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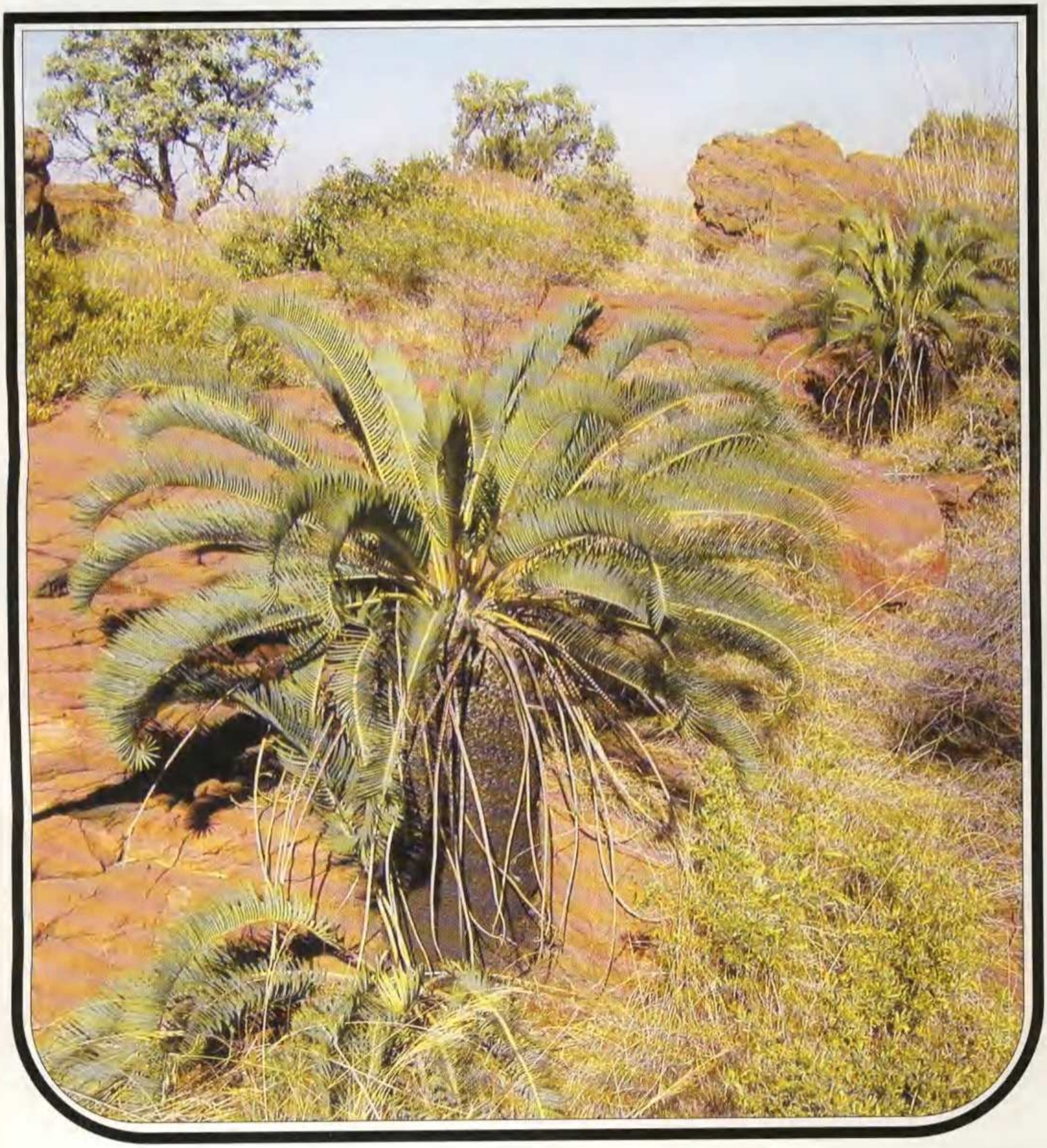

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ENCEPHALARTOS

JOURNAL OF THE CYCAD SOCIETY OF SOUTH AFRICA

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NO. 75 **SEPTEMBER 2003** **ISSN 1012-9987**

COVER / VOORBLAD : **A magnificent *Encephalartos lanatus* specimen in habitat near Middelburg, Mpumalanga, South Africa. / 'n Pragtige voorbeeld van *Encephalartos lanatus* in habitat naby Middelburg, Mpumalanga, Suid-Afrika.**

Photo / Foto: Derik Minnaar

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FROM THE PRESIDENT

VAN DIE PRESIDENT

ENCEPHALARTOS* 75**, three quarters towards the 100 issue mark, and the Society is in serious trouble. In the March issue, pages 3 and 4, and again in June on page 3, we announced that the terms of office of the *President, Secretary*, and *Editor* expire at the end of this year, and asked for nominations to fill these positions. We have not received a single nomination. For serious personal reasons neither of us are able to serve for another term. This means that, unless members *post haste* make themselves available to serve the Society, there won't be anyone to compile ***ENCEPHALARTOS or process your membership monies after 31 December. Only these three positions are at stake: the *Accountant & Auditor, Electronic Services Officer*, and *Overseas Correspondents* are co-opted members of the Board and can only be replaced if they voluntarily step down or if you are dissatisfied with their performances.

This issue is the regulation 36 pages long, with four pages of colour. This is less than some recent issues, but we have to exert self-discipline if we are to keep costs, and hence your membership fees, within limits. As it is, we have to increase membership fees for next year to keep pace with sharp increases in printing costs and postage. Almost all your subscription money goes towards ***ENCEPHALARTOS***. In mitigation I remind you that for the current year we had no increase in membership fees, in spite of considerably increased production costs.

ENCEPHALARTOS is about us and our plants. This issue contains some particularly nice contributions from members. To mention just some: our *Focus on* article on the recently discovered and rare *Macrozamia cardiacensis* by Paul Forster and Roy Osborne from Australia, a very intriguing article on different forms of *Encephalartos laevifolius* from Diekie de Klerk in Pietersburg, and a travelogue of a cycad-hunting expedition to Chad by Ian Turner from Zimbabwe. Nat Grobbelaar of Pretoria's article on light intensity and survival of *Encephalartos lanatus* seedlings has considerable bearing on our backyard growing of cycads from seeds, an activity which not only helps to make plants widely available but also takes much of the pressure off wild plants.

With this issue we distribute a circular on the ***CYCAD 2005*** conference to be held in Mexico. Think seriously of attending it. Those of us who attended previous conferences in this series, can vouch for how instructive and plain nice these get-togethers are.

Piet Vorster

Piet Vorster

ENCEPHALARTOS* 75,** driekwart na die 100ste uitgawe, en die Vereniging is in ernstige moeilikheid. In die Maart-uitgawe, op bladsye 3 en 4, en weer in Junie op bl. 3, het ons aangekondig dat die dienstermyne van die *President, Sekretaris*, en *Redaktrise* aan die einde van hierdie jaar verstryk, en gevra vir nominasies om hierdie poste te vul. Ons het nie 'n enkele nominasie ontvang nie. Om ernstige persoonlike redes is nie een van ons drie instaat om vir nog 'n termyn te dien nie. Dit beteken dat, as lede hulself nie *vinnig* beskikbaar stel om die Vereniging te bestuur nie, daar na 31 Desember niemand sal wees om ***ENCEPHALARTOS saam te stel of om u ledegeld te prosesseer nie. Slegs hierdie drie posisies is ter sprake: die *Rekenmeester & Ouditeur, Elektroniese Dienste Beampte*, en *Buitelandse Skakelbeamptes* is ge-koöpteer en kan slegs vervang word as hulle vrywillig uittree of as u ontevrede is met hulle diens.

Hierdie uitgawe is die voorskriftelike 36 bladsye lank, met vier kleurbladsye. Dit is minder as sommige onlangse uitgawes, maar ons is verplig om selfdisipline toe te pas as ons kostes, en gevolglik u ledegeld, binne perke wil hou. Soos dit is, moet ons die ledegeld vir volgende jaar verhoog om tred te hou met skerp stygings in drukkoste en posgeld. Byna al u ledegeld word gebruik vir ***ENCEPHALARTOS***. Ter versagting herinner ek u daaraan dat ons vir vanjaar geen verhoging in ledegeld gehad het nie, ten spyte van aansienlik hoër produksiekoste.

ENCEPHALARTOS gaan oor ons en ons plante. Hierdie uitgawe bevat 'n aantal besonder interessante bydraes van lede. Om slegs enkeles te noem: ons *Fokus op* artikel oor die onlangs-ontdekte en seldsame *Macrozamia cardiacensis* deur Paul Forster en Roy Osborne uit Australië, 'n stimulerende artikel oor verskillende vorms van *Encephalartos laevifolius* deur Diekie de Klerk in Pietersburg, en 'n reisbeskrywing van 'n broodboom-ekspedisie op soek na plante in Chad deur Ian Turner van Zimbabwe. Nat Grobbelaar se artikel oor ligsterkte en oorlewing van *Encephalartos lanatus* saailinge het direkte betrekking op die broodbome wat ons in ons agterplase van saad kweek, 'n bedrywigheid wat nie alleen help om plante beskikbaar te stel nie, maar wat ook baie van die druk op wilde plante verlig.

Saam met hierdie uitgawe versprei ons 'n omsendbrief oor die ***CYCAD 2005*** kongres wat in Mexico gehou gaan word. Die van ons wat vorige kongresse in hierdie reeks bygewoon het, kan getuig van hoe leersaam en doodgewoon lekker hierdie byeenkomste is.

Piet Vorster

Piet Vorster

OBITUARY

KNUT NORSTOG, Honorary Life Member of our Society, passed away on the 18th June.

He was the first to demonstrate insect pollination in cycads, a discovery which had a profound influence on our views of reproduction, evolution, and conservation of cycads. Together with Nichols he produced in 1991 *The biology of cycads* - this started off as an update of an unpublished manuscript by Chamberlain, but soon evolved into an entirely new book which is the prime source of information on the subject. He was basically a functional biologist, and liked nothing better than to work out how processes take place. His wife Priscilla Fawcett, botanical artist at the Fairchild Tropical Garden, was a very good naturalist, and was instrumental in working out the life history of at least one pollinator of *Dioon*. Their years at Fairchild Tropical Garden, after Knut's academic career, must have been very happy indeed, as can be testified by so many cycadophiles who were welcomed like their own kin in their house. Even happier must have been their years of retirement in their log cabin in rural Illinois.

Knut often wrote to *ENCEPHALARTOS*, on a variety of subjects, including pollination, conservation, and hybridization, and even on Chamberlain the man; and his reasoned discourses always brought order to our sometimes heated arguments. Those of us who were fortunate to have known him in person, shall always remember him as a mentor, unselfish with his knowledge, and a warm human with a deep rooted sense of fairness and integrity.

RECOLLECTIONS

Willie Tang
Fairchild Tropical Garden, 11935 Old Cutler Road, Miami, Florida 33156, U.S.A.

I first met Knut Norstog in 1982, after walking several miles in the subtropical Miami sun to the Fairchild Garden Research Center to see him. When I told him of my interest in studying cycad pollination he gently encouraged me, as I'm sure he did many students before me. By then Knut had already had a long and distinguished research career probing the ultrastructure of cycad sperm cells and examining cycad chromosomes. He was widely respected in the field of botany and served as editer for the *American Journal of Botany*, one of the preeminent publications in the field. Of course he was already delving into insect pollination in cycads. His interests and knowledge was vast. To me Knut came across as a quiet, serious and deeply concerned scientist and human being. Perhaps this was a reflection of his upbringing in the Midwest. He had many concerns about conservation of cycads and about society at large. But I think the aspect of his personality that touched me the most was the genuine respect he always showed his colleagues and the helping hand and acts of generosity he could show to friends who were down and out. When I left graduate school and was doing various odd jobs he showed up one day out of the blue and handed me a check from the Garden for $500 to go to Mexico and look for cycads. What more could I have wished for ?

I have a *Dioon spinulosum* in my garden with a 1 meter trunk. It was given me as a seedling by Knut when I first met him. I am inclined to think that like this plant Knut Norstog's influence continues, and continues to grow, in the world of cycads in the scientific work he produced and the goodwill, professionalism, and sense of fair play he liked to foster.

MY MEMORIES OF KNUT

Andrew P. Vovides
(his last post-doc student)
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9100 Xalapa, Veracruz, México.

The first contact I had with Dr. Knut Norstog was back in 1982 when he was Editor of the *American Journal of Botany*. I sent to him an article on cycad chromosome numbers that was published in 1983. In late '87 he wrote to me with the intention of visiting me in Mexico and the cycad collection at the botanic garden in Xalapa. He stayed at our house during his brief stay of a week and we soon struck up a collaboration that led me to planning a sabbatical/post-doc year at Fairchild Tropical Garden (FTG) for 1989–90. This eventually had to be a post-doc year since INIREB, the institution that employed me, was terminally closed in November 1988 and everybody made redundant, therefore the sabbatical funds I would have been entitled to had vanished. Knut was then instrumental in obtaining a year's post-doc grant from the Montgomery Foundation (now the Montgomery Botanical Center), through Mrs Jennings, the Foundation's chief. Knut received me as a guest in his home in Perine, Miami, in Dec. 1988. After a short interview with John Poppenoe, my post-doc research proposal was accepted, the grant came through and by spring 1989 I was installed, with family, in Miami. A close friendship was soon struck up with Knut and Priscilla and ourselves. Knut and Priscilla made us very welcome in Miami and were concerned for our welfare and that of our two girls aged 11 and 12. They lent us furniture for our Continental Gardens appartment on 154 SW Street to get us going, and became a kindly father figure to us throughout our stay. Knut was a practical man and liked to tinker with mechanical things, I remember him always giving us a hand when we had trouble with our little Plymouth Horizon. Towards the autumn of 1989 Knut officially retired from FTG, and moved to his retirement home in Waterloo, Illinois, a beautiful wood house he built over the years, on a patch of forested land near a small lake. He came down to Miami in December 1989 and rented an apartment in Continental Gardens for a month, two buildings away from ours. We spent x-mass together.

Figure 1 Knut and Priscilla Norstog at their log cabin in Waterloo, Illinois, in April 1994. Photo: Andrew Vovides.

Knut had greatly inspired my work with cycads during my year's stay at FTG and still does to this day. He assessed me on the then pioneer work on the cycad pollination syndrome and published articles on the subject for years following. Upon my return to Mexico to occupy a research post at the Instituto de Ecología, that occupied the INIREB premises, I received a research grant to follow up on pollination biology of cycads in the field, and I included Knut as collaborator. He visited with Priscilla in 1991 for a month and we visited a number of cycad populations and he gave a seminar on cycad biology at the Institute. He felt very much at home here in our country home in Veracruz.

