ENCEPHALARTOS

JOURNAL OF THE CYCAD SOCIETY OF SOUTH AFRICA

TYDSKRIF VAN DIE BROODBOOM VERENIGING VAN SUID-AFRIKA

NO. 41 MARCH / MAART 1995 ISSN 1012-9987

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Tel.: 018-4841565

Editor of "*Encephalartos*"
Redakteur van "*Encephalartos*"
Isabella Claassen
P.O. Box / Posbus 25688
0105 Monumentpark
Tel.: 012-453350

Printing & dispatch officer
Druk- en versendingsbeampte
Piet Vorster
Botany / Plantkunde Dept.
University of / Universiteit van Stellenbosch
Private Bag / Privaatsak X1
7602 Matieland
Tel.: 021-8083056

Back copies officer
Beampte vir vorige uitgawes
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COVER/VOORBLAD: *Cycas revoluta* female cone, about $^{2}/_{3}$ life size, at stage when sporophylls separate to indicate pollen-receptiveness.

Photo: Piet Vorster

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FROM THE PRESIDENT

Most of the members have already renewed their membership for 1995, but in many cases the membership number on the renewal form was left out. Please rember always to supply your membership number in any correspondence with the Society. This is the best way we can ensure that we are dealing with a specific member. The number appears on the address label of the journal that is mailed to you.

We are in a progress of upgrading the membership record system to accommodate more details about each member. At the moment we only have the address of each member, but we also would like to have the telephone numbers, fax numbers en E-mail address of members where available to facilitate easier contact between members and the Society. You will note that the renewal form in this issue of "*Encephalartos*" already make provision for this information. My fax number is: (012) 3422713 and my E-mail address is: Hannes@Agric.UP.AC.ZA

It was brought to my attention that rumours are going around that cycads growing along streets in East London in the Eastern Cape, are going to be uprooted and sold by the authorities and that the money be spent on housing. No one can deny the fact that housing for the underprivileged is one of the priorities at the moment and it is also a fact that insufficient funds are available for this, but is it really necessary to sell these plants rather than keeping them as national monuments for future generations? These cycads must have been planted close to the turn of the last century and have grown to stately monuments that can not be replaced. The possible amount of money that could be earned by selling these plants will be minuscule compared to the amounts required for the housing projects. Hundreds of houses can be built in a relatively short period, but it takes hundreds of years for a cycad to grow the size of the plants along the streets of East London. The Cycad Society of South Africa wants to make a call on the authorities of this city to reconsider the idea of selling these valuable plants.

Prof. Nat Grobbelaar, former president of the Cycad Society of South Africa has been elected honourary member of the Society. We congratulate him and hope that he will retain his mental and physical agility to continue to serve the Society for many years to come. The Society now has four honourary members and they are: Prof. Nat Grobbelaar (SA), Dr. K. Norstog (USA), Prof. Roy Osborne (SA) and Dr. D.D. Pant (India).

The first circular regarding the IV International Conference on Cycad Biology to be held in Panzhihua, Sichuan, China in May 1996 is out. The conference will be hosted by the Cycad Society of China. Interested

VAN DIE PRESIDENT

Die meeste lede het reeds hul lidmaatskap vir 1995 betaal, maar in baie gevalle het lede nie hul lidmaatskapnommer op die hernuwingsvorm ingevul nie. Onthou asseblief om in enige korrespondensie met die Vereniging altyd u lidmaatskapnommer te verstrek. Dit is die beste manier om te verseker dat ons met 'n bepaalde lid te doen het. Die nommer verskyn op die adresplakker van die tydskrif wat aan u gestuur word.

Ons is tans besig om die inligtingsisteem vir lede op te gradeer met die doel om meer inligting in verband met elke lid te kan akkomodeer. Op die oomblik het ons slegs die adres van elke lid, maar ons sou graag ook die telefoonnommer, faksnommer en E-posadres van lede waar dit beskikbaar is, wil hê om makliker kotak tussen lede en die Vereniging te bewerkstellig. U sal opmerk dat die hernuwingsvorm wat in hierdie uitgawe van "*Encephalartos*" verskyn, reeds vir die inligting voorsiening maak. My faksnommer is: (012) 3422713 en my E-posadres is : Hannes@Agric.UP.AC.ZA

Dit het onder my aandag gekom dat berigte die rondte doen dat broodbome wat langs die strate in Oos-Londen in die Oos-Kaap groei, ontwortel en verkoop gaan word en dat die geld vir behuising aangewend gaan word. Dit kan nie ontken word dat behuising vir die mindergegoedes tans 'n hoë prioriteit geniet en dat daar te min fondse vir behuising beskikbaar is nie, maar is dit werklik nodig dat hierdie plante verkoop moet word in plaas daarvan dat hulle as nasionale monumente vir die nageslag behou word? Hierdie broodbome is seker na aan die einde van die vorige eeu aangeplant en het sedertdien tot statige monumente ontwikkel wat nie vervang kan word nie. Die moontlike bedrag geld wat met die verkoop van die plante verkry kan word is minimaal in vergelyking met die koste van 'n behuisingsprojek. Honderde huise kan in 'n relatief kort periode opgerig word, maar dit neem honderde jare vir 'n broodboom om die grootte van die bome langs die strate van Oos-Londen te bereik. Die Broodboom Vereniging van Suid-Afrika wil 'n beroep doen op die outoriteite van die stad om die idee van die verkoop van die plante te heroorweeg.

Prof Nat Grobbelaar, vorige president van die Broodboom Vereniging van Suid-Afrika is as erelid van die Vereniging gekies. Ons wens hom geluk en hoop dat hy die geestelike en fisiese gesondheid sal behou om steeds vir baie jare die Vereniging te dien. Die Vereniging het nou vier erelede naamlik, Prof Nat Grobbelaar (SA), Dr K Norstog (VSA), Prof Roy Osborne (SA) en Dr D D Pant (Indië).

Die eerste omsendbrief in verband met die "IV International Conference on Cycad Biology" wat gedurende Mei 1996 in Panzhihua, Sichuan, Sjina gehou

members who have not received this circular can contact the conference chairman, Prof. CHEN Chiajui, IV International Conference on Cycad Biology, c/o Insttitute of Botany, Academia Sinica, Xiangshan, Beijing 100093, CHINA. His fax number is, 0086-01-8319534 and his Internet EM address is, lis@botany.ihep.ac.cn (see also "CYCAD 96" on page 31).

It seems as if allegations about the cycads in East London have been denied (see newspaper clipping "Council to apologise for cycad sale hoax" on page 47), but I still want to carry this message through.

Hannes Robbertse

sal word is uit. Die konferensie word deur die Broodboom Vereniging van Sjina aangebied. Belangstellende lede wat nie die omsendbrief ontvang het nie, kan met die konferensievoorsitter, Prof CHEN Chiajui, IV International Conference on Cycad Biology, c/o Institute of Botany, Academia Sinica, Xiangshan, Beijing 100093, CHINA in verbinding tree. Sy faksnommer is, 0086-01-8319534 en sy E-posadres is, lis@botany.ihep.ac.cn (kyk ook "CYCAD 96" op bladsy 31).

Dit wil voorkom asof die bewerings oor die broodbome in Oos-Londen ontken is (kyk koerantuitknipsel "Council to apologise for cycad sale hoax" op bladsy 47), maar ek wil nogtans hierdie boodskap deurstuur.

Hannes Robbertse

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1) PRINTING AND DISPATCH OFFICER / DRUK- EN VERSENDINGSBEAMPTE:

Piet Vorster
Botany/Plantkunde Dept.
University of/Universiteit van Stellenbosch
Private Bag/Privaatsak X1
7602 Matieland

2) EDITOR OF/REDAKTEUR VAN "ENCEPHALARTOS"

Isabella Claassen
P.O. Box 25688
0105 Monumentpark

FOCUS ON ... FOKUS OP ...

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:

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:

CYCAS REVOLUTA Thunberg

Roy Osborne[1] and Hajime Tomiyama[2]

[1]Department of Chemistry, University of Natal, 4001 Durban, South Africa

[2]66-2 Oki, Yomitan-son, Okinawa, 904-03 Japan

INTRODUCTION

Although it is undoubtedly the most popular ornamental cycad in the world, and although more has been published in the scientific literature on this species than any other cycad, most westerners know very little of *Cycas revoluta* in the wild. Indeed, rumours have been circulating that the species is "near extinct" in Japan. In an attempt to redress this imbalance, we are pleased to present our findings in this "Focus on....." contribution.

Cycas revoluta has been known, respected and utilised by the Japanese people for many centuries. This enormously popular plant has been widely-cultivated as an ornamental in shrines and temples, in public and private garden plantings, in containers and as a bonsai subject, quite apart from having a variety of other economic uses (see later). One of the many mainland Japanese names for the species is *sotetsu* (lit. trans. "coming back from the dead by iron"); one explanation of this name seems to be that, when a rusted iron nail is driven into the trunk of a debilitated cycad, the plant is greatly rejuvenated. Other Japanese names, now mainly obsolete, for *C. revoluta* include: *hou bi* (referring to the tail feathers of *hou ootori*, a traditional bird of China), *hou bi shou* ("resembling a broken banana leaf"), *sha ka shou* ("the firebreak banana"), *ban shou* ("the barbarian's banana"), *tesshou* or *tessio* ("the iron banana") and *tetsu ju* ("the iron tree"). In the Ryukyu islands, an even more bewildering array of local names, mostly variants on *sotetsu* and *sutiichi*, is used for the whole plant, e.g. *hichichi, hitichi, hituku, satetsu, shichichi, sichi, sichidzi, sidzichi, sidzidzui, sihittu, sirichi, sitechi, sitichi, sitidzi, sitochi, sitsuchi, sitsudzu, situchi, siudzu, suchichi, susitykuki, sutachi, sutticha, sutichi, sutta, sutuku, suutichi, syutta, syutto* and *tsudzu*. Also in the Ryukyus, the seed, rather than the plant, has its own set of names, viz. *nari* or *sutitsi-nari* (on Amami-O-shima), *yanabu* (on Okinoeraba-shima), *nadzu* (on Miyako-jima) and *mii* or *kungama* (on Ishigaki-shima).

C. revoluta was described botanically to the western world by the Swedish botanist, Carl Thunberg, in his work on the Flora of Japan (Thunberg 1784), although names such as *Palma farinifera japonica, Sotitsou japonensibus, Palma prunifera japonica, Palma japonica* and *Palma vinifera belgarum* had been used for this plant by various European writers for about 100 years prior to Thunberg's description. Thunberg recognised the Japanese cycad as being a species of *Cycas*, the genus having become "official" when used by Linnaeus in 1753 for the description of *C. circinalis*. Common names for *C. revoluta* in the western vernacular include Sago Palm, Sago Cycad, Japanese Sago Palm and Fern Palm. These names are to some extent misleading, as the true sago comes from trunks of the palm genus *Metroxylon*, particularly *M. sagu*, widely cultivated throughout south east Asia for this purpose.

DISTRIBUTION AND ECOLOGY

Cycas revoluta does not grow naturally on the Japanese mainland itself, but is endemic to the southernmost part of Kyushu and the southern Japanese Archipelago (Figure 1). The latter comprises islands such as Tanega-shima and Yaku-shima (collectively the Osumi-shoto), and the chain of islands known as the Nansei-shoto or the Ryukyu Islands, the principal ones of which are Amami-O-shima, Tokuno-shima, Okinoerabu-shima (these comprising the Amami-shoto or northern Ryukyus), Okinawa and its own offshore islands (Okinawa-shoto or the central Ryukyus) and Miyako-jima, Ishigaki-shima, Iriomote-jima and associated

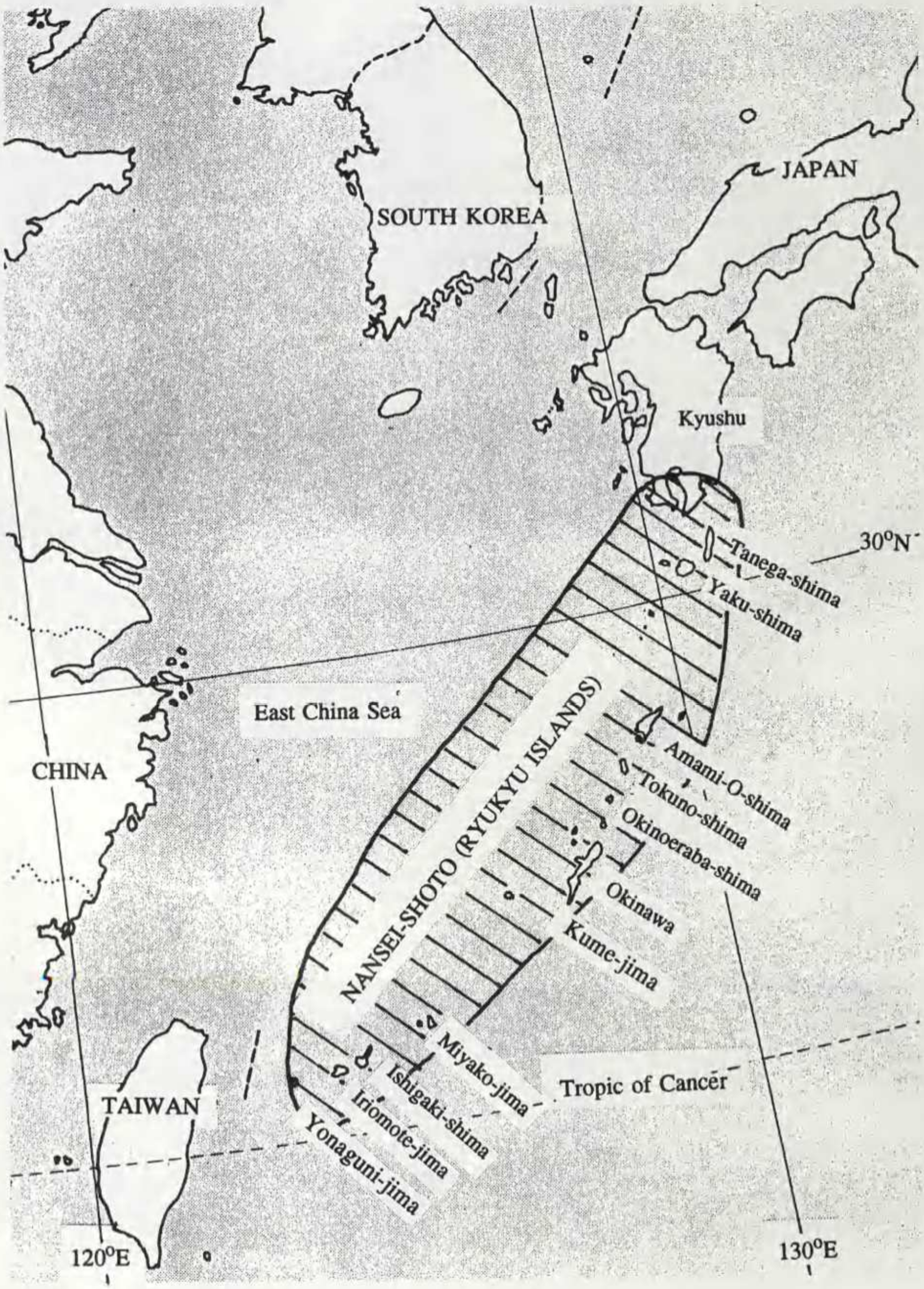


Figure 1 Distribution map for *Cycas revoluta*.

Figure 2 *Cycas revoluta* plants on near-vertical seaside cliffs near Kagoshima in southern Kyushu, towards the northern limit of the distribution for the species. The mountain in the background is Kaimon-dake, a volcano which last erupted in the 9th Century. Photo: Takashi Maruoka, in *Shukan Asahi Hyakka Sekaino Shokubutsu*, December 1977.

Figure 3 A clump of *C. revoluta* plants on a limestone cliff at Uza, Yomitan-son, Okinawa Island in the Ryukyus. Photo: Hajime Tomiyama.

smaller islands (these being the Sakishima-shoto or southern Ryukyus). Interestingly, the westernmost of these islands, Yonaguni-jima, is within 125 kms of Taiwan, the home of the species now known as *Cycas taitungensis*.

There are presently estimated to be several hundred thousand *C. revoluta* specimens in this subtropical fragmented island distribution pattern. Most plants are found on near-vertical cliffs along the coast or on the sides of limestone mountains (Figures 2-4). They are more rarely found on the forest floor but only in a limestone environment. The plants tolerate harsh conditions of salt water spray, fiercely strong winds and seasonal typhoons, drought and even snow, but one consistent requirement for their survival is adequate sunlight. Rainfall varies widely, generally averaging between 2000 and 2500 mm annually, the wettest months being April to September. Temperatures range from about 7-20 °C in winter and 26-33 °C in summer and the

Figure 4 *Cycas revoluta* on coastal sand dunes at Gushikawa, Gushikawa-son, Kumejima, Okinawa. Photo: Hajime Tomiyama.

Figure 5 Part view of the multi-trunked 800-1000 year old female specimen of *C. revoluta* at Kawazu, Japan. The tallest stem is 10 m in height; there are 21 branches in total and the basal circumference is 2.5 m. Photo: Hideo Shimizu.

humidity is usually between 60 and 70 %.

Seed dispersal is accomplished by birds. The native crow, *Corvus macrorhynchos*, appears to be the main dispersal agent (Ishida 1985) but the thrush (*Turdus maumanni*) and the bulbul (*Hypsipetes amaurotis*) are also known to eat the fleshy outer portion of the seeds.

Figure 6 Part of a group of 15 specimens of *C. revoluta* at Orto Botanico, Naples, Italy. The first specimen was brought from Japan by Queen Carolina in 1813. Photo: Roy Osborne.

