillaume Theron.

The Web Page will be a fast way of getting essential information about the Society. It will be especially

useful in a world-wide context, enabling all those enthusiasts out there who don't yet know about us, to learn about our Society and how to make contact with us. As such it will have priceless promotional value.

COLOUR ISSUES OF *ENCEPHALARTOS*: CALL FOR VOLUNTEERS

Piet Vorster, President of the Cycad Society of South Africa

As you can see from the figures published in ***ENCEPHALARTOS*** no. **61** (March 2000), there is no way in which we can continue publishing colour photographs in ***ENCEPHALARTOS*** unless we either increase the membership fee drastically (which we don't want to do if we can prevent it), or find the money elsewhere.

The best way would probably be to get sponsors to sponsor individual colour pages. We would then acknowledge the sponsorship on the page concerned in a clear but unobtrusive way. We are less enthusiastic about advertisements because unless we increase the advertisement fees considerably or recruite enough paid advertisements it won't bring in the necessary funds.

Your current Council members have no spare capacity to attend to this matter, therefore we invite members to volunteer for a committee to raise funds for colour pages. If you think that you can play a part, please contact Guillaume Theron.

DANIE NEL AND AVIS MERESMAN

Piet Vorster, President of the Cycad Society of South Africa

We are delighted to announce the wedding of ***Danie Nel*** and ***Avis Meresman*** on the 30th December 1999.

Both are long-standing and staunch supporters of the Society. Through their Umlaas Road based business, ***The Cycad Centre***, numerous members have built up their collections with plants or seeds from all over the world, as well as other cycad-related items. Both have been around "since always": Danie's membership number, which they now share, is 261. In the very beginning Danie did sterling work as seedbank officer, and both have run the Natal branch since 1994.

Congratulations! We wish you many happy years together, a flourishing business, and may you never tire of cycads.

LEARNING POLLINATING INSECTS

Piet Vorster
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Received 7 April 2000

In the *Proceedings of the Third International Conference on Cycad Biology* (1995), pages 367–378, I had an article entitled *Aspects of the reproduction of cycads. 1. Pollination mechanisms and the association of* Amorphocerus *(Curculionidae) with* Encephalartos. In this I reported on the presence of beetles of the genus *Amorphocerus* in cycad cones in a garden situation.

In nature these beetle species are associated with a narrow range of host species, sometimes each beetle species occurring only on a single cycad species. This situation was initially mirrored in the garden where the

observations were made, with the beetle species occurring on the cycad species on which they are found in nature. However, after a few years I started finding the odd beetle in cones of other cycad species, and even other genera like *Dioon*, but always in very low numbers. The conclusion was nevertheless very significant: in spite of the specialization of both cycads and beetles with respect to the olfactory attractant (odour) emitted by the cycad and its recognition by the beetle, some beetle individuals are able to detect the attractant signal of cycad species with which they have never been associated, in other words they can recognize the odour as coming from a cycad.

During the last season I found the same beetles on yet another host species, indeed in quite another genus, on which they have never been recorded in nature, namely in a male cone of *Cycas thouarsii*. This occurrence differed from previous such observations in that there were not one or two but a large number of beetles.

What can this mean? My guess is that a very small percentage of beetles are able to detect the attracting odour of species to which they are not normally attracted. Once they have successfully bred in the cones of such species, their offspring consider the unusual host as home with a perfectly normal attracting odour, and they remain attracted to it.

There are more examples of the same phenomenon. A correspondent in Ecuador reported that *Zamia lindenii* (which he says is not the same as *Z. poeppigiana*) occurs naturally in his area, and his garden plants spontaneously get pollinated. He also planted *Zamia furfuracea* from Mexico in his garden. These produced unfertilized cones for a number of years, and then suddenly started to produce copious quantities of seed. It seems as if the natural pollinator of *Zamia lindenii* got used to *Z. furfuracea*, and started visiting and pollinating it. Something similar happened in Florida, where *Zamia integrifolia* is native but where numerous other species were introduced, sometimes with their pollinators. Perhaps Willie Tang would like to tell us about it in the next issue.

Dr. Henk Geertsema of the Entomology Department at the University of Stellenbosch told me that the phenomenon is also not unknown in butterflies. If larvae are forced to feed on plant species which do not normally constitute their food plants, their offspring spontaneously breed on these "foreign" plants.

This phenomenon has implications for conservation. Our problem with near-extinct species is often that the pollinating insects are no longer present, dooming any attempts at *in situ* conservation or re-introduction. If we can teach other pollinating beetle species to establish on these near-extinct species, it means that the plants can continue their existence without our intervention.

THE PLIGHT OF *ENCEPHALARTOS APLANATUS*

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Encephalartos aplanatus has never been plentiful. Round about 1945 a few specimens made their way to the National Herbarium and associated botanical garden in Pretoria, where two of the original living plants can still be seen. In the 1960's and perhaps early 1970's a number of plants were removed from the wild in Swaziland and ended up in various private collections. In the same period a few wild plants were removed to the Lowveld Botanical Garden in Nelspruit, where they can still be seen. In the late 1970's seeds were collected from the wild on two separate occasions known to me.

When I became interested in this species in 1990, it was already on the brink of extinction. We were unable to find any plants on the farm from where material was first sent to the National Herbarium in the 1940's, and extensive questioning of local people failed to get a response. Finally we went to the ravine where one of the seed batches was collected in the late 1970's, where we found only about half a dozen plants which did not look particularly healthy. Since then we haven't been able to locate any additional plants, in spite of diligent searching by local agents. Reluctantly we have to conclude that the species is practically extinct in nature.

A few weeks ago I received a message from the person who took me to the remaining wild plants, saying that a new tarred road is to be built within sight of the plants, and which is likely to facilitate the end of the remaining plants.

To me this looks like an opportunity for our Society to make a difference.

We have enough plants in cultivation to initiate a captive breeding program. Our first aim should be to increase numbers significantly, perhaps to a thousand or two. Our second aim should be to establish an artificial breeding colony from our propagated material. Regular readers would know that normally I am not enthusiastic about re-introduction of previously eradicated plants, but in this case it may be our only option apart from total extinction. The ideal would be to re-introduce them to their original area, but I am not in favour of that unless Swaziland can guarantee sufficient protection against poaching, which I don't think they can do at the moment. Instead I propose that we identify a suitable ravine either on private land or in a protected South African area, without other cycads (we don't want genetical contamination), and try to re-establish the seedlings once they have reached a sufficient size. For long-term survival the pollinating insect species is essential. The original insect is probably now extinct, but perhaps we can "teach" the insect of the closely related *Encephalartos villosus* to do the job (see "Learning pollinating insects" elsewhere in this issue). The main thing would be to remove the factors which caused the plants' decline in the first place, and for that reason we should perhaps grow 5000 plants (a wild guess) which can be made available to collectors.

I am calling for volunteers to undertake this project. Firstly we need someone to co-ordinate the project, and secondly we need everybody who owns plants of *Encephalartos aplanatus*. I do not envisage removing plants from their current owners. Instead I envisage a registry enabling members of the group to know where to get or to offer pollen, and where to get help when needed. Seedlings produced would remain the property of their producers, either to sell to collectors or to make available for re-introduction. It may be a good idea to make participation of the scheme conditional on donating a percentage (25%?) of the plants produced for re-introduction.

It also entails research to identify the natural pollinator of *Encephalartos villosus* which remains unknown. Once that is known, we will have to try and establish it on *E. aplanatus*. Needless to say, the place where *E. aplanatus* is to be re-introduced into nature, must be sufficiently far away from any *E. villosus* to prevent genetical contamination of either species through pollinating insects moving from one to the other.

This project will be a labour of love. The Society cannot afford to make a financial contribution, and conservation authorities have such a low opinion of us (see "Us and Nature Conservation" elsewhere in this issue) that we cannot expect any help from them either. However, the selling of surplus plants to collectors should pay to some extent for containers, fertilizers, and travel.

Do write in, and let us see if we can make a difference to the fate of *Encephalartos aplanatus*. To get things going: I have two male plants, grown from the two different seed collections mentioned above.

US AND NATURE CONSERVATION

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One thing which hurts, is the low esteem in which we are held by nature conservation authorities. There may be individual staff members of these institutions who differ, but on the whole we are seen as the enemy, hell-bent on poaching the last remaining cycads from nature.

To some extent they have a point. Many of our members possess plants which are larger than they could ever have grown from seed in their lifetimes, sometimes with difficult to explain charred trunks. It is a sad fact that plants both large and small vanish with regular monotony from nature and even from protected areas and botanical gardens, and the obvious conclusion is that our members are guilty. Yet I want to challenge that assumption. Of the many people caught and convicted of poaching cycads during the last 20 years, I know of only one who was a member of our Society, and we expelled him. I invite the nature conservation authorities to correct me if they know more than I do.

Still, some horrifying things do happen. The very week in which I first received research material of *Encephalartos brevifoliatus*, I also received photographs of a cultivated plant for identification. Today we know of only five individuals in the wild, and obviously this species is too rare to be in private hands. Similarly, almost immediately after the discovery of *Encephalartos cerinus* the authorities placed a complete ban on it; yet

many of us today possess it, interestingly enough mostly as first- or second- generation seedlings. The very worst concerns *Encephalartos hirsutus*, which almost none of us nor any of our National Botanical Gardens have; yet the other day I received a telephone call from someone abroad who claimed that he had several trunks more than 1.2 metres long.

The authorities have engaged in the expensive and questionable practice of microchipping wild plants. I say questionable, because there have been too many reports of plants in cultivation dying after unsanitary insertion of microchips, and also because I think that the poached plants don't land in our members' collections. Again, if the authorities have contrary evidence, I invite them to write to ***ENCEPHALARTOS***.

Conservation is one of the founding principles of our Society, yet most members are not enamoured with conservation authorities. This is because of the way in which many conservation officers behave towards our members. Remember, a person is innocent until his guilt has been proved. Then also, it is my considered opinion that the unbending attitude of conservation authorities is hindring rather than promoting the cause. I believe that the reason why most of our seed- and pollen banks have ground to a halt, is the too literal interpretation of "plants or parts thereof" to include seed and pollen, so that we cannot even exchange these items without bothersome permits.

Solutions? Firstly, nature conservation authorities, it is my educated guess that a one-off supply of 5000 seeds of a species is more than enough to satisfy the demand in the foreseeable future. To collect that number of seeds, is easy (e.g. 10 cones of *Encephalartos longifolius*), and our members would be happy to help under supervision. Even in the case of very rare species it should be easy to produce that number of seeds through hand-pollination, and there the considerable expertise of our members is available.

Furthermore, our members are already involved in private initiatives to produce seed from wild plants, raise seedlings, and using these to augment the parent wild populations. Here I refer to the *Encephalartos middelburgensis* project on which we previously reported in **ENCEPHALARTOS**, a project involving *E. eugene-maraisii*, and the newest initiative on *E. aplanatus* reported on elsewhere in this issue.

Our members are available and keen to do something, but we need some help and encouragement rather than hindrance from the authorities.