During my two visits to the USA, in 1994 and 1997 to photograph living cycad collections and fossil cycads at the Smithsonian for the cycad CD-ROM, I visited Knut at his home in Waterloo (Figure 1) to ask his collaboration with the cycad fertilization video that he had produced years earlier. I remember helping him install a wood-burner stove in his sitting room in 1994 and was impressed with his home and grounds - we even went fishing on the small lake and Priscilla was well into vegetable gardening - an ideal retirement scenario. I will always remember the hearty dinners he and Priscilla always prepared, from the first night in 1988 in Perine. I felt part of his extended family.

Knut's last visit to Mexico was in August 1997 that coincided with a visit from Ted Delevoryas (on vacation), we visited the established cycad nurseries in Veracruz. While Ted stayed on in Veracruz, to carry on with his vacation, Knut and I flew down into Chiapas to visit colleagues and the nurseries there and also went into the field to visit a population of *Zamia soconuscensis* in the Soconusco mountains. We climbed very difficult slopes and when Knut slipped he refused any help from us to get to his feet, he was quite independent and took the mountain in his stride in spite of his years. There he met the peasant growers and students of the cycad nursery project and he gave them much encouragement.

Mexico was not new to Knut, he had driven down south of the border on other occasions not connected to cycads many years ago. I remember him telling me an anecdote, when he drove down once in an official US university truck with a spread-winged eagle logo of that particular university (De Kalb?) on the door that looked a bit like the Mexican official eagle emblem, the colours of the logo's decorative ribbons were right too, red, white and green. He just couldn't understand why every police officer at each check-point along Mexican highways had waved him on and even saluted! He later realized (or was told) that the emblem on his truck was almost identical to the official seal of the Mexican presidency!!

In August 1999, during the Botanical Congress at St. Louis, I stayed at Knut's country home for the last time. This time I coincided with Piet and Elsa Vorster as house guests. Knut and Priscilla met me at the St. Louis airport and we rode the metro downtown, then by car to Waterloo. As usual Knut and Priscilla were excellent hosts to us, and during my brief stay there the Vorsters and I rode each day to the St. Louis Congress with Ed, a kind neighbour that offered to drive us when Knut wanted to rest. During that time Priscilla was recovering from a debilitating stroke and made remarkable progress.

I consider myself very fortunate to have worked with Knut. I only regret for not having known him longer. As it appears I must have been Knut's last post-doc student, and for the brief year I had contact with him at Fairchild Tropical Garden and later his visits to Mexico during our collaboration I found his enthusiasm, companionship and integrity contagious.

Knut was indeed a memorable mentor and example to all of us that had any contact with him, a most kind and compassionate soul - we shall miss him. R.I.P.

NEW CYCAD PUBLICATIONS

COSTA, J.L. & LINDBLAD, P. 2002. **Cyanobacteria in symbiosis with cycads.** In *Cyanobacteria in symbioses* by Rai A.N., Bergman, B. & Rasmussen, U. (Editors).

[This review focuses on recent advances in understanding the symbiotic cyanobacteria in cycads.]

First author's address: Department of Physiological Botany, Evolutionary Biology Centre, Uppsala University, Villavagen 6, SW-752 36 Uppsala, Sweden.

KATO, M. 2001. **Insect fauna associated with *Cycas revoluta* (Cycadaceae), with a discovery of a Cerambycid megasporophyll miner.** *Special publication of Japan Coleopterogical Society* No. 1: 73–78.

[Larvae of *Mimectatina meridiana ohirai* (Cerambycidae) were found mining megasporophylls and dead frond rachises of a cycad, *C. revoluta*, on Okinawa Islands, Japan. The larvae started mining at apical pinnate lamina of a megasporophyll, then descended the central axis, and sometimes entered side stalks to bore into immature seeds. The emerged adult beetles nibbled trichomes on megasporophylls. Since the beetles have not been observed to visit male cones, they appeared not to contribute to pollination of the cycads. From the dead frond rachises four beetle species, including two cerambycid, one curculinoid and one scolytid species, emerged, while living fronds were not observed to be damaged by insect herbivores.]

Author's address: Graduate School of Human and Environmental Studies, Kyoto University, Yoshida-Nihonmatsu-cho, Sakyo-ku, Kyoto 606-8501, Japan.

LILY, S.S., & KANNAIYAN, S. 2002. **Cycad-cyanobacterial symbiosis.** In *Biotechnology of biofertilizers* by Kannaiyan, S.S. (Editor). Kluwer Academic Publishers, Dordrecht, Netherlands.

[This chapter in the book reviews the nitrogen fixing symbiosis between cycads and cyanobacteria.]

First author's address: Department of Agricultural Microbiology, Tamil Nadu Agricultural University, Coimbatore – 641 003, India.

LINDBLAD, P. & COSTA, J.L. 2002. **The cyanobacterial-cycad symbiosis.** *Biology and Environ-ment: Proceedings of the Royal Irish Academy, Section B,* 102(1): 31–33.

[An overview is presented of the location, establishment, characteristics and specificity of the symbioses between cycads and cyanobacteria, as well as information on the transfer of metabolites between the two partners.]

First author's address: Department of Physiological Botany, Evolutionary Biology Centre, Uppsala University, Villavagen 6, SE-752 36, Uppsala, Sweden.

MATHUKUMAR, T. & UDAIYAN, K. 2002. **Arbuscular mycorrhizas in cycads of Southern India.** *Mycorrhiza* 12(4): 213–217.

[Root and soil samples of three potted or ground-grown cycads (*Cycas circinalis, C. revoluta, Zamia* sp.) were collected between November 1999 and June 2000 and surveyed for arbuscular mycorrhizal (AM) colonization and spore populations. AM fungi were associated with all root systems and rhizosphere samples examined. Root colonization was of a typical Arum type and AM colonization levels differed significantly between species and between potted and ground-grown cycads. Mycorrhizal colonization levels were inversely related to root hair number and length. Spores of nine morphotypes belonging to three genera (*Acaulospora Glomus, Scutellospora*) were extracted from soil. The percentage root length colonized by AM fungi was not related to soil factors, but total AM fungal spore numbers in the rhizosphere soil were inversely related to soil nitrogen and phosphorous levels. AM fungal spore numbers in the soil were linearly related to root length colonized. The co-occurrence of septate non-mycorrhizal fungi was recorded for the first time in cycads. These observations and the relationship between plant mycorrhizal status and soil nutrients are discussed.]

First author's address: Microbiology Laborotary, Department of Botany, Bharathiar University, Coimbatore –641 046, Tamil Nadu, India.

PENA GARCIA, E. 2000. ***Microcycas calocoma*: morphological characters for the identification and determination of the origin of plants or their parts.** *Revista del Jardin Botanico Nacional* 21(2): 185–194.

[Cycads are considered an endangered group of plants and many species are internationally protected. This paper presents the vegetative characters of juvenile and adult plants as an aid to identification. Differences between *in vitro*-raised plant material, plantlets from seeds germinated in controlled conditions or raised from seed germinated in the wild are discussed.]

Author's address: Jardin Botanico Nacional Carretera "El Rocio" km 3½, Calabazar, Boyeros, CP. 19230, Ciudad de La Habana, Cuba.

PEREZ-FARRERA, M.A., QUINTANA-ASCENCIO, P.F., SALVATIERRA IZABA, B. & VOVIDES, A.P. 2000. **Population dynamics of *Ceratozamia matudai* Lundell (Zamiaceae) in el Triunfo biosphere reserve, Chiapas, Mexico.** *Journal of the Torrey Botanical Society* 127(4): 291–299.

[The paper describes the geographic distribution of *Ceratozamia matudai*, its basic demographic parameters, and the association of these parameters with environmental factors. A species survey and a review of herbarium collections indicate that *C. matudai* occurs only on the Pacific slopes of the Sierra Madre of Chiapas, Mexico. Two censuses (1998–1999) were performed in a Pine-Cupressus forest in the core zone of the Triunfo Biosphere Reserve, and a Montane Rain Forest in its buffer zone. Neighbouring floristic composition, soil depth, and slope around marked and mapped *C. matudai* individuals in each site were described. This species showed a clump local distribution on shallow soils on steep slopes. Individuals showed differences in amount of leaf production, stem diameter, and height between sites. Neighbouring species composition affected seedling mortality. Because of its low numbers and limited range it is recommended that there should be a status change in its IUCN category to endangered. As with other cycads, *C. matudai* can reach high market values. *Ex-situ* propagation of this and other species may provide incentives among local peasants for conservation of the natural populations and its habitat.]

First author's address: El Colegio de la Frontera Sur, Apartado Postal 63, San Cristobal de la Casas, 29200, Chiapas, Mexico.

RAI, A.N., BERGMAN, B. & RASMUSSEN, U. 2002. **Cyanobacteria in symbiosis.** In *Cyanobacteria in symbiosis* by Rai, A.N., Bergman, B. & Rasmussen, U. (Editors).

[This book with 16 chapters covers cyanobacterial symbioses with plants (diatoms, bryophytes, *Azolla*, cycads, *Gunnera*), cyanobacterial symbioses in marine environments, lichens, *Nostoc-Geosiphon* symbiosis and artificial associations of cyanobacteria with economically important plants.]

First author's address: North-Eastern Hill University, Shillong, India.

RASMUSSEN, U & NILSSON, M. 2002. **Cyanobacterial diversity and specificity in plant symbioses.** In *Cyanobacteria in symbiosis* by Rai, A.N., Bergman, B. & RAMUSSEN, U. (Editors).

[This paper presents the cyanobacteria in symbioses, methods used for identification of the symbionts, diversity of the symbionts in the individual symbioses and the specificity in plant symbioses. *Nostoc* is the most dominating genus in terrestrial symbiotic systems, forming symbioses with fungi, bryophytes, *Azolla*, cycads, and *Gunnera*.]

First author's address: Department of Botany, Stockholm University, 10691 Stockholm, Sweden.

SONG, T.Y, CHEN, J., BAO, X.D., ZHENG, W.W. & ZHENG, F.Q. 2001. **Analysis of DNA diversity of cyanobacteria freshly isolated from cycads based on PCR [polymerase chain reaction] with different primers.** *Fujian Journal of Agricultural Sciences* 16(4): 53–57.

[DNA diversity of 25 cyanobacteria freshly isolated from 15 cycads (Cycadopsida) were analysed based on PCR fingerprinting STRR [short tandemly repeated repetitive] and Hip [highly iterated palindrome] primers. Compared with 5 other primers, STRR primer 68051 was the best one for distinguishing PCR products. No high specificity occurred in the symbiosis between cycads and its symbionts.]

First author's address: Biotechnology Center, Fujian Academy of Agricultural Sciences, Fuzhou 350003, Fujian, China.

THIEN, L.B., AZUMA, H. & KAWANO, S. 2000. **New perspectives on the pollination biology of basal angiosperms.** *International Journal of Plant Sciences* 161(6): Suppl. S225–S235.

[Coleoptera and Diptera are the primary pollinators of extant basal angiosperms (wind pollination is rare); lineages of these insects were established by the late Jurassic. Contemporary examples of insect pollination of non-angiosperm plants are present in Gnetales (flies, moths) and Cycadales (beetles). The breeding systems of extant basal angiosperms are dominated by bisexual, protogynous, fragrant flowers that may form chambers in the female phase. Floral thermogenesis is widely distributed throughout the extant basal angiosperms (Nymphaeaceae, Illiciaceae, Aristolochiaceae, Magnoliaceae, and Annonaceae), into the basal monocots (Araceae) and extends into advanced monocots (Arecaceae and Cyclanthaceae) and eudicots (only one family, Nelumbonaceae). The cycads are the only other plant group with heat-producing repro-ductive structures (male and female cones). Flower temperatures of thermogenic plants are in the range required by endothermic insects for purposes of mating and flight, and its hypothesized that is a direct energy reward to insects (a resource). Floral fragrance and heat played major roles in early plant reproductive systems, and fragrance could signal not only food and sex but also heat.]

First author's address: Cell and Molecular Biology Department, Tulane University, New Orleans, LA 70118, U.S.A.

TREUTLEIN, J. & WINK, M. 2002. **Molecular phylogeny of cycads inferred from rbcL sequences.** *Naturwissenschaften* 89(5): 221–225.

[The chloroplast gene rbcL was sequenced to elucidate the evolution of the gymnosperm plant order Cycadales. In accordance with traditional systematics, the order Cyca-dales and the corresponding general cluster as monophyletic clades. Among them, the genus *Cycas* forms a basal group. The genetic distances within the genus *Encephalartos* and between the sister groups *Encephalartos, Lepidozamia* and *Macrozamia*, are unexpectedly small, suggesting that the extant species are the result of Miocene and Pliocene speciation. Their distribution in Africa or Australia respectively, may therefore rather be due to long-distance dispersal than to Cretaceous continental drift, as had previously been assumed. The rbcL sequences also indicate that the colonization of Madagascar by *Cycas thouarsii* occurred only recently as the sequences of *C. thouarsii* and *C. rumphii* from Indonesia are identical. In contrast, the divergence of the Cycadaceae and Zamiaceae apparently occurred in the Mesozoic.]

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FOCUS ON ...

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

FOKUS OP ...

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

MACROZAMIA CARDIACENSIS P.I. Forst. & D.L. Jones

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and

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INTRODUCTION

Mount Walsh National Park, near the small town of Biggenden in Queensland's Wide Bay district, is one of many of Australia's smaller and less-well known national parks. Most visitors to the site are there for the purpose of tackling the steep and rocky ascent of Mount Walsh (Figure 1) an impressive rhyolite inselberg rising some 600 m above the surrounding flat plains. The Mount Walsh National Park is notable for a handful of endemic vascular plants, notably *Micromyrtus vernicosa* A.R. Bean and *Triplarina volcanica* subsp. *borealis* A.R. Bean, as well as numerous disjunct occurrences of diverse species. Mount Walsh is part of the larger Coast Range that runs south from Biggenden. Although Mount Walsh and the adjacent Biggenden Bluff are the most visually impressive parts of this range, there are a number of equally precipitous and largely unnamed slopes to the south. One of these was somewhat mischievously named as "Cardiac Hill" by the first author and Peter Machin as a consequence of dealing with its slopes whilst carrying heavy female cones of the cycad that grows there. Thus, when it came to naming the cycad growing in Mount Walsh National Park, what could be more appropriate than *Macrozamia cardiacensis*?