Figure 7 *Cycas revoluta* specimens with a Japanese stone lantern in the Durban Botanic Gardens, South Africa. Photo: Roy Osborne.

Not surprisingly, many very old specimens are found in gardens in Japan. A photograph appearing in the books of Weiland (1906) and Pant (1973) shows an impressive group of plants, in the Ryugeji Temple at Shimizu, near Fjiri, about 200 km west of Tokyo, the largest of which measured 8 m in height and 2 m in basal circumference. A single specimen at Kawazu, about 20 km from the Atagawa Tropical and Alligator Garden, has a main trunk 10 m in height, a total of 21 branches and a 2.5 m basal circumference; this plant is thought to be between 800 and 1000 years old (Figure 5). These and several other similar specimens and documented in a Japanese publication by Dr Keiji Uehara (1970).

Cycas revoluta is better represented in botanic gardens, worldwide, than any other cycad. Many of these specimens are in display plantings planned many years ago. The results of such designs are seen in gardens

such as Huntington Botanic Gardens in Los Angeles; the Orto Botanico in Naples, Italy (Figure 6); the Giardino Botanico Hanbury in Latte, Italy; the Durban Botanic Gardens in South Africa (Figure 7); and numerous "Japanese Gardens" throughout the world. Curiously, the largest reported single "collection" of this cycad is the Disneyworld Gardens, Florida, U.S.A., which has in excess of 100 specimens at the Magic Kingdom, the Epcot Centre and the Disney-MGM studios.

DESCRIPTION

Data which follow are taken mainly from Jones (1993), Miquel (1842), Pant (1973) and Schuster (1932) but have been modified on the basis of personal observations.

1. STEM

Although typically a medium sized pnat, *Cycas revoluta* will have stems up to 3 m tall and 350-400 mm in diameter, many cases of older plants of much greater height are, however, known. Trunks are usually unbranched, but dichotomous forks are sometimes seen. The trunk surface is densely patterned with the remains of leaf, bract and sporophyll bases. Basal suckers and stem offsets are regular and prolific in appearance. The stem apex is densely hairy and protected by whorls of sharp leathery bracts.

It is quoted in several references that male plants of *Cycas revoluta* bear more stem suckers than female plants, but the authors are not able to substantiate this through personal observations. (Readers of this magazine are invited to submit comments and photographs on this point).

2. LEAVES AND LEAFLETS

Young leaves emerge in flushes in early summer, covered with a layer of brown hairs which are soon lost as the leaf develops and leaflets "unroll". Mature leaves are a dark, glossy green, typically about 0.75-1.5 m long. The rachis bears numerous, crowded, evenly-distributed leaflets inserted at an angle of about 45°. Median leaflets are about 90-180 mm long and 5-6 mm wide, the leaflet margins showing the very pronounced "rolling-under" or revolute appearance which distinguishes this species from all other *Cycas* taxa. Leaflets are straight to slightly falcate, with a conspicuous midrib and terminate in a sharp point. The lower leaflets reduce abruptly in size to be replaced by a few short thorns along a petiole about 100 mm in length.

3. REPRODUCTIVE STRUCTURES

Male plants of *C. revoluta* bear a single apical cone (Figure 8). These structures are cream to pale brown in colour, compact, narrowly cylindrical to ovoid in shape, up to 700 mm long and 60-80 mm in diameter with short peduncles. Microsporophylls are narrowly wedge-shaped, 20-40 mm long and 10-17 mm wide with a short upturned point about 5 mm long. Male cones produce copious amount of pollen which is believed to be wind transported.

Figure 8 A male cone of *C. revoluta* at the pollen shedding stage. Photo: Roy Osborne.

The female plants bear a whorl of pale white megaporophylls tightly packed at first, opening out at the time of pollen receptivity (Figure 9) and later closing in to a loosely-compact cluster, tawny brown in colour (this developmental sequence was illustrated in "*Encephalartos*" 31: 23). The individual sporophylls, covered with an indumentum of brownish hairs, are 120-200 mm long and end in an apical lobe 40-60 mm long by 20 mm wide, with margins deeply incised to form 12-18 tapered lobes about 20 mm long, i.e. the sporophyll blades are described as pectinate. The morphology of the female sporophyll is a key feature in separating *Cycas* species one from another. Each megasporophyll bears 4-6 densely hairy ovules which enlarge rapidly after fertilisation to give, after about two months, seeds which are bright orange to red, glabrous but loosely hairy, and which measure about 20-35 mm by 15-25 mm (Figure

10). Yellow-coloured seeds are rare, but have been reported. Seeds germinate sporadically over a 6-18 month period.

Figure 9 The female sporophylls of *C. revoluta* open outwards for a short time when the ovules are ready for pollination. Photo: Roy Osborne.

AFFINITIES

In his presentation at the CYCAD 93 Conference, Ken Hill (Hill, in press) divided the genus *Cycas* into 4 sections: Section Asiorientales, Section Stangerioides, Section Indosinenses and Section Cycas. The first of these, Section Asiorientales, contains only two species, *Cycas revoluta* Thunberg and *C. taitungensis* C.F.Shen, K.D.Hill, C.H.Tsou & C.J.Chen (previously and erroneously referred to as *C. taiwaniana*). Implicit in this is that the two taxa have strong affinities, but differ from the species in the remaining three sections. Furthermore, in the taxonomic treatment of the Taitung cycad (Shen *et al.* 1994), the authors maintain that *C. taitungensis* is, on average, slightly more primitive than *C. revoluta*. If this is the case, it may be argued that both species originated from common stock in the south and that a speciation event, combined with a north-easterly migration along the Ryukyus, resulted in the occurrence of *C. revoluta*.

Figure 10 A fully developed cluster of *C. revoluta* female sporophylls, some removed to expose the seeds. Photo: Yoshitaka Takatsuki.

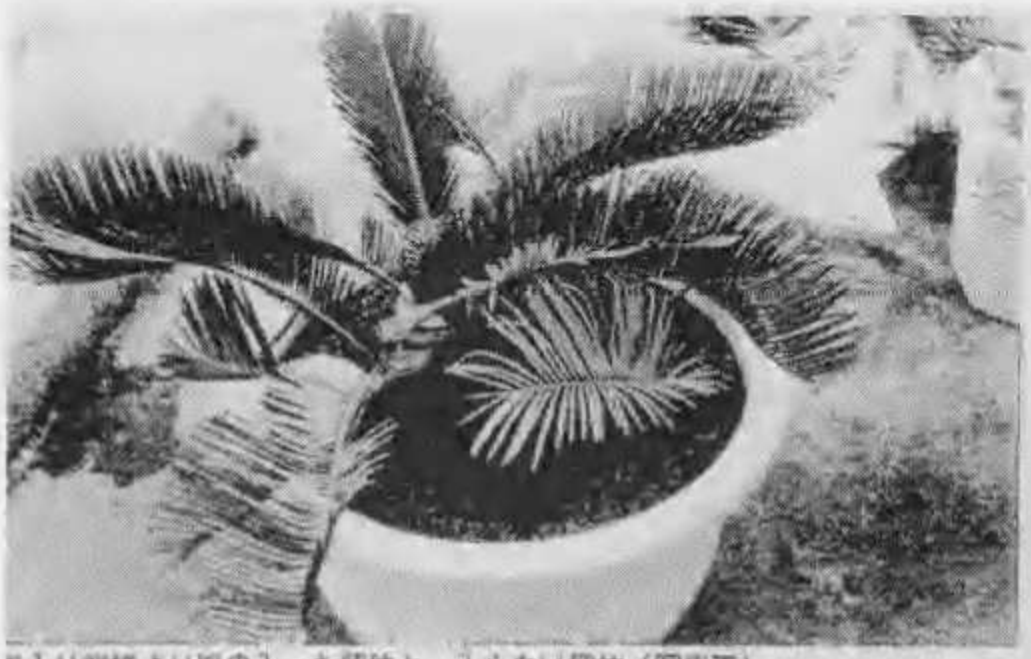
Figure 11 A spectacular fan-shaped cluster of crested male cones on *C. revoluta* at the Shenzhen Fairy Lake Botanical Garden, China. Photo: Dingyue Wang.

UNUSUAL FORMS

With its wide distribution and large numbers in the wild and, more so, in cultivation, it is not surprising that there is some variation within *Cycas revoluta*. However, these forms are not true botanical taxa at the subspecific (or lower) level, but rather names by which horticulturists can conveniently identify them. A fascinating description of these forms is given by Toshihiko Satake (*Satake-san*) (Satake 1981) in which he lists nine cultivars:

- *C. revoluta* var. *cristata* (Jap: *tosaka*, *shishi-sotetsu* or *tategami-sotetsu*), the "cockscomb" or crested form (Figure 11).
- *C. revoluta* var. *diplofoliolum* (Jap: *matsuba-sotetsu*), a form in which varying numbers of the pinnae are dichotomously forked, or bifid (see Figure 5 in "*Encephalartos*" 40, p. 15).
- *C. revoluta* var. *corrugata* (Jap: *chirimen-sotetsu*), a rare cultivar in which the trunks have vertical

ソテツの研究・収集などの情報がほしい



斑入り羽葉より斑の入った個体と、入らない個体（写真下）

羊羹様黄金斑を出した個体（写真下）

初めてクリーム黄色を出した個体（写真右）

この個体は黄紗干物斑入りになると思います。幼苗時より確実に全部の葉に斑が入り、弧軸で斑の部分はオレンジ黄色にはならないか、非常に安定した個体です。

この個体は、増殖のため親株を切り取ったもので、今のところ8株ほど出ていますが、そのうち2株は全てクリーム黄で、中の1株は2年連続で全黄葉が出た変異株です。

この個体は、私の所で2番目に大きな株で、葉の長さが、1m程あります。写真の様に、斑の部分が、濃いオレンジ色になり、非常に目立つ色です。緑色の普通葉も混じって出ますが、これまでに、このオレンジ斑が全体の80%をしめた事もあります。

Figure 12 The variegated forms of *C. revoluta*, showing a colourful contrast between the sulphur yellow and dark green parts of their foliage, are much sought after by Japanese enthusiasts. From *Midori to Seikatsu*, August 1989.

ゴールデンウィークの5月頃から黄金色に変わっていく糸数さんのオウゴンソテツ。

Figure 13 One of the particularly striking and rare *C. revoluta* variations which has vivid yellow leaves, from March through to June, later turning green. From *Midori to Seikatsu*, August 1988.

stripes on the leaf and bract bases.

- *C. revoluta* var. *variegata* (Jap: *fuiri-sotetsu*), a much sought-after mutant form with variegated leaves (Figure 12).
- *C. revoluta* var. *alba* (Jap: *shiroba-sotetsu*), a form in which an entire crown of leaves is creamy-yellow (Figure 13).
- *C. revoluta* var. *aurea* (Jap: *kogane-sotetsu*), which has golden-yellow tips to the pinnae.
- *C. revoluta* var. *hystrix* (Jap: *hari-sotetsu*), with

elongated and persistent prickles on each bract.
C. revoluta var. *involuta* (Jap: *tako-sotetsu*), a "morbid-looking" cultivar in which the leaflets remain involute and are covered with brownish hairs.
C. revoluta var. *glabra* (Jap: *aoe-sotetsu*), a rare form in which the undersurface of the leaflets is entirely glabrous, giving a completely smooth appearance to the entire plant.

Figure 14 An illustration of a *C. revoluta* specimen in the bonsai style known as *hoso* (tree-formed palm). After Weiland, 1906.

Apart from these cultivars, there has long been an enormous interest in the use of *C. revoluta* for bonsai, especially, of course, in Japan (Hodge 1973). These specimens, variously referred to as dwarf *Cycas*, mini-*Cycas* or *C. revoluta* var./forma *nana* (Jap: *Ryukyu-sotetsu* or *kumeyama-sotetsu*), may be of considerable age and great value (Figure 14). Satake's text (Satake 1981) tells that one method of obtaining the desired shape is that a seed is germinated under sandy soil and the growing plant repeatedly covered with more sand as the stem grows. This process results in a long narrow trunk but the growth rate is only about 3-5 mm per year. It can thus take 60-100 years for a plant to reach 300 mm in height. The trunk diameter is typically about 25 mm and bonsai protocol dictates that the height must exceed four times the diameter. Leaves and roots are trimmed to maintain a slow growth rate and reduce the trunk diameter.

Figure 15 A 100 year old plantation of *C. revoluta* at Ankyaba, Tatsugo-cho, Amami-O-shima. These plantings were established many years ago to serve as a possible resource in times of famine. Photo: Yoshitoka Takatsuki.

ECONOMIC USES

Apart from its enormous economic value to the local and international horticultural industry (see below), *Cycas revoluta* is known to have a number of other economic uses. Indeed, the importance of these plants to Japan was so great that their export was an offence punishable by death in the 18th Century (Tessier *et al.* 1793). Best known is its use in Japan as a source of food, particularly in times of famine. For this purpose, several "plantations" were established many years ago (Figure 15). Both seeds and stems are used as a soya-type feed (*miso*, *syoyu*), a cake-like foodstuff (*mochi*) and a variety of soup (*kayu*). This consumption has not been without problems arising from the inadequate treatment to remove the methylazoxymethanol glycosides, cycasin and macrozamin, (and possibly the non-protein aminoacid ß-methylamino-L-alanine, BMAA), toxins implicated both in acute conditions and the more insidious chronic effects of amyotrophic lateral sclerosis - Parkinsonism Dementia (ALS-PD) and associated neurological disorders (numerous references). The common methods of detoxification of cycad seeds and stem tissues in the Ryukyus is that the material is variously sliced, sun dried, fermented and steeped in repeated changes of water before being pounded into a flour (Nishida 1934). Apart from valuing the cycads for their food harvest, the Japanese also use cycad starch for laundry purposes, a 1925 report indicating that 230 tons of *C. revoluta* seed was harvested annually for this purpose (Nishida 1934). Furthermore, the people of the Ryukyus sometimes distil an alcoholic beverage called *amamoti* from the fermenting seeds (Haring 1952) and occasionally eat the young succulent cycad leaves as a vegetable (Kinch 1883).

C. revoluta plants also find agricultural usage as windbreaks or hedge plants along fields, this being a common practise in the Amami-shoto (northern

Ryukyus). In addition, it is said that the nitrogen-rich leaves were used as a fertiliser for rice, sweet potatoes and sugar cane (Whiting 1963), but this practice is now discontinued. The species has in the past been used for firewood.

Medicinal applications of *C. revoluta* seeds include use of a decoction (Jap: *muroshi, muroka* or *sotetsujitsu*) in promoting menstruation, as an astringent or hydragogue, to check diarrhoea, as an expectorant and a cough medicine (Whiting 1963 and personal observations). Leaf material is also used to cure hangovers! Chinese herbalists make a preparation called *tie shu yie* from dried leaves of *C. revoluta*, claiming this to be effective for the promotion of circulation, serving as a haemostatic agent and for the treatment of diarrhoea and back pain (Huang 1993).

Minor uses of *C. revoluta* include the Japanese export, chiefly from Amami-O-shima and Okinawa, of the specially treated leaves to Europe and America for use in floral decorations (Wagner, in Schuster 1932), as many as 3 million leaves being exported to the U.S.A. in one particular year (Boyer 1992). A further reference tells that the trunks provide an attractive spotted "wood" which was used at Mount Hakone, near Yokohama, for the manufacture of small boxes, dishes, flask bases, etc, a craft known as "Hakone work" but which is no longer practised (Thieret 1958).

By far the most important use of *C. revoluta* is the vast horticultural trade in this plant. For example, in 1993, 182 tons of seed was exported from the Ryukyus, mainly to Hong Kong and Taiwan, the material fetching 200 Yen ($2.00) per kilogram. In addition approximately 110,000 plants were exported in the same year, mostly originating from Amami-O-shima where there are several very large commercial nursery operations (Figure 16).

Figure 16 View of part of an enormous cycad nursery operation at Ankyaba, Tatsugo-cho, Amami-O-shima. Photo: Yoshitaka Takatsuki.

CULTIVATION

The Japanese cycad is remarkably easy and tolerant in all respects of its cultivation, this undoubtedly adding to its popularity as an ornamental. It is one of the few cycads that can be grown out-of-doors in temperate climates, apparently able to withstand temperatures as low as -6°C (Boyer 1992). Since all *Cycas* seeds which develop to full size are fertile, there is not the usual risk (as with *Encephalartos*) that one may be attempting to germinate infertile seeds. Germination of seeds is hastened by the somewhat tedious process of removing the outer fleshy layer. As with other cycad seeds, warmth and moisture promote germination. Propagation by basal suckers, and those which arise along the trunk, is easily accomplished and usually offers the advantage of one's knowing the sex of the plant. Incidentally, two cases have been recorded of sex reversals in *Cycas revoluta*, one from male to female (Kemp 1985) and one from female to male (Osborne 1994).

C. revoluta is relatively fast growing but, like most plants, responds to adequate light, regular watering, good soil and occasional feeding, particularly in spring and early summer. Since it grows in the wild on limestone cliffs, it is wise to ensure that the soil is slightly on the alkaline side. Leaves are sometimes prone to infection by scale insects, particularly if plants are stressed, and application of a commercial insecticide may be necessary to control this.

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ARTICLES / ARTIKELS

THE SHENZHEN FAIRY LAKE BOTANICAL GARDEN

Si-Lin Yang[1], Ding-Yue Wang[2] and Roy Osborne[3]
[1]Department of Horticulture, Southwest Agricultural University, Chongqing, Sichuan 630716, China
[2]Fairy Lake Botanical Garden, Liantang, Shenzhen, Guangdong 518004, People's Republic of China
[3]Department of Chemistry, University of Natal, 4001 Durban

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Although three reserves have been set aside for the protection of Chinese cycads in habitat (the Panzhihua Nature Reserve in the Sichuan Province and the Pu-du-he Nature reserve in the Yunnan Province for *Cycas panzhihuaensis* and the Taitung Hong-yeh Village Cycas Nature Preserve in Taiwan for *Cycas taitungensis*), there has not until recently been any effort in *ex situ* conservation planning. The Shenzhen Fairy Lake Botanical Garden (SFL), situated in a most attractive setting in China's Guangdong Province, has taken the initiative in a strategic plan to become one of the world's important repositories for cycad germplasm.