I invite our provincial conservation authorities to contact me, so that we can normalise a totally unnecessary situation.

ALBINISME BY BROODBOME / ALBINISM IN CYCADS

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Ontvang/Received 13 April 2000

Ek het oor baie jare duisende broodbome uit saad gekweek en in die proses allerlei ongewone saailinge teengekom. Die algemeenste, maar tog uitsonderlike afwyking, is pitte wat lang normale wortels vorm en vir jare aan die lewe bly sonder om 'n sigbare stingel met blare te vorm. Die stingel is in die saadpit teruggevou en kan nie uitgroei nie. 'n Ander besonder rare verskynsel is 'n saadpit wat aan twee plantjies oorsprong gee. Alhoewel daar verskeie eierselle in elke broodboomsaadknop voorkom wat elk bevrug kan word om aan 'n embrio oorsprong te gee, gebeur dit baie selde dat meer as een embrio per saad volledig ontwikkel.

'n Paar jaar gelede het ek vir die eerste keer op 'n albino *Encephalartos natalensis* saailing in my kwekery afgekom. Die saailing het vir meer as twee jaar aan die lewe gebly. Die blaartjies het nie baie lank geleef nie maar die plantjie het opeenvolgend drie blare gevorm voordat hy dood is. Albinoplante kan nie fotosintetiseer nie en kan gevolglik net bly leef solank dit reserwe voedingstowwe besit. In die geval van albino saailinge teer hulle op die reserwe voedingstowwe in die saad.

Gedurende die afgelope somer was ek verbyster toe ek tussen 21 *E. cerinus* saailinge nie minder as 4 albino saailinge (Kleurfiguur 7 op p. 18) vind nie. Kort daarna bel 'n vriend my uit Mica se wêreld om by my te hoor wat die rede is vir die baie wit *E. cerinus* saailinge in sy kwekery. 'n Ander vriend naby Groblersdal het my ook laat weet dat hy ewe onverwags vanjaar baie albino *E. villosus* saailinge in sy kwekery waarneem.

Albinisme by plante is 'n genetiese afwyking wat

verhoed dat plante die groen pigment chlorofil kan sintetiseer. Waarom die verskynsel van albinisme vanjaar so algemeen by die twee broodboomspesies is, is onbegryplik. Ongelukkig het ek nie die afgelope somer saadpitte van *E. villosus* uitgesit om te kiem nie. Dit sou interessant gewees het as ek ook by daardie spesie 'n groot persentasie albino saailinge sou gekry het want dan sou die verskynsel, minstens vir hierdie seisoen skynbaar hoofsaaklik tot hierdie twee spesies beperk skyn te gewees het. Ek het honderde saadpitte van ander broodboomsoorte ook die afgelope somer gekiem en nie by enige van hulle enige albino's gevind nie.

Dit sal interessant wees om the hoor of van ons lesers ook van tyd tot tyd albino saailinge kry en meer spesifiek of hulle die afgelope somer en veral met *E. cerinus* en/of *E. villosus* hierdie ongewone verskynsel waargeneem het.

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I have raised thousands of cycads from seed over many years and have encountered various unusual seedlings in the process. The commonest abnormality, albeit quite rare, is for the seed kernel to produce a long root which will stay alive for several years without producing a visible stem with a leaf. The stem is folded back on itself within the seed kernel and can't emerge. Another very rare event is the production of two seedlings from one and the same seed kernel. Although there are always more than one egg cell in a cycad ovule which can be fertilized to develop into an embryo, it is usually only one of these that will develop into a mature embryo.

A few years ago I came across the first albino seedling (*E. natalensis*) in my nursery. The leaves of this plant did not last long but the plant formed three leaves in succession over slightly more than two years before it perished. Albino plants can't photosynthesize and therefore can remain alive only for as long as it contains reserve nutrients. In the case of albino seedlings, the seed reserves sustain their growth.

During the past summer I was amazed to discover no less than four albinos (Colour Figure 7 on p. 18) amongst my 21 *E. cerinus* seedlings. Shortly afterwards a friend phoned me from the Mica area to enquire about the cause for the large number of white *E. cerinus* seedlings in his nursery. Another friend from the Groblersdal area also informed me that several of his *E. villosus* seedlings unexpectedly turned out to be albinos this season.

Albinism in plants is caused by a genetic abberation which prevents the synthesis of the green pigment, chlorophyll, by the plant. The high incidence of albinism in the two cycad species this season is baffling. Unfortunately I did not germinate seed kernels of *E. villosus* this season. It would have been interesting to see whether I would also have obtained a high incidence of albinism with that species, indicating that for this season at least, the phenomenon apparently was restricted to these two species. I have germinated hundreds of seeds of several other cycad species during the past summer but in no case was any albinos encountered.

It will be interesting to hear whether some of our members also periodically encounter albino seedlings in their nurseries and especially whether they observed this phenomenon with *E. cerinus* and/or *E. villosus* during the past summer.

NEW LOCALITY OF *ENCEPHALARTOS CAFFER*

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According to Cynthia Giddy (1974: 68) the northernmost border of the distribution area of *Encephalartos caffer* is Kentani (32°30'S). Douglas Goode (1993: 162) broadens this northern border to Willowvale (32°15'S). Most of these areas are within 50–60 km from the coast. This new locality, as discovered by Cameron McMasters (*Encephalartos* **47**: 27, 1996) is as north as the colony at Willowvale but almost 100 km from the coast and at an altitude of 1150 above sea-level. Due to this high altitude plants are exposed to regular thick mist.

The cycads grow on north facing cliffs of about 60 degrees overlooking the Kei River, in full sun (Colour Figure 1 on p. 17). According to Goode (1993: 162) plants found north of East London have foliage more similar to *Encephalartos ngoyanus*. The plants found in this new area are, however, similar to the typical plants found south of East London, with crowded leaflets (Colour Figure 2 on p. 17).

Goode also says that the largest population (300 plants)

of *E. caffer* is perhaps found in the Cycad Nature Reserve on the banks of the Kariega River south of Grahamstown. This new population must surely be the largest of all with 500+ plants. In some areas the plants are spaced so close together that I could count up to 25 plants in an area of about 150 square metres. There is a good distribution of young and adult plants, and there are signs of a few cones. What make this population even more unique is that three distinct species of *Encephalartos* can be found within 50 metres of each other, *E. caffer, E. friderici-guilielmi* and *E. princeps* (Colour Figure 3 on p. 17). Strong populations of both *E. princeps* (2000+) and *E. friderici-guilielmi* (500+) occur in the same area, and *E. altensteinii* only about 40 km away. There are no signs of poaching of any of the plants in this area, probably because of the remote locality of the site. The population is quite difficult to reach, a four-wheel drive vehicle only brought us to within a steep 2 hour climb through thick forest of the population.

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ARTICLES / ARTIKELS

REPORT ON A JOURNEY TO DARKEST MEXICO IN PURSUIT OF RARE AND INTERESTING CYCADS - PART 2

undertaken in the last year of the 20th Century under the able leadership of
Jeff Chemnick
botanical explorer, cycadologist, and member of the Cycad Society of South Africa

Piet Vorster
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In the previous issue of ***ENCEPHALARTOS*** we reported on the first half of the Mexican cycad trip. We now continue with the fifth day, which involved a certain risk, as we planned to cross the Istmo de Tehuantepec almost to the Pacific Ocean. This involved crossing a very high mountain range. The road is a new tar road, not two years old, but the wild terrain and torrential rainstorms had already washed away portions of the road, and we were by no means sure that the road could be used. In the event we were lucky, for, although we witnessed some amazing damage and the going was slow, it was in fact easy travelling.

Our first species was a somewhat nondescript *Ceratozamia*, of medium size, as usual struggling for existence in a coffee plantation. The surrounding vegetation was tall cloud forest of pine and oak (Figure 1), with various other broadleaf species. This place is just over the crest of the mountains on the Pacific side, getting plenty of rain and mist from the ocean. The altitude results in this being a relatively cool locality. These cycads (Figures 2, 3) are not plentiful, but appear to be a new species. Recently seeds were distributed under the name *Ceratozamia* "pacifica". All in all this was a sad experience, as we cannot see this species surviving for very long.

Continuing along this road almost to the Pacific and almost to sea level, we saw the relics of *Dioon holmgrenii* (Figure 4, Colour Figures 10, 11, 18 on pp. 18–20), not far from San Gabriel Mixtepec. Previously I hadn't realised it, but this species is almost extinct. There are only a handful of plants left, all on a single private property. Nevertheless they seem to be reproductively active (witness Figure 4), and the owner of the property will hopefully keep an eye on them, as Jeff went out of his way to impress upon him the rarity of the plants. The plants grow on a gentle slope (Colour Figure 18 on p. 20), along some boulders, in a dense savanna looking as if it would change into evergreen forest if left alone.

Figure 1 *Ceratozamia* **"pacifica": its cloud forest habitat.**

Figure 2 *Ceratozamia* **"pacifica" amongst coffee trees.**

Scattered around in open places were *Zamia paucijuga* (Figure 5). At that stage it was already late in the afternoon, and reluctantly we had to break off our admiring of the cycads to head back over the mountains to Oaxaca and our midnight-supper.

On day six we headed northwards from Oaxaca on the road to Cosamatuapan. By now we had seen so many spectacular views and vegetation types that we were

Figure 3 *Ceratozamia* **"pacifica": a leaf.**

Figure 4 *Dioon holmgrenii*: **a female cone.**

hardly able to take in more, yet we travelled through a mountain pass topping almost 3000 metres, and through successively oak-pine-, fir-, cloud-, and thorn-forests, with huge tree ferns and epiphytes everywhere. Near Valle Nacional we saw *Ceratozamia whitelockiana*, a medium-sized species growing on cliff ledges within wet cloud forest. This is a recently described species, almost unknown in cultivation, bearing two to five leaves each

of which are 1.8 to 2.5 m long (Colour Figures 9, 13 on pp. 18, 19).

Figure 5 *Zamia paucijuga*, **growing in a grassy opening amongst** *Dioon holmgrenii*.