In the "Focus on ... *Macrozamia longispina*" (Forster & Osborne 2000) and the subsequent "Focus on ... *Macrozamia douglasii*" (Osborne [*Encephalartos* **74**: 6–11, June 2003]), readers were introduced to two of the seven species in the *Macrozamia miquelii* species complex (*M. cardiacensis, M. douglasii, M. macleayi, M. longispina, M. miquelii, M. mountperriensis* and *M. serpentina*). *Macrozamia cardiacensis* gained "official" status only in 1998

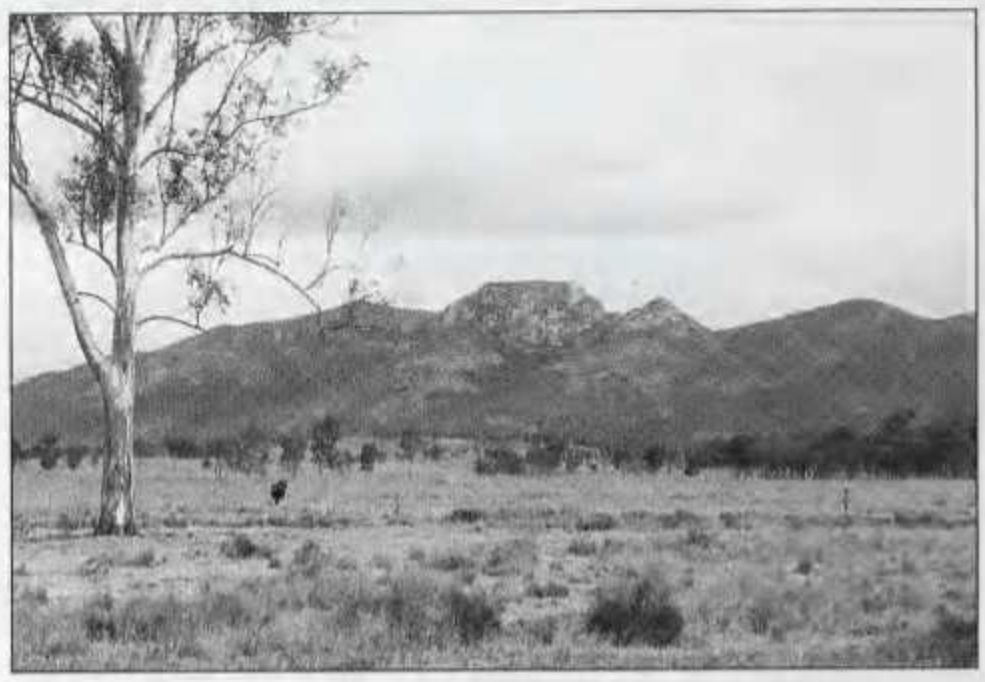

Figure 1 Mount Walsh is an impressive landmark rising from the flat plains in cattle-farming country near Biggenden in south-east Queensland.

with the formal description in Volume 48 of the *Flora of Australia*. The *Macrozamia miquelii* group was the subject of a recent monograph (Jones *et al.* 2001) and the first colour illustrations of *M. cardiacensis* appeared in "Cycads of Australia" (Hill & Osborne 2001). We now take the opportunity to introduce "*Encephalartos*" readers to *Macrozamia cardiacensis* in somewhat greater detail.

DISCOVERY

The first herbarium collection of *Macrozamia cardiacensis* was made in 1977 by Ian Telford, formerly of the Australian National Botanical Gardens in Canberra. This

Figure 2a ***Macrozamia cardiacensis*****: One of the two herbarium sheets comprising the holotype that is deposited at the Queensland Herbarium (BRI). Photo: Terry Boyle.**

specimen was lodged under the name *Macrozamia miquelii* in that institution's herbarium (CBG) which is now incorporated into the Australian National Herbarium (CANB). Casual sightings of *Macrozamia* cycads were made in the Mount Walsh area by a number of people, but no serious investigation of the status of these plants was made until the early 1990s. Undoubtedly at this stage, the casual observer may well have regarded the plants as being just another population of the widespread *M. miquelii*. Realisation that the 'superspecies' *Macrozamia miquelii*, as promulgated by Laurie Johnson (1959), was not an accurate way of recognising the apparent morphological variation in south-eastern Queensland, dawned around 1991, followed initially by the resurrection of *M. mountperriensis* F.M. Bailey (Forster & Jones 1992). In the Biggenden area, populations of *Macrozamia* that occur in non-montane situations are invariably *M. mountperriensis* (Forster & Jones 1992; Jones *et al.* 2001), hence the montane habitat of the Mount Walsh cycads was unusual and warranted investigation.

An initial investigation was undertaken by Peter Machin (of *Macrozamia machinii* P.I. Forst. & D.L. Jones fame) in August 1992. Examination of these initial collections (the first for the Queensland Herbarium) indicated that the material did not match other known species of *Macrozamia*. This culminated in a further visit to Mount Walsh in

Figure 2b ***Macrozamia cardiacensis*****: The second herbarium sheet is the associated carpological specimen comprising the holotype that is deposited at the Queensland Herbarium (BRI). The specimens were collected by Paul Forster and Peter Machin in February 1993. Photo: Terry Boyle.**

February 1993, when the first author and Peter Machin collected fertile voucher material for the Queensland Herbarium, including the holotype (P.I. Forster PIF13109a & P. Machin, BRI) nominated in the species description (Figures 2a, 2b).

DISTRIBUTION AND ECOLOGY

Macrozamia cardiacensis is restricted to several sites at altitudes between 500 and 640 m in Mount Walsh National Park and adjacent State Forest, near Biggenden in Queensland's Wide Bay District (Figure 3). There appear to be two major populations, one that occurs on the top of Mount Walsh, and the other that occurs somewhat to the

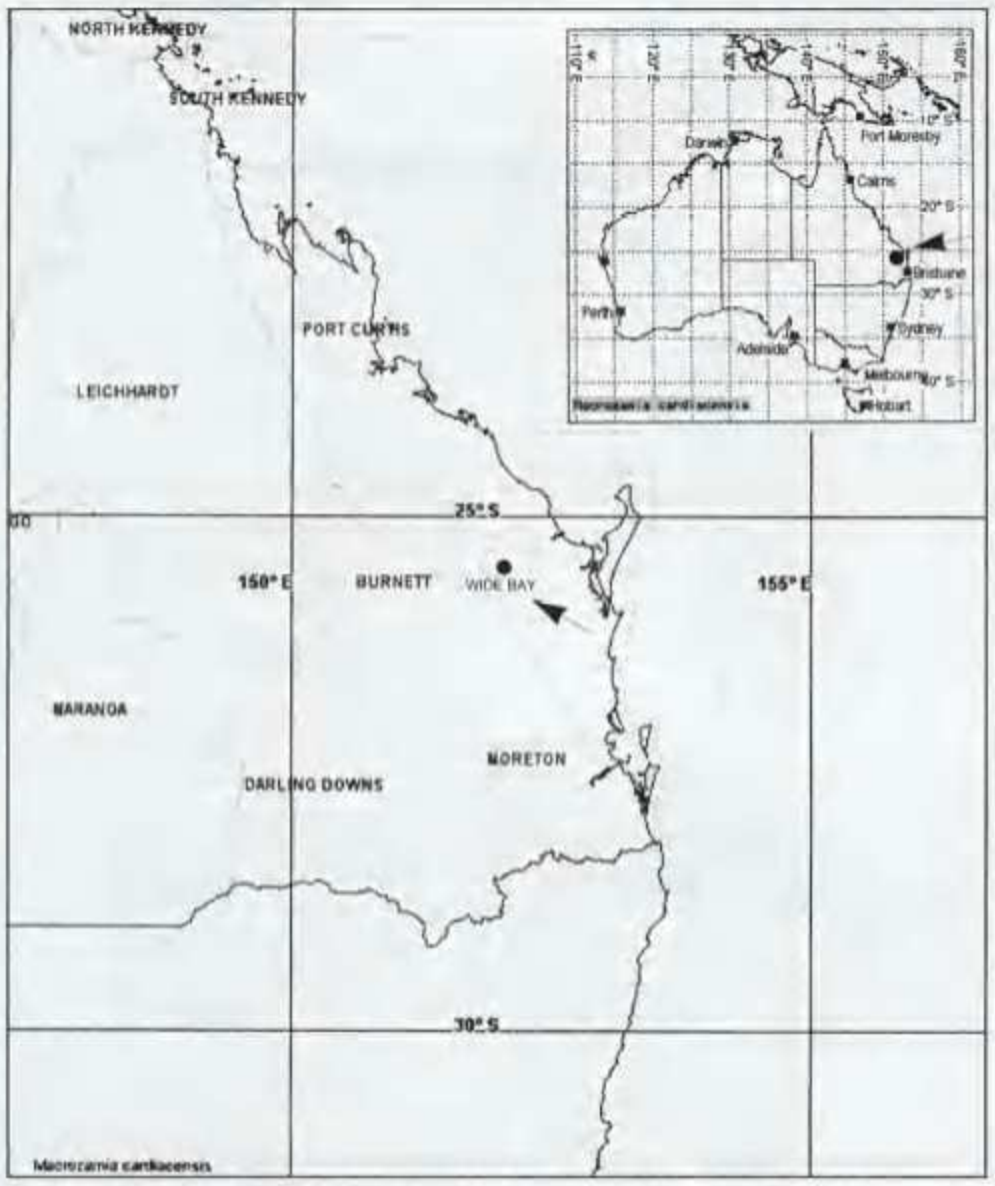

Figure 3 Map indicating the approximate locality for *Macrozamia cardiacensis*.

Figure 4 View from the summit of Mount Walsh showing the rocky slopes and the plains below. Seven specimens of *Macrozamia cardiacensis* can be seen amongst the vegetation on the foreground.

south at the aforementioned Cardiac Hill. Both of these localities are within the National Park. Scattered plants can also be encountered at a number of other spots within the general confines of the National Park or adjacent State Forest.

The Mount Walsh cycads grow on gentle to steep, generally south-facing slopes in skeletal soils derived from rhyolites or andesites (Figure 4). The vegetation comprises mixed open eucalypt forest of a shrubby habit in the higher exposed sites but taller trees in the lower more sheltered sites. Common trees at the cycad localities are *Eucalyptus acmenoides, E. andrewsii, E. decolor* and *Corymbia citriodora*. Also of interest in the area are the many fine examples of a native grass tree, *Xanthorrhoea latifolia*.

Recent visits to the area show the plants to be in good vegetative condition with the fairly large numbers of seedlings indicating effective regeneration. *Macrozamia cardiacensis* populations are exposed to periodic fires and their reproductive behaviour may be strongly influenced by such fire cycles. Both male and female cones are visited by a *Tranes* weevil and the thrips *Cycadothrips chadwickii*, and it is almost certain that these insects play a rôle in pollination. Little is known of *M. cardiacensis* seed dispersal agents, but, as with the other cycads in the *M. miquelii* complex, it is speculated that rodents and small marsupials eat the fleshy sarcotesta and are responsible for at least some degree of seed movement.

DESCRIPTION

1. STEM

Macrozamia cardiacensis plants have trunks 20–40 cm in diameter, mostly subterranean but sometimes reaching 0.4 m above ground level in rocky sites or on shallow soils.

2 LEAVES AND LEAFLETS

Macrozamia cardiacensis (Colour Figures 1, 3 on p. 13) has a moderately dense crown of leaves, 10–20 in number, 1.0–2.0 m long, flat in cross section, arching in profile and glossy mid- to dark green in colour. The petiole is 30–40 cm long, 1.5–2.0 cm wide at the first leaflet, flattened on the upper surface but convex and angular on the lower surface. The petioles are expanded basally where there is a covering of soft, woolly grey-brown hairs. Each leaf holds about 100 to 140 leaflets, closely spaced towards the leaf apex but more widely spaced towards the petiole, and inserted at about 40° to the leaf axis but lying in a flat plane. Median leaflets are thin in texture, typically 20–31 cm long by 8–12 mm wide, tapering to a sharp apex, with stomata on the lower surface only. Leaflets have a pale yellow callous base at the point of insertion onto the rachis (Colour Figure 4 on p. 13). The lowermost 4–7 pairs of leaflets are reduced in size to rigid pinnacanths (Figure 5).

2. REPRODUCTIVE STRUCTURES

Male plants of *M. cardiacensis* bear 1–5 cylindrical green cones, typically 35–40 cm long by 6.5–8 cm in diameter, on a peduncle 15–30 cm long by 1.5–2.5 cm in diameter. Microsporophylls measure about 22–32 mm by 10–15 mm and terminate in a stiff sharp spine 2–25 mm long, these being more prominent towards the cone apex. Cones shed pollen in November and December each year, generally about a month after other species in this complex have finished.

Female plants of *M. cardiacensis* bear 1–2 narrowly ovoid green cones (Colour Figure 2 on p. 13), typically 32–36 cm long by 11–14 cm wide, on a peduncle 20–25 cm long by 1.6–2.5 cm in diameter. Megasporophylls measure about 40–45 mm by 35–47 mm and terminate in a stiff sharp

Figure 5 *Macrozamia cardiacensis* **showing lower leaflets progressively reducing in size to rigid pinnacanths above a 30–40 cm yellow-green petiole.**

spine 10–50 mm long, these also being larger towards the cone apex.

Seeds are oblong to ovoid, 22–35 mm by 12–20 mm, with an orange to red sarcotesta. Seeds are shed from March to May.

AFFINITIES

Affinities of *Macrozamia cardiacensis* necessarily lie with all the other members of the *M. miquelii* group, but the species seems closest to *M. miquelii* and *M. douglasii*. *M. cardiacensis* differs from *M. miquelii* in having larger cones with longer megasporophyll spines towards the cone apex. It differs from *M. douglasii* by its more numerous pinnacanths, less prominent and more yellowish callous swellings at the leaflet bases and longer megasporophyll spines towards the cone apex. Morphological analysis and a limited isoenzyme investigation (Jones *et al.* 2001) indicate that *M. cardiacensis* is probably the most closely related to *M. douglasii*, found on coastal sand-dunes some 100 km to the east. (See also the discussion of comparative features as given in the recent "Focus on ... *Macrozamia douglasii*" article).

Limited observations of seedlings in this group indicates that the individual species are recognisably different in

Figure 6 *Macrozamia cardiacensis* **seedlings seen in habitat idicate healthy population recruitment.**

juvenile leaf and leaflet characters (Figure 6).

Reproduced below (see page 12) is a key (from Jones *et al.* 2001) to the species of the *Macrozamia miquelii* group, repeated from the recent "Focus on *Macrozamia douglasii*" article:

CONSERVATION AND CULTIVATION

Although restricted in its distribution to only two main populations, *Macrozamia cardiacensis* is abundant at these sites and the species is not considered to be at risk. The species is listed as Rare in terms of the Queensland Nature Conservation Act of 1992. All populations of *M. cardiacensis* are on Crown Land (National Park or State Forest) owned by the State of Queensland. Harvesting of plants and seeds from habitat is possible only under permit issued by the Queensland Environmental Protection Agency and is prohibited from the National Park. The adjacent State Forest (where only a small number of plants occur) is likely to be added to Mount Walsh National Park in the near future. Hence in future, any plants or seed of this species that may be encountered in cultivation are likely to have been illegally collected.