Shenzhen, a principal economic region of China, covering an area of 2020 km^2, shares its border, the Shenzhen River, with Hongkong, Although it started as only a small town, with a population of less than 20,000 people before 1980, it has now become one of the large and important cities of China, the present population being about three million.

Shenzhen Fairy Lake Botanical Garden takes its name from a lake in the garden called "Fairy Lake". Folklore has it that, long long ago, visiting fairies were so intoxicated by the beautiful scenery at the site that they forgot to go home and stayed there.

The Garden, located at 22 °34'N, 114°10'E, covering an area of 590 hectares, is important not only for tourism, but also for scientific research, science popularization and horticulture. Five scenic areas and fifteen special plant sections are being established in the overall plan, preparatory work on which commenced in 1982. At present, scenic constructions include the Lake area, Temple area and Fairyland area as well as features with captivating names such as the Double-fitting Pavillion, Luting Village Ferry, Fairy Ferry, Hill Pond Field Navigation, Eleven-arch Bridge, Bamboo-shading Depth and Buddhism-developing Temple. The plant collections presently include a palm garden, cycad garden (Figure 1), bamboo garden, fruit garden, litchi garden, aquatic plant garden, conifer garden, shade-loving plant garden, rare and endangered tree garden and a desert garden. SFL was formally opened to the public on 1 May 1988 and between 600,000 and 1,000,000 people now visit the garden anually.

The Shenzhen climate, with an average annual temperature of 22°C and rainfall of nearly 2000 mm, coupled with the garden's hilly terrain and the

Figure 1 View of part of the Shenzhen Fairy Lake Botanical Garden with cycad plantings. Photo: Ding-Yue Wang.

Figure 2 A group of *Cycas szechuanensis* specimens at SFL. Photo: Ding-Yue Wang.

Figure 3 A walkway in SFL with *Cycas taitungensis* plantings on the right. Photo: Ding-Yue Wang.

availability of a variety of microhabitats, is particularly appropriate for *ex situ* cycad conservation plantings. Prior to 1988, the garden had representative material of *Cycas inermis, C. micholitzii, C. revoluta, C. rumphii, C. szechuanensis* (Figure 2), *C. taitungensis* (Figure 3) and *C. taiwaniana.* Since that time, collaborative expeditions in association with researchers Terrence Walters (then from Fairchild Tropical Garden, Miami, U.S.A.) and Si-Lin Yang (Southwest Agricultural University, Chongqing, China) have lead to the development of a new 2 hectare site to accommodate breeding groups of each *Cycas* population in China. The collecting phase is still continuing and will be followed by an enriching period over the next two years and a

research period from 1997, when SFL aims to become one of the largest *ex situ* conservation and research centres for cycads worldwide, also having herbarium and laboratory facilities.

SFL plans to extend international links with other gardens and cycad enthusiasts. Ding-Yue Wang, the cycad researcher of the garden, who manages the cycad collection, has made three cycad expeditions in China and will participate in another expedition this year. The garden hopes to have specimens of all the Chinese cycads before the end of 1994. Anyone interested in Chinese cycads, including the exchange of dried specimens, seeds, suckers and plants, is invited to contact Mr Wang at: *Fairy Lake Botanical Garden, Liantang, Shenzhen, Guangdong 518004, People's Republic of China. [Fax/Tel: 0755-5736917; Tel (home): 0755-5736570].*

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Authors: *Dr Si-Lin yang is presently a visiting scientist to the University of Florida, Florida, USA and will be supported by the Fairchild Tropical Garden and the Montgomery Foundation in a new cycad expedition to China, Vietnam, Laos and Thailand in the latter part of 1994. Ding-Yue Wang is horticulturist at the Shenzhen Fairy Lake Botanical Garden, while Professor Roy Osborne is with the University of Natal, Durban, South Africa.*

STOMATAL DENSITIES ON THE LEAVES OF SOME AFRICAN CYCADS

N. Grobbelaar and I. van der Westhuijzen
Botany Department, University of Pretoria, 0002 Pretoria

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In an experiment in which it was attempted to produce whole new plants from isolated whole cycad leaves of several indigenous cycad species (Proceedings of CYCAD 93) it was observed that the aerial parts of the isolated leaves of *Encephalartos transvenosus* all dried up completely within a few weeks whilst none of the leaves of some of the other species showed signs of dessication. Because this could be attributed to differences in the stomatal densities and consequent rates of transpiration between species, it was decided to make a comparative study of the stomatal densities of all those *Encephalartos* species of which material was readily available.

A pinnule was removed from the central part of a mature leaf and coated on both surfaces with colourless nail polish. For each species five plants from different localities (mostly private gardens) were sampled unless indicated differently. The dried film of nail polish was removed from the leaf, mounted in glycerol and the stomates counted by means of a projection microscope. For each leaf impression, the stomates in four microscope fields were counted. The results are given as a mean value for the total leaflet surface area. In those cases in which stomates occurred on the abaxial surface only, the stomatal density on the surface was therefore double the value provided in the table below. All the species with amphistomatic leaf surfaces that were encountered, had similar stomatal densities on the adaxial and abaxial surfaces.

Fourteen species, viz. *E. chimanimaniensis, E. cycadifolius, E. friderici-guilielmi, E. heenanii, E. humilis, E. inopinus, E. laevifolius, E. lanatus, E. latifrons, E. longifolius, E. natalensis, E. paucidentatus, E. transvenosus* and *E. woodii* have structures on their adaxial leaflet surfaces which resemble pores but which are not stomates. They are not bordered by guard cells and they lie in the same plane as the ordinary epidermal cells whilst the true stomates occur in depressions in the leaflet epidermis. Koeleman (1978) observed similar structures on some of the species and speculated that they may be scars of dislodged leaf hairs.

The stomates are not distributed evenly over a leaf surface but are generally limited to the intercostal zones except in the case of *E. gratus*. In this species the

Table 1 Stomatal densities of some *Encephalartos* species. The species are arranged in decreasing order of stomatal density. Specific epithet between inverted commas, indicates taxon not officially recognized.

Cycad species	No. of plants sampled	Standard deviation	Stomates per mm^2
Encephalartos transvenosus	5	4.04	104.4
E. paucidentatus	5	4.25	98.8
E. natalensis	5	3.45	79.8
E. woodii	5	2.75	78.4
E. altensteinii	5	6.11	72.4
E. latifrons	5	6.09	67.7
E. friderici-guilielmi	5	1.47	67.0
E. lebomboensis	5	3.84	65.5
E. cycadifolius	5	5.03	65.2
E. chimanimaniensis	3	1.43	64.3
E. pterogonus	2	3.50	63.7
E. laevifolius	5	4.93	61.8
E. concinnus	2	1.13	61.0
E. arenarius	5	4.98	60.6
E. manikensis	4	0.52	59.9
E. ghellinckii	5	1.77	59.0
E. munchii	3	2.12	59.0
E. heenanii	5	3.16	57.9
E. longifolius	5	2.64	58.3
E. ngoyanus	5	1.57	57.8
E. princeps	5	2.11	57.4
E. ferox	5	2.35	54.5
E. kisambo	1	----	52.5
E. "piet-retiefii"	5	3.82	51.7
E. horridus	5	4.22	51.6
E. lanatus	5	1.64	46.7
E. hildebrandtii	2	4.75	46.0
E. humilis	5	3.06	44.6
E. caffer	5	2.40	42.9
E. trispinosus	5	1.32	41.8
E. inopinus	5	2.09	41.7
E. "msinga"	2	2.25	40.7
E. lehmannii	5	3.54	40.5
E. barteri subsp. *barteri*	1	----	39.5
E. umbeluziensis	5	2.50	34.4
E. villosus	5	2.03	33.2
E. gratus	2	2.75	33.0
E. bubalinus	1	----	32.4
E. eugene-maraisii	5	1.50	30.5
E. dyerianus	4	3.70	30.5
E. aemulans	2	1.68	30.4
E. dolomiticus	3	2.49	29.6
E. middelburgensis	5	2.97	28.4
E. poggei	1	----	28.0
E. "giant cupidus"	2	1.89	23.9
E. "venetus"	1	----	22.8
E. cupidus	5	2.15	22.4
E. cerinus	2	7.04	17.5

stomates are evenly distributed over the whole abaxial leaflet surface. It was difficult to assess the stomatal density of species such as *E. paucidentatus* and *E. heenanii* which has pronounced intercostal grooves on their abaxial leaflet surfaces because the stomates in those cases do not occur in a flat plane. The very

revolute nature of the leaflets of *E. ghellinckii* also made an accurate assessment of its stomatal density difficult.

RESULTS AND DISCUSSION

General. The results are presented in Table 1. The only statistically significant discontinuity in the results occurs between *E. paucidentatus* and *E. natalensis*. However, the stomatal density of many species that are widely separated in the table differ statistically significantly at the 5% level of probability.

Localities. Material was drawn from a total of 10 localities within the Pretoria magisterial district as well as from the Durban Botanical Garden. Using the "Multiple Range Test", it was found that within a species, none of the results differed significantly at the 5% level of probability between any of the localities sampled. It would therefore appear that for a given species, the locality at which a test plant grew, did not materially affect its stomatal density.

Amphistomatic leaflets. The unofficial species referred to as *E. "giant-cupidus"* and *E. "venetus"* by cycad collectors as well as the officially recognized *E. cupidus, E. dyerianus, E. eugene-maraisii, E. dolomiticus, E. middelburgensis* and *E. poggei* were all found to have amphistomatic leaflets. It is interesting that all these species with the exception of *E. poggei* have greyish-blue leaves. After *E. cerinus*, which has the lowest stomatal density recorded in this study, the eight species with amphistomatic leaflets occupy the lowest positions in the table. However, some other cycads with similar greyish-blue leaves, such as *E. cycadifolius, E. friderici-guilielmi, E. horridus, E. laevifolius, E. princeps, E. lanatus* and *E. lehmannii* have considerably higher stomatal densities and are not amphistomatic.

Because *E. transvenosus* has the highest stomatal density of the species examined, it is tempting to conclude that this was the reason for the rapid dessication of the isolated leaves that was used in the regeneration experiment referred to above. In that experiment the second largest percentage of leaves that were lost through dessication were those of *E. paucidentatus* which, from Table 1 also has the second highest stomatal density of the species experimented on.

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CYCADS AT THE BOGOR BOTANIC GARDENS, INDONESIA

Paul I. Forster
Queensland Herbarium, Meiers Road, Indooroopilly, Queensland 4068, Australia

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During February 1992, David Liddle and I visited *Herbarium* Bogoriense (BO) to examine the asclepiad holdings at that institution (Forster & Liddle 1994). For a period of two weeks we stayed at the Bogor Botanic Gardens guesthouse (Figure 1) and were able to explore many areas of the extensive surrounding gardens.

The Bogor Botanic Garden is located on the island of Java in Indonesia and was established in 1817 during the Dutch colonial era. The Garden contains predominantly tropical plants and there are extensive plantings of rainforest trees, many dating from last century. There are also extensive plantings of showy tropical plants such as Heliconias, gingers and orchids, plus various miscellaneous epiphytes in the trees and planthouses.

One area of the Gardens is devoted to a cycad planting (Figures 2-6), predominantly of large old plants. Plants

Figure 1 Bogor Botanic Gardens guesthouse. David Liddle for scale.

Figure 2 Part of the cycad planting at Bogor Botanic Gardens.

Figure 3 Small plant of *Lepidozamia hopei*.

Figure 4 Group of mainly *Encephalartos hildebrandtii*.

that we particularly noted, included small plants of *Lepidozamia hopei* (Figure 3), several very large clumps of *Encephalartos hildebrandtii* (Figures 4, 5), a large clump of *Bowenia spectabilis* (Figure 6), and some medium sized plants of *Macrozamia mountperriensis*. The clumps of *E. hildebrandtii* must be of considerable age, and could well have been established in the 1880's as this species was apparently widely distributed to

Figure 5 Large clump of *Encephalartos hildebrandtii*.

Figure 6 Large clump of *Bowenia spectabilis*.

Botanic Gardens during this period (Jones 1993). Interestingly enough, the plants of *M. mountperriensis* were labeled as such, indicating that the nomenclature used on the labelling in general was quite old, as it had obviously not been changed to accomodate Johnson's (1959) unnecessary lumping of this species with *M. miquelii* (Forster & Jones 1992).

While the cycad planting at Bogor Botanic Gardens covers relatively few species, the plants are well worth visiting because of their large size and good development.

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ATAGAWA TROPICAL & ALLIGATOR GARDEN, JAPAN

Hideo Shimizu[1] and Roy Osborne[2]
[1]Atagawa Tropical and Alligator Garden, Atagawa, Higashi-izu, Kamo-gun, Sizuoka, 413-03 Japan
[2]Department of Chemistry, University of Natal, Durban, South Africa

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Atagawa Tropical and Alligator Garden (Figure 1) was founded in 1958 by Mr Wataru Kimura, father of the present owner, Mr Satoshi Kimura. The novel concept was based on the integration of a living crocodilian and a tropical plants collection and incorporating a local hot spring as a source of energy. This immaculately-kept and colourful garden, occupying a 33 000 m^2 site approximately 125 km south-west of Tokyo is situated in a rural but popular resort site on Japan's Pacific coast. The garden has a staff of 60 and attracts an astonishing 600 000 to 700 000 visitors annually.

Figure 1 Main entrance to Atagawa Tropical & Alligator Garden at Sizuoka, Japan. Photo: Hideo Shimizu.

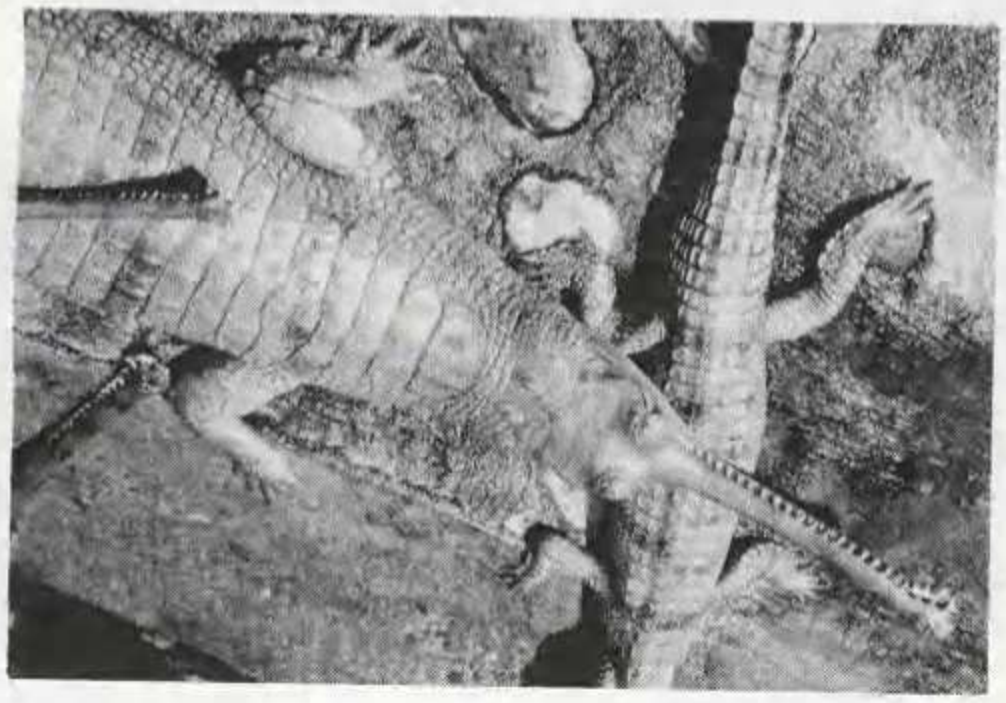


Figure 2 Of special interest in the reptile collection are these specimens of the rare Indian gavial, *Gavialis gangeticus*. Photo: Hideo Shimizu.

Figure 3 A popular resident of the Atagawa garden is this baby red Panda, *Ailurus fulgens*. Photo: Hideo Shimizu.

Figure 4 The enormous leaves of *Victoria cruziana* add a special feature in the species orchid house. Photo: Hideo Shimizu.