Figure 6 *Dioon spinulosum* **amongst limestone boulders.**

Eventually the road led to Tuxtepec, and the stronghold of *Dioon spinulosum* (Figures 6–8, Colour Figures 12, 14 on p. 19). Now, I had always been under the impression

Figure 7 *Dioon spinulosum*: **habitat near Tuxtepec.**

Figure 8 *Dioon spinulosum*: **a female cone in the Fairchild Tropical Garden. For a photo of a male cone see front cover of** *ENCEPHALARTOS* **no. 50 (June 1997).**

that this species grows in an inaccessible mountainous region, in tall evergreen forest. Its abundance in cultivation made me think that there must be vast numbers of plants in nature. What we found, was rather sobering. The landscape consists of tropical lowland,

Figure 9 ***Zamia loddigesii*** **near Tuxtepec, growing amongst** ***Dioon spinulosum*****.**

just like KwaZulu-Natal sugar country, and also planted up with sugar, maize, and other crops. The Dioons emerge from low evergreen forest on isolated limestone hills and rock outcrops which dot the landscape (Figure 7). Though far more tropical, the situation looked similar to the habitat of *Encephalartos altensteinii*. Through agriculture and industrialisation this area is changing very rapidly beyond recognition, and Jeff had some difficulty in locating a locality which only a few years previously comprised pristine natural habitat. Now there is a huge factory at the base of the cycad hill which he knew from previous visits, and the surrounding area is either built-up or badly degraded. We found the plants almost on top of a small, very densely vegetated hill, growing amongst boulders and emerging from the forest. Figure 6 and Colour Figure 12 (on p. 19) show smaller specimens which do not yet emerge through the forest canopy. There were not many plants, and no sign of seedling recruitment was seen. I had always thought that this is one of the largest cycads, but these plants were no more than four metres tall, with surprisingly thin stems (15 to 20 cm thick), and leaves not nearly as large as on the plants in the Fairchild Tropical Garden or the Durban Botanical Garden. The associated vegetation was also interesting: epiphytes were not so much in evidence, but there was a huge "bird-nest" *Anthurium*, as well as *Dioscorea macrostachys* which looks exactly like an outsize *D. elephantipes* (tubers some 60 cm diameter), but growing in compost and in dense shade within the bush. Here and there were also plants of what we took to be *Zamia loddigesii* (Figure 9). From what we saw here, I think *D. spinulosum* really is in peril, and it is imperative that a conservation area be put aside for them immediately.

Figure 10 ***Ceratozamia ? robusta*****: habitat near San Bartolom.**

Figure 11 ***Ceratozamia ? robusta*** **in habitat near Oaxaca, photographed on another occasion by Jeff Chemnick.**

Our final act was to visit *Dioon rzedowskii* (Colour Figures 15–17 on p. 20; Front Cover), the one species

Colour Figure 1 *Encephalartos caffer* **on a north facing cliff overlooking the Kei River. Photo: Marius Helm.**

Colour Figure 4 *Encephalartos ngoyanus*: **plants from the Ngoye Forest type locality in pots in a courtyard in Queenstown. Photo: Marius Helm.**

Colour Figure 2 *Encephalartos caffer*: **note the crowded leaflets. Photo: Marius Helm.**

Kleurfiguur / Colour Figure 5 Vroulike / Female *Encephalartos transvenosus* **met / with 10 keëls / cones. (Met / With Mev. / Mrs. Amie Botha regs / on the right.)**

Colour Figure 3 *Encephalartos princeps* **in the same habitat as** *E. caffer*. **Photo: Marius Helm.**

Colour Figure 6 *Encephalartos ferox* **male plant, showing the cone that developed from the side of the stem way below the leaves. Photo: Nico Henning.**

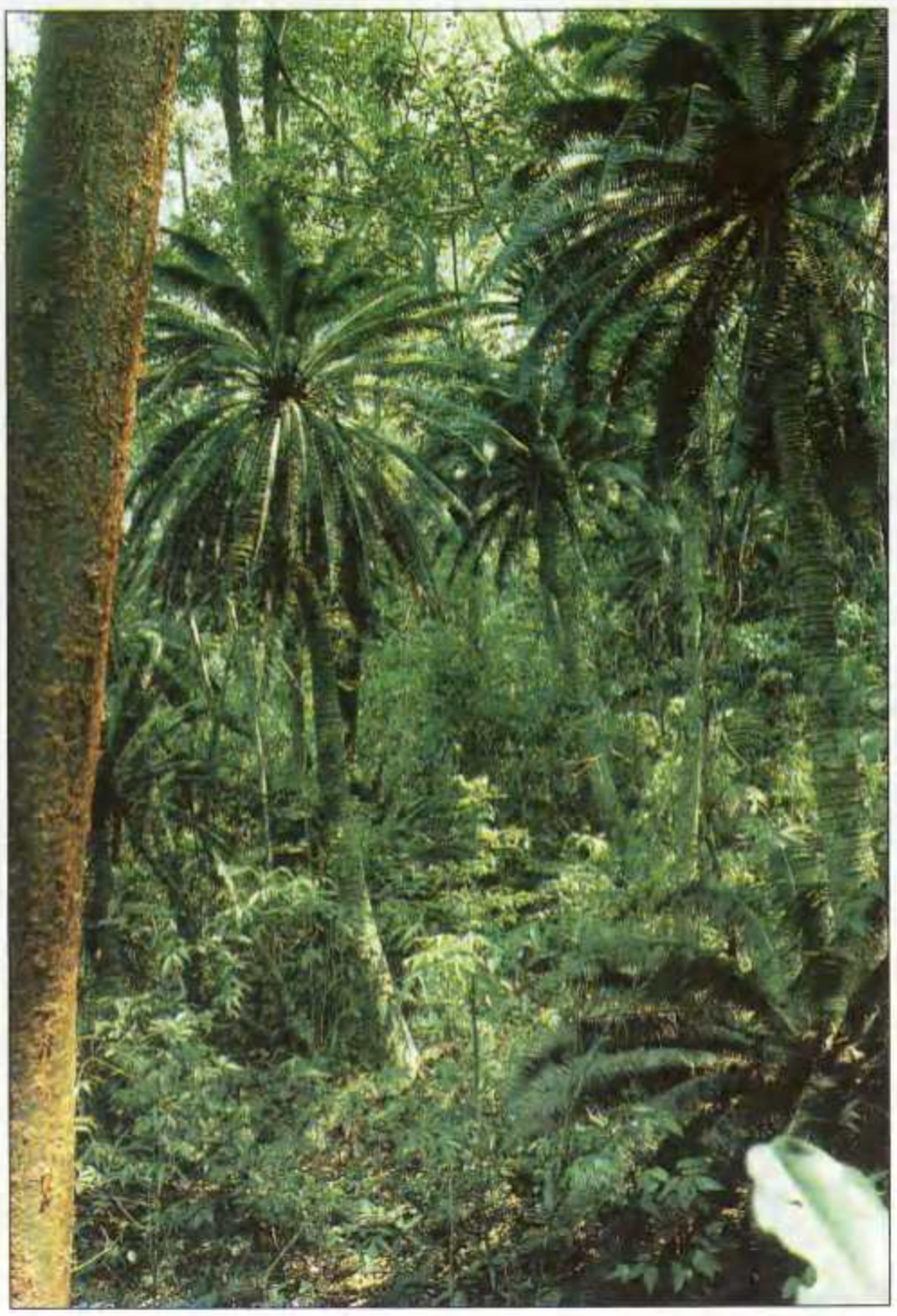
Kleurfiguur / Colour Figure 7 **'n Albino saailing van / An albino seedling of *Encephalartos cerinus*. Foto / Photo: Nat Grobbelaar.**

Colour Figure 9 ***Ceratozamia whitelockiana*: Jeff Chemnick displaying a splendid leaf of this rare species. Photo: Piet Vorster.**

Colour Figure 8 ***Ceratozamia*** **"robusta": a female cone, about 250 mm long. Photo: Piet Vorster.**

Colour Figure 10 ***Dioon holmgrenii*: Elsa Vorster admiring a particularly fine plant. Photo: Piet Vorster.**

Colour Figure 11 *Dioon holmgrenii*: **leaf detail. Photo: Piet Vorster.**

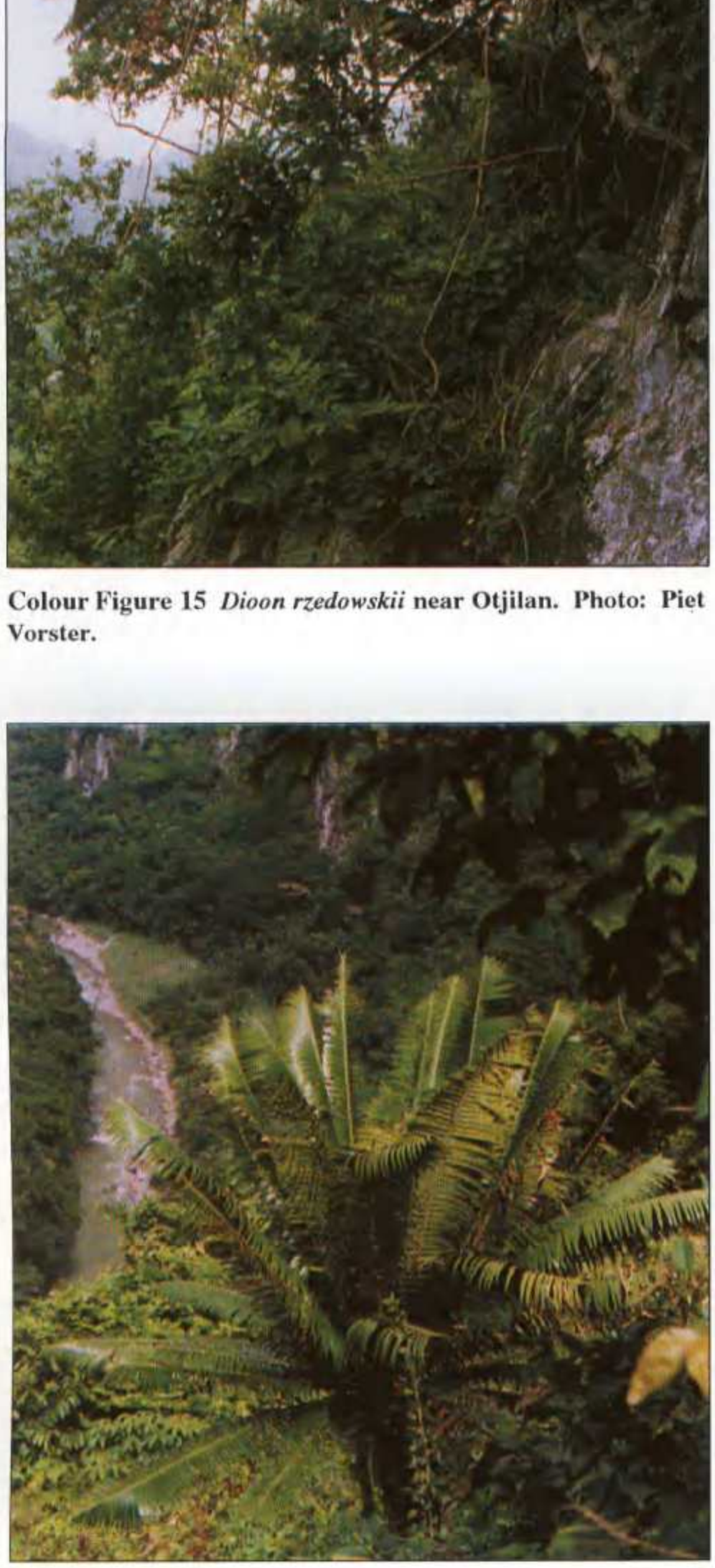


Colour Figure 12 *Dioon spinulosum*, **photographed on another occasion by Jeff Chemnick.**