This species has only recently been named and there are not many specimen plants known to be in cultivation. It is reasonable to assume that *M. cardiacensis* would respond to

Key to the species of the *Macrozamia miquelii* group

1. Lower 8 or more leaflets reduced to pinnacanths 2
   Lower 4 or less leaflets reduced to pinnacanths, or pinnacanths absent 5

2. Female cones narrowly ovoid; male cones 35–40 cm long ..... ***M. cardiacensis***
   Female cones cylindrical to barrel-shaped; male cones 12–28 cm long 3

3. Male cones 2.5–3.5 cm in diameter; microsporophylls 8–12 x 4–8 mm ..... ***M. serpentina***
   Male cones 3.5–6.5 cm in diameter; microsporophylls 12–25 x 8–15 mm 4

4. Leaves glossy above, thin-textured; female cones 7–10 cm in diameter ..... ***M. macleayi***
   Leaves dull to slightly glossy above, thick-textured; female cones 10–25 cm in diameter ..... ***M. miquelii***

5. 1–4 leaflets reduced to pinnacanths ..... ***M. douglasii***
   Pinnacanths absent 6

6. Leaflets 50–110, 6–9 mm wide; male cones 12–25 x 3–4 cm; distal megasporophylls with spines 2.5–4 cm long ..... ***M. mountperriensis***
   Leaflets 100–140, 3–6 mm wide; male cones 8–15 x 2.5–4 cm; distal megasporophylls with spines 4.5–7 cm long ..... *M. longispina*

cultivation in much the same way as other species in the *Macrozamia miquelii* complex, i.e. it would make an attractive garden or container plant requiring minimum maintenance and probably be reasonably cold-hardy.

ACKNOWLEDGEMENTS

Terry Boyle of the Queensland Herbarium provided the photographs of the herbarium vouchers. We thank Peter Machin for the use of photographs.

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SHORT COMMUNICATIONS AND ARTICLES
KORT MEDEDELINGS EN ARTIKELS

WHO WILL BE THE CULPRIT?

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Received 28 June 2003

Cycad collectors, Nature Conservation, Poachers or muthi collectors. Who will lead to *Encephalartos*' final extinction in nature? It's my opinion that at the going rate everyone will. In the Limpopo Province ten of the eleven species are in big trouble and more than half are on the verge of extinction.

Colour Figure 1 *Macrozamia cardiacensis* **plants in understorey habitat on Cardiac Hill, Mount Walsh National Park. Photo: Peter Machin.**

Colour Figure 2 *Macrozamia cardiacensis* **female cone with the near-mature orange-coloured seeds forcing the sporophylls apart in a spiral fashion. Photo: Peter Machin.**

Colour Figure 3 A *Macrozamia cardiacensis* **specimen in a sunny position near the summit of Mount Walsh. Photo: Roy Osborne.**

Colour Figure 4 *Macrozamia cardiacensis* **leaf detail, showing leaflet morphology, angle of insertion of leaflets and the pale callous swellings at the leaflet bases. Photo: Roy Osborne.**

If you are the proud owner of an *E. hirsutus*, don't fool yourself that it is legal! Only about 10 mature plants were legally collected and all the rest can't originate from these ten plants. Mature *E. hirsutus* plants are dying as a result of unscrupulous and incorrect collection of suckers and smaller stems (Colour Figures 5, 6 on p. 14). The minority of the stem damage (Colour Figure 9 on p. 14) seems to be that of muthi collectors. *E. hirsutus* grows, in a very harsh and extreme habitat, in clusters which sucker profusely and originate from the same plant and sex. Male and female plants grow far from each other and no natural pollination takes place (most likely as result of the lack of natural insect pollinators).

An illegally removed *E. inopinus* stem of 2 m (Colour Figure 7 on p. 14) was brought to me by nature conservation to try and salvage. It was illegally removed, left out in the veldt for months and only then moved. Poachers

Colour Figure 5 Damage to stem of *Encephalartos hirsitus* where suckers were incorrectly removed. See also leaf damage by leopard moth larvae. Photo: Xander de Kock.

Colour Figure 6 Obvious lack of suckers due to the removal from this *Encephalartos hirsitus* cluster. Stem on background was removed and left to it's fate. Photo: Xander de Kock.

Colour Figure 7 This *Encephalartos inopinus*, with leaf basis still green, had 80% stem damage. See black discolouration on cut surface. Unfortunately the remaining 20% of the stem died months later. Photo: Stan Rodgers.

Colour Figure 8 Close-up photo of damage to *Encephalartos dolomiticus* stem. Photo: Xander de Kock.

Colour Figure 9 Muthi harvesting damage to stem of *Encephalartos hirsitus*. Photo: Xander de Kock.

Colour Figure 10 Muthi harvesting damage to the stem of *Encephalartos dolomiticus*. Photo: Xander de Kock.

Colour Figure 11 Female cone on *Encephalartos laurentianus* in the botanic garden in Limbe, Cameroon. Photo: Ian Turner.

always leave plants for weeks to months to make sure Nature Conservation is not alerted, before they move them. The poachers were caught and brought to justice. The stem was dried out with a secondary fungal infection and could not be saved. If this plant was not confiscated a person would have bought it, at a big price, with no hope of growth ever and this is one the fates of illegal collected plants.

Muthi collection in the Limpopo Province is less of a problem than in some of the other Provinces. Recently I visited a female *E. dolomiticus* that has been severely damaged by muthi collectors (Colour Figures 8, 10 on p. 14) and over the past 3 years the damage progressed from none to severe.

Out of the above-mentioned examples there are several issues, with no simple solutions. It is important to realize that in the cycad world you will always have good and bad guys. As a member of this Society I hope that you are not the latter. I would like to bring two of our aims to your attention, namely:
(1) To arrange the legal exchange of plants, seedlings, seed and pollen of different cycad species between members.
(2) To promote all aspects of cycad conservation.

If you as a member really want to make a difference, don't ever be tempted to buy a sucker or plant that you know is of dubious origin. Why do certain collectors always want to have a complete collection at whatever the cost to nature or their own conscience? Don't fool yourself with arguments that you as a collector will know better than a layperson how to grow an illegal plant and that your chance of success is better than theirs. That stem might have already been dead by the time you got it. I'm also a collector and I know what the temptation feels like.

Members will argue that they are protecting cycads by growing them in their gardens and producing offspring via seed and suckers. It is important to realize that once a plant is removed from nature its genetic material is lost forever for nature. Their offspring can never be reintroduced or until such time that accurate technology regarding DNA typing is available and affordable. By growing and supplying seedlings we are reducing the demand and pressure on nature, even if it is veldt collected seed. Good examples are that of Hartebeeshoek and Modjadji Nurseries which supplied thousands of seedlings in the past. Unfortunately Hartebeeshoek Nursery was closed and Modjadji Nursery is currently poorly managed.

Where does Nature Conservation fit in? They are the custodians of nature, employed by the Government, paid with taxpayer's money and most of them are as dedicated and honest as most of our members. It seems that they are fighting a losing battle with the lack of manpower, funds, knowledge, improper law enforcement and legislation and bureaucratic red tape being their biggest enemies. The *E. hirsutus* colony is known to them since it's descriptions in 1996 (Hurter and Glen) and no effort has been made to pollinate this colony. This colony has produced cones on at least two occasions with thousands of seeds – all infertile. Just think of the impact it would have made if these seeds were fertile! This is the very sad scenario with several *Encephalartos* colonies. The Mapumalanga Nature Conservation officers are far ahead of the other Provinces with the growing of veldt collected seedlings for replanting into nature and resale to the public in the future.

At this stage there are more questions than answers and the cycad conservation issue in a third world country will never be simple. Alternative medicine is very important and muthi collectors will always be with us. Local communities are very poor and they will do anything for a bag of flour! Socio-economic situations don't change overnight and only if the communities close to cycad colonies can benefit from their survival and be educated as such, will they help to protect them.

All the parties involved need to change their mindset towards each other. This is starting to happen in the Limpopo Province. The Northern Cycad Work Group were invited to give a presentation, on our perspective of Nature Conservation and where we think we fit in, at a National Cycad Workshop that was held in Polokwane by Limpopo Nature Conservation. This was a big step forward and we must build on this relationship of mutual trust. We all would like to be the persons who saved the cycad from extinction and leave behind a national heritage for our grandchildren.

THE SEARCH FOR *ENCEPHALARTOS RELICTUS*

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Received 28 June 2003

Some years ago I heard that a new cycad species from the small southern African country of Swaziland was in the process of being described. Admittedly it came as no surprise to me as there are still vast unexplored areas in that country. Until recently very little information on this species was available and I had to rely on people in the cycad community to answer my many questions, but I received very few answers. It seems that a lot of details have been lost with the passing of time and the original collector has also sadly passed away. It was only recently that some degree of detail information became available with the publication of Nat Grobbelaar's new book on cycads.

As I have it only one colony of *E. relictus* existed on a farm at a single locality in the north east of Swaziland and it is

understood that all of these plants were removed from habitat by the original collector.

As has been the case with several newly discovered cycad species, the distribution has in many instances been more widespread than initially anticipated and further localities are subsequently discovered. This urged me to go in search of this species in the wider area of its original discovery. I have subsequently made two trips in search of this species in the hope that new populations could be located.

This farm's original owner was apparently forced to vacate it somewhere in the 1970's or maybe even earlier. It took a fair degree of research but I eventually found the old farmhouse in a state of decline. Rumour has it that a few specimens of *E. relictus* were planted in the garden, but I found none and no-one seems to know where they have disappeared to.

The farm is situated in vast mountainous terrain with many valleys, rocky outcrops and gorges. I have searched through most of the original farmland as well as most of the neighbouring areas. Two other Swaziland cycad species are found in the area in abundance, but I could not locate any *E. relictus*. It amazes me that a small population of *E. relictus* could have existed amongst thousands of other cycads without any hybridization occurring between them, much like *E. woodii*.

From the description of this species, I can only think of two possible options for this species occurrence at the original single locality. The first option involves the possibility of a hybrid between plants from the area, possibly *E. senticosus* and *E. umbeluziensis*. I am not aware of any artificial hybrids between these two species for making any comparison. Having seen *E. relictus* it does strongly resemble what I imagine such a hybrid would look like. The leaflets certainly resemble *E. umbeluziensis* and the leaves have a clean petiole with only a spine or two. The male cones of *E. relictus* also seem to have intermediate characteristics of both *E. umbeluziensis* and *E. senticosus*. The one characteristic of *E. relictus* that do not match any of the aforementioned species is the ridging on the undersurface of the pinna, which resembles the leaflets of the 100 km distant species of *E. heenanii* and *E. pauci-dentatus*.

Secondly if these plants were indeed originally found on this farm, and did not originate as a hybrid, then surely it must have been a truly relict population of an ancient species that once maybe had occurred in great numbers. Or one could speculate on the possibility that a number of seeds were once carried across the border from Mozambique and dropped there by an ancient traveller. I am not aware of any botanical exploration that has ever been undertaken in the area just across the Mozambican border where some foothills are scattered before the plains spread out towards the coast, but this could prove to be worth its while.

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THICKENING OF CYCAD STEMS

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Received 28 June 2003

Do cycad stems increase in thickness after commencing longitudinal growth? (* See E-mail letters below.)

At least some certainly do.

In NORSTOG & NICHOLLS' *The biology of the cycads*, pages 33 to 43, the stem thickening of cycads is explained. It does not really answer Pieter's question, beyond explaining that there is a mechanism for stem thickening even though it acts very slowly or not at all.

The genera about which we probably know least, are *Stangeria*, *Bowenia*, and many species of *Zamia*, with naked underground stems. These stems are underground and out of sight, and to know what they do one will have to uproot and measure them periodically.

Some, but not all, species of *Cycas* certainly increase their stem diameters. In these species the stems thicken so much that the old leaf bases are sloughed off and the stems get a corky, fissured coat. Plate 86 in NORSTOG & NICHOLLS' *The biology of the cycads* is a photo of such a thickened *Cycas* stem, more than a metre thick. In other species of *Cycas* the stem remains cylindrical through a considerable length, and covered with the familiar chain-mail of old leaf bases.

In *Lepidozamia*, some *Dioon*'s (notably *D. spinulosum*), and *Microcycas* the stem also thickens with age to the extent that the coat of old leaf bases gets replaced with a corky bark.

In most other cycads with columnar stems, the stems are of equal thickness throughout their lengths. Nevertheless one sometimes finds such cycads where the thickness of the stem varies, indicating a number of harsh or more favourable growing conditions.

In *Encephalartos*, I cannot say with certainty that in all species a columnar trunk will become thicker over its entire

length under favourable conditions, yet I can offer a few observations to which readers may wish to add. I would like to claim that all species of *Encephalartos* increase their stem diameters if well-fed, but find that I have no proof. Yet:

- *Encephalartos horridus* gets thicker.
- *E. altensteinii* gets thicker, and dramatically so. For instance, we have one which had a stem 60 cm long and 18 cm thick when measured 24 years ago, but that stem is now uniformly 40 cm thick.
- *E. lehmannii* also gets dramatically thicker, but interestingly only with respect to new growth.

This observation on *E. lehmannii* has direct bearing on Pieter's question. In recent times plants of several species, almost certainly wild-collected, appeared on the market. What they had in common, were thin stems (10 to 12 cm diameter), yet 30 to 40 cm long. The question is whether these miserable things will ever get thicker throughout, or only on the new growth.

In some species of *Cycas*, and in *Microcycas, Lepidozamia,* and *Dioon spinulosum*, the stem is conspicuously thickened at the base. This can also be seen in *Encephalartos woodii*, where Dyer considered it to be the result of compression from the weight of the massive stem. Curiously the stem of the gigantic *Encephalartos laurentianus* does not seem to be basally thickened, judging from the photograph in GOODE's *Cycads of Africa*, volume 1. In some species of *Cycas*, including *C. siamensis* and *C. pachypoda*, the stem base shows a pronounced bulbular swelling. This must surely be the result of meristems (zones of dividing cells) which are active in the basal region to form a swollen half-underground storage organ.

* E-mail letters:

On Wednesday, Jun 4, 2003, at 07:48 Africa/Johannesburg, Pieter van der Walt wrote:

I recently had a discussion with a fellow collector who said to me that I don't have to worry about the thin trunks of some smaller *E. inopinus* specimens. Apparently *E. inopinus* is the only *Encephalartos* species where the trunk will thicken and obviously grow in height over time as opposed to only thicken at the top with new growth like other specimens when their water and fertilizer conditions are optimised - as opposed to intermittent intervals of feeding or drought in a more natural setting.

Question is, is this statement/assumption true? Your 2c (*sic.*) appreciated.

• From: Vaughn [mailto:vaughn@shift.co.za]
Sent: 12 June 2003 09:35 AM
To: sacycad@yahoogroups.com
Subject: Re: [sacycad] Inopinus trunk/caudex thickening.

Hi Pieter

Are the plants suckers or grown from seed? A friend of mine who often transplants plants for people has shown me some suckers that have thin trunks for up to a meter long. The sucker grows horizontally out of the mother plant and then pops up and thickens once it is above ground. All the plants I saw were still thin. Don't know if this answers your question. I posted this observation some months ago and the feedback from others confirmed it.