At present, the Atagawa Garden has more than 400 crocodilians representing nearly all the species in the world (Figure 2). Other animals include the Amazonian manatee, the giant salamander, a breeding colony of red pandas (Figure 3) (a special favourite of the younger visitors), giant tortoises from the Seychelles, ornamental pigeons and numerous tropical birds. In addition to and complementing the animals, the garden has the most beautiful tropical plant collection in Japan (9000 or more species and cultivars) which can be enjoyed by visitors walking through the external plantings and the many interestingly-arranged greenhouses. These include a

Table 1 Cycad holdings at the Atagawa Tropical and Alligator Garden in 1994

Species	Number of plants
Bowenia serrulata	2
Ceratozamia latifolia	1 (1♀)
C. matudae	2 (1♂)
C. mexicana	4 (2♀ + 1♂)
C. norstogii	2 (1♀ + 1♂)
Cycas cairnsiana	2
C. circinalis	3
C. media	1 (1♂)
C. pectinata	3
C. revoluta	many
C. rumphii	2
C. siamensis	10
C. simplicipinna	2
C. taitungensis	2
Dioon edule	1 (1♂)
D. purpusii	3 (1♂)
D. spinulosum	1 (1♀)
Encephalartos altensteinii	4
E. arenarius	2
E. barteri subsp. *barteri*	1 (1♀)
E. bubalinus	2 (1♂)
E. caffer	3 (1♂)
E. cupidus	1
E. ferox	2 (2♀)
E. friderici-guilielmi	2
E. ghellinckii	1
E. gratus	1
E. hildebrandtii	2 (1♂)
E. horridus	7 (1♂)
E. humilis	3 (1♀)
E. inopinus	1 (1♀)
E. kisambo	1
E. laevifolius	2 (♂)
E. lanatus	6 (2♂)
E. lehmannii	1
E. longifolius	3
E. manikensis	7
E. natalensis	3
E. paucidentatus	3
E. princeps	2
E. transvenosus	2
E. trispinosus	3 (1♂)
E. umbeluziensis	2 (2♂)
E. villosus	1 (1♂)
E. sp. "Piet Retiefii"	1 (1♂)
E. sp. "Msinga"	1
Lepidozamia peroffskyana	5
Macrozamia communis	5 (5♀)
M. diplomera	6
M. fawcettii	5 (1♀)
M. flexuosa	5 (1♀ + 2♂)
M. miquellii	2 (1♀ + 1♂)
M. moorei	2
M. platyrachis	1
M. reidlei	3
M. secunda	1
M. spiralis	1
Stangeria eriopus	4 (1♀ + 2♂)
Zamia fischeri	5 (1♀ + 2♂)
Z. furfuracea	8 (2♀ + 5♂)
Z. inermis	1
Z. integrifolia	1 (1♀)
Z. pumila	1 (1♂)

Note: Seedling stocks of these, and several other species (e.g. *Ceratozamia hildae, Cycas calcicola, C. conferta, C. panzihuaensis, C. wadei, Lepidozamia hopei* and *Zamia loddigesii*) have not been included in this inventory.

tropical flower house (especially for *Hibiscus* and *Bougainvillea*), a fern house (400 species), a small showroom for new introductions and rare plants, a bromeliad house (400 species), a cultivated orchid house (figure 4) with spectacular showings of *Cattleya*, a tropical jungle house with aroids, succulent caudiciforms, vines, *Pandanus* and a baobab tree, a tropical waterlily house (60 varieties said to be the world's best collection), a wild orchid house (1 500 species and over 10 000 plants), a banana house, a tropical fruits house, a *Papaya* house, a spicy and medicinal plants house (Figure 5), and a *Begonia* house.

Of special interest to the readers of this magazine is the greenhouse containing the valuable and diverse cycad collection (Figure 6), possibly the best collection of cycads (Table 1) in Japan open to the public (Dr Sataki's private cycad collection is said to be the best in Japan). In the same house there are *Tillandsia* (400 species and cultivars), *Anthurium*, orchids and cacti.

The garden's cycads were introduced almost 20 years ago from some local succulent nurseries. Possibly most of the specimens were wild collected, although the plants are relatively small and unfortunately completely without any field data. The cycad house is heated from mid-October to the end of April to keep the minimum temperature at 12°C or more. In summer time the maximum temperature is about 37°C. Watering is done constantly to keep the topsoil of the bed moist. Feeding is not done in order to prevent the plants growing too large for the limited space available. The greenhouse is

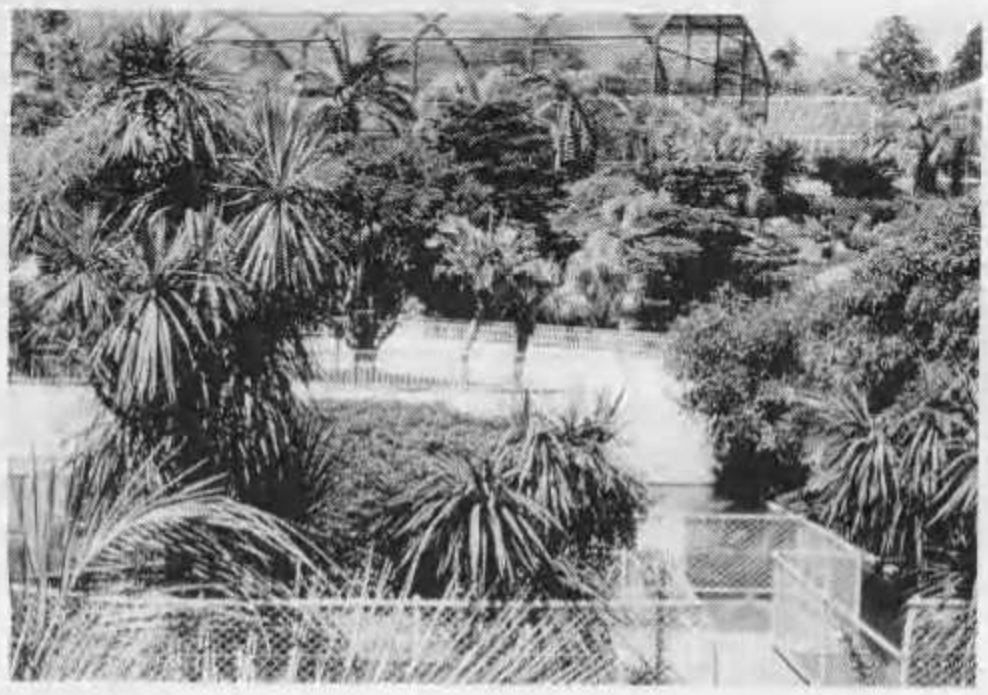


Figure 5 A general view of the Atagawa Garden showing the tropical fruits section, the alligator pool and main birdcage. Photo: Hideo Shimizu.

Figure 6 Cycads and *Tillandsia* plants are combined in one of the Atagawa glasshouses. Photo: Hideo Shimizu.

of glass construction; no shade is used for growing cycads. The only serious pest is scale which attacks *Zamia furfuracea* and *Macrozamia* species. Scale attacks on *Encephalartos* are relatively easy to control.

A serious problem is the shortage of greenhouse space to house these important collections. Space must be balanced with the demands of many other ornamental plants which are also a key attraction to visitors. At present, a 60 m^2 cycad bed contains 99 specimens of 55 cycad species. Small plants are almost overgrown by large ones and need to be transplanted to more suitable sites.

Since snow or freezing cold are rare in this area during the Japanese winter season, *Cycas revoluta* can be grown outside readily, and it is possible that many other cycads can be grown in the natural conditions. They are experimenting in this regard with *Macrozamia communis* and *Lepidozamia peroffskyana*. However, it is thought that fast-growing *Encephalartos* and *Zamia* species are too tender to survive in the outside environment.

Members of the international cycad community visiting Japan are cordially invited to make contact with Hideo Shimizu, Curator of the garden, to arrange a conducted tour of the Atagawa Tropical and Alligator Garden. Mr Shimizu can be contacted at Japan 0557-23-1105 (telephone) or 0557-23-0866 (fax).

A STUDY OF THE GROWTH RATE AND CONING CYCLE OF CULTIVATED CYCAD PLANTS IN JAPAN

Hideo Shimizu
Atagawa Tropical and Alligator Garden, Atagawa, Higashi-izu, Kamo-gun, Sizuoka, 413-03 Japan

Received 9 January 1995

INTRODUCTION

All readers will be aware of the slow growth of cycads as frequently mentioned in the cycad literature. For example, *Encephalartos altensteinii* at Kew Gardens grows 25 mm in trunk height annually. From my experience this is a very special case and the growth rates of cycad plants are generally slower than that for this example.

For this reason I decided to investigate the growth rates of the cycads in the collection at Atagawa Tropical and Alligator Garden. However, our plants are generally too small to check the growth rate using trunk length as an index. Therefore I decided to count the leaf numbers for each cycad as the leaf flush occurs (annually or every 2-3 years.) In addition some of the smaller species produced cones and I recorded these also.

Table 1 The growth rate and coning cycle of cultivated cycads in Japan

Species	Ref. No. Sex	Aspect	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Cycas media	C-9(♂)	Single head	8	9	8	20	21	28		30		20	1♂	33
Dioon edule	C-19(♂)	Clump	8 1♂	5 1♂	2 1♂	8 1♂	6 1♂	7 1♂	Buds 2♂	Buds 1♂	Buds	Buds 1♂	Buds 2♂	Buds 2♂
D. purpusii	C-11	Single head	10	15		20		20		17		19		14
D. purpusii	C-12	Single head		10	10	12	13		11		14		14	
D. purpusii	C-13(♂)	Single head				19		21			13	15		20
D. spinulosum	C-57(♀)	Single head	15	11	13	15	18	19	20	20	1♀	23		18
Encephalartos altensteinii	C-14	Single head	11	11	12	14	11+13	11	9	14+14	15	11	12	13
E. altensteinii	C-15	Single head	10	13	14+14	15	15	14	12+10	17	15+15	16	18	18
E. barteri	C-16(♀)	2 heads	3♀	6,5	0,7	13,8	19 1♀		1♀	5,2	1♀		10,4	
E. bubalinus	C-17	Single head				2		5			8		8	
E. bubalinus	C-18(♂)	Clump	7	3♂	13		7♂		14	4♂	15	1♂		
E. caffer	C-19(♂)	Single head			8 1♂			9			9			
E. cupidus	C-20	Clump	7	8			Buds	Buds	6,Buds	Buds	8,6	Buds	5	7,3
E. ferox	C-21(♀)	Single head	12	12	2♀	3 1♀	14	18	14	15	15	2♀	12	13
E. ferox	C-22(♀)	Single head	16	10 1♀	11	18	19	2♀		22	16	2♀	1♀	16
E. friderici-guilielmi	C-23	Single head		8	9	8	8	10	9	8			11	13
E. ghellinckii	C-24	Clump		11						29				
E. gratus	C-25	Single head	9	9	9	7	7	6	6	5		5	4	3
E. hildebrandtii	C-26(♂)	Single head	7	11	8	12 1♂	16	5♂	17	4♂	16	5♂	4♂	19
E. horridus	C-27(♂)	2 heads		11	13 1♂	12	11+8	9	10	13	13 1♂	12	3,11	10,5
E. horridus	C-29	Clump	6	9			13	16	12	12	13	12,2,2	12	12
E. horridus	C-32	Single head	5			4		3			5,3	10,4	2	5
E. horridus	C-152	Clump	9	8	8,6	9	11	11,7	11	11	11,6,2	11,7,2	11,7	11,5
E. humilis	C-30	Single head				14				18				
E. humilis	C-31(♀)	Single head		6			10		11		11		1♀	7
E. inopinus	C-34(♀)	Clump	1♀	22		1♀	24	23	Buds	Buds 1♀	21,3	18	1♀	21,3,4,4
E. lanatus	C-33(♂)	Clump		12		1♀	16 1♂			16			16 1♂	
E. lanatus	C-35	Single head	5		6			7				6		

Species	Ref. No. Sex	Aspect	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
E. lanatus	C-36	Clump		24			24				33			
E. lanatus	C-37(♂)	Single head	18			23 1♂		15				3	3	
E. lanatus	C-38	Clump	18		10					15				
E. laevifolius	C-39(♂)	Clump	28			2♂		23	18		2♂		3,20	
E. laevifolius	C-40(♂)	Clump	22			2♂			29		2♂		6,5	1♂
E. lehmannii	C-56	Single head	3	5	3	4+5	4+6	4+12	8	8	8	8	8	
E. longifolius	C-41	Single head	4	8	7	4	11	7	8	8	8	8	8	8
E. longifolius	C-42	Single head		10	13	14	16	17	16	12	15	15	15	14
E. natalensis	C-44	Single head	7	8	10	10	10+8	10	11	16+10	13	12	19	22
E. paucidentatus	C-46	Single head	16	16	16	17	18	18	18	18	17	18	20	21
E. paucidentatus	C-47	Single head	13	14	17	17	19	19	21	16	21	17	19	19
E. princeps	C-50	Single head	17	14	21		31			28	22	24	18	22
E. princeps	C-51	Single head	2	9	12		14	13	11	12	12	14	15	15
E. transvenosus	C-52	Single head	16	15	20	17	18	19	16	16	16	17	17	24
E. trispinosus	C-53(♂)	Clump	12 1♂	7 1♂	9	1♂	5,5 1♂	8,5,4	8,5,3	6,5,5	8,5,4	6,5,3	5,4 1♂	5,3,3,4
E. umbeluziensis	C-54(♂)	Clump	1♂	7	4	7	0,3 1♂		2♂	3,5	2♂	6,5	2♂	7 1♂
E. umbeluziensis	C-137(♂)	Clump	5 1♂	5	2 1♂	Buds 1♂	Buds 1♂	Buds 2♂	Buds 1♂	Buds 1♂	4,2,1	4,3 1♂	5,2 1♂	3,2,2 2♂
E. villosus	C-55	Single head	3	5	4	6		6 2♂		4 2♂		2 1♂	5 1♂	5
E. sp. 'Piet Retiefii'	C-49	Single head	12	1♂	13	1♂	26	28+14		23	1♂	18	1♂	1♂
E. sp.	C-58	Single head	10	11	1♂	14	6 3♂	13	12	11+13	12	4♂	20	18
Lepidozamia peroffskyana	C-60	Single head	7	8	7	7+7	6+7	5	7	6	7	7+7	10	12+14

NOTES
1. The number in each block represents the leaf number for new growth. If they produce new growth twice a year, the leaf numbers are shown with "+".
2. In case of clumped plants, new growth of each head are separated with",". "#♂" or "#♀" means the number of cones and their sex.
3. "Buds" mean small new side buds or bulbils with single leaves or without any leaves or similar conditions where it was difficult to check exact numbers.

RESULTS

As documented in the literature, the leaf colour, leaflet width, annual rainfall and altitude of their native environment are all factors strongly related to plant growth rate. My results (Table 1) confirm this. All cycads have the tendency to keep their natural habit and not change their growth rate or growing cycle even when placed in conditions more favourable
than those in wild environment.

Encephalartos ghellinckii produced a leaf crown only twice in the 12 year period. *E. caffer, E. humilis, E. lanatus* and *E. laevifolius* produced leaves in 3-year cycles. Notably all these species have narrow leaflets and come from more harsh natural conditions than other species. By contrast, *E. altensteinii, E. natalensis, E. paucidentatus, E. transvenosus* and *E. longifolius* produced leaf crowns annually or biannually and grow rapidly. All these species have broad leaflets and their colour is green and fresh. This indicates more mild growing conditions in their native environment than the former set of species.

During this 12 year study of cycad plants, I found that many plants produced cones, but unfortunately seeds were never formed because in nearly all cases specimens of both sexes were absent and thus we were unable to carry out artificial pollination. This underlies the importance of maintaining a pollen bank and promoting the international exchange of pollen supplies.

Although 12 years are relatively long periods for a human being, for cycads it is only "a blink time" (a Japanese expression) and I appreciate the necessity of a more lengthy study in this regard.

CONCLUSION

This is time-consuming but very simple work. If all these cycad specimens were planted well-spaced out in open conditions, it would be easy to check them. But in our cramped greenhouse conditions, I may easily have overlooked some new growth or cones and feel conscious of the difficulty of precise recording of these growth data.

ACKNOWLEDGEMENT

I thank Roy Osborne for assisting in the translation of this article which originally appeared, in Japanese, in the *Bulletin of the Japanese Association of Botanical Gardens* No. 25 pp. 23-28, in March 1991, and to which the 1991-1994 data have been added.

THE AUTHOR

Mr Hideo Shimizu is the Curator of the Atagawa Tropical and Alligator Garden. Apart from being a member of the Cycad Society of South Africa, he is also a member of the Botanical Society of South Africa, the Cactus & Succulent Society of America and various Bromeliad, Gesneriad, Camellia, Bulb, Orchid and Waterlily Societies. He is anxious to obtain seeds of any African cycads, especially those species not presently represented at Atagawa and is always keen to acquire new, beautiful and rare tropical plants for the Garden.

RADIOGRAPHIC EVALUATION OF CYCAD SEED

R.P. Goldschmidt and A.J. Sacks

Department of Radiology, Hillbrow Hospital, Johannesburg

Received 8 January 1995

The use of x-rays for seed evaluation was described by Kamra in 1967. Specific radiographic evaluation of cycad seed has to the authors' knowledge not been previously described

Traditional methods of assessing cycad seed involve the float test, "rattle" test and the most direct, but destructive method of seed dissection.

Radiographic evaluation has advantages. First and foremost it is non destructive. Secondly a permanent photographic record is obtained.

Uses of the technique could be listed as follows:

1. The assessment of viability of rare and valuable seed without the need to sacrifice seed.

2. The assessment of the structure and condition of the plant embryo and endosperm. It would also allow the evaluation of physical parameters affecting the rate of embryo maturation as well as the

monitoring of the embryo prior to germination.