Colour Figure 13 *Ceratozamia whitelockiana* **in habitat, photographed on another occasion by Jeff Chemnick.**

Colour Figure 14 *Dioon spinulosum*: **portion of a leaf, showing teeth on the leaflet margins. Photo: Piet Vorster.**

Colour Figure 15 *Dioon rzedowskii* **near Otjilan. Photo: Piet Vorster.**



Colour Figure 16 *Dioon rzedowskii* **near Otjilan. Photo: Piet Vorster.**

Colour Figure 17 *Dioon rzedowskii*: **portion of a leaf, showing leaflets almost devoid of teeth compared to** *D. spinulosum* **(Colour Figure 4). Photo: Piet Vorster.**

Colour Figure 18 *Dioon holmgrenii* **near the Pacific coast of Mexico. Photo: Piet Vorster.**

Figure 12 *Ceratozamia ? robusta*: **portion of a leaf.**

which I previously never could dream of seeing in nature. This we found near Ojitlan, after more mountain roads. We reached the plants by climbing down the very steep slopes of a river valley, on a footpath used by the locals to visit their maize fields. So serious is the shortage of agricultural land in Mexico that even places such as this, so steep that one can hardly walk or stand there, are cultivated, by hand of course. A potentially very damaging practice is weeding, which everywhere is now done with weedkillers. As for *Dioon rzedowskii*, nothing could have prepared us for the sight which met our eyes. There were hundreds, maybe thousands, of huge, bright glossy green plants hanging from the limestone cliff faces, in full sunlight (Front Cover). In practically all cases it was impossible to get to the plants, either to examine or to photograph them. The surrounding vegetation seems to have been grassland with bush clumps which looked as if they needed not much prompting to change into evergreen forest. Probably those bushes are kept in their present state by grass fires. Along the cliffsides and streambanks are patches of wet forest full of epiphytes and other interesting plants, such as *Anthurium podophyllum*, and amongst the grasses and within the bush clumps was the ubiquitous *Zamia loddigesii*. Unfortunately we did not see many Zamias on this trip, and those which we did see, were neither very spectacular nor looked particularly happy.

We had time for one more species, a bonus so to speak, which we called *Ceratozamia robusta* (Figures 10–12, Colour Figure 8 on p. 18). Whether this really is the same as the plants in Honduras, or at Santiago Tuxla, both going under this name, I cannot say. Certainly these plants are markedly smaller than the giants in Fairchild Tropical Garden (see *Encephalartos* **60**: 17). Maybe we shouldn't have looked at these plants after seeing the magnificent *Dioon rzedowskii*, because these Ceratozamias have nearly completely been eradicated. They now are only to be found here and there on limestone outcrops surrounded by cultivation (Figure 10), where they survive in composty rock crevices in the shade of scrub.

And so ended a memorable journey. We headed back to Veracruz where we had started from, seemingly a lifetime previously. Hardly had we reached our hotel when the heavens opened up, after we had the most glorious weather throughout our trip. After a good night's rest, aided by the drumming of rain on the roof, it was time to say good-bye, and we all scattered to our respective homes.

Since writing this, Jeff has announced that he plans to lead another expedition over much of the same ground, though I noticed that some of the species on his itinerary are additional to those which we saw. Certainly we travel with him in our imaginations, and we all dream of going back to Mexico one day.

CULTIVATED CYCADS IN FIJI

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INTRODUCTION

The Republic of the Fiji Islands is a nation in the Southwest Pacific, located between 15°S to 20°S and 177°E to 179°W, that consists of numerous islands. The two biggest islands, Viti Levu (20,388 km^2) and Vanua Levu (6,000 km^2) make up the bulk of the landmass.

For a relatively small country in the Pacific a surprisingly large number of cycads are found in cultivation in Fiji. In the floristic inventories of Fiji (Seemann 1865–73, Parham 1972, Smith 1979), the only cycad species

Table 1: List of cycads cultivated in Fiji. Species of cycads are listed in alphabetical order under their respective families. The location where the species are cultivated is given. USP = The University of the South Pacific, Suva. SG = The Garden of the Sleeping Giant, Nadi. DP = Horticultural nursery of the late R.H. Phillips (horticulturist).

Species	Location
CYCADACEAE	
Cycas apoa K.D. Hill	SG
Cycas bougainvilleana K.D. Hill	USP (Botanical Garden)
Cycas campestris K.D. Hill	DP
Cycas guizhouensis K. Lan & Zou	DP
Cycas panzhihuaensis K.D. Hill & Yang	DP
Cycas revoluta Thunb.	USP (Cycad Garden)
Cycas rumphii Miq.	Widely cultivated in Fiji
Cycas seemannii A. Br.	Native to and widely cultivated in Fiji
Cycas taitungensis C.F. Shen, K.D. Hill, C.H. Tsou & C.J. Chen	USP (Cycad Garden), DP
Cycas thouarsii R. Br. ex Gaud	USP (Cycad Garden), SG
STANGERIACEAE	
Bowenia serrulata (W. Bull) Chamb.	SG
Bowenia spectabilis Hook. ex Hook.	USP (Cycad Garden, Botanical Garden), DP
Stangeria eriopus (Kunze) Baill.	SG
ZAMIACEAE	
Ceratozamia robusta Miq.	SG
Dioon edule Lindl.	SG
Dioon purpusii Rose	USP (Cycad Garden)
Dioon spinulosum Dyer	USP (Cycad Garden), SG
Dioon rzedowskii De Luca, Moretti, Sabato & Vazquez Torres	DP
Encephalartos aemulans Vorster	DP
Encephalartos ferox Bertol. f.	SG
Encephalartos heenanii Dyer	SG
Encephalartos hildebrandtii A. Br. & Bouche	DP
Encephalartos kisambo Faden & Beentje	SG
Encephalartos lebomboensis De Wild	USP (Cycad Garden), SG
Encephalartos manikensis (Gililand) Gililand	USP (Cycad Garden, Botanical Garden), SG
Encephalartos paucidentatus Stapf & Burtt Davy	USP (Cycad Garden), DP
Encephalartos villosus Lem.	DP
Encephalartos sp. "Sudan" Heibloem	DP
Lepidozamia hopei Regel	USP (Cycad Garden), SG
Lepidozamia peroffskyana Regel	USP (Cycad Garden), SG
Macrozamia diplomera (F. Muell.) L.A.S. Johnson	DP
Macrozamia dyeri (F. Muell.) C.A. Gardn.	DP
Macrozamia johnsonii D.L. Jones & K.D. Hill	SG
Macrozamia macdonellii (F. Muell. ex Miq.) DC	DP
Microcycas calocoma (Miq.) DC	DP
Zamia fairchildiana L.D. Gómez	USP (Cycad Garden), SG
Zamia fischeri Miq.	SG
Zamia furfuracea L.f. in Aiton	USP (Cycad Garden), SG
Zamia cf. *loddigesii* Miq.	USP (Cycad Garden), SG
Zamia muricata Willd.	DP
Zamia neurophyllidia D.W. Stev.	DP
Zamia portoricensis Urban	USP (Cycad Garden)

Table 2: Comparison of length of leaves and the reproductive structures of cycads cultivated in Fiji. The length of various vegetative and reproduction structures of cycads cultivated in the Cycad Garden of The University of the South Pacific are compared with the maximum values recorded.

Species	Structure measured	Max. length measured (m)	Literature Value (m)	Source
Cycas taitungensis	Leaf	1.80	1.80	Hill & Stevenson 1998
Bowenia spectabilis	Leaf Male cone Female cone	2.25 0.12 0.17	2.10 0.06 0.12	Stewart 1994 Jones 1993 Jones 1993
Dioon purpusii	Leaf Female cone	1.82 0.26	1.60 0.44	Jones 1993 Jones 1993
Dioon spinulosum	Leaf	1.88	2.00	Jones 1993
Encephalartos manikensis	Leaf Male cone Female cone	2.50 0.72 0.83	2.00 0.60 0.90	Heibloem 1998 Jones 1993 Heibloem 1998
Encephalartos lebomboensis	Leaf Female cone	2.10 0.40	2.00 0.45	Jones 1993 Giddy 1974
Encephalartos paucidentatus	Leaf	2.70	2.50	Giddy 1974
Lepidozamia hopei	Leaf Female cone	2.90 0.40	3.00 0.60	Stewart 1994 Stewart 1994
Lepidozamia peroffskyana	Leaf	2.00	3.00	Stewart 1994
Zamia fairchildiana	Leaf Male cone	2.30 0.30	2.50 0.40	Jones 1993 Jones 1993
Zamia furfuracea	Leaf Petiole Male cone Female cone Male peduncle Female peduncle	1.70 0.70 0.19 0.24 0.20 0.60	1.00 0.15 0.12 0.23 0.10 0.05	Jones 1993 Jones 1993 Jones 1993 Jones 1993 Jones 1993 Jones 1993
Zamia cf. *loddigesii*	Leaf Female cone Female peduncle	1.70 0.25 0.32	1.00 0.15 0.06	Jones 1993 Jones 1993 Jones 1993
Zamia portoricensis	Leaf Male cone Female cone Male peduncle Female peduncle	1.70 0.11 0.14 0.10 0.08	1.50 0.12 0.14 0.08 0.10	Jones 1993 Jones 1993 Jones 1993 Jones 1993 Jones 1993

mentioned is the naturally occurring *Cycas seemannii* A. Br., which is a widely cultivated ornamental throughout the country. Another cycad widely cultivated in Fiji that was mentioned by Hill (1994a, 1994b) is the yellow cycad, *Cycas rumphii*. No other cycads have been reported to occur in cultivation despite a number of species being grown. This chapter attempts to list the cultivated cycads in Fiji, thereby increasing the knowledge of the plants in the country.

METHODOLOGY

Cycads are mainly cultivated in the Botanical Garden and the Cycad Garden of the University of the South Pacific in Suva and the Garden of the Sleeping Giant in Nadi. Several species are cultivated at the private plant nursery of the late R.H. Phillips. These plants were identified using published literature (Giddy 1974, Jones 1993, Hill 1994a, Heibloem 1998) and personal

communication. Any features different from those reported by the above authors were noted.

Measurements of some of the morphological features of cycads growing at the University of the South Pacific were taken and compared to values stated in various literature sources. Being 10 to 20 years old, these plants are the oldest exotic cycads that are cultivated in Fiji. The measurements were taken in an attempt to assess the variation and growth of the various exotic species in Fiji. The length of leaves and of various reproductive structures was chosen as representative characters for this purpose.

Herbarium voucher specimens of the exotic species were, wherever possible, prepared and deposited at the South Pacific Regional Herbarium, Suva, Fiji. Wet collections in Formalin-Acetic-Alcohol ("FAA", Carlquist 1976) were prepared, if feasible, and stored at the teaching collection of the Biology Department of the University of the South Pacific. Some cones were preserved by drying and were deposited at the South Pacific Regional Herbarium, Suva, Fiji.