Vaughn

• MessageFrom: Pieter van der Walt
[pvdwalt@altron.co.za]
Sent: 12 June 2003 10:37
To: sacycad@yahoogroups.com
Subject: RE: [sacycad] Inopinus trunk/caudex thickening.

HI Vaughn - not 100% sure if it is just suckers - but if you think about it it is probably likely.

My understanding from the statement was that yes any *Encephalartos* specimen will remain thin up to the point where it receives better growth factors, i.e. water, soil, fertilizer, and will then thicken from the apex of the caudex - however the exception appears to be *E. inopinus*. Thin trunks of *E.* inopinus will thicken proportionally instead of just at the apex.

Prof Piet Vorster said/indicated that he will do some investigation on this and hopefully enlighten us in the next issue of Encephalartos.

Kind regards
Pieter

NUUS OOR DIE TRANSVAALSE / GAUTENGSE STREEKTAK VAN DIE VERENIGING

Derik Minnaar
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Ontvang 30 Junie 2003

Verslae oor onlangse aktiwiteite

Botchabello uitstappie

Op 24 Mei het 'n klein groepie lede van die Broodboom Vereniging by die sendingstasie Botchabello net buite Middelburg in Mpumalanga bymekaargekom. Derik Minnaar het die groep verwelkom en Prof. Nat Grobbelaar het as toerleier opgetree omdat hy die afgelopes dekade baie navorsing in die gebied gedoen het. Hy het die interessante

geskiedenis van die stasie met die groep gedeel en daarna het ons vertrek om die *Encephalartos lanatus* plante in die natuur te besigtig (Figuur 1, Voorblad en Kleurfigure 12–15 op. p. 19). Net soos tevore was daar tekens van baie goeie bestuiwingsmeganisme. Op verskeie plekke kon 'n digte kol saailinge tussen die gras waargeneem word waar 'n vroulike keël gedisintegreer het en die saad gekiem het (Figuur 1). Nadat die groep by 'n paar plekke in die natuur vertoef het, het hulle teruggekeer na die sendingstasie. Prof. Nat Grobbelaar het ons na 'n paar besienswaardighede rondgeneem, soos byvoorbeeld die begraafplaas, die museum, die kerkie en ook die ou fort. Na 'n vinnige piekniek het die groep verdaag en huiswaarts gekeer.

Figuur 1 Saailinge van *Encephalartos lanatus* waar saad spontaan gekiem het waar 'n vroulike keël die vorige jaar gedisintegreer het.
Figure 1 Seedlings of *Encephalartos lanatus* where a female cone disintegrated the previous year and the seed germinated.

Besoek aan broodboomtuine in Pietersburg (Polokwane)

Die naweek van 7 en 8 Junie het 'n groot groep belangstellendes deelgeneem aan 'n besondere byeenkoms in Pietersburg, Limpopo Provinsie. Hierdie byeenkoms was uitsonderlik aangesien dit twee dae beslaan het en baie aktiwiteite afgehandel is. Die drie mees besonderse broodboomtuine in die omgewing is besoek, en ook 'n lesing oor die verskillende vorms van *Encephalartos nubimontanus* is aangebied.

Die Saterdagmiddag het die groep by dr Diekie de Klerk se besonderse tuin vergader. Derik Minnaar het die groep welkom geheet en 'n biltongruiker aan Diekie oorhandig. Daar het Philip Grobbelaar 'n detail inligtingsessie aangebied insake die verskillende vorms van *E. nubimontanus*. Twaalf verskillende vorms is geïdentifiseer en 'n boekie met detail foto's en 'n vergelykende tabel is uitgehandig. Diekie het die verskillende vorms in sy tuin uitgewys en die groep ook deur die res van sy pragtuin geneem (Kleurfigure 16–17 op p. 19 en 18 op p. 20). Diekie het die groep ook later na 'n plaas geneem van nog 'n versamelaar om drie verdere vorms van *E. nubimontanus* aan die groep te wys. Die groep het Diekie en Philip bedank vir die moeite en verdaag.

Die volgende oggend het die groep by dr Gerrie de Haas se tuin vergader waar sy vrou die gebruiklike biltongruiker van Derik ontvang het. Na die verwelkoming het Diekie die groep deur Gerrie se pragtuin geneem (Kleurfiguur 19 op p. 20). 'n Groot verskeidenheid van veral Midde-Afrika spesies is in die versameling opgemerk. Die groep het daarna 'n heerlike koppie tee in die voorhuis geniet en toe vertrek na die volgende tuin.

Figuur 2 Blaar detail van *E. chimanimaniensis*.
Figure 2 Leaf detail of *E. chimanimanisensis*.

By die Afrika-tuin (Kleurfiguur 20 op p. 20) van wyle mnr Smit het die groep pragtige voorbeelde van groot Midde-Afrika broodbome gesien. Plante wat indrukwekkend vertoon het was *E. bubalinus, E. gratus, E. kisambo* (Kleurfiguur 21 op p. 20) met ongelooflike lang pinnas, die blaar amper 'n halfmeter breed, *E. whitelockii* (Figuur 4) met sy baie lang blare, en veral *E. chimanimaniensis* (Kleurfiguur 22 op p. 20 en Figuur 2). 'n Groot *E. concinnus* (Kleurfiguur 23 op p. 20) het ons ook baie beïndruk aangesien die pinnas anders voorkom as dié van kleiner plante wat mens dikwels in versamelings sien.

Figuur 3 'n Groepfoto van die besoekers aan die Afrika tuin.
Figure 3 Photo of the visitors to the Africa garden.

Die groep (Figuur 3) het toe die naweek afgesluit deur 'n heerlike middagete geborg deur die Streektak. John Kloppers word veral ook bedank vir die oorhoofse reëlings van die naweek.

Kleurfiguur/Colour Figure 12 Ongeskonde *Encephalartos lanatus* wat so naby aan die rots groei dat dit lyk of hulle van onder die rots uitgroei. / Undamaged *E. lanatus* growing very close to a large rock. Foto/Photo: Derik Minnaar.

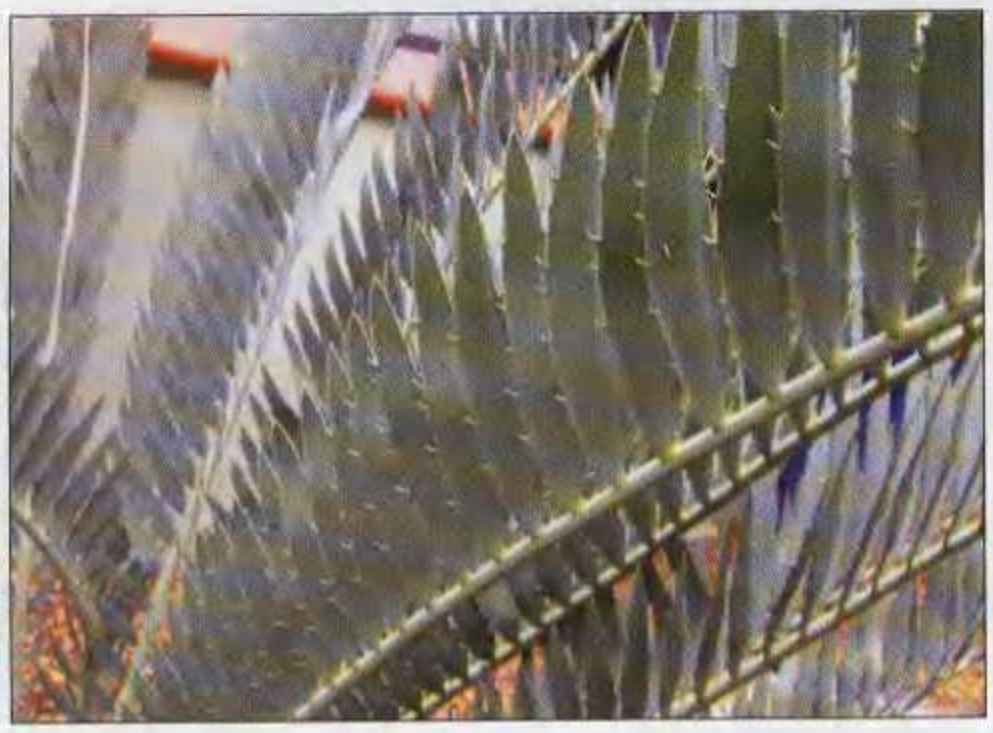
Kleurfiguur/Colour Figure 13 'n Manlike *E. lanatus* met ou keëls nog aan die plant. / Male *E. lanatus* with the old cones still on the plant. Foto/Photo: Derik Minnaar.

Kleurfiguur/Colour Figure 14 'n Groep *E. lanatus*-plante in die natuur. / A group of *E. lanatus* specimens in the wild. Foto/Photo: Derik Minnaar.

Kleurfiguur/Colour Figure 15 'n Pragtige voorbeeld van *E. lanatus* in die natuur. / A magnificent specimen of *E. lanatus* in the wild. Foto/Photo: Derik Minnaar.

Kleurfiguur/Colour Figure 16 Dr Diekie de Klerk tussen die *E. nubimontanus* vorms in sy tuin. / Dr Diekie de Klerk amongst the *E. nubimontanus* forms in his garden. Foto/Photo: Derik Minnaar.

Kleurfiguur/Colour Figure 17 Die kroon van 'n *E. nubimontanus* "robusta" vorm. / The crown of a *E. nubimontanus* "robusta" form. Foto/Photo: Derik Minnaar.



Kleurfiguur/Colour Figure 18 Blaardetail van die *Encephalartos nubimontanus* "robusta" vorm. / Leaf detail of the *E. nubimontanus* "robusta" form. Foto/Photo: Derik Minnaar.

Kleurfiguur/Colour Figure 19 Ingang van die tuin van dr Gerrie de Haas. / Entrance to the garden of Dr Gerrie de Haas. Foto/Photo: Derik Minnaar.

Kleurfiguur/Colour Figure 20 Uitleg van die Afrika tuin van wyle mnr Smit. / Lay-out of the Africa garden of the late Mr Smit. Foto/Photo: Derik Minnaar.

Kleurfiguur/ Colour Figure 21 Blaardetail van *E. kisambo*. / Leaf detail of *E. kisambo*. Foto/Photo: Derik Minnaar.

Kleurfiguur/Colour Figure 22 'n Volwasse voorbeeld van *E. chimanimaniensis*. / A mature specimen of *E. chimanimaniensis*. Foto/Photo: Derik Minnaar.

Kleurfiguur/Colour Figure 23 Blaardetail van *E. concinnus*. / Leaf detail of *E. concinnus*. Foto/Photo: Derik Minnaar.

Figuur 4 Derik Minnaar by 'n volwasse *E. whitelockii*.
Figure 4 Derik Minnaar standing next to a mature specimen of *E. whitelockii*.

Toekomstige aktiwiteit

Onthou asseblief die jaarlikse afsluitingsfunksie op 1 November 2003. Tree asseblief na-ure in Oktober in verbinding met Derik of Lynette by selfoonnommeres 082 413 1025 of 083 417 7608 om bywoning te bevestig asook vir die fyner detail van die byeenkoms.

Summary

Botachabello Outing

On 24 May a small group of members gathered at the Botchabello Mission Station just outside Middelburg, Pumalanga. Prof. Nat Grobbelaar, who did research work on *Encephalartos lanatus* in this area for several years, acted as touring guide. Many quite nice looking *E. lanatus* specimens were observed in the wild (Front Cover, Colour Figures 12–15 on p. 19) were observed in the wild as well as quite a number of seedlings (Figure 1).

Visit to cycad gardens in Pietersburg (Polokwane)

The weekend of 7 and 8 June a large group of cycad enthusiasts (Figure 3) visited three exceptional cycad gardens in Pietersburg, Limpopo Province.

On the Saturday, in the garden of Dr. Diekie de Klerk (Colour Figures 16, 17 on p. 19 and 18 on p 20). Philip Grobbelaar gave a detailed talk on the 12 different forms of *Encephalartos nubimontanus* that they have identified.

On the Sunday they visited the garden of Dr. Gerrie de Haas (Colour Figure 19 on p. 20) who owns, inter alia, a nice collection of Central African Cycads.

Afterwards a visit was paid to the late Mr. Smit's Africa Garden with its beautiful specimens of large Central African cycads (Colour Figures 20–23 on p. 20, and Figures 2, 4).

THE EFFECT OF LIGHT STRENGTH ON THE SURVIVAL OF *ENCEPHALARTOS LANATUS* SEEDLINGS

Nat Grobbelaar
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Received 1 July 2003

During 1990 a total of 600 fairly uniform two year old *Encephalartos lanatus* seedlings that were grown in sandy soil from my smallholding contained in plastic bags, were planted apart on the smallholding without clearing the area of its natural vegetation. The smallholding is situated in the Derdepoort area on the northeastern outskirts of Pretoria. The indigenous vegetation of the area that was planted consisted mainly of grass and other herbs but also contained some trees and shrubs. Twenty-five seedlings were planted a metre apart in each of 24 parallel rows that were also a metre apart. Small holes were dug to accommodate the sods that were removed from the split plastic bags. No compost or fertiliser was applied. The seedlings were watered regularly at weekly intervals.

During the first year many of the seedlings made poor growth in that their new leaves were depauperated. Several of these seedlings eventually died and were replaced by fresh seedlings from the same original batch. These, in most cases also soon perished.

Because the climate at my smallholding is not very

different to that of the natural habitat of *E. lanatus* and considerably warmer during winter, it was decided, after a year to discontinue the artificial watering of the plants.

From an inspection of the seedlings during 1992 it struck me that the ones that showed poor growth as well as the ones that have perished were located in sunny spots whilst practically all the plants that made good growth were situated in areas that were shaded during at least a substantial part of the day. I then decided to measure the irradiance (light strength) at soil level at some of the seedling sites and to correlate it with the condition of the plants. Measurements were made on cloudless days at sites 1, 4, 7, 10, 13, 16, 19, 22 and 25 of rows 1, 5, 9, 13, 17, 21 and 24 at 09h00, 12h00 and 15h00 on the 5th of July 1992, 25th of September 1992 and 26th of December 1992. During the December 1992 measurements the plants were also allocated the following ratings: 0 = dead; 1 = poor; 2 = fair; and 3=fine.

The light irradiance measurements, in various combinations, were correlated with the condition of the plants. The condition of the plants was found to correlate best with the average irradiance on the 26th of December - yielding a correlation coefficient of -0,77 (see Table 1). A value of 0 would indicate that no correlation existed whilst a value of 1 would indicate a perfect correlation. The negative value of the coefficient indicates that the correlation is an inverse one - that the higher the light intensity, the poorer the growth of the seedlings. The correlation coefficient for the average irradiance on the 5th of July was zero and for the September measurements was -0,55. Whereas the irradiance of full sunlightt at noon on the 26th of December was 2100 micromole photons per square metre per second, the corresponding value was 1350 and 1650 on the 5th of July and the 25th of September respectively.