3. Evaluation of the action and development of predatory insects.

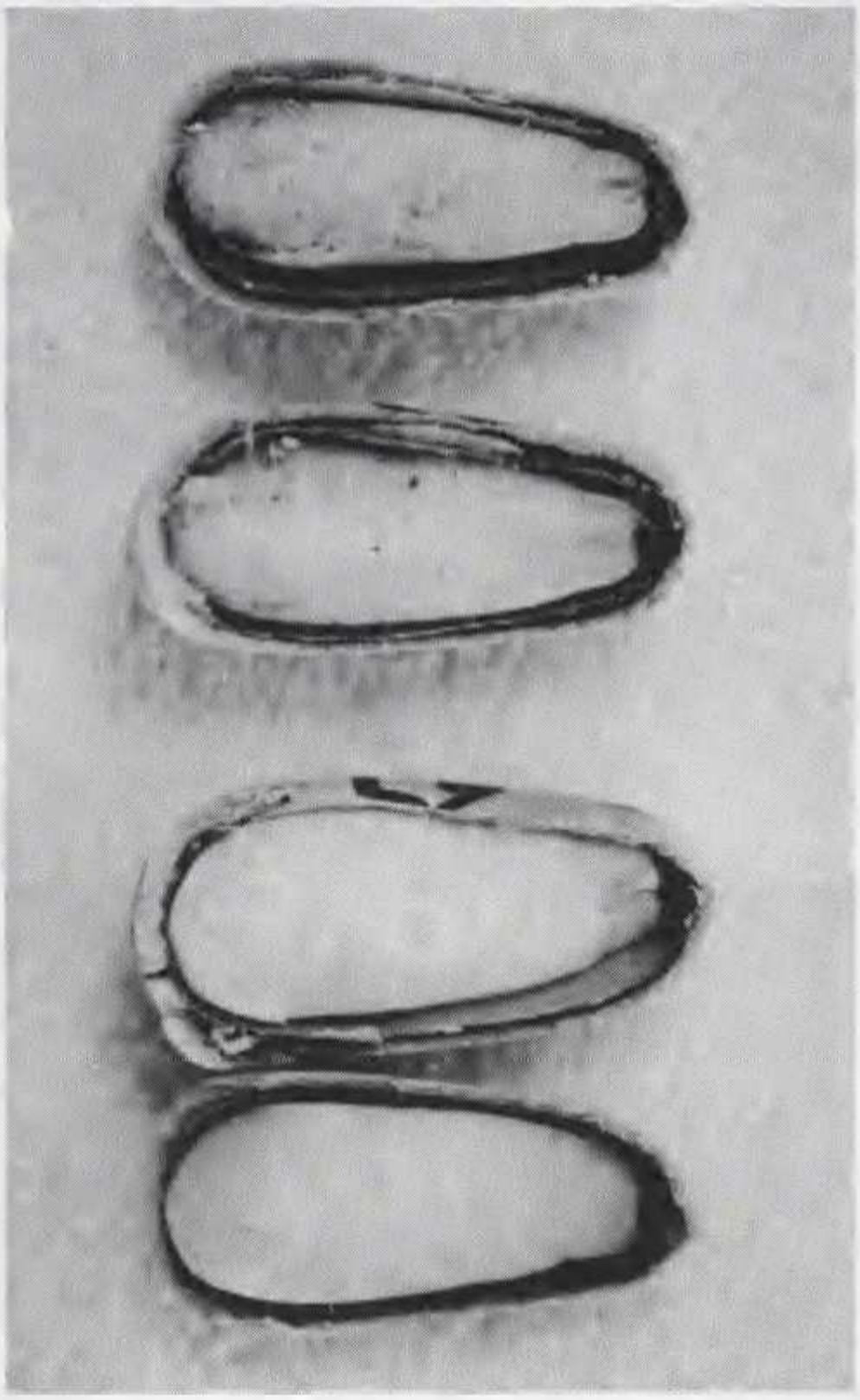


Figure 1A Photograph of a longitudinal section through two infertile *E. hildebrandtii* seeds.

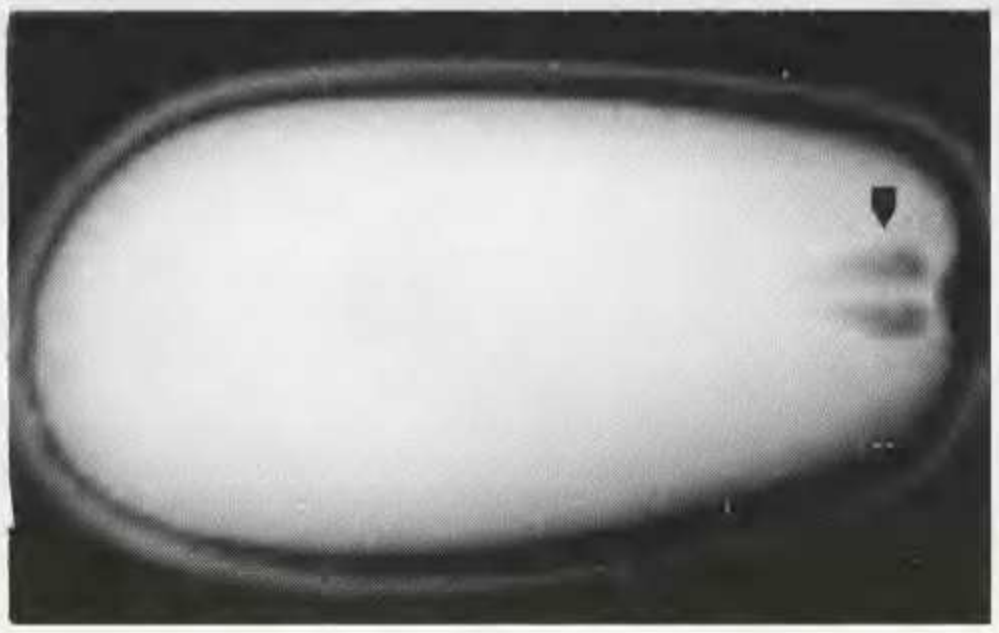


Figure 1B A radiogram of one of the seeds prior to sectioning it. Two of the unfertilized archegonia (arrow) are clearly visible on the radiogram.

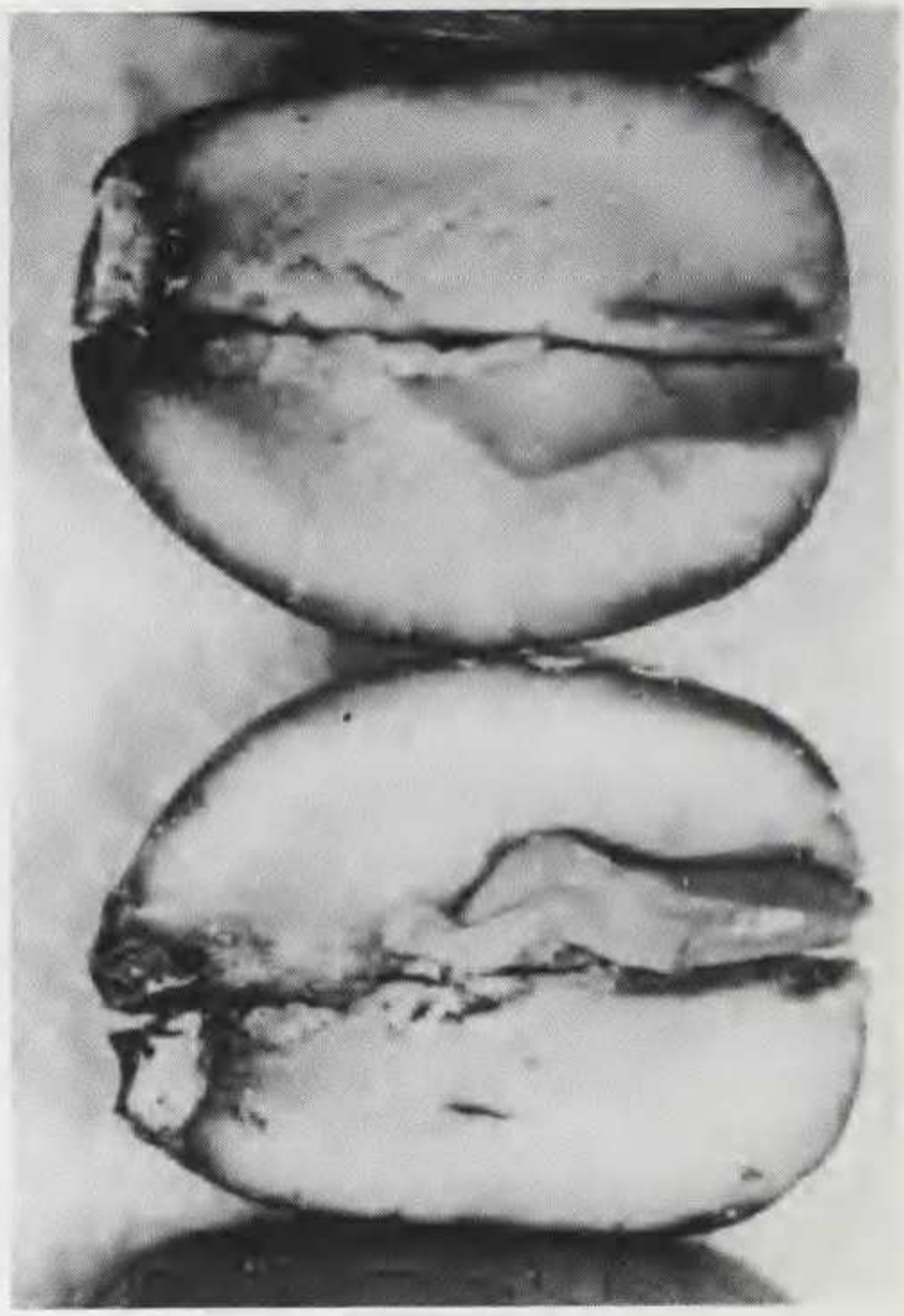


Figure 2A Photograph of a longitudinal section through an *E. middelburgensis* seed of which the embrio and endosperm had become necrotic.

Figure 2B A radiogram of the same seed prior to sectioning it. The embryo is fairly clearly visible.

Due to the sensitivity of specific energies of radiation to subtle differences in tissue density evaluation of an embryo can be made from early on in its development up to germination.

The x-ray dosages required for seed evaluation are thought to be too small to cause damage and to cause any future development abnormalities.

For examples of radiographic assessment and correlative dissection see Figures 1-4.

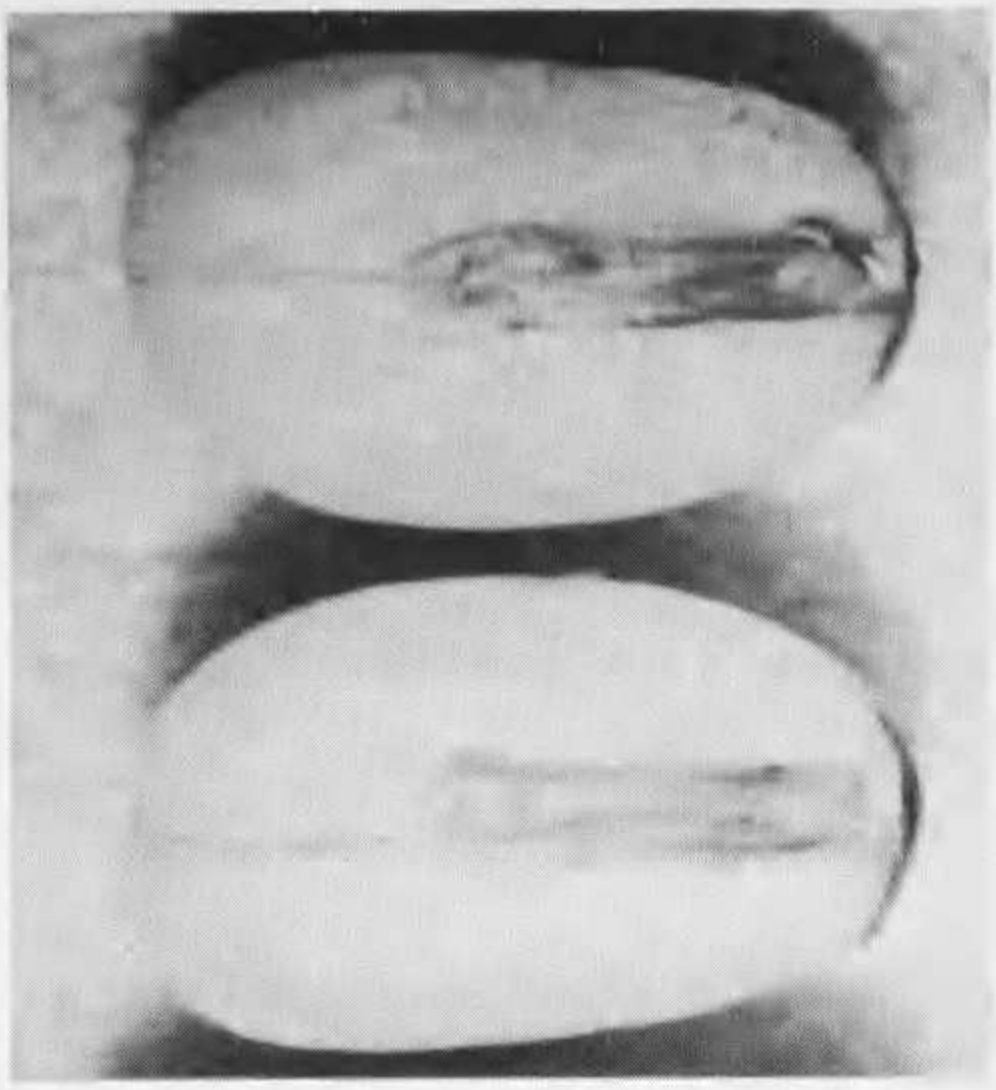


Figure 3A Photograph of a longitudinal section through a healthy fertile seed of *E. natalensis*.

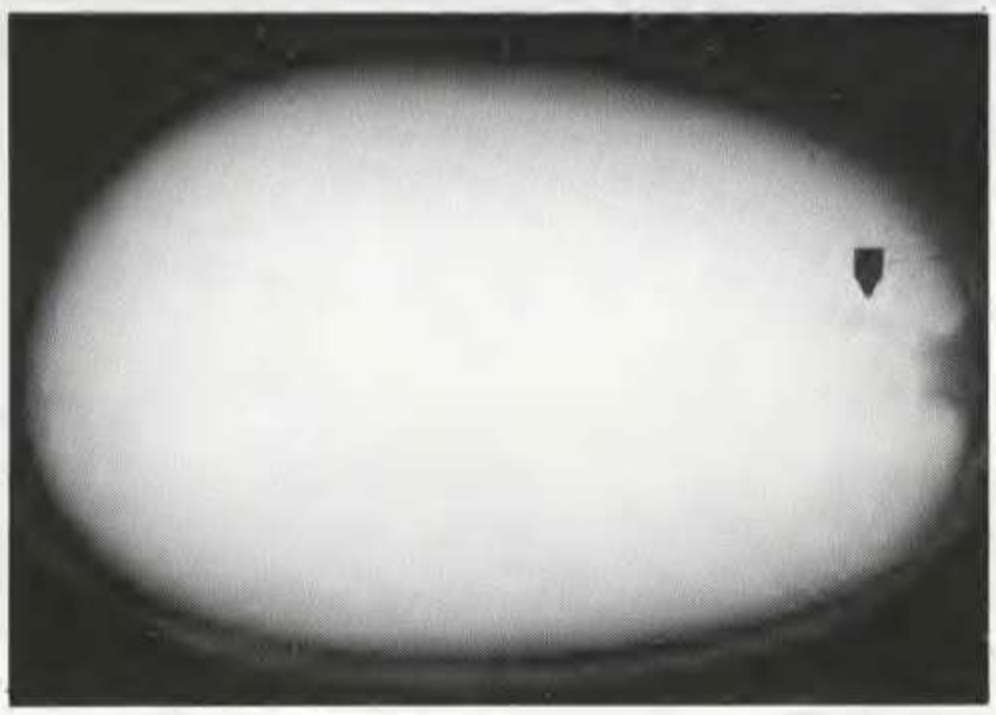
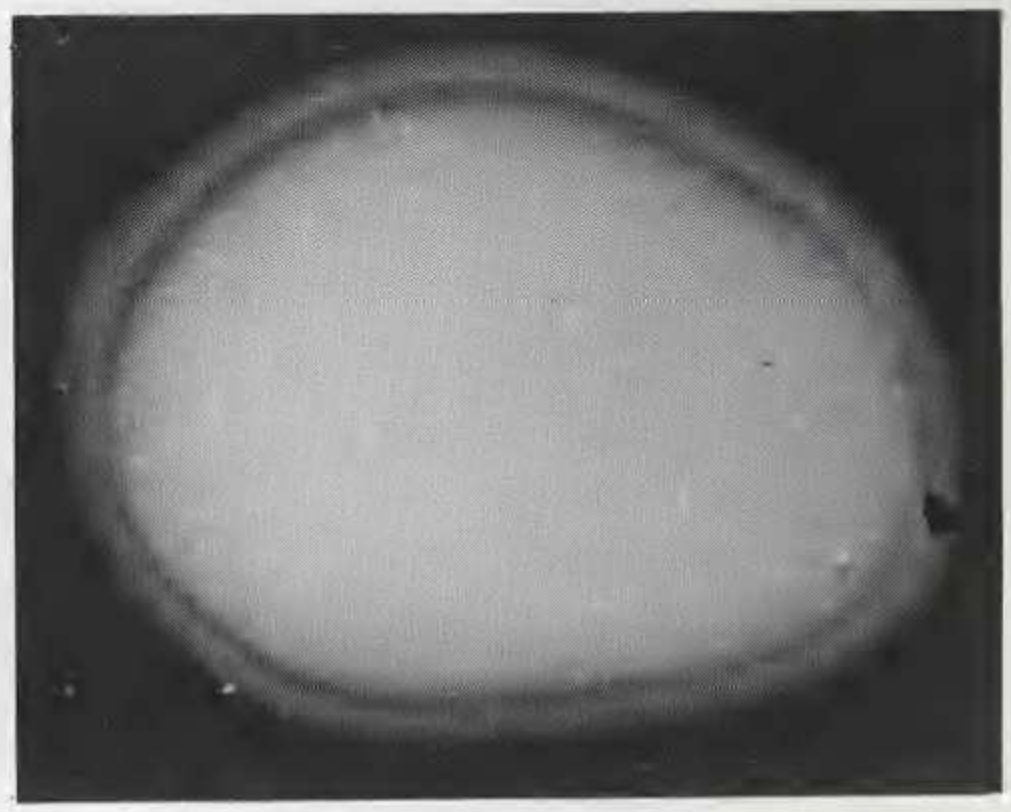
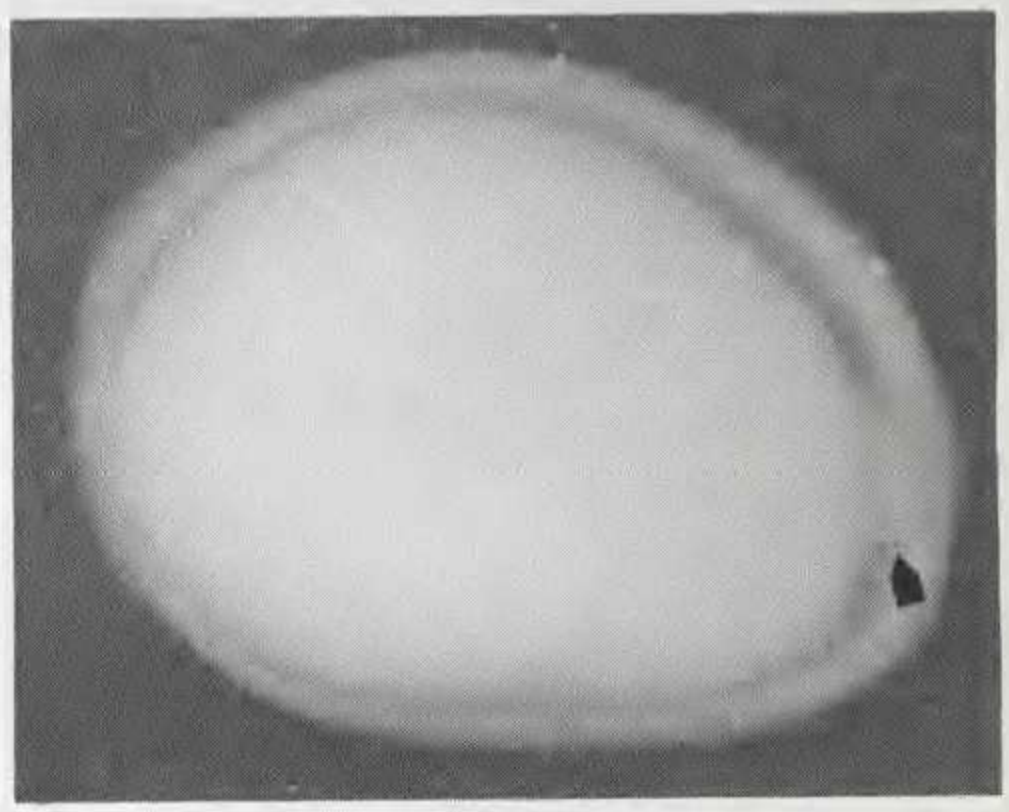