RESULTS

SPECIES RECORDED

Ten of the eleven genera and 42 of the ca. 250 species of cycads are recorded in cultivation in Fiji. The genera and species recorded were *Bowenia* (2 species), *Ceratozamia* (1 species), *Cycas* (10 species), *Dioon* (4 species), *Encephalartos* (10 species), *Lepidozamia* (2 species), *Macrozamia* (4 species), *Microcycas* (1 species), *Stangeria* (1 species) and *Zamia* (7 species) (Table 1).

There are likely to be additional species in private collections that are not known to us. Species that could not be identified with certainty are not listed in Table 1. Identification of cycads is difficult in immature plants, as the foliage of young plants is often different from that of mature plants and because some species, especially of the genus *Cycas*, are almost impossible to identify in the absence of reproductive structures. The conservative growth form and the considerable phenotypic plasticity displayed by the foliage of cycads, further complicates the process of assigning a plant to a species. As species of uncertain identity are not listed in Table 1, the list is still incomplete. However, we believe that it includes most of the taxa cultivated in Fiji.

GROWTH AND VARIATION

The plants growing at The University of the South Pacific are probably the oldest exotic cycads cultivated in Fiji. These plants were planted at The University of the South Pacific in 1988 by the late R.H. Phillips after five to ten years of growth in the nursery and, therefore, have an approximate age of 15 to 20 years. Of these *Zamia portoricensis, Z. loddigesii*, and *Z. furfuracea* cone more than once a year, with cones being present almost throughout the year. *Bowenia spectabilis, Cycas seemannii, C. rumphii, Encephalartos manikensis, Lepidozamia hopei* and *Zamia fairchildiana* are recorded to have produced cones in 1998 and 1999. *Cycas bougainvilleana, Dioon purpusii*, and *Encephalartos lebomboensis* produced cones in 1998, while no coning event occurred in *Cycas taitungensis, Dioon spinulosum, Encephalartos paucidentatus* and *Lepidozamia peroffskyana*. In addition, *Stangeria eriopus* produced a cone in 1998 in R.H. Phillips' nursery and also in 1999, after transplantation to The Garden of the Sleeping Giant.

Growth of cycads in Fiji is vigorous. This is true both for the vegetative and the reproductive growth. Table 2 compares the measurements taken from vegetative and reproductive structures of cycads growing at The University of the South Pacific with the maximum values of the characters under consideration stated in published literature (references in Table 2).

DISCUSSION

The ten genera and 42 species in the order Cycadales that were identified during this study, represent a significant increase to the two species, *Cycas seemannii* and *Cycas rumphii* f. *aurea*, previously reported from Fiji (Smith 1979, Hill 1994b, 1994c). Two previously unrecorded families, Stangeriaceae and Zamiaceae, are also cultivated in Fiji. However, the actual number of cycad species present in the country may actually be slightly higher because some, mainly young, specimens could not be identified. *Chigua* is the only cycad genus not recorded from Fiji and consists of two species endemic to Columbia, neither of which are readily available to horticulturists.

The fact that most species grown at The University of the South Pacific produce leaves and cones with dimensions similar to or even greater than the maximum values reported in literature (see Table 2), show that cycads thrive under the tropical warm conditions in Fiji. Cycads, therefore, seem to be ideally suited as attractive ornamentals for landscaping in Fiji and, probably, in the entire tropical Southwest Pacific. Since most cycad species are now believed to be insect-pollinated (Norstog and Nichols 1997), they also have the additional advantage of not becoming naturalized and weedy after having been introduced as exotics. This is important, since several introduced plants presently dominating disturbed landscapes are beginning to invade the native forest vegetation of Fiji (Liebregts in press, Mueller-Dombois & Fosberg 1998).

ACKNOWLEDGEMENTS

We wish to thank the French Embassy in Suva, Fiji, which by financial support through the French Ministry of Foreign Affairs made this project possible. Similarly, we are grateful for the financial assistance received through a URC research grant from The University of the South Pacific. We would also like to thank M.F. Doyle, P.F. Newell, K.D. Hill, The Garden of the Sleeping Giant and S.A. Ghazanfar for their assistance during this project. The latter also made many helpful suggestions when reviewing this paper, which I am very thankful for.

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LETTERS TO THE EDITOR / BRIEWE AAN DIE REDAKTEUR

Dear Editor

CYDEX ELECTRONIC INDEX TO *ENCEPHALARTOS*

As an amateur collector and enthusiast of cycads, I generally find the *Encephalartos* journal a most interesting and informative magazine. The range of topics covered and the fact that most articles and submissions are written in layman's terms makes the journal a valuable, and in my case, often consulted reference.

However, the lack of an up to date reference guide or index cause some frustration when one needs to consult a specific topic. In past issues, specifically Volumes 20, 28, 31, 38 and 51, various Index listings have been published. Whilst these are useful in their own right, apart from being outdated, the generic problem with such listings is that they were sorted and printed according to a pre-defined format. Thus for example, if the reader wishes to scan all "Focus on ... " articles, this still requires some searching through the Index.

For this reason, I have compiled a PC based Index which is easily updated and can be sorted according to the user defined field type. For the IT technically minded, the Index, which I have called CYDEX, runs under Microsoft Word software. The uncompressed file is only 217 Kbytes and thus easily transferable over the internet. When printed in Aerial font (size 10) in landscape version, the document equates to approximately 51 A4 pages.

CYDEX has five different field types (and sort categories), viz:

article title,
author(s),
type of article (e.g. Focus On, Letter, Short Communication, etc),
journal number and
page(s)

As noted earlier, by utilising the Microsoft Word Sort facility, CYDEX records can be sorted according to the user's requirements by selecting any one or a

combination of sort categories. This allows for a quick reference to specific target material.

For readers who are interested in obtaining an electronic copy of CYDEX, I will be pleased to E-mail a copy at no charge.

My E-mail address is: slaviero@ibi.co.za

L.G. Slaviero, 2 Pierneef Road, Elma Park, 1609 Edenvale, R.S.A.

Received 25 January 2000

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Dear Editor

NEW PRESIDENT OF CYCAD SOCIETY OF SOUTH AFRICA

I was excited to learn that the Cycad Society of South Africa recently nominated Dr. Piet Vorster to become their next president. What great news for the entire international cycad community.

Today I received the December 1999 issue of ***ENCEPHALARTOS***. The Society's magazine continues to improve with every issue. I especially enjoy and appreciate the wide diversity of topics included in each issue. You are to be congratulated on the wonderful page layout of the issues. I continue to see that the quality of the photographs continue to improve with each issue. Thank you for overseeing the production of such a wonderful magazine for all of us.

Terrence Walters, *Executive Director, Montgomery Botanical Center, 11901 Old Cutler Road, Miami, Florida 33156–4242, U.S.A.*

Received 28 January 2000

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Dear Editor

HYBRID OF DIFFERENT SPECIES OF CYCADS IN GARDENS

I have met a friend about 3 years ago who has hybridized his *Encephalartos friderici-guilielmi* (female) with *E. altensteinii* pollen by dry-pollination during 1987. I don't know if this was recorded or printed in a newsletter before.

The seeds were harvested in 1987 and during 1988 some of the seeds germinated. Three of the seedlings were planted in his garden. The leaves are glaucous-blue when young but become green with age and are up to 1 m long. The leaflets (Figure 1) are 8 to 13 cm long and 12 to 15 mm broad, they are reduced in size towards the base of the leafstalk. They are toothed on the upper and lower margins. They are well spaced and do not overlap. One of the three plants (a female) now coned for the first time in January 1999 and also produced a sucker. The female cone (Figure 2) is 40 cm long and 17 cm in diameter and is light greenish-yellow in colour.

Figure 1 Photostat copy of one of the hybrid's leaflets.

Figure 2 ***Encephalartos friderici-guillielmi*** **x** ***E. altensteinii*** **hybrid: lower parts of leaves, and female cone.**

I pollinated this female cone with *E. altensteinii* pollen (dry-pollination) during April 1999. The seeds were harvested during December 1999 and the sarcotestas are orange-red in colour.

L.M. Myburgh, 6 Link St South, 2092 Triomf, R.S.A.

Received 28 January 2000

[I do not know of anyone having successfully produced hybrids between narrow-leafed and broad-leafed *Encephalartos* species. The author also included a photostat of part of a leaf of the hybrid in question and it rather resembles the leaves of my *E. trispinosus* x *E. altensteinii* hybrid but the author phoned me and said that the original mother plant was indeed an *E. friderici-guilielmi*. **- Editor.**]

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Dear Editor

THE CYCAD DATABASE VOL II

In the December 1999 issue of ***ENCEPHALARTOS***, I advertised a computer program for collectors which I have used very effectively to manage my collection. Inputs from other collectors since then have helped me to improve the program and the new version is now available. The most important addition is a section we called "Cycad history" which includes the fields "Record number", "Date leafed" and "Date coned". Most of the enquiries concerning the program asked for these additions. The cycad database section has also been modified slightly and now contains the following fields: "Record number", "Species", "Microchip Number", "Acquired from", "Sold to", "Date Acquired", "Sex", "Age when acquired", "Date sold", "Permit number" and "Value". I believe that any collector will find the new program sufficient for his/her cycad data needs. The program is still available for R100 (excluding postage) and I will still donate R5 to the Cycad Society of South Africa for every program sold. I can send the program via E-mail without extra cost. Anybody is free to contact me should they wish to purchase the program.

André Cilliers, P.O. Box 351, 2520 Potchefstroom, R.S.A.; Tel: 018 2996308 (w), 018 2971602 (h); E-mail: andre_c@ops1.agric.za

Received 21 February 2000

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Geagte Redaktrise

ENCEPHALARTOS TRANSVENOSUS **VROULIKE PLANT MET 10 KEËLS**

Mevrou Amie Botha van die plaas Loa net buite Duiwelskloof het die foto (Kleurfiguur 5 op. p. 17) aan my gestuur en geskryf dat toe hulle die plaas in 1945 gekoop het die betrokke broodboom reeds 'n volwasse plant was. Hulle het gelees dat 7 keëls 'n rekord vir broodbome is en toe hulle 10 keëls aan die plant getel het, het hulle die foto geneem (± Julie 1979).

Ek glo dat 'n mens nie elke dag 'n plant met soveel gesonde keëls raakloop nie. Vir my is dit 'n baie interessante verskynsel. Ons verneem graag of dit baie voorkom al dan nie.

Ons vind die ***ENCEPHALARTOS*** tydskrif baie interessant.

***C.J. Botha**, Posbus 65, 0835 Duiwelskloof, R.S.A.*

Ontvang 28 Februarie 2000

[Volgens die groottes van die keëls op die foto is dit duidelik dat hulle in twee opeenvolgende jare verskyn het aangesien die buitenste krans van vyf reeds volwasse is en die binneste krans jonger. Volgens prof. Nat Grobbelaar sit vroulike keëls by *E. transvenosus* vir ongeveer 18 maande op die plant en omdat 'n plant soms in twee opeenvolgende jare keël, het hy ook al tien vroulike keëls per stam waargeneem - maar dit is nie algemeen nie. - **Redaktrise.**]

Summary

ENCEPHALARTOS TRANSVENOSUS **FEMALE PLANT WITH 10 CONES**

Mr. C.J. Botha received the photo (Colour Figure 5 on p. 17) of the female *Encephalartos transvenosus* from Mrs. Amie Botha of the farm Loa just outside Duiwelskloof, and she wrote that the cycad was already an adult plant when they bought the farm in 1945. Having read that 7 cones are a record for cycads they photographed this plant with its 10 cones (round about July 1979).