From these results it is clear that the seedlings of even a cycad with bluish-green leaves with narrow leaflets, which is generally thought to be very hardy, requires shade for survival. It would seem as if the average midday irradiance for such a seedling during especially the summer should not exceed about 40% of full sunlight in the Pretoria region for good growth.

Table 1. The influence of irradiance (in micromole photons per square metre per second) on the growth of two year old *Encephalartos lanatus* seedlings during two years in the Pretoria area.

Seedling condition at end of Experiment*	Irradiance on 26th December 1992			
	09h00	12h00	15h00	Average
0	1650	2100	1500	1750
0	1500	2100	1560	1720
0	1500	2100	1560	1720
0	1350	2100	1650	1700
0	1500	2100	1500	1700
0	1500	2100	1500	1700
0	1440	2100	1500	1680
2	1350	2100	1500	1650
1	1500	2100	1200	1600
0	1350	2100	1050	1500
0	700	2100	1560	1453
1	1500	1950	900	1450
0	1500	2100	700	1433
0	500	2100	1500	1367
3	1350	1350	1350	1350
0	300	2100	1560	1320
0	1500	2100	300	1300
0	135	2100	1650	1295
0	1440	2100	300	1280
1	150	2100	1500	1250
3	750	2100	900	1250
0	60	2100	1560	1240
1	1500	2100	111	1237
0	90	2100	1500	1230
1	75	2100	1500	1225
0	1350	2100	200	1217
1	70	2040	1500	1203
0	200	2100	1200	1166
0	900	1950	600	1150
3	210	1650	1560	1140
2	1500	1500	300	1100
2	1200	1950	52	1067
0	120	2100	960	1060

3	1500	83	1200	928
3	40	1920	750	903
2	300	900	1500	900
2	195	2100	350	882
3	400	2040	165	868
2	90	1440	1050	860
2	90	2100	80	757
0	600	250	1350	733
3	35	1950	120	702
1	90	580	1350	673
3	60	1920	40	673
3	65	1500	150	572
2	300	1350	60	570
3	60	105	1500	555
3	1500	90	70	553
3	50	70	1470	530
3	90	40	1440	523
3	600	700	150	483
3	240	65	1050	452
3	50	75	1200	442
3	30	300	900	410
3	250	144	750	381
3	200	600	90	297
3	25	40	600	222
3	400	150	90	213
3	150	165	105	140
3	210	60	40	103
3	200	40	30	90
3	40	40	65	48
3	50	50	33	44
Correlation coefficient	-0,45	-0,68	-0,47	-0,77

* 0 = Dead; 1 = Poor; 2 = Fair; 3 = Fine.

A TRIP TO CAMEROON AND CHAD

Ian Turner
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Received 16 May 2003

Many years ago I had seen an old paper regarding cycads and a locality for *Encephalartos septentrionalis* was given near Fort Archibault (now Sarh) in Chad. Since I was now off my farm, it was a good opportunity to investigate the report. In recent years no one has reported any cycads growing in Chad.

So a friend and I set out by air from Johannesburg and flew to Cameroon. Someone had told us about a small botanic garden in a town called Limbe in Cameroon. It turned out to be a very nice garden which was established in 1892 by a German horticulturist under the directorship of Professor Paul Preuss. It was used as an acclimatization centre for plants with an economical and medical importance. Successful species supported the economy of "Kamerun". Examples included quinine, coffee, rubber, tea, cocoa and bananas. Many of these plants continue to play an important economic role in Cameroon today. Following an extended period of decline from the 1930's, the British government assisted with the renovation of the garden in 1988 and it is now well kept and has many interesting plants. The one which stands out for the cycad enthusiast is a specimen of *Encephalartos laurentianus* which must hold the record for size of any cycad in cultivation (Figure 1). Starting off as a single plant it had made 18 really massive suckers. In fact, it was not possible to see which the original stem is, the stems of the plant covered an area of 6 metres by 7 metres and from leaf tip to leaf tip a staggering 16 metres. Many female cones (Colour Figure 11 on p. 14) were being produced and with a second but smaller female plant also producing cones many thousands of seed must have gone to waste over the years.

The town of Limbe is right on the coast and the weather was very hot and humid, and that was the dry season, so when the rains start falling it must be a very good growing

Figure 1 A very large *Encephalartos laurentianus* in Limbe Botanical Gardens.

weather for *E. laurentianus*. In fact, new leaves and small suckers were seen growing from the big trunks so I think they grow continuously throughout the year. The name on the label for the plant is *Encephalartos barteri*, South Africa. Maybe there was an *E. barteri* there one day which died and the label ended up on the wrong plant when the garden was renovated, but of course *E. barteri* does not come from South Africa. Some big *Cycas thouarsii* plants were also growing well but not making cones. I believe this species will not produce cones in a very hot tropical climate. Also a big *Zamia* with many suckers was seen, possibly *Z. pumila*. *Platycerium stemmaria* plants (Figure 2) were growing on trees, rocks, the sides of a bridge, and one was even growing from the crack of a mudguard of a broken down car. They were mostly quite dehydrated and waiting for the rains to start but with all the humidy they can survive.

Figure 2 A quite dry *Platycerium stemmaria* growing on the stem of a large old *Cycas thouarsii*.

In the town of Yaundi, *Platycerium stemmaria* and *Platycerium elephantotis* were growing by the hundred, sometimes together on the same tree,

It was from the town of Yaundi we boarded a train to take us north towards Chad. The train went as far as a small town Ngaoundere. This town must be quite high in altitude because in the evenings and early morning the temperature is quite low. We booked into an hotel and organized to get a bus the next day to a place called Figuil on the border with Chad. In Figuil we boarded a minibus which was going to Moundou in Chad. It was a very old minibus and the doors let in plenty of dust. In Cameroon the roads are of tar, but not so in Chad. When we arrived at the border a guard asked where we were going and when we said Sarh, he laughed and said did we know it was 600 km away. Well the trip to Moundou was rough to say the least, we travelled the whole night with very many stops to have passports checked and, of course, where there was no problem the man at the checkpoint surely made one and money had to be paid to get past. This was not only for us but the locals also. One guy got the driver to stop about 1 km before the checkpoint. He did a run through the bush and met the bus further down the road. He must have been a frequent traveller. One poor lady who had been to Cameroon for shopping had her bag emptied out in the dust beside the bus. She eventually gathered up her goods and had to follow the guards into a room where it took from 2 a.m. to 4 a.m. to work out how much she had to pay to get past. We all stood around the bus waiting. After that we drove for about 3 to 4 km to a small town and by then the driver was tired, so he got out a plastic sheet which he spread out on the ground, then he and a few other passengers went to sleep on it. Those who did not feel like sleeping on the plastic tried to sleep in the bus. It was a long night. At daybreak we thought we would be on our way but we were in a devout Muslim country so everyone was called for prayers. After prayers it was tea-time. There are small stalls along the road selling nice hot sweet tea and plenty of powdered milk was available. The tea is made, then put in thermos flasks ready for drinking. We eventually got going but by the time we got to the last roadblock we had no money left in the local currency. We did not carry too much from Cameroon because we did not realize that they use the same money in both countries. Anyway, the driver could see we were going to be held up for quite a long time because the guards did not want to let us pass. So since by now it was about midday, the driver paid for us. We got to Moundou and my friend went off with the driver to try to change some money so he could be paid back. It was siesta time so everything was closed up. After about half an hour a guy came to collect me on a motorbike. We went along some small back streets and I was expecting to be robbed of everything when we stopped at a gate and on going in I was very relieved to see my friend sitting inside. The gate led to a house of a very kind man whose mother is Italian and father Chadian. He could speak some English, which was a big help because French is spoken in Chad. Our newfound friend, Abdula, was to turn out to be our saviour in Chad. Since we had not eaten much for two days, we must have looked hungry so he sent out a girl to get two whole roast chickens and lovely French loaves for us to eat. He made us very welcome in his home where we stayed and he would not accept any payment for anything.

When we told him we wanted to go to Sarh, he asked if we had heard of Ali Baba (and the 40 thieves) because he said the chief Ali Baba stays there! And if we go there alone it could be very dangerous for us. We would be lucky to come back with the clothes we were wearing. Luckily Abdula had many contacts in Moundou. He was able to

organize a good twin cab Toyota, a letter from the Chief of Police to get us past the road-blocks and another man who is another chief in the area to accompany us to Sarh. We set off the next morning together with Abdula. It was a 300 km trip but all went well and we made good time in the nice twin cab. The first call was made to the chief of the area because nothing could be done without his permission. Abdula had a friend in Sarh who welcomed us in his house as if his long lost brothers had arrived. We spent two nights there and ate very well from a massive tray of assorted food, which was brought in for all the men, women were never seen. There were armed guards on duty at this man's house because robbers are very numerous. Sarh is not far from the border with the Central African Republic. I think many things like cars and trucks are stolen and taken into the Central African Republic, so one has to be very careful. We often saw lorries with armed guards riding on top and on the road we once came to a suspicious looking road-block. Our driver stopped far back to make sure it was a police check and not an armed hold-up. We only proceeded when someone walking on the road assured us it was all right to continue on our way.

That afternoon we asked around to try to find someone who might know cycads. A man who works at the house where we were staying thought he knew the plants, so we went off for quite a long way out of town and we stopped at a village where another man said he has seen them and we should return the next day because it was now getting late. We were quite excited. The next day we eventually got back to find some *Sansevieria* plants. Truly our spirits sank to a low ebb but we travelled around in every direction and the only thing of interest we saw was a very lovely *Adenium*. We went to some old farms, which had been abandoned by the French farmers many years ago, to see if any cycads were growing around the houses but there were none, only Adeniums (Figures 3). In the town of Sarh many old buildings from the colonial era were in a state of disrepair. At one time it must have been a beautiful small town but now it was far from that. In Chad one sees herds of really beautiful cattle. We thought a man who herds the cattle would be a good one to ask about the cycads, and one man said he had seen them near the Central African Republic border. The land around Sarh is very flat and not the sort of countryside where one would expect to find cycads. It was now getting late so we decided to head back to Moundou asking along the way. We stopped at a cotton ginnery for our security chief companion to see a friend who travels around the countryside and he said he has indeed seen the cycads near the Central African Republic. He said they have like a pineapple in the centre so he seems to know them, but since it was 3 days to go there and back, we could not do the trip. We had far to get back to Cameroon and catch our flight back to Johannesburg.

At the border leaving Chad the Chief there was not happy to see the letter we had with us from the Chief of Police. He thought he was going to make big money out of us because we were leaving Chad at a different port to the one we entered by. Of course there is no problem in doing that but without the letter I am sure we would have had to pay dearly to get through. We crossed a big river bridge and passed into Cameroon and were met with smiling faces and a welcome to Cameroon. In that country there were no road-blocks where money was demanded. In fact Cameroon seems to be quite well organized when compared to some other African countries.

Figure 3 A very old *Adenium* plant, ± 3 m high, at an abandoned farm house.

We got back to Ngaoundere to find there had been a derailment so there was no train that night to take us back to Yaundi. So we booked into the same hotel and were glad to have a good night's sleep after a good meal in a French run restaurant.

Something which I thought is very good in Cameroon, and to a lesser extent in Chad, is a very economical mode of transport. There are hundreds of small motorbikes (100cc/150cc) gliding around the towns carrying people on the back seats for a very reasonable fare compared with what it would cost to hire a taxi. All minibuses have to stop at a depot just outside town and most people, if they are alone, jump on the back of a motorbike and off they go. Even two people sometimes squeeze on to the back seat. The bike drivers are very careful drivers and it is amazing how many bikes are on the road and very few accidents are seen.

The train journey back to Yaundi was all night and pretty tiring and sleep was hard to get. There were very many stops and at each place we stopped people were selling

things for eating and most important, bottled water. We were due to arrive in Yaundi at 6.30 a.m. but did not arrive until 1 p.m. We caught a bus to Duala from where we were to board the plane back to South Africa.

We had a day to spare before the plane left so we got a minibus to Limbe to have another look at the botanical gardens and I collected a few Platyceriums. By the time I got home they were as dry as paper but they gradually rehydrated and are now growing well. Even a very small *Platycerium elephantotis* not much bigger than a postage stamp and just as dry as one has survived. It seems that as long as the small growing bud is in good condition they can survive much dehydration. In Douala there is a small flower market, which I visited. I have never seen such nice Heliconias and other related plants like those on sale there. I would love to have been able to visit the farm where they were being grown but I think it was quite far out of town.

We went back to the hotel and had an early night because we had to be up at 5 a.m. for an early morning flight to Kinshasa where we were to catch a South African Airways flight to Johannesburg. We arrived at the airport to find the flight had been delayed for 2 hours. We eventually got on our way but after 5 minutes into the air, the plane developed a technical fault and had to return to the airport. After it touched down and taxied up to the terminal buildings, a tractor with a tank of fuel disappeared out of my sight to the front of the plane. After a few minutes it returned from where it came and we took off for Kinshasa. I wonder if the technical fault was the fuel gauge not registering enough fuel to get us to Kinshasa? It certainly looked like that, maybe the crew on being 2 hours late to take off fired up the engines and took off only to realize no one had topped up with fuel.

All in all it was a very hard trip with long uncomfortable days and nights on the road and rail and we still do not know if there are in fact cycads in Chad.

VARIATION IN ENCEPHALARTOS LAEVIFOLIUS

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Encephalartos laevifolius was first described as long ago as 1926, but is still poorly known and not well represented in collections. Yet it has one of the widest distributions of all cycads, occurring sporadically from the northern Drakensberg between Mpumalanga and Limpopo provinces southwards to the very south of KwaZulu-Natal. However, this is not a continuous distribution, and the plants occur in small populations which are well isolated from each other. As can be expected from such isolated populations, there is considerable variation between populations, and an experienced person can readily tell from where a particular garden plant originally came. One may ask why these discrete groups are not made separate species. The reason is that, though the extreme variations are very different from each other, this variation tends to be almost continuous when viewed over the whole distribution range.

The species was first described from a large population, comprising hundreds of plants, in the mountains at Kaapse Hoop near Barberton. These plants tend to have erect stems up to 3 or more metres tall; and the leaves are blue and flat. The successive leaflets touch each other and overlap ever so slightly (Figure 1). These are magnificent plants, but, as with the species as a whole, not easy to transplant or maintain in cultivation. This population has been very severely depleted by poaching over the years, and most plants in cultivation are from this source. By contrast, plants from Krokodilpoort, not far away, are conspicuously more robust with wider and longer leaflets (Figure 3).

In the late 1960's a small population of rather interesting plants were found in the mountains above Barberton, over the border in Swaziland near Havelock. These had exceptionally long and not particularly stiff leaflets, blue in colour, and apparently the plants were rather short in stature (Figure 1). To the best of my knowledge these have all been poached.