Figure 3B In the radiogram of the seed prior to sectioning it, it is only the part of the embryo (arrow) close to the micropyle that is distinguishable from the endosperm.



A



B

Figure 4 One of the advantages of the radiographic method is that a particular seed can be scanned repeatedly in order to ascertain whether changes have taken place inside the seed with time. In these two radiograms "A" and " B" the growth of the embryo (arrows) at the micropylar end of a *Macrozamia douglasii* seed during one month can be clearly seen.

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ABNORMAL CONES ON *ZAMIA FURFURACEA*

William Tang
Fairchild Tropical Garden, 11935 Old Cutler Rd., Miami, Florida 33156, U.S.A.

Received 15 December 1994

Figure 1 *Zamia furfuracea*; original specimen (left) and "bulb" (right) with female cones.

In "*Encephalartos*" 29 (March 1992) I reported an unusal bulb in a specimen of *Zamia furfuracea* growing on the end of a cone stalk. In the three years that I have been observing this "bulb" it has continued to flush new leaves. This last October, when John Donaldson of the Botanical Garden at Kirstenbosch was on a visit to Fairchild Gardens we viewed this abnormal "bulb". To our delight we found that this "bulb" had produced a female cone of its own (Figure 1)! I see hundreds of cones of this species in cultivation each season in Miami. Abnormal cones with leaves appear to be much less frequent in the genus *Zamia* than in *Encephalartos*. Recently another odd *Z. furfuracea* cone in Miami was brought to my attention by Gordon Muraoka of the U.S. Dept. of Agriculture (Figure 2) This one had a female cone with a robust head of leaves on its apex and was similar to that reported by Marion Debruyne (*Encephalartos* 11: 16, September 1987).

Figure 2 *Zamia furfuracea* female cone with leaves on its apex.

WHAT IS THE TALLEST SPECIES AND INDIVIDUAL OF CYCAD?

Paul I. Forster
Queensland Herbarium, Meiers Road, Indooroopilly, Queensland 4068, Australia

Received 5 January 1995

Figure 1 A multiheaded individual of *Lepidozamia hopei* from the Tully River Valley, Queensland. Single-headed plants grow much taller. Photo: Queensland Herbarium.

There is always interest in the biggest or tallest of live or inanimate objects and beings. So what is the tallest living cycad species and individual? Jones (1993) commented that *Lepidozamia hopei* at up to 20 m high, is the tallest of the Australian cycads and perhaps the tallest of the living cycads. Certainly it is a massive cycad (Figure 1) with large individuals dwarfing the human observer. I would have observed plants of *L. hopei* near Cape Tribulation, Queensland up to 15 m high but have never taken the time to accurately measure the height of individuals. Bosworth (1993) measured individuals of *L. hopei* at Dallachy Creek at up to 13.7 m and estimated the top 2 m of stem that lacked footholds, could have grown in the last 60-80 years since cessation of seed harvest by Australian Aborigines.

People have taken the trouble to measure the tallest Saguaro Cactus (*Carnegiea gigantea*) (Hales & Rowley 1987) and the tallest Boojum (*Idria columnaris*) (Humphrey 1991), so it must be about time that *L. hopei* or other contenders were measured in the interest of the record books.

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NEWSITEM: T.W. WALTERS

The Montgomery Foundation, Inc.

Miami, Florida, U.S.A.

Received 29 November 1994

Terrence W. Walters has been appointed Executive Director of the Montgomery Foundation. He commenced his duties on November 15, 1994.

Walters previously held a position with Fairchild Tropical Garden as a Systematist, where his primary responsibility was to preserve, dvelop, and study the cycad collection. In achieving these objectives, he co-authored and helped implement the garden's first collection policy as well as their five year strategic plan for the cycad collection. His vision, to increase the value of FTG's cycad collection, required taking a global perspective.

The practical manifestations of his global commitment included conducting international field expeditions, attending international cycad meetings, and publishing in journals with worldwide distribution. Walters organized expeditions to China in 1992 and Mexico in 1993 and established collaborative relationships with botanical gardens in each country. He established FTG's first *ex situ* conservation collection of cycads at

Fairy Lake Botanical Garden, Shenzhen, China. In addition, Walters worked with his China host, Dr. Si-Lin Yang, to organize additional expeditions to Southeastern Asia in 1993 and 1994.

Walters received his B.A. from the University of Colorado and his M.S. and Ph.D. from Texas A & M University. His professional affiliations include: American Cycad Society, American Society of Plant Taxonomists, Association for Tropical Biology, Botanical Society of America, Cucurbit Genetics Cooperative, and Society for Economic Botany.

CYCAD 96

Cynthia Giddy
P.O. Box 45, P.O. Umlaas Road 3730

Received 12 January 1995

The long awaited brochure on CYCAD 96 which will be hosted by the Cycad Society of China and the ICUN's Committee of National Parks and Protected Areas has arrived. The theme of the Conference will be "Saving Cycad Diversity". China is well known for its rich flora and diverse cycads. Cynthia Giddy and Nat Grobbelaar will serve as the Africa members on the Organizing Committee.

Copies of the circular have been sent to all those who attended the CYCAD 93 conference in Pretoria. A warm invitation is extended to all other cycad enthusiasts who would like to attend what promises to be a very exciting Conference. The Conference will be held in Panzhihua from May 1-5th 1996. A five day pre conference tour starts at Beijing and includes visits to the Beijing Botanical Garden, the Summer Palace, Archaeological Museum, the Great Wall, the Ming Tombs and Chengdu Botanical Garden. After the Conference there is a choice of a 7 or 16 day southern tour which will in addition to various Botanical Gardens also include viewing several of the Chinese cycads in die wild.

For a copy of the brochure please send a stamped and self addressed envelope to **Cynthia Giddy**, P.O. Box 45, P.O. Umlaas Road 3730, Natal. Enquiries from foreign members should be addressed to Prof. CHEN Chiajui, Institute of Botany, Academia Sinica, 20 Nanxincun, Xiangshan, Beijing 100093, China. Fax: 0086-01-8319534 Internet EM: lics@botany.ihep.ac.cn or ningjc@botany.ihep.ac.cn

PRESENTATION OF CONSERVATION AWARD TO CYNTHIA GIDDY

Avis Meresman
P.O. Box 4726, 4000 Durban

Received 16 January 1995

The first meeting of 1995 of the Natal Regional Branch of the Cycad Society of South Africa was a bring-and-braai social at Giddy's Nursery, Umlaas Road on 15 January. An enthusiastic group of "regulars" and a sprinkling of new members braved the unpredictable Natal's midsummer to view the nursery and enjoy the social aspects.

The function was also the occassion at which the Natal Regional Branch presented its annual Conservation Award, and Cynthia Giddy was the deserving recipient this year. In making the presentation to Cynthia, past-president Roy Osborne made the following comments:

"Cynthia Giddy is, or was, a *boeremeisie* from Cradock and went on to complete her tertiary education, as an anthropologist, at Rhodes University in Grahamstown. (Rhodes University has produced more cycadologists - Cynthia Giddy, Nat Grobbelaar, Roy Osborne and John Donaldson are all Old Rhodians - than any other institution in the world!) After settling in Natal, she was involved in education, farming, child-rearing and of

course horticulture. Not cycads to start with, but aloes, cacti, succulents, orchids and indigenous bulbs. Apart from cycads, apart from horticulture, Cynthia has been and still is deeply involved with studies of genealogy and her meticulous hobby of creating the miniature houses and furniture which many visitors to Giddy's Nursery have had the privilege of seeing.

Cynthia is undoubtedly the person who has done most, anywhere and at any time, to publicise cycads as a plant group - and she's been doing it for more than 25 years. The popularity of cycads in gardens throughout this country, and further afield, is very largely due to Cynthia in terms of her book (Cycads of South Africa, 1974, 1984), her nursery, her numerous public lectures, and her frequent exposure in magazines, newspapers, radio and television. A colourful and sometimes controversial figure, she has lead a relentless crusade against cycad poachers - and done this far more effectively than all the various provincial and governmental agencies have been able to. She has travelled widely seeing cycads in all parts of the world (by air, by train, by car, on foot and, recently in Mexico, on horseback) and has been involved in the International Conferences on Cycad Biology in France (1987), Australia (1990) and of course in Pretoria in 1993 as well as being a participant in the CITES Plants Committee meetings in Belgium, Mexico, England and Thailand.

Cynthia has already received recognition for her cycad conservation work. For instance, she was the first recipient of the Natal Parks Board's Conservation Award in 1991. In 1993, she was the first South African to receive an "Honourable Mention" in the Rolex Awards for Enterprise. Only a few months ago (October 1994) Cynthia was presented one of the six "Conserva" awards for 1994 by Dr Dawie de Villiers, Minister for Environmental Affairs and Tourism. Our award to Cynthia is in recognition and appreciation for all that she has done and has been brought to the fore this year by her appointment as Chairman of the International Cycad Specialist Group. We thank her for what she has have done in the past and we look forward to another good many years' worth of steadfast dedication."

ENCEPHALARTOS MIDDELBURGENSIS: UNVEILING OF NATIONAL MONUMENT COUNCIL'S PLAQUE

Nat Grobbelaar
P.O. Box 15357, 0039 Lynn East

Received 5 January 1995

Figure 1 Unveiling the plagues are Mr Simon Mabena (left) and Professor Nat Grobbelaar (right) with the owner of the farm, Mr Anton Prinsloo standing on the far left and Mr William Marthinson of the National Monuments Council on the far right.

What is probably the oldest and largest living specimen of *Encephalartos middelburgensis* (see "*Encephalartos*" 39: 21, 1994), was declared a National Monument by the National Monuments Council of South Africa in April 1994. During a ceremony on 15th October 1994 on site, the Council's plaque together with an informational plague provided by the owner of the farm, were unveiled (Figure 1). Mr Simon Mabena represented the Provincial Government and Mr William Marthinson the National Monuments Council. Both made speeches after an introductory one by Professor Nat Grobbelaar in a colourful marquee. After the ceremony, the approximately 75 people present were entertained to refreshments that were kindly provided by the owner of the farm, Mr Anton Prinsloo and his wife.

A few months before the date of the ceremony, practically the whole of Mr Prinsloo's farm suffered a fierce veld fire. As a result, the numerous specimens of *E. lanatus* that occur in the vicinity of the celebrated *E. middelburgensis* specimen (Figure 2) stood out majestically with their blackened trunks crowned by flushes of new leaves on the rugged but grassless terrain.

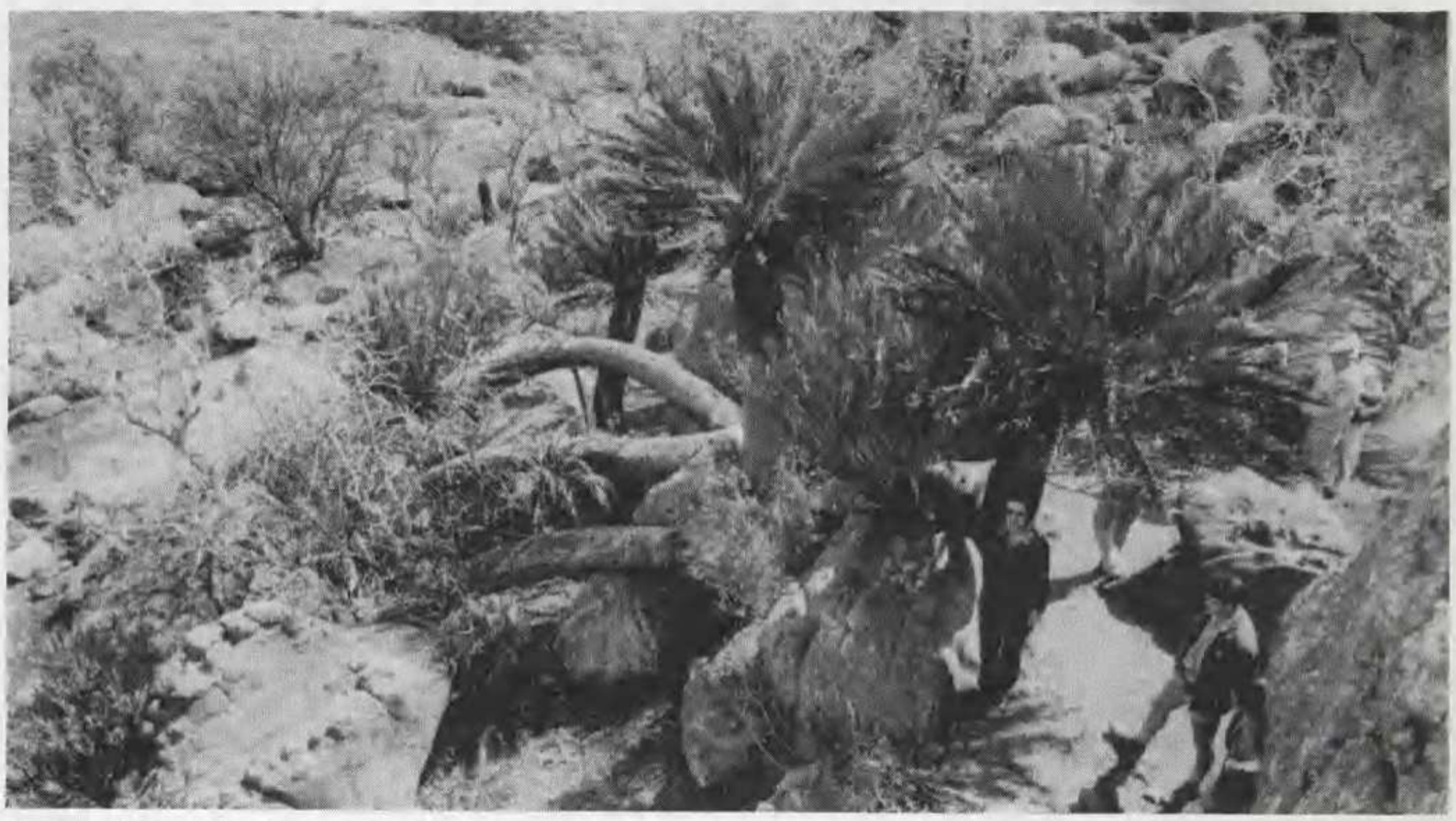

Figure 2 Some of the 7 m long branches of the celebrated plant can be seen arching over the large rocks amongst which the plant grows. All the leafy cycad crowns in the photograph belong to the single *E. middelburgensis* specimen that was declared a national monument.

CYCADS FOR AFRICA

Roy Osborne
20 Maryvale Road, 3630 Westville

Received 9 January 1995

The ambitious "Cycads for Africa" project, located just outside Knysna in the Western Cape, is "on stream" according to developer **Mark Richter** and his Springbok angler colleague **Mike Pautz**. Commenced in August 1992, the project involved the acquisition of a 6 hectare site on the outskirts of Knysna where a number of major private collections are being consolidated into a single "cycad sanctuary". Focused exclusively on African cycad species (Figure 1), the sanctuary will serve the multifold purposes of a display garden (based on island groupings in a geographic arrangement) a retail nursery, a gene-bank for pollen and seed production and a propagation centre. A tea-garden will add to the tourism aspect and a large number of indigenous trees will complement the cycad plantings.