Mr. Botha asks whether it is a common phenomenon that a cycad can produce so many healthy cones.

[The photograph shows that the cones must have been produced in two successive years as the five cones in the centre are much smaller than the five surrounding them. According to Prof. Nat Grobbelaar female cones of *E. transvenosus* remain for about 18 months on the plant, and because a plant sometimes cones in two successive years he has also observed 10 cones on one stem - but it is not a common phenomenon. - **Editor.**]

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Dear Editor

ENCEPHALARTOS NGOYANUS **PLANTS FROM THE NGOYE FOREST**

Included is a photograph (Colour Figure 4 on p. -) of two adult plants of *E. ngoyanus* that I have taken with me when I moved to Queenstown in the Eastern Cape from Richards Bay in KwaZulu-Natal. All these plants pushed new leaves within the first year with one having pushed 10 leaves (plant on righthand side), and for the first time one is pushing a cone this year (plant on lefthand side). These plants are kept in pots in a walled courtyard on the southern side of my house. According to the person that I got the plants from they are from the Ngoye Forest type locality. Can you tell me if any differences exist between the plants from the Ngoye Forest locality and the next concentration of the species at Mkuze, Ubombo and around the Pongola Poort Dam,

and if it is advisable to use pollen from the same locality?

Marius Helm, P.O. Box 9612, 5320 Queenstown, R.S.A. Tel: 0838071029.

Received 3 March 2000

[Readers, please respond. **-Editor.**]

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Dear Editor

A SHADE STORY

A local nursery has done away with all its shade cloth nursery units and is operating under the shade of trees. SO WHAT? There is surely nothing new about that! Let me explain. The new twist is the fact that the trees were planted for the sole purpose of providing shade for nursery plants. The original spacing was 3 x 3 metres. As time passes and the tops meet and form too close an umbrella they will be thinned out.

The trees planted are a Leguminosae, the "Leopard tree" *Caesalpinia ferrea*, they provide a dappled shade which is ideal for the purpose. The leaflets are shed more or less throughout the year and provide a thin rich **nitrogenous** layer on the ground and over the tops of bagged plants.

Under our climatic conditions (Lowveld) the tree growth is so rapid that a usable shade area is attained in five years and thinning out will be required after ten or twelve years. Stem pruning from an early age will insure free movement throughout the plantation.

Should any "***ENCEPHALARTOS***" reader wish to have a look at one or two nurseries making use of Leopard trees as shade providers I shall be pleased to give them the phone number or to take them to the nurseries.

Jack van der Merwe, P.O. Box 39, 0835 Duiwelskloof, R.S.A., Tel: +27(015) 309 9360.

Received 25 March 2000

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Dear Editor

CYCAD 2002

Up to now there have been five ***International Conferences on Cycad Biology***, and all have become legendary. The reason is that they are the nicest get-togethers imaginable. I have heard many people saying that they avoid these meetings because they fear that it would be too technical, but nothing can be further from the truth. Surely there is a strong scientific element, but first and foremost these meetings are organised by cycad enthusiasts for cycad enthusiasts. They are wonderful opportunities for meeting other enthusiasts from all over the world, to talk about cycads till the early hours, to learn about all aspects of cycads from world-renowned experts, and to see strange cycads in their natural habitats.

Previous conferences were held in Nice (France) in 1987, Townsville (Australia) in 1990, Pretoria in 1993, Panzhihua (China) in 1996, and Miami (Florida) in 1999. Do have a look at the reports in ***ENCEPHALARTOS***: all are glowing. The proceedings have all been published, (see review of the Panzhihua conference proceedings elsewhere in this issue), and present milestones in the advancement of our knowledge of cycads. Quite rightly they have become valued collectors' items.

The next conference is scheduled to be held at the Nong Nooch Tropical Garden in Thailand, in December 2002. Having been to Thailand and Nong Nooch myself, I have no doubt that it is going to be the best conference yet and I urge members to start planning now to attend. Exact dates and cost estimates are not yet available, but I think if one starts putting aside R300 a month from now on, there will be money to spare in the end.

See you in Thailand in 30 months' time!

***Piet Vorster**, Botany Department, University of Stellenbosch, Private Bag X1, 7602 Matieland, R.S.A.*

Received 7 April 2000

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Dear Editor

IS THIS PHENOMENON RARE?

In January 1999 this *Encephalartos ferox* male plant started producing two normal cones which were removed during March for pollen collection. A few months later I noticed a single small cone developing from the side of the stem below the last row of leaves. It ended up as a dwarf cone but it also "opened up" in the end and shed its pollen. In February 2000 the same happened with a single cone way below the leaves from the side of the stem (Colour Figure 6 on p. 17). Has anybody else seen this before?

***Dr. N.G.C. Henning**, 80 Cantonments Road, Lyttelton Manor, 0157 Centurion, R.S.A.*

Received 14 April 2000

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The following two letters were written in Afrikaans to Piet Vorster. Because the subject is of such wide interest, we publish them here together with Piet's reply, and he has translated them into English for the benefit of our overseas readers:

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Dear Piet

DNA IDENTIFICATION OF *ENCEPHALARTOS* SPECIES

I am contacting you on behalf of the Northern Province Cycad Working Group.

I would like to know how far the botanists have progressed with DNA identification of *Encephalartos* species. Is it yet possible to identify certain species with great certainty via DNA identification or not? What is the cost of the procedure, and do you foresee that it will become more common in the near future or not? Have you yet found the sex determining factor or not, and would it be possible to use it commercially in the future?

If there is a considerable amount of information on these subjects, I would appreciate it if you could assist me in obtaining it.

***Xander de Kock**, P.O. Box 2498, 0700 Pietersburg, R.S.A.*

Piet Vorster's reply:

Dear Xander

Alas, DNA identification is not an option.

As far as identification of species is concerned, preliminary results suggest that all the species are genetically practically identical in respect of the genes which were investigated. We don't yet know which genes are significant in the evolution/speciation of cycads. We are also still far from having standards against which we can measure an unknown plant. Alternatively, there are other methods for genetical analysis, such as electrophoresis of iso-enzymes, which provide considerably better results, but all these methods are very expensive.

Concerning DNA fingerprinting of individuals, we still know hopelessly too little about the genome of cycads. A while ago one of the nature conservation departments was interested in having fingerprinting performed on about 200 individual plants to enable them to recognise these individuals in the future. I asked our DNA experts for a cost estimate, which turned out to be something like a quarter of a million rand. With humans it is different, because the human genome is already well known and we know what to look for.

We know nothing about sex determination in cycads. Apparently there is not a special sex chromosome, but sex is determined by hormones which in turn are controlled by genes. However, we don't know which genes are responsible.

***Piet Vorster**, Botany Department, University of Stellenbosch, Private Bag X1, 7602 Matieland, R.S.A.*

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Dear Piet

CONSERVATION OF SPECIES ONLY FEASIBLE IN NATURE

I am writing this letter in reaction to the interesting information which you sent to my brother, Alexander, in Pietersburg, [see above - ed.] on the identification of cycads by means of DNA. It is really a pity that we are as yet unable to use the technology for the identification of species and sex.

Another grave concern is the numerous hybrids around; not only those which originated "accidentally", but also some which are created by breeders. In the absence of proper DNA classification, this constitutes a serious problem. Conservation of species would then only be feasible in nature. I have seen many hybrids which look very nice as garden plants. Is there any information on chemical sterilization of such plants and/or seeds?

What about a data base of plants in possession of collectors known to have been collected at specific places in nature? What about a system of cycad pedigrees, where every seedling is registered with reference to male and female parents? I am a fairly worried cycadophile.

***Gideon de Kock**, P.O. Box 5836, 6065 Walmer, R.S.A.*

Piet Vorster's reply:

Dear Gideon

Your letter raises two aspects which in my opinion don't have much in common, and I hope that the day never dawns when they do become indistinguishable. The one aspect concerns plants in nature and their continued existence there, while the other concerns beautiful and interesting plants which we grow in our gardens for our pleasure.

Concerning the plants in nature, we have little leeway. From a scientific viewpoint, and as part of our natural heritage, we cannot merely allow their continued existence but must guarantee it. This means that their genetical integrity may not be compromised under any conditions, either by introducing into such colonies plants of the same species but from another locality, or

by introducing foreign species. It is for this reason that I have in the past taken a strong stand against the "enriching" of nature areas by introducing species which never in the past occurred there. However, there is also the case of natural populations which are already so depleted that they no longer reproduce, and there the choice is between losing all the plants eventually through attrition, or to introduce "new blood" of the same species but from a different locality.

Concerning plants in gardens, the situation is quite different because for all practical purposes these plants are lost for the continued existence of the particular species in nature.

At the one end there are dedicated enthusiasts who try and maintain the genetical integrity of their captive plants even going so far as to keep representatives of the different populations of species like *Encephalartos natalensis, E. transvenosus*, and *E. manikensis* separate when pollinating artificially. Such practices are laudable. Practical problems are firstly that already for many years it has been totally forbidden to remove even seed from nature. The result is that the collecting data are old and increasingly unreliable because the collectors' memory fail them (how few of us have decent accession registers and labels for our plants!), or else the plants were collected illegally and the collector won't divulge the data. Secondly, already in many gardens there are large populations of cycad-associated beetles, some of which are effective pollinators. In nature these beetle species are mostly restricted to specific cycad species, but under garden conditions they move between cycad host species (and even between genera), so that hybridization happens readily (see ***Learning pollinating insects*** elsewhere in this issue). These beetles are probably also responsible for a marked percentage of the seed which we so painstakingly produce being impure. Thirdly there is the question of reliability: seedlings are often distributed as being of certain forms; but when one carefully goes into the matter, it transpires that the origin of the parents is not above suspicion. It is therefore true that in gardens there are many plants which could perhaps be used to produce seedlings to supplement natural populations, but personally I hope that the day will never dawn that it really becomes necessary. [In a sense that day has however already dawned: see ***The plight of*** **Encephalartos aplanatus** elsewhere in this issue.]

At the other end there are those of us who are gardeners rather than collectors. Such people want nice plants which look good in a specific position; and if a hybrid is better for that purpose than a natural species, it is perfectly in order. There is nothing wrong with hybridizing for this purpose, just as we breed specific races of dogs or cultivars of roses. If such hybrids sabotage the efforts of "pure breeders", it points to carelessness on the part of the latter. There is no danger that such hybrids can contaminate wild populations, because almost all wild populations are situated far away from places where people grow cycads. It is, however, quite true that the wild progenitors of a considerable number of crop plants, and also domesticated animals, have become extinct as a result of genetical contamination by the cultivars or races bred from them; but that is usually only possible when the cultivars or races are kept so close to the wild progenitors that cross breeding can take place.