In 1969 another population of some 16 plants were found at Mariepskop near Klaserie, and in successive years a few more widely scattered plants came to light. These plants sucker profusely, and the stems seem to be shorter and more leaning as opposed to erect than at Kaapse Hoop. The leaves are dark green, strongly V-shaped in cross section, the leaflets also overlap slightly, and, although not apparent in our illustration, shorter and narrower than the Kaapse Hoop form when the two are grown together (Figure 2). These plants are rare, don't produce seed, and are still poached occasionally.

In the 1970's scattered plants were found along the northern Drakensberg escarpment near The Downs. Some of these plants were big, with erect trunks 3 or 4 metres tall, and a few basal suckers. These plants have dark green leaves, and the leaflets are closely spaced but not overlapping, and wider than in any of the previously discussed forms (Figure 2). These are very rare in cultivation, but some are around.

With some reluctance I must mention a plant to which I refer as BQRV, also from the northern Drakensberg escarpment. It has markedly short and wide leaflets, tightly overlapping, and uncannily like *E. brevifoliolatus* (Figure 3).

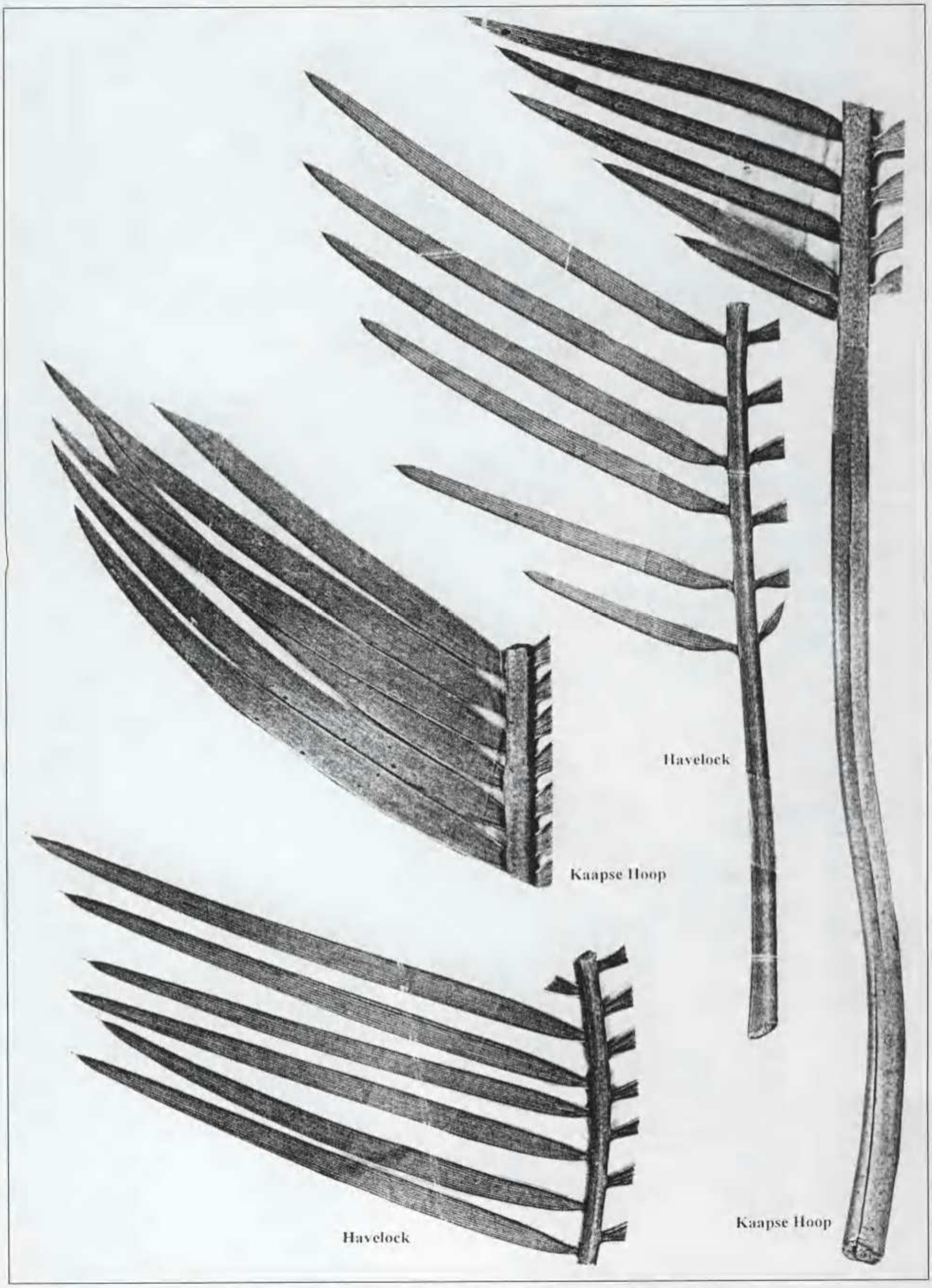

Figure 1 ***Encephalartos laevifolius*****: portions of leaves of variants from Kaapse Hoop and Havelock.**

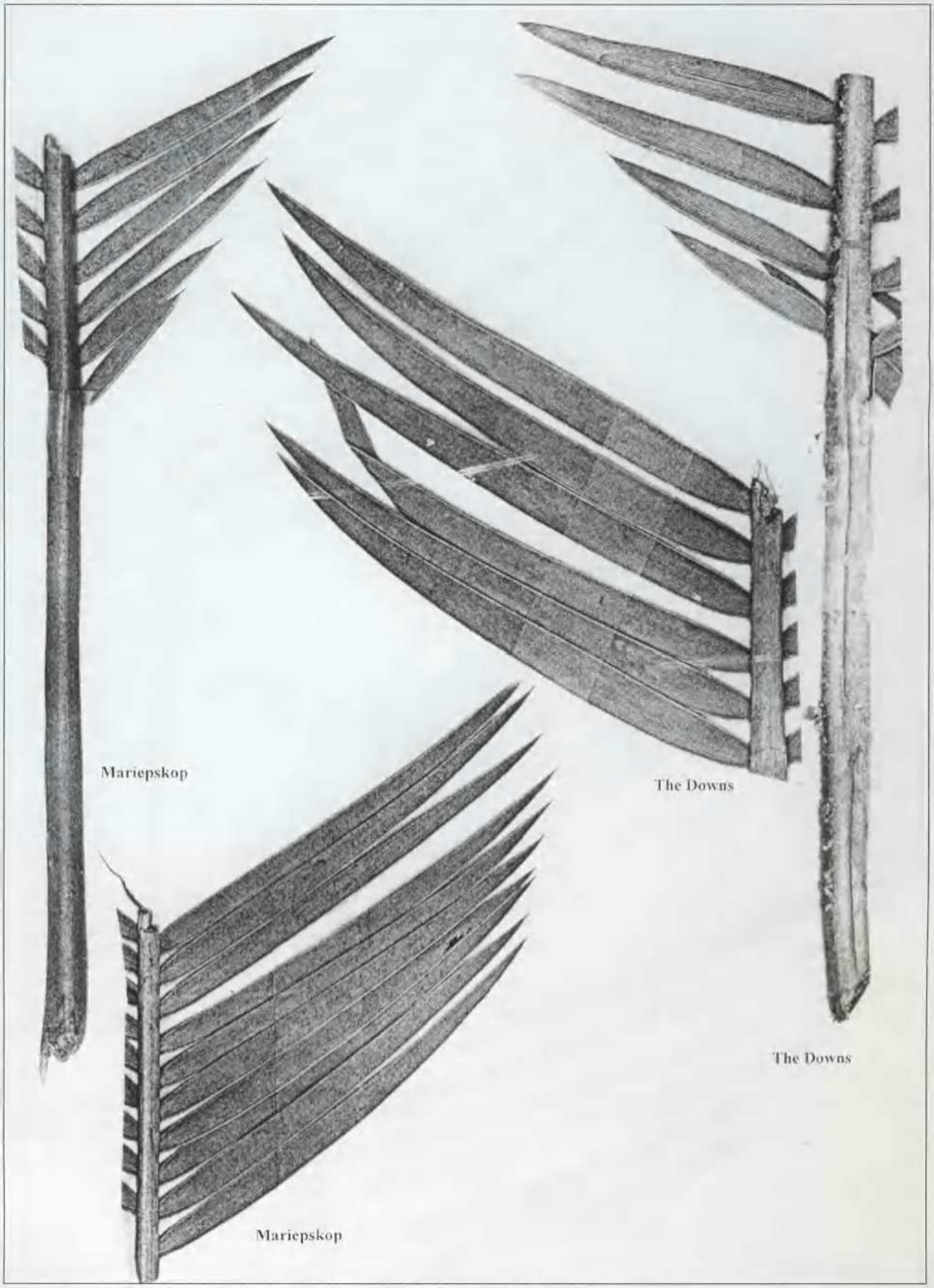

Figure 2 ***Encephalartos laevifolius*****: portions of leaves of variants from Mariepskop and The Downs.**

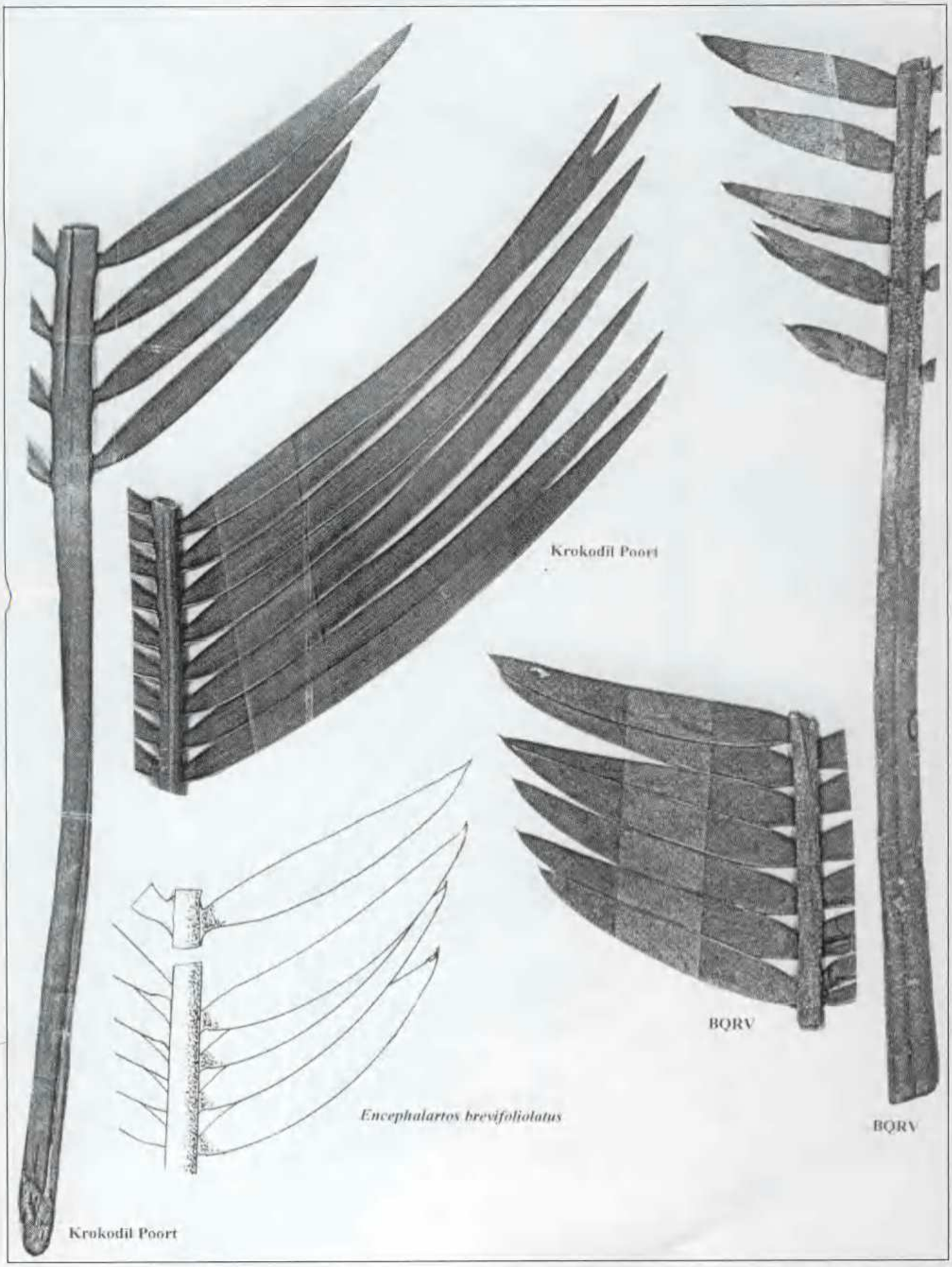

Figure 3 ***Encephalartos laevifolius*****: portions of leaves of variant from Krokodil Poort. Also shown is the "BQRV", and** ***E. brevifoliolatus*** **for comparison.**

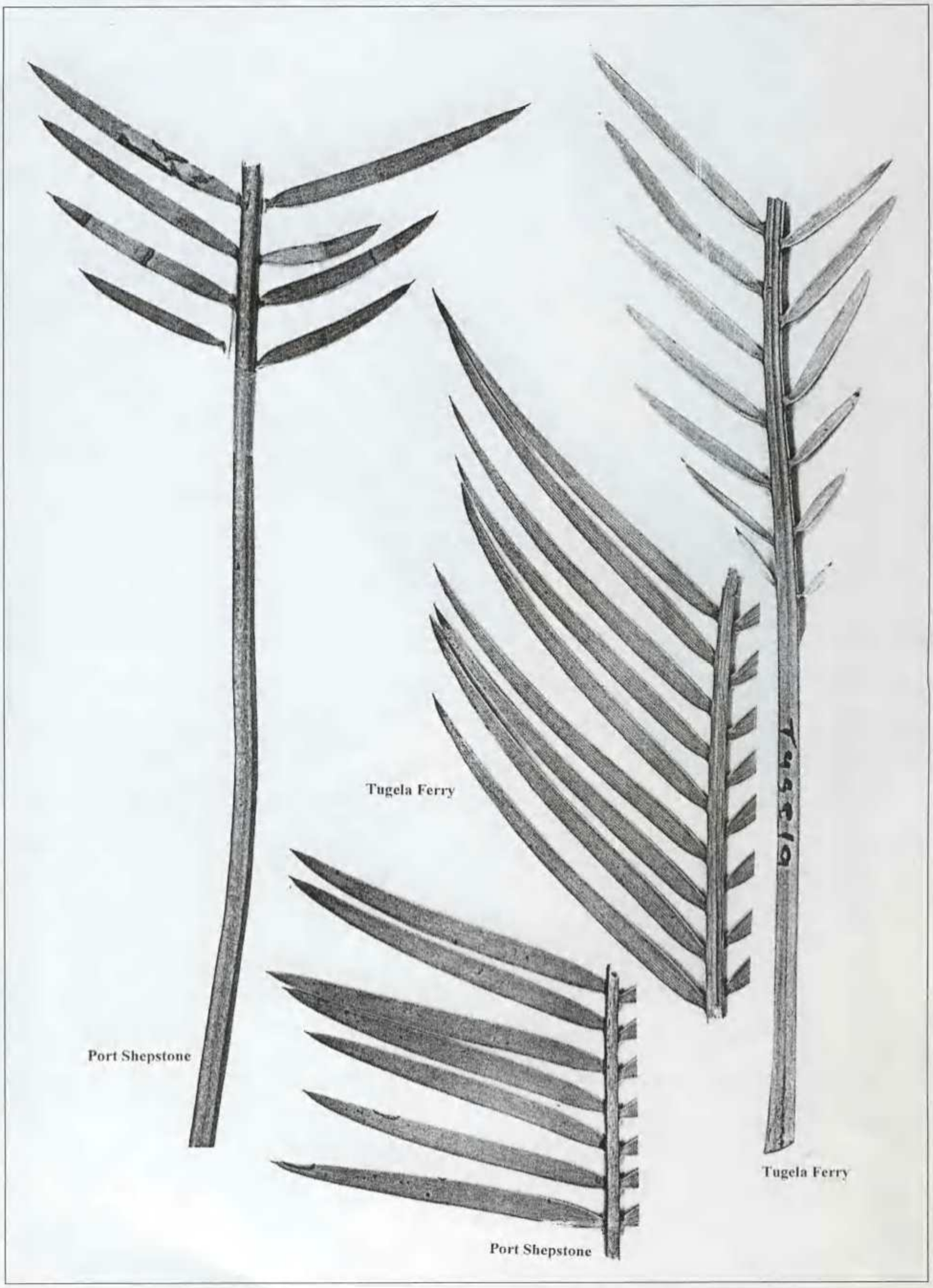

Figure 4 *Encephalartos laevifolius*: **portions of leaves of variants from Tugela Ferry and Port Shepstone.**