Figure 1 Mark Richter admiring new leaf flushes on recently re-located *Encephalartos* specimens at the "Cycads for Africa" project, Knysna, December 1994.

In December 1994, 150 specimens had been planted and a target of 700 plants will be moved by the end of 1995. The site, previously covered with exotic trees and weeds, has been completely cleared and re-landscaped. The feasibility of the entire project, taking into account the local climate, soil type, geographical aspect and strategic position, has been thoroughly researched with **Roy Osborne** and **Nat Grobbelaar** involved in the early stages of planning, together with the Cape Nature Conservation Department and the local Knysna authorities.

The project has already generated considerable local interest and several school visits have been organized. Plants relocated so far have responded well and losses have been minimal. An opening ceremony is planned which promises to be a key social event for South African cycad aficionados.

"CONSERVA AWARD" 1994

Roy Osborne
Department of Chemistry,
University of Natal, 4001 Durban

Received 24 November 1994

At a prestigious champagne breakfast event at the headquarters of the National Botanic Institute, Pretoria, on 25 October 1994, **Cynthia Giddy** was one of the six recipients of the 1994 "Conserva Awards" in the individual category. Presenting the awards, Minister Dawie de Villiers, of the Department of Environmental Affairs and Tourism, said that these were made to "recognize outstanding achievement towards effective conservation and sustainable utilization of the environment to ensure a better quality of living for all South Africans".

A PIPEDREAM?

Roy Osborne
20 Maryvale Road, 3630 Westville

Received 9 January 1995

Cycad enthusiasts driving through what used to be the Transkei, now part of the Eastern Cape, cannot fail to notice the collection of *Encephalartos altensteinii* plants growing in concrete drainpipes (Figure 1) outside Vugani's Hotel and Garage, near Umtata. The specimens originated from the Port St. John's area.

Figure 1 *Encephalartos altensteinii* specimens in concrete drainpipes outside Vugani's Hotel and Garage, near Umtata.

ACADEMIC AWARD FOR OSBORNE

Nat Grobbelaar
P.O. Box 15357, 0039 Lynn East

Received 9 January 1995

Professor **Roy Osborne**, founder and first President of the Cycad Society of South Africa, has been selected from nearly 1000 Faculty members of the University of Natal to receive the University's first Distinguished Teachers Award, for the period 1992-1995. The award, to be conferred at the 1995 graduation ceremony, is in recognition for sustained excellence in teaching at all levels, as evaluated by students, staff and administrators.

CYCAD PROPAGATION

Len A. Forrester
P.O. Box 26, 5310 Cathcart

Received 17 January 1995

It is with a certain amount of trepidation that I have written an article on cycad propagation because I am not an authority on this historic plant and my observations may be critisized by experts who publish articles in the "*Encephalartos*" magazine from time to time.

I have confined my observations to the *Encephalartos friderici-guilielmi* species which has its habitat in a fairly limited area according to Cynthia Giddy's book from which I have learnt a lot.

I have spent many pleasant hours scrambling on western slopes and I have come to the conclusion that only a fraction of 1% of seed shed by female plants have resulted in the increase of the cycad population.

The area, as described by Mrs Giddy, was originally open ground and I am sure that the natural propagation of the cycad had a far better chance then as compared with the position at the present time.

About 150 years ago this ground was surveyed into farming units and all units fenced in such a way that animal raising could be carried out on a semi-intensive scale.

The method of farming necessitated a rotational grazing system and veld burning from time to time became a normal practice. This practice undoubtedly took a big toll on small cycad plants that had not yet reached a stage of being fire resistant. The burning also depleted the decaying vegetation which would normally occur around the big plants and the seed would have very little chance of germinating.

It is common knowledge that veld fires are occasionally started by lightning and accidentally, but these were few and far between as compared with organized burning.

Apart from veld fires the seed has been subjected to other factors which did not occur 150 years ago, such as the trampling of animals near the plant and the seed being washed into areas where germination became impossible.

I have openly invited soil conservation officers to join me on a tour of inspection so that I can conclusively prove that over the last 150 years many thousands of seed have only resulted in a handful young plants.

Many years ago I came to the conclusion that the best method of increasing cycad populations was by collecting seed and distributing the seed to nurseries and cycad enthusiasts in South Africa and further afield.

Any collector of seed will agree that it is physically impossible to bag more than a fraction of shedded seed which scatters in all directions on slopes which vary from 45-60 degrees.

In conclusion I have no hesitation in advising the Department of Nature Conservation to grant permits to collectors who are responsible and concerned about the preservation of the cycad species.

LETTERS TO/FROM THE EDITOR / BRIEWE AAN/VAN DIE REDAKTEUR

Dear Editor

CYCAS REVOLUTA IN WALT DISNEY WORLD

I came across this beautiful, perfectly healthy Cycad-example (Figure 1) of what looks like *Cycas revoluta* during my recent (June 1994) visit to the famous Walt Disney World's Epcott Centre in Orlando, Florida. It is located in front of the Japanese display on the grounds. Being a grapevine physiologist, I was on my way to California (Napa Valley) and Canada (Okanagan Valley, British Columbia) when I made a stop-over in Orlando. To my amazement, beautiful examples of *Cycas revoluta* with ample suckers were found virtually around every corner, so to speak, the size of which made my own examples look tiny indeed.

Figure 1 *Cycas revoluta* plants in front of the Japanese display in Disney World.

I am not sure whether this type of general material is suitable for publication in "*Encephalartos*". I nevertheless felt that I should send it to you for consideration. Thank you for a great, user-friendly journal.

***Kobus Hunter**, 13 Speciosa Street, 7600 Stellenbosch.*

Received 7 November 1994

[Newsworthy contributions are accepted gratefully. - **Editor.**]

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Dear Editor

SLIDE SHOW AND LECTURE ON SOME SOUTH AMERICAN CYCADS

Prior to the 1993 cycad congress in Pretoria, I was asked by one of the founding members of the Cycad Society of South Africa if I would be prepared to give a slide show and short lecture on some of the South American cycads I had material of. As the date of the congress approached, I enquired whether the subject had been mooted to, and whether there had been any interest shown by, those entrusted with the congress program. I was told that "They" were not interested in what was described as a "travelogue".

I ask you then, who apart from a tiny group of erudite illuminati care two hoots about the biochemistry, chromosomal structure and other important but obscure scientific discoveries, when it really is that glorious being whose lushness and diversity of form in Nature that inspired most of us in the first place? I wonder how many persons who attended the congress have first hand knowledge of any of the following cycads: *Zamia amplifolia, Z. boliviana, Z. chigua, Zamia* cf. *montana, Z. obliqua, Z. poeppigiana, Z. roezlii* and *Z. ulei*. Yes scientific study is the priority at a cycad congress, but let's not bore everyone to death on an exclusive diet of obscure monologues.

Yours sincerely

***Bernard Fischer**, African Palms, P.O. Box 27, 0510 Nylstroom.*

Received 24 November 1994

[Comment by the Chairman of the CYCAD 93 Organizing Committee: I regret to inform Mr Fischer that his willingness to present a travelogue-type cycad slide show at CYCAD 93 was never brought to my attention. My Committee was very aware of the necessity to include such items at the Conference. Provision was therefore made for two lengthy travelogue-type presentations during the Conference. Dr Terrence Walters gave a very interesting and well-illustrated talk on the cycads of China whilst Mr Loran Whitelock entertained those present with a magnificent series of slides on the cycads of the Americas. In the latter presentation nearly all the species of *Zamia, Ceratozamia, Chigua* and *Dioon* were shown. - **Nat Grobbelaar.]**

[Mr Fischer is invited to share his expertise with us by preparing an article on these interesting *Zamia* spp. for our readers. Furthermore, all regional branches of the Society would be delighted to have Mr Fischer present a slide show at one of their functions. - **Editor.**]

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Dear Editor

CYCADS: THEIR CORRUPTULES, OMNULES AND OMNELS

We really appear to have a nomenclatural problem with

the **ovules** that masquerade as **seeds** in mature cycad cones! In my letter (*Encephalartos* 38: 40) I attempted to indicate that **embryoless "seed" development** did not really involve **seeds**, by placing the **seed** between inverted commas. As John Donaldson rightly points out (*Encephalartos* 40: 24), it would be better to refer to the process by means of which these structures develop as **pseudo seed maturation**.

Despite the above, there still appears to be a need, within the scientific community at least, for a term for unfertilized ovules that superficially are indistinguishable from true seeds. After consulting some of my learned latin friends, I wish to propose that we call these structures **corruptules** from the latin word "corruptus" meaning "made useless" and "ovule".

Whilst on the subject of cycad propagules, I would also like to point out that we commonly erroneously refer to the stony part of a cycad seed as a seed. Although the layman will probably always refer to true seeds, corruptules as well as the kernels of both as "seeds", it is desirable that distinctive terms for these structures be coined for use in scientific communication. For this reason I would like to propose that the term **omnule**, from the latin "omnis" for "all" and "propagule", be used as a collective term for both a true seed and a corruptule. Similarly, **omnel**, from the latin "omnis" and "kernel" could serve as a collective term for the kernels (seed or corruptule from which the sarcotesta has been removed) of both seeds and corruptules.

***Nat Grobbelaar**, P.O. Box 15357, 0039 Lynn East.*

Received 5 January 1995

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Geagte Redakteur

***ENCEPHALARTOS FEROX* FRATS?**

Die foto wat ek saamstuur (Figuur 1) is van 'n snaakse keël van 'n *E. ferox* vroulike plant. Die foto is min of meer van bo geneem. Van die begin af toe die keël sigbaar geword het was die saadkoppe blootgestel en het dit voorgekom asof die keël se binnekant na buite uitgegroei het, die skubbe het 'n ring om die saadknoppe gevorm. Die keël was ook byna heeltemal plat van bo en ongeveer 50 mm hoog; die saadknoppe het so een tot twee lae gevorm. Die keël was nooit beskadig of gesteur terwyl dit gegroei het nie en was van die begin af oranje van kleur.

Dit sal vir my interessant wees om menings te hoor of so 'n frats al voorheen waargeneem is.

Figuur 1 Die foto toon die blootgestelde "sade" van die *Encephalartos ferox* vroulike keël.

***M. Rautenbach**, Irving Steynstr. 19, South Crest, 1449 Alberton.*

Ontvang 6 Januarie 1995

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Dear Editor

TOTAL BAN ON DISTRIBUTION/EXPORT/SALE OF SEED OF ENDANGERED PLANTS ENCOURAGES ILLEGAL TRADE IN THOSE SEEDS

I would like to be able to obtain seed of the African cycads I do not yet possess but the present total ban (as I understand the position) makes it very difficult to do this. I am only interested in adding to my private collection - not selling to others.

It is interesting to note that in the last three years or so significant numbers of certain species' seed have been received in Australia including *Cycas pectinata*, *C. wadei*, *Ceratozamia kuesteriana*, *C. latifolia*, *C. mexicana*, *C. norstogii*, *C. robusta*, *Dioon mejiae*, *D. spinulosum*, *Zamia fischeri*, and *Z. loddigesii*. However, *Encephalartos* species remain very scarce and, when available, are generally prohibitively expensive.

I remain of the view that total prohibition on distribution/export/sale of endangered plants and seed of those plants is a "last resort" step in their conservation. It seems to me that conservation requires that plants,

particularly mature plants, not be removed from the wild. To take the pressure off the demand by collectors for such plants, the fertile seeds should be permitted to be distributed (after retention of sufficient seed necessary for regeneration) by the appropriate authorities.

Total prohibition seems to me to lead in many cases to a flourishing illegal trade in plants and seeds putting those species in greater danger than by controlled distribution. It means that unscrupulous persons will take risks to dig out mature plants and remove all fertile seeds because they know the plants and seeds will command unrealistically high prices from collectors desperate to obtain material.

A classic example has occurred in Australia. The foxtail palm, *Wodyetia bifurcata*, was relatively recently discovered in a restricted area in North Queensland. In spite of a prohibition of seed collection from the palm which was located in an area declared a National Park at an early stage after its discovery, very large quantities of seed were collected and distributed at high prices, mainly by export to America where demand was fierce to obtain seed.

Only in about the last 12 months has the Queensland Government allocated sufficient resources to police the ban imposed by it, which has led to a few prosecutions. However, notwithstanding the ban, this palm has been readily available (albeit at a price substantially higher than other palms) almost since its discovery.

Fortunately, it appears that the palm is reasonably prolific in its restricted habitat and each plant produces extensive quantities of seed. I understand that the Department of Primary Industries has recently decided there will be controlled distribution of seed collected by its officers rather than a total ban. One wonders why this decision could not have been made years ago, after realistic assessment of the status of the palm and the availability of seed.

Perhaps there is further scope for exchange of seeds between South Africa and Australia. This distribution of seeds will enable exotic cycads to be cultivated by the receiving country, leading in time to mature plants of such cycads and a further (local) source of seeds.

***Keith T. Thompson**, 11 Turner Street, Corinda, Queensland 4075, Australia.*

Received 12 January 1995

Dear Editor

TWIN SEEDS ON *CERATOZAMIA*

After collecting a cone from a *Ceratozamia norstogii*, I had earlier hand pollinated, I noticed that half of the seeds were twins. Either two separate seeds, both connected to the same half of the sporophyll, or a siamese twin type seed (Figure 1).

Figure 1 Photograph showing a sporophyll with a double seed on the right side, the cleaned double seed (lower left), and a twin seed (lower right).

I was wondering, does this happen very often and will the two plants from the double seeds be identical? I have had seeds from time to time that were "welded" together, but never double seeds.

***Tom Broome**, 9128 Golden Gate Blvd., Polk City, FL 33868-9747, U.S.A.*

Received 12 January 1995

[The plants from the double seed will not be genetically identical because they developed from separate egg cells. - **Editor.**]

Dear Editor

WILDLIFE EXPO

We in Natal have just finished with an exhausting week at the WILDLIFE EXPO. It was visited by many thousands of visitors and we had an huge stand there, approximately 10 metres long and 3.5 metres wide. It was an exceptionally wonderful exposure for the

CYCAD SOCIETY - at least 50 membership forms were given away and who knows maybe there will be a whole lot more members from the NATAL area.

I would like to thank the Botanic Gardens and especially Anne Lambert for all her help and all the wonderful plants which were on loan to us. Without their kind assistance we would never have been able to put up such a spectacular show.

Thank you Cynthia and Ted Giddy, for your donation towards mechanics required by ourselves for the stall. We used 25 metres of hessian and bark and who knows what else one requires for this sort of stall.

To Roy Osborne, Logos Pillai, Andre Jordaan, Freda and Hassim Seedat, Nellie and Andre Vdede and Danie Nel - a very big thank you for your support in cash, kindness and time.

To crown things we had a second show on at the same time at the BLUFF SPECTACULAR GARDEN SHOW - and here I would like to thank George Walters and his son Andrew for their magnificent effort in putting up a show all on their own.

Avis Meresman, *P.O. Box 4726, 4000 Durban.*

Received 16 January 1995

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Dear Members of the Cycad Society of South Africa

COMPUTER EQUIPMENT FOR THE USE OF THE EDITOR

The computer and laser printer were delivered on 13 December 1994. I thank all of you who, in being members of the Society, have contributed financially and enabled the Council to buy the equipment.

This issue of "*Encephalartos*" is the first one that has been set up with the new equipment and I trust that it will satisfy all the requirements.

Isabella Claassen, *Editor: "Encephalartos", P.O. Box 25688, 0105 Monument Park.*

NEW SCIENTIFIC REPORTS

Forster, P.I.* & Machin, P. 1994. Cycad host plants for *Lilioceris nigripes* (Fabricius) (Coleoptera: Chrysomelidae) and *Theclinesthes onycha* (Hewitson) (Lepidoptera: Lycaenidae). *Australian Entomologist* 21: 99-102.

[Larvae of the chrysomelid beetle *Lilioceris nigripes* and the lycaenid butterfly *Theclinesthes onycha* feed on soft new foliage of Australian cycads. The authors review the host cycad species for these insects in line with recent advances in the taxonomy of the host plants. There seems to be little specialization of either the beetle (found on various *Cycas, Bowenia* and *Macrozamia* spp.) or the butterfly (found on many species of *Cycas* and *Macrozamia*).]

**Author's address: Queensland Herbarium, Queensland Department of Environment & Heritage, Meiers Road, Indooroopilly, Q 4068, Australia.*

Forster, P.I.*, Machin, P.J., Mound, L. & Wilson, G.M. 1994. Insects associated with reproductive structures of cycads in Queensland and northeast New South Wales, Australia. *Biotropica* 26: 217-222.

[Eight different identified insect taxa viz. *Hapalips* sp., *Tranes* sp. 1, *Tranes* sp. 2, *Enteles vigorsii, Ulmoides australis, Trigona* sp., *Exaireta spinegra*, and *Cycadothrips chadwickii* were found variosly associated with the male cones on several *Cycas* spp. and the male and female reproductive structures of *Lepidozamia peroffskyana* and several *Macrozamia* spp. There is a general, but not absolute, lack of host specificity. Some speculation is made of the role of these insects as pollinators and this may relate to the presence of cycad hybrids and intergrades in Australia. The record of *Trigona* sp. on male cones of *Macrozamia* reopens the question whether bees are implicated in cycad pollination.]

**Author's address: Queensland Herbarium, Queensland Department of Environment & Heritage, Meiers Road, Indooroopilly, Q. 4068, Australia.*

Grilli Caiola, M. & Canini, A. 1994. Nitrogenase activity and iron-superoxide dismutase localization in *Cycas revoluta* Thunb. cyanobionts. *Symbiosis* 16: 289-299.