At this time it is simply not practical to try and identify hybrids by looking at their DNA. The genome of plants is enormously big, and perhaps 99 per cent of the genes are common to different species. It would be very difficult to find firstly those genes which do differ between species, and secondly to determine what such differences mean.

I don't know of any way of sterilizing plants, short of cutting off the cones at an early stage.

As concerns reliable records, these are absolutely essential for any collection, whatever the purpose of the collection. In the past Nat Grobbelaar has stressed this on innumerable occasions.

Piet Vorster, Botany Department, University of Stellenbosch, Private Bag X1, 7602 Matieland, R.S.A.

Received 7 April 2000

NEW CYCAD PUBLICATIONS

BERTHELIN, M. & PONS, D. 1999. **Significance of the characters shared between Bennettitales and Cycadales. Implications of the discovery of a new Cenomanian cycad from Anjou (France).** *Annales de Paleontologie* 85(4): 227–239.

[The lagoonal Cenomanian formation (Lower Cretaceous) of clays of the region of Baugeuis (north of Angers) has supplied an exceptionally well-preserved fossil flora: leaves, woody structures or/and reproductive organs of pteridophyta, gymnosperms and

angiosperms. A well-preserved fossil plant found in a quarry "Le Brouillard" (8 km from Angers), has allowed a detailed morphological and structural study of this species. A comparative study with extant plants has confirmed an undoubted link between the contemporary genus *Dioon* (an endemic cycad from Mexico) and the fossil species. However, features observed on the lower epidermis of the leaflets, present a similarity with some Jurassic Bennettitales. This discovery, added to other common features shared by these two orders, raises questions about their relationships, thought to be different from a phylogenetic viewpoint.]

First author's address: Laboratoire de paleobotanique et de Paleoecologie, Wquipe Classification, Evolution et Biosystematique, FR3-CNRS, Universite Pierre-et-Marie-Curie, 12, Rue Cuvier, 75005, Paris, France.

BROOME, T. 1999. **Increasing the growth rate of plants and offsets by removing leaves.** *The Cycad Newsletter* 22(3): 20–21.

[Unfortunately an abstract is not available.]

Author's address: The Cycad Jungle, Polk City, Florida, U.S.A.

BUCKLEY, R. 1999. **A new significance for *Stangeria*?** *The Cycad Newsletter* 22(4): 11–14.

[Unfortunately an abstract is not available.]

Author's address: Trabuco Canyon, California, U.S.A.

FORSTER, P.I. 1999. **Typification and application of the name *Macrozamia macleayi* Miq. (Zamiaceae).** *Austrobaileya* 5(3): 577.

[Unfortunately an abstract is not available.]

Author's address: Queensland Herbarium, EPA, Brisbane Botanic Gardens Mt Coot-tha, Mt Coot-tha Road, Toowong, Qld, 4066, Australia.

FRANCIS, D. 1999. **The role of cycads in disease: The ethnobotanical work of Margaret Whiting.** *The Cycad Newsletter* 22(3): 17–19.

[Unfortunately an abstract is not available.]

Author's address: 36 Tano Alto Road, Santa Fe, N.M., 87501, U.S.A.

HILL, K.D. 1999. **What is *Cycas circinalis*?** *The Cycad Newsletter* 22(4): 7–9.

[Unfortunately an abstract is not available.]

Author's address: Royal Botanic Gardens, Mrs Macquaries Road, Sydney 2000, Australia.

KORZHENEVSKAYA, T., LOBAKOVA, E. S., DOL'NIKOVA, G.A. & GUSEV, M.V. 1999. **Topography of microsymbionts in apogeotropic roots of the cycads *Cycas revoluta* Thunb. and *Encephalartos horridus* (Jacq.) Lehm.** *Mikrobiologiya* 68(4): 501–507.

[Morphological peculiarities of the apogeotropic (coralloid) roots of the cycads *Cycas revoluta* and *Encephalartos horridus* and the distribution of microsymbionts in them were studied. In the peridermal intercellular spaces and the external layer of the cortical parenchyma of the coralloid root apex, numerous bacterial cells of various morphological types were found (cocci and long and short rods). Localisation of the dominant microsymbionts, cyanobacteria, was different in coralloid roots of different cycad species: in *E. horridus*, cyabobacteria occurred only in the intercellular space of the slime ring, whereas in *C. revoluta*, they also occurred inside the cells of the cortical parenchyma. It is suggested that two different cyanobacterial species serve as microsymbionts in *C. revoluta*. Peculiarities of the localisation of microsymbionts in cycad coralloid roots correlated with the morphological peculiarities of the latter and the amount of secondary metabolites synthesised in them, suggesting that the infection process and distribution of microsymbionts in apogeotropic cycad roots was under the control of the plant host.]

First author's address: Moscow State University, Vorob'evy gory, Moscow, 119899, Russia.

OW, M.C., GANTAR, M. & ELHAI, J. 1999. **Reconstitution of a cycad-cyanobacterial association.** *Symbiosis* 27(2): 125–134.

[*Zamia furfuracea* and its cyanobiont *Nostoc* FUR 94201 were separated and reunited in the laboratory to reconstitute a functional symbiosis between a cycad and cyanobacterium. Reconstitution was achieved also with *Nostoc* 2S9B, a soil cyanobacterium. The identities of the cyanobacteria were confirmed by amplified fragment length polymorphisms, using the highly polymorphic intergenic region separating the 16S RNA and 23S RNA genes. Scanning electron microscopy indicated the presence of mucilaginous material on the surface of roots present when *Nostoc* FUR 94201 was cocultivated with the plant.]

First author's address: Dept. of Biology, University of Richmond, Richmond, VA 23173, U.S.A.

PANT, D.D. 1999. **On some unusual species of *Cycas*.** *The Cycad Newsletter* 22(3): 24–29.

[Unfortunately an abstract is not available.]

Author's address: Botany Department, University of Allahabad, India.

Compiled by **Nat Grobbelaar**, *P.O. Box 15357, 0039 Lynn East, South Africa.*

DONATIONS RECEIVED / DONASIES ONTVANG

1 JANUARY/JANUARIE 1999 TO/TOT 31 DECEMBER/DESEMBER 1999

THE FOLLOWING DONATIONS TO THE CYCAD SOCIETY OF SOUTH AFRICA (AS WELL AS UNLISTED DONATIONS BY FOREIGN MEMBERS) ARE ACKNOWLEDGED WITH THANKS:
DIE VOLGENDE DONASIES AAN DIE BROODBOOM VERENIGING VAN SUID-AFRIKA (ASOOK ONGELYSTE DONASIES DEUR BUITELANDSE LEDE) WORD MET DANK ERKEN:

Number Nommer	NAME/NAAM	Amount Bedrag	Number Nommer	NAME/NAAM	Amount Bedrag
2184	Anthony, L.	R 35.00	0542	Fritz, G.	R 10.00
2261	Arnold, Hein & Marnel	35.00	1632	Füglister, F.J.	50.00
1578	Avenant, S.F.du T.	15.00	0200	Gerber, Harry	20.00
2405	Badat, Ebrahim A.	100.00	2496	Gifford, Glen Alan	50.00
2489	Bassingthwaighte, I.B.	35.00	1614	Gneitung, C.F.H.	85.00
0276	Botha, T.J.R.	35.00	1789	Greyling, J.J.	20.00
2042	Bothma, C.S.M.	15.00	1720	Griesel, C.L.B.	20.00
0848	Bothma, J.W.	35.00	2285	Grobler, Phil	35.00
1807	Brumme, D.	35.00	2502	Groenewald, D.M.	35.00
1191	Bruwer, P.C.	5.00	1600	Harris, R.	25.00
2200	Cilliers, André	5.00	0601	Hart, G.B.	30.00
2268	Cilliers, Drienie	35.00	0115	Henman, Enrico	5.00
2478	Clarkson, Keith	15.00	0433	Henning, N.G.C.	135.00
1436	Clarkson, S.P.	65.00	1794	Hoog, R.J.L.	35.00
2312	Coetzee, Derrick F.	35.00	2236	Howes, Cobie & Julie	35.00
1206	Coetzee, S.D.	30.00	2495	Hyman, Dawie	50.00
2176	Cohen, G.L.	25.00	2490	Jacobs, W.J.	35.00
1930	Cronjé, J.A.S.	5.00	2448	Janse van Rensburg, J.B.	70.00
1389	Curling, C.A.	35.00	1002	Janse van Rensburg, J.M.	35.00
2247	Day, G.L.	50.00	2501	Johannesburg Botanic Garden Foundation	35.00
2233	De Andrade, A.G.	120.00			
2241	De Jager, Lourens	135.00	2485	Jordaan, J.A.	35.00
0410	De Haas, G.N.	15.00	0146	Jordaan, Sakkie & Anna	10.00
2017	De Ridder, Gerard	35.00	0223	Kachelhoffer, N.J.	70.00
1403	Doddemeade, P.W.	20.00	1989	Kempkes, Ingo	25.00
2281	Du Bois, B.	5.00	2442	Kilian, D.R.	35.00
2419	Du Plessis, J.H.	5.00	1867	Kockott, C.P.	35.00
1428	Du Rand, L.	35.00	1672	Kuschke, A.E.	35.00
1810	Du Toit, Biem	35.00	2475	Labuschagne, D.L.	35.00
1064	Du Toit, H.J.	5.00	2420	Lambrechts, A.H.D.	50.00
0971	Du Toit, K.P.	20.00	2418	Lavis, A.	35.00
2040	Du Toit, P. & Van der Westhuizen, J.	35.00	1679	Leach, M.F.	15.00
			2228	Loots, H.	35.00
2148	Elliott, V.	35.00	0645	Lotter, W.J.	35.00
2426	Engelbrecht, A.W.	125.00	0159	Loubser, J.D.	35.00
1863	Erasmus, P.M.S.J.	15.00	2491	Lourens, S.	45.00
2504	Ferreira, M.P.	35.00	1676	Louw, J.P.	10.00
1963	Fokkens, J.F.	65.00	1324	Lovatt, M.	35.00
2430	Fourie, Carl	5.00	2069	Manga, Vasan	35.00
2044	Fourie, J.J.A.	185.00	2203	Maritz, H.P.	35.00
0689	Fourie, M.J.	5.00	2255	Massyn, C.	35.00