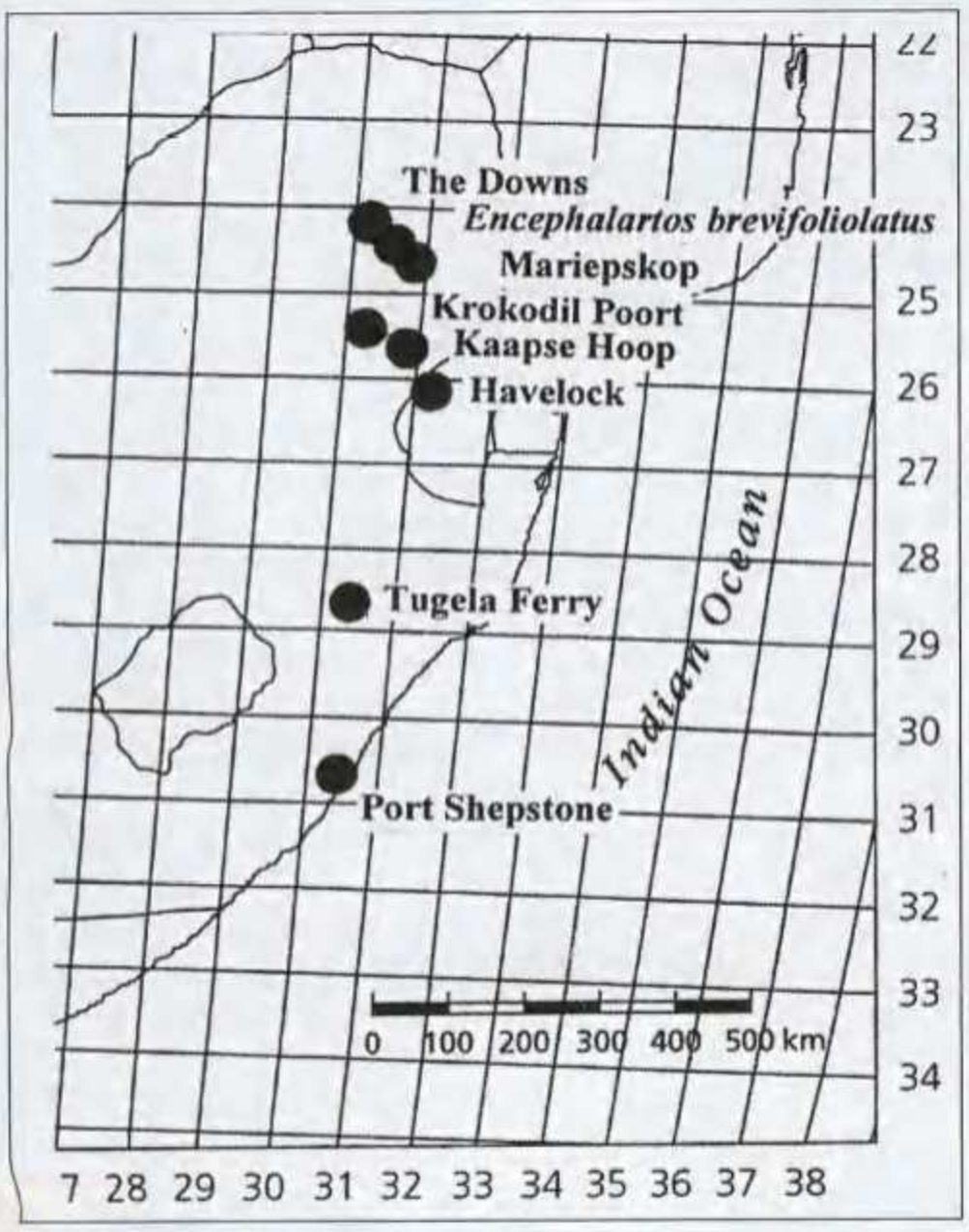

Figure 5 ***Encephalartos laevifolius*****: known geographical distribution.**

Also in the early 1970's a single plant was found, *Encephalartos woodii*-like, near Tugela Ferry in KwaZulu-Natal. This particular place is an hotspot for cycad diversity, as one can stand on one peak and see the places where *E. msinganus, E. natalensis, E. villosus, E. cerinus*, and this *E. laevifolius* grew. This plant had a trunk about a metre tall and several suckers at the base. Its leaves are blue, and the leaflets are widely spaced (Figure 4). This plant was removed to a local garden, subsequently broken up, and sold to different collectors.

In the 1980's plants confiscated during investigations into illegal trading, led to a population of perhaps 20 smallish scattered plants in the area south of Port Shepstone, hundreds of kilometres from any others known. They had blue foliage, and the well-spaced leaflets were shorter and narrower than elsewhere (Figure 4), yet no evidence could be found that these are anything else than a form of *E. laevifolius*. In a much-publicised operation all the remaining plants were lifted and removed by helicopter to a nursery by the Natal Parks Board. To the best of my knowledge none survived this treatment, and the only remaining specimens are the original poached plants which escaped confiscation.

In the discussion above I haven't mentioned cones. We know that the female cones of the Mariepskop plants are differently shaped and much more hairy than those at Kaapse Hoop, but there is just not enough information about the other forms to make conclusions. Also, if one has only one or two plants of each form in your garden, the cones may consistently look different, but that does not mean that the observed differences are significant when looking at the variation *within* a whole population.

What is going on here? These scattered populations (Figure 5) are probably relics of a former widespread and perhaps continuous population which varied from end to end. For some or other reason the plants declined and vanished over much of their former range, to leave only a few isolated remnants. It now looks as if these remnants differ greatly from each other, but in fact they only represent samples of a former continuous variation.

Clearly this is a species in real danger of extinction, as shown by its low number of plants, and the lack of sexual reproduction over much of its range. It is our responsibility to increase the number of plants by hand-pollinating cultivated plants, but it is absolutely essential that we should have clarity on where our plants come from so that we don't destroy these discrete forms by hybridization.

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CYCADS: STATUS SURVEY AND CONSERVATION ACTION PLAN - A REPORT TO THE EXECUTIVE COMMITTEE AND MEMBERS OF THE CYCAD SOCIETY OF SOUTH AFRICA

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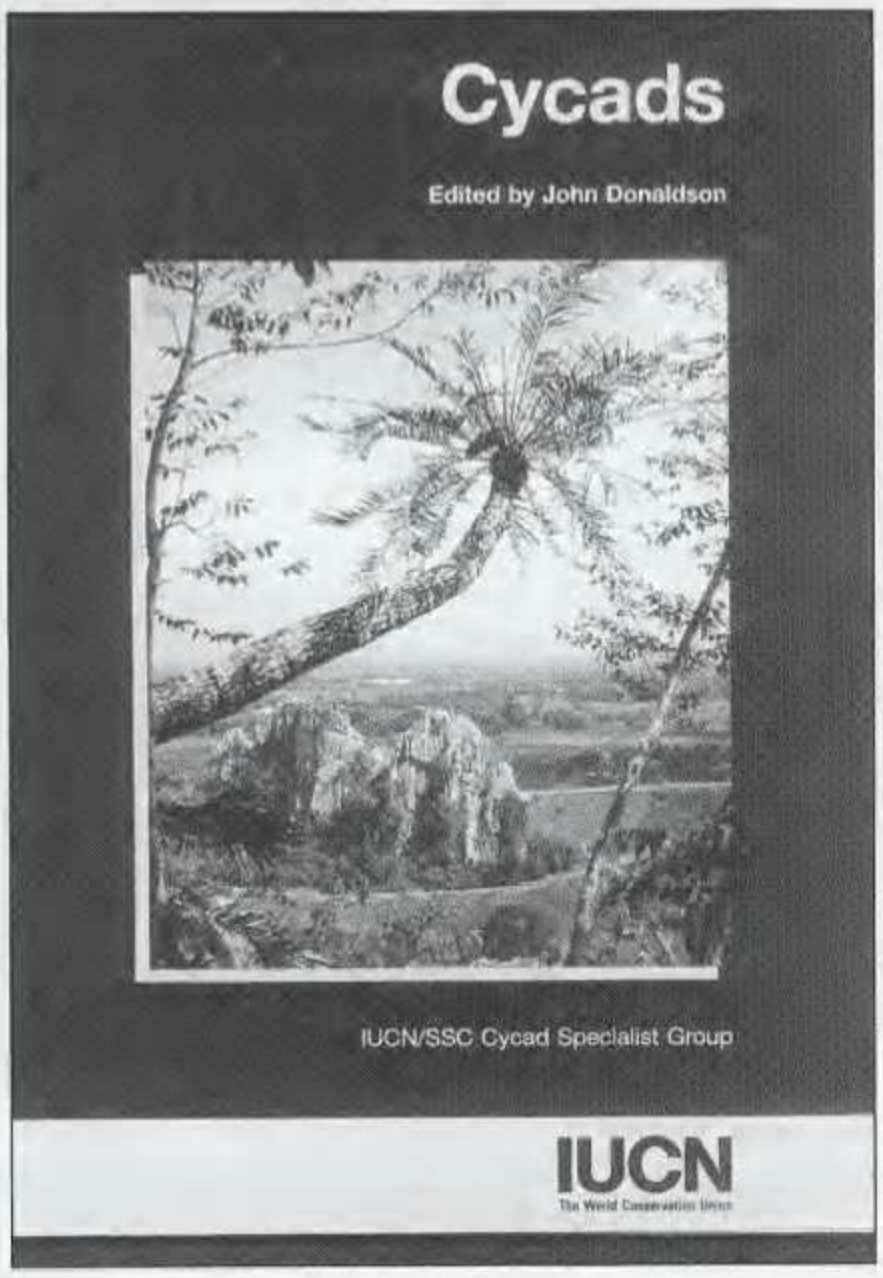

Front cover of the Cycad Status Survey and Conservation Action Plan report. The plant featured is the critically-endangered species *Cycas tansachana*, restricted to limestone outcrops in Thailand, as photographed by John Donaldson.

As your representative to the Cycad Specialist Group (CSG) of the Species Survival Commission (SSC) of the World Conservation Union (IUCN), it gives me much pleasure to report on the completion of a major phase of the Cycad Specialist Group's work which has lead to the publication of the first comprehensive Cycad Status Survey and Conservation Action Plan. The work, summarised in a 68-page report, is very largely due to the enormous efforts of CSG Chairman John Donaldson and is fittingly dedicated to the memory of Cynthia Giddy, the first Chairperson of the CSG.

The Status Survey component comprises Regional Overviews of cycads in Africa (Chapter by John Donaldson), Australia (Chapter by Ken Hill), Asia (Chapter by Ken Hill, Chia-Jui Chen and Phan Ke Loc) and the New World (Chapter by Dennis Stevenson, Andrew Vovides and Jeff Chemnick). Each of these Chapters gives a summary of the conservation threats to cycad species indigenous to the particular region and a report on how these threats are being addressed locally. The regional overviews are followed by a summary (Chapter by John Donaldson, Bijan Dehgan, Andrew Vovides and Willie Tang) on global trade in cycad plants and seeds, the influence of CITES and the sustainable utilisation of wild cycad populations. The importance of *ex-situ* cycad collections as a genetic reservoir and research facility is outlined in a Chapter by Terrence Walters. The necessity for a global unifying framework for cycad conservation is stressed in a Chapter by Willie Tang, John Donaldson and Terrence Walters. The Status Survey hightlights the importance of the African cycads, with 69 species and subspecies currently recognised, mostly from South Africa, and with at least 5 new species still awaiting formal description. The threatened status of the African cycads arises partly from their inherent rarity and their natural decline, but local and international trade in wild-collected plant specimens continues to pose problems. Added to this is the impact of large-scale land clearing for urban and agricultural development. Fortunately, at least 25 African species are included in one or more reserves and cycads are well-represented as *ex-situ* genetic resources in botanical gardens. The community-based nurseries *for Encephalartos transvenosus* at Modjadji and for *E. lebomboensis* at Mananga are seen as important developments. However, the sustainable collection of seeds from wild populations has not been properly addressed and remains an objective for the cycad specialist group. There is a growing awareness that effective cycad conservation requires partnerships between law enforcement agencies, conservation departments, scientists and members of the community. Involvement of the Cycad Society of South Africa is seen as of paramount importance in further developments.

The Action Plan aims to establish effective protection for the remaining cycad populations, especially in Asia and the New World, and focuses strongly on the holistic concept of habitat preservation. Definite schedules of activities, responsibilities and timeframes are given for proposals to reduce the threat to wild cycad populations and to strengthen *ex-situ* conservation initiatives. The report concludes with a series of Appendices including a discussion of the Red Listing evaluation process.

The report can be downloaded as a PDF file from the IUCN website
http://www.iucn.org/themes/ssc/news/cycadsap.htm or can be purchased from the IUCN/SSC publications office, Rue Mauverney 28, CH 1196 Gland, Switzerland, Tel: +41 22 999 0000; Fax: +41 22 999 0015,
e-mail: mcl@hq.iucn.org Copies of the report have been sent to the Presidents of the various cycad societies.