Number Nommer	NAME/NAAM	Amount Bedrag	Number Nommer	NAME/NAAM	Amount Bedrag
1805	Maud, C.J.	R 35.00	2378	Smook, G.J.	R 35.00
2324	McKinley, D.F.	15.00	2391	Snyman, S.H. Edgar	10.00
2048	Millar, R.E.	50.00	2249	Sole, Terry	35.00
2150	Minnaar, D.	185.00	0609	Stainer, O.	15.00
0006	Minnie, O.J.	5.00	2503	Stanton, J.H.	35.00
1908	Monteux, Gorman	250.00	2464	Stofberg, P.	35.00
1210	Moodie, S.T.	35.00	2484	Stolts, Danie	35.00
2086	Mostert, P.J.	35.00	2254	Stolz, A.H.G.	50.00
2476	Myburgh, L.M.	35.00	1596	Storbeck, G.	10.00
1423	Nel, J.J.G.	5.00	0139	Swanepoel, Johan	15.00
0237	Nell, J.M.	15.00	2444	Swart, L.M.	35.00
1194	Niemand, H. & D.	20.00	0265	Tarr, A.A.	20.00
2480	Nienaber, L.P.J.	35.00	1708	Terblanche, J.	35.00
0872	Oosthuizen, J.C.	35.00	2514	Theron Laura (Trust)	35.00
2446	Osmers, Rita	35.00	0304	Topham, André	35.00
2215	Parker, K.	35.00	0178	Topham, C.W.	15.00
2244	Pauw, J.C.	35.00	1526	Van den Berg, I.J.	5.00
1709	Pellisier, Robert	150.00	1144	Van den Heede, A.M.P.	200.00
2287	Pienaar, W.J.	35.00	0203	Van der Walt, A.S.J.	20.00
2185	Powell, J.B.	35.00	2284	Van der Walt, W.H.	34.00
2409	Pretorius, J.J.	100.00	2297	Van Geems, Jaco	15.00
0166	Prinsloo, G.C.	10.00	2105	Van Jaarsveld, W.J.	100.00
1112	Rautenbach, M.J.	25.00	2213	Van Onselen, R.L.	10.00
1197	Reinach, Norman	35.00	2240	Van Rensburg, P.F.J.	15.00
1222	Riordan, S.	10.00	1258	Van Rooy, Leon	35.00
2005	Roos, P.B.	15.00	2470	Van Rooyen, A.L.	20.00
0187	Ross, W.D.	5.00	1924	Van Rooyen, H.C.	15.00
0973	Rossouw, N.B.	15.00	2492	Van Sittert, E.J.	35.00
1442	Roux, J.J.	10.00	1819	Van Vuuren, J.A.	100.00
0415	Rudman, R.R.	35.00	1703	Veldhoen, Gerrit	15.00
1829	Schaap, S.	35.00	2060	Veldkamp, J.A.	35.00
2301	Schelhase, Fred	35.00	0681	Venter, F.F.C.	35.00
0311	Schimmel, C.M.	10.00	2466	Venter, M.M.	35.00
0804	Schlegel, Helmut	5.00	1945	Viljoen, F.	5.00
1984	Schmidt, E.V.	35.00	2123	Viljoen, J.H.	20.00
2202	Schutte, M.	15.00	1770	Visser, W.P.	10.00
0477	Scriba, J.H.	35.00	0847	Walters, J.W.	285.00
2256	Sim, Henry	15.00	2119	Webb, A.R.F.	35.00
2479	Smal, D.A.	35.00	0039	Wentzel, B.	135.00
1959	Smalberger, H.C.	135.00	0047	Wentzel, Stephanus	35.00
2399	Smit, C.A.	35.00	0448	Wessels, F.H.	35.00
2454	Smit, Marius	35.00	0008	Wohlberg, H. Edgar	25.00
				TOTAL / TOTAAL	**R6599.00**

CHEN, Chia-Jui. ***Biology and conservation of cycads. Proceedings of the Fourth International Conference on Cycad Biology.***
BEIJING: International Academic Publishers, 1999. 415 pages, monochrome photographs, diagrams. Hardcover. Available from Prof. C.-J. Chen, Herbarium, Institute of Botany, Chinese Academy of Sciences, Xiangshan, Beijing 100093, China;
E-mail: chenjiar@public2.east.cn.net
Fax: 0086-10-625 908 33 or 625 908 43
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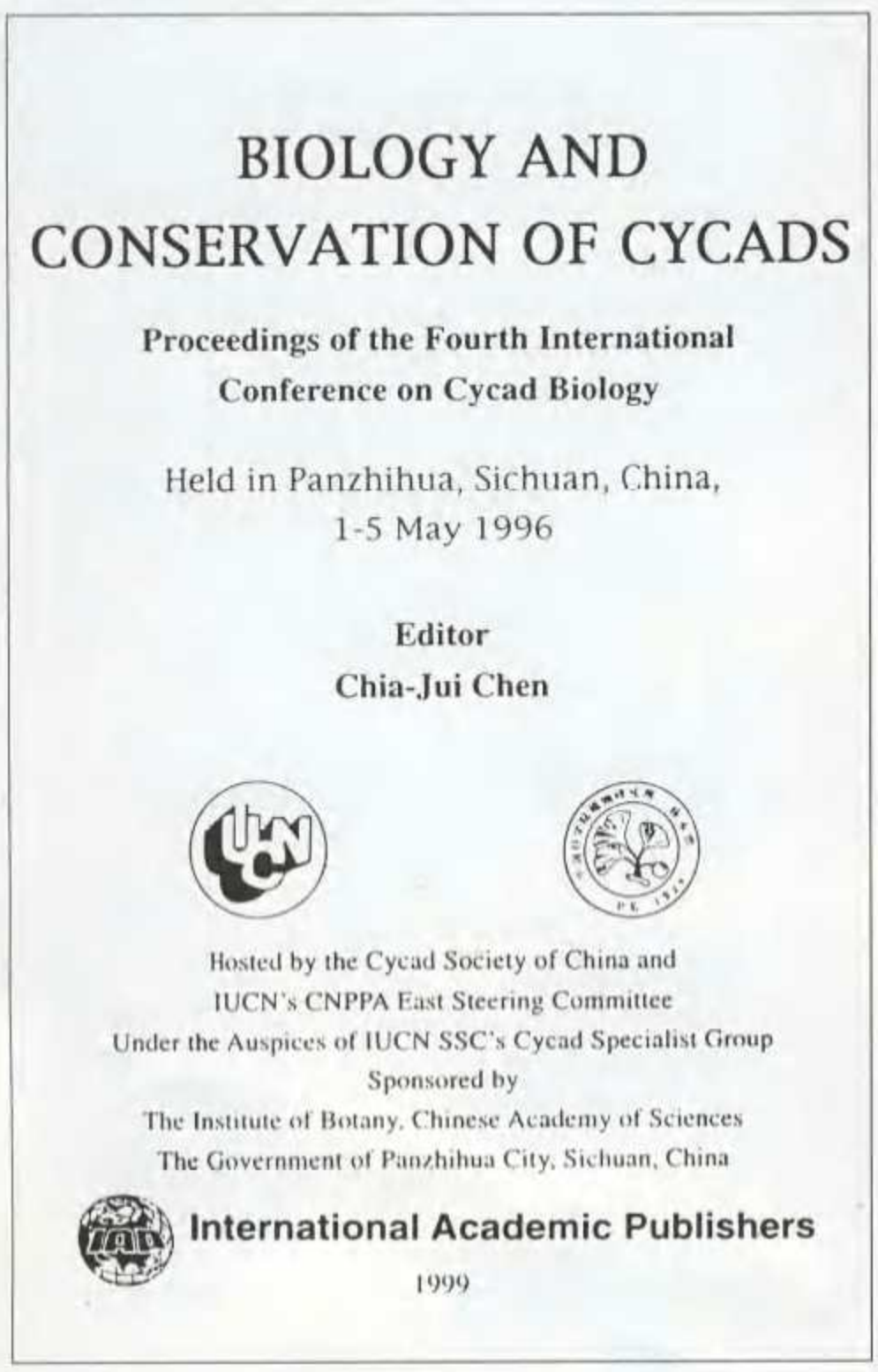

One of the nice things about ***International Conferences on Cycad Biology*** is that all the talks given are published in volumes of Proceedings. These volumes are priceless sources of information, and document all the latest information on every conceivable aspect of cycads. The volume here reviewed, contains the papers read at the conference in Panzhihua China, in 1996.

The book is divided into six sections, these being *Cycad diversity and characteristics of different floras; Systematics and phylogeny; Ecology; Reproductive biology; Physiology, biochemistry and toxicology;* and *Conservation and cultivation*. In total there are 57 articles, of which more than half are by Chinese botanists.

This volume contains a lot of good things. It could not have been easy for our Chinese friends to produce a book like this in a foreign language and foreign script, and they must be congratulated on this fine achievement. Yet I am sorry that they didn't ask a westener just to read through the text, because on just about every page there are spelling or typesetting mistakes. Some of these are serious: in the case of my own article starting on page 87, two thirds of the text were simply left out. [I now have copies of these pages kindly supplied by Prof. Chen, and would gladly send them to readers on receipt of a stamped addressed envelope.] How these things could happen is beyond my understanding, as many or most of the articles were submitted on computer disks.

The paper has a non-glossy surface, and the photographs are rather grey. It was a thoughtful gesture to bind it in hard cover, in a smart-looking blue cloth with gold blocking.

As a record of yet another milestone in the accumulation of knowledge on cycads, this is a very important document, and I recommend that cycadophiles acquire it without delay. Normally the print runs of these volumes are small, with only a few available for sale after the congress attendants have received their copies.

Piet Vorster
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What to Plant

Mexican Dioons for landscapes

Stan Walkley of *Plantation 2000* in Queensland recently returned from an arduous 3000km trip around Mexico researching the conditions under which some of his favourite cycads - the Dioons - grow in the wild. Stan was seeking better knowledge of the plants he has grown from seed at his Burpengary nursery.

Stan found Mexico to have fascinating and diverse climatic zones moving from tropical rainforests to high deserts, and higher again into pine oak forests. The genus Dioon grows in a range of climates from the tropical wet to an altitude in excess of 1700 metres. All of the various species grow equally well just above sea level at his Burpengary nursery, and Stan now has seven different varieties seeding at Plantation 2000. These very attractive, low-maintenance plants are hardy and highly resistant to scale and other chewing insect infestations.

To date Dioons have been under utilised in landscapes, although Dioon spinulosum in now popping up more regularly as designers realise their value as accent plants in prestigious plantscapes. Recent examples of projects where Dioons have been used are at the Twin Waters Novatel Resort, and Morayfield Shopping Centre, Cinema Entrance.

Dioon spinulosum makes a hardy and versatile container specimen plant.

There are approximately twelve different species of Dioons, and the more common varieties available include D. spinulosum and D. edule. Others of particular interest to plant connoisseurs include D. mejaie, D. merolae and D. califanoi.

Stan's regular overseas sorties continue to supply Plantation 2000 and its sister nursery, Cycad Connections, with exciting new species for the 65 acre tree farm which has become one of Australia's leading specialist landscape suppliers.

Various Dioon species set out for seed production at Plantation 2000's Burpengary nursery.

[Reproduced with permission from the author, Jan Walkley, and the editor of ***Practical Queensland Landscape Design***, Donna Clare Tyman. (Permission obtained by Roy Osborne)]