[This work relates to heterocyst frequency, nitrogenase activity and the enzyme iron-superoxide dismutase in the cyanobiont zone of *Cycas revoluta* coralloid roots. It is proposed that the dismutase enzyme could have a function in protecting cells against damaging superoxide

radicals generated in the cyanobiont zones with high oxygen concentration.]
Authors' address: Dipartimento di Biologia, Università di Roma 'Tor Vergata', I-00133 Rome, Italy.

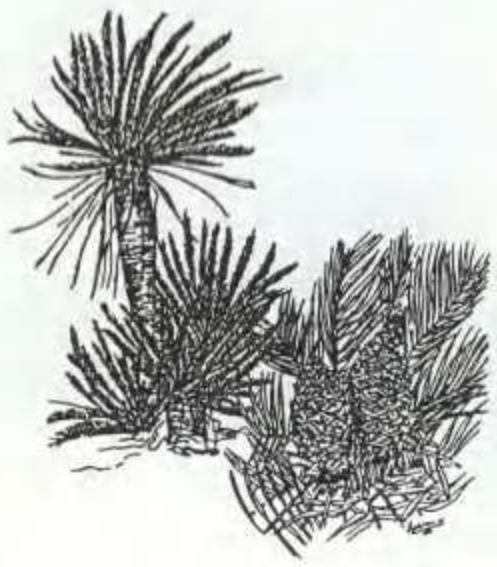
Jones, D.L.* & Forster, P.I. 1994. Seven new species of *Macrozamia* section *Parazamia* (Miq.) Miq. (Zamiaceae section *Parazamia*) from Queensland. *Austrobaileya* 4: 269-288.
[Seven new species of *Macrozamia* section *Parazamia* from south-east Queensland, Australia, are described and illustrated in this paper. All are restricted endemics and all but two species have been discovered during the past eight years. Naming of these taxa allows their listing on the schedule of rare or threatened flora of Queensland and hence facilitates conservation programmes for their survival. The new species are associated with two species complexes which dominate section *Parazamia* in Queensland. Five of them, *Macrozamia conferta, M. cranei, M. machinii, M. occidua* and *M. viridis*, fall within the *M. plurinerva* complex while the remaining two, *M. crassifolia* and *M. parcifolia*, belong to the *M. pauli-guilielmi* complex. A key to the species of *Macrozamia* section *Parazamia* in Queensland, based on leaf and leaflet characters, accompanies the text.]
**Author's address: Australian National Botanic Gardens, P.O. Box 1777, Canberra ACT 2601, Australia.*

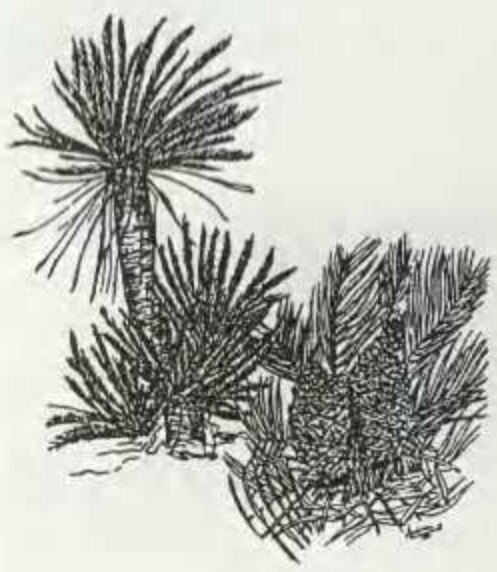
Meurer-Grimes, B. & Stevenson, D.W. 1994. The biflavones of the Cycadales revisited : biflavones in *Stangeria eriopus, Chigua restrepoi* and 32 other species of Cycadales. *Biochemical Systematics & Ecology* 22: 595-603.
[The distribution pattern of leaf biflavones, a special class of phenolic plant pigments, was investigated for 34 cycad taxa. The pattern in *Chigua* is similar to that in *Zamia*. Four specimens of *Stangeria* gave a complex and variable pattern of biflavones with some similarities to the profile for *Bowenia* - these two findings in sharp contrast to the "standard" and much quoted reference work of Dossaji and co-workers in 1975. Techniques used included HPLC (high performance liquid chromatography) and TLC (thin layer chromatography) and the six known compounds reported on are amentoflavone, bilobetin, isogingketin, gingketin, sciadopitysin and hinokiflavone. Some 29 other biflavonoids were detected but could not be identified. These chemotaxonomic data are considered of importance in the continuing cladistic studies of the Cycadales.]
Authors' address: New York Botanical Garden, Bronx, New York 10458, U.S.A.

Nagano, K., Inoue, R. & Kato, A. 1994. On the fluctuation of volatile fatty acids in the rumen contents of goats administered cycasin. Discussion on the cycasin administering method. *Gakujutsu Hokoku-Kagoshima Daigako Nogakubu* 44: 1-9 (in Japanese).
[Experimental goats were given doses of cycasin at 2.53 mg/kg/day for 91 days, one set having the cycasin fed through a nasal catheter and the other by administration via a rumen fistula. The volatile fatty acid contents of the rumen were monitored, together with body mass and some biochemical assays. The results suggest that the two different methods for cycasin administration did not affect rumen metabolism.]
Authors' address: Faculty of Agriculture, Kagoshima University, Kagoshima, 890 Japan.

Osborne, R.*, Grove, A., Oh, P., Mabry, T.J., Ng, J.C. & Seawright, A.A. 1994. The magical and medicinal usage of *Stangeria eriopus* in South Africa. *Journal of Ethnopharmacology* 43: 67-72.
[Trading at the two main "muthi" outlets in Natal results in sales of as many as 3410 *Stangeria* caudices per month, the material being used for both magical and medicinal purposes. A comprehensive chemical analysis of the root tissue is provided. The unusually high concentration of sodium sulphate in the plant material may explain its use as an emetic. Readers are referred to a preliminary report on this project which appeared in "*Encephalartos*" 32: 8-11.]
**Author's address: Department of Chemistry, University of Natal, King George V Avenue, Durban 4001, South Africa.*

Compiled by ***Roy Osborne****, Department of Chemistry, University of Natal, 4001 Durban.*





DONATIONS RECEIVED / DONASIES ONTVANG

2 OCTOBER/OKTOBER 1993 TO/TOT 12 DECEMBER/DESEMBER 1994

THE FOLLOWING DONATIONS TO THE CYCAD SOCIETY OF SOUTH AFRICA ARE ACKNOWLEDGED WITH THANKS:
DIE VOLGENDE DONASIES AAN DIE BROODBOOM VERENIGING VAN SUID-AFRIKA WORD MET DANK ERKEN:

Number Nommer	NAME/NAAM	Amount Bedrag	Number Nommer	NAME/NAAM	Amount Bedrag
223	N.J. Kachelhoffer	R329.00	1374	K.N. de Kock	R30.00
847	J.W. Walters	169.00	448	F.H. Wessels	29.00
1079	P.J. Gelderblom	129.00	477	J.H. Scriba	29.00
584	S. Srikum	121.36	512	R. Snelling	29.00
719	P.A. van Niekerk	100.00	836	Z. Bard	29.00
1144	A. van den Heede	100.00	969	B.L. Matthee	29.00
587	D. Shahak	95.17	1047	J.M. Begley	29.00
1666	G.G. Gerber	88.00	1185	H.G. van Heerden	29:00
78	C.E. Pinker	79.00	1201	A. Roos	29.00
1543	M.E. de Kooker	79.00	1275	G.A. Meyer	29.00
1721	C. Malan	79.00	1514	P.D. Niehaus	29.00
1566	M.H.P. Cole	71.00	1755	C. Buys	29.00
1506	R.M. Hardy	70.03	237	J.M. Nell	28.00
94	L.H. Olivier	69.00	1675	F.J. de Jager	28.00
1033	A.R. Vice	69.00	1760	A.G. Uys	27.50
1117	C. Strang	69.00	81	H.C. Kennedy	26.50
1324	M. Lovatt	69.00	734	R.J. Platford	26.50
1697	A. le Roux	69.00	1236	R.C. Steyn	26.50
1730	All Trux-Transport	69.00	1794	R.J.L. Hoog	26.50
1784	P.W. Nel	69.00	906	J. Brunner	26.00
1434	J.M. Clemitson	67.00	1687	E. König	26.00
853	P.W.B. Kruger	60.00	1715	G. Ausloos	26.00
1705	E.J. van der Merwe	50.00	1681	S.G. Cooper	23.00
1809	G.C. Middlewick	50.00	829	C.F. Niewoudt	22.50
1688	G.F. Slaviera	49.00	1319	A. du Plessis	22.00
1196	M.J. de Bruyn	47.50	1056	C.L. Visser	21.50
1545	A. Zissler	46.91	8	H.E. Wohlberg	20.00
1060	D.W. & F.V. Wilson	46.00	59	Y.H. Phipson	20.00
1060	F.V. Wilson	45.00	817	C.S. Erasmus	20.00
1676	J.P. Louw	41.00	1372	M.A.M Marx	20.00
47	S. Wentzel	39.00	1481	A.J. Snyman	20.00
991	C.M. van der Linde	39.00	1503	J. Niewoudt	20.00
1271	H.X.N. du Toit	39.00	1540	I.W. Ferreira	20.00
1428	L. du Rand	39.00	1624	J. Heyneke	20.00
1632	F.J. Füglister	39.00	1695	J. van Greuning	20.00
1323	F. Pieterse	38.00	1803	J. la Grange	20.00
1669	K.D. Botha	38.00	43	V.L. Pringle	19.00
1672	A.E. Kuschke	38.00	109	M. Lasnitski	19.00
242	D.J. Cochrane-Murray	36.50	159	J.D. Loubser	19.00
947	J.J. Booysen	36.50	166	C.G. Prinsloo	19.00
518	N.P.A. Schellevis	32.00	168	N. Munro	19.00
1507	R.J. Cohen	31.00	228	G. Christopulo	19.00

Number Nommer	NAME/NAAM	Amount Bedrag	Number Nommer	NAME/NAAM	Amount Bedrag
265	A.A. Tarr	R19.00	1788	G.R. Allison	R19.00
271	I.M. Freeman	19.00	1789	J.J. Greyling	19.00
328	D.S. de Wet	19.00	1791	M.A. Kadwa	19.00
399	K. Bischofberger	19.00	1818	D.J. de Smidt	19.00
427	K.H. Palmer	19.00	1819	J. van Vuuren	19.00
433	N.G.C. Henning	19.00	595	J. Bursey	18.00
629	K. Watson	19.00	1016	A.S. Breytenbach	16.50
698	M.N. Smuts	19.00	1258	L. van Rooy	16.50
710	J.N. de Bruin	19.00	1378	N.J.S. Kruger	16.50
773	A. Lampret	19.00	1487	S.C. Jacobs	16.50
776	J. Besseling	19.00	1714	J J. Kloppers	16.50
923	J.A. de Beer	19.00	1764	W.A. Cooper	16.50
1002	J.M. Janse van Rensburg	19.00	1194	H. & D. Niemand	16.00
1004	P. Stranex	19.00	1489	J.D. Pryer	16.00
1019	J.J. Ras	19.00	822	R.B. Boy	15.00
1081	D.J. Nel	19.00	1227	H.M. Besseling	14.00
1109	P.K. Meyer	19.00	1682	P. van Zyl & J.H. Venske	14.00
1178	M.V. Harris	19.00	224	R.J. Campbell	11.50
1190	H.P.J. Fouche	19.00	437	G.L. Schoeman	11.50
1197	N. Reinach	19.00	525	P.H. Gore	11.50
1229	P.C.H. van der Merwe	19.00	1282	S.J.H. Britz	11.50
1283	C.H. van der Merwe	19.00	397	J.S. Myburgh	10.00
1335	T.M. Gould	19.00	420	H.W. Hanaczeck	10.00
1338	C. Stokes	19.00	569	L.D. van Rooyen	10.00
1346	T. Newland-Nell	19.00	601	G.B. Hart	10.00
1403	P.W. Doddemeade	19.00	1249	H. Seedat	10.00
1415	R.R. Rudman	19.00	1318	J.W. Wessels	10.00
1462	A.J. Kable	19.00	1355	W. Joubert	10.00
1470	M. Nasser	19.00	1358	J.H. Kofman	10.00
1478	M.J. van den Berg	19.00	1474	R.K. Marson	10.00
1482	J.J. Kemp	19.00	1528	S.J. Naude	10.00
1513	C.C. Viljoen	19.00	1534	N.N. Harvey	10.00
1531	I.J. Joubert	19.00	1535	M.M. Hinterding	10.00
1539	J.L. van den Heever	19.00	1586	B. Heiberg	10.00
1548	R.J. du Preez	19.00	1606	G.E. Edmondson	10.00
1567	L.J. Pereira	19.00	6	O.J. Minnie	9.00
1578	S.F.du T. Avenant	19.00	115	E. Henman	9.00
1581	J.J. Prinsloo	19.00	139	J.J.G. Swanepoel	9.00
1585	B.J. Handley	19.00	178	C.W. Topham	9.00
1597	P. Nel	19.00	200	H. Gerber	9.00
1614	C.F.H. Gneitung	19.00	304	A.L. Topham	9.00
1639	K. Nair	19.00	311	C.M. Schimmer	9.00
1652	S. van Sittert	19.00	410	G.N. de Haas	9.00
1654	P.J. Robbertse	19.00	545	M.S. Kruger	9.00
1679	M. Leach	19.00	741	I.B. Mulder	9.00
1685	A. Schele	19.00	848	J.W. Bothma	9.00
1690	N.S. Botes	19.00	911	K. Steenkamp	9.00
1706	A. Calitz	19.00	953	P. Kirkel	9.00
1711	W.J. Hollander	19.00	971	K.P. du Toit	9.00
1718	C.S. Williams	19.00	993	A.S.B. Naude	9.00
1725	B. Young	19.00	1039	D.F. McKinlay	9.00
1726	H. Müller	19.00	1140	S.R. Kruger	9.00
1746	G.J. Lotz	19.00	1166	C.G. Lightley	9.00
1761	W.D. Botma	19.00	1207	W. van Rooyen	9.00
1780	A.P. van Staden	19.00	1222	S. Riordan	9.00

Number Nommer	NAME/NAAM	Amount Bedrag	Number Nommer	NAME/NAAM	Amount Bedrag
1240	J.H. Lombaard	R9.00	1628	L.C. Eksteen	R6.50
1268	E.J. Myburgh	9.00	194	T. Titchen	6.00
1285	J. Vorster	9.00	609	O. Stainer	6.00
1348	G. Corlett	9.00	1361	F. Habekost	6.00
1369	E.J. van Buren-Schele	9.00	1446	R. Schmidt	6.00
1380	P. Wentzel	9.00	1502	K. Wiegner	6.00
1423	J.J.G. Nel	9.00	1596	G. Storbeck	6.00
1505	Everdon Landgoed	9.00	1670	M.P. Leach	6.00
1523	I. Schoppers	9.00	1719	P. van Vinckenroye	6.00
1532	J. & S. Lessing	9.00	203	A.S.J. van der Walt	5.00
1564	J.S. du Toit	9.00	1417	J.D. Bedford	5.00
1609	J.J. Viljoen	9.00	1766	J.J. Hunter	5.00
1694	D. Erasmus	9.00	5	S.M. Pienaar	4.50
1712	J.H. Wentzel	9.00	38	I. van der Walt	4.00
1722	T.I. Muller	9.00	80	J.J. de Jong	4.00
1756	E. van Zyl	9.00	147	D.M. Tate	4.00
1766	J.J. Hunter	9.00	542	G.P.J. Fritz	4.00
1776	I. & S. Burden	9.00	759	B. Ridge	4.00
1786	W. & R. Drake	9.00	769	G.A. Nel	4.00
1807	D. Brumme	9.00	912	R.E. Buchanan	4.00
1821	J. Smit	9.00	1126	H. van der Westhuizen	4.00
1822	A. Napolitano	9.00	1183	W.P.J. Raats	4.00
142	J.D. Basson	8.00	1192	R. Nieuwenhuizen	4.00
1793	H. Tomiyama	7.93	1272	W.H. Louw	4.00
97	N. Grobbelaar	7.50	1431	S. le Roux	4.00
645	W.J. Lotter	7.50	1572	H. Rönnkvist	4.00
1400	H. Grobbelaar	7.50	1575	J.J.M. Meyer	4.00
276	T.J.R. Botha	6.50	1759	J.W. Rautenbach	4.00
316	C. Campbell	6.50	1808	V.A. Thurston	4.00
424	C.F. Schmidt	6.50	1637	K. Mieritz	2.22
458	G.A. Johannes	6.50	346	J-P. Sclavo	2.00
523	P.P. Myburgh	6.50	1216	F.G. Neytzell-de Wilde	2.00
746	J.F.G. van der Westhuizen	6.50	1691	H. Shimizu	1.89
752	J. van Greuning	6.50	187	W.D. Ross	1.50
1112	M.J. Rautenbach	6.50	229	G. van Wyk	1.50
1206	S.D. Coetzee	6.50	528	W.J. Jacobs	1.50
1405	W.W. de Beer	6.50	1490	S. Wagner	1.00
1526	I.J. van den Berg	6.50	205	C.C. Meyer	0.50
1542	D.J. Keyser	6.50			
				TOTAL/TOTAAL	**R6124.01**

Illicit cycad dealer fined

EASTERN PROVINCE HERALD, WEDNESDAY, JULY 13, 1994

Taking scarce plants out of Eastern Cape brings R15 000 penalty

By MNCEDISI SALISO

A BUSINESSMAN who lost R22 000 in an illicit cycad deal was yesterday convicted in Port Elizabeth of illegal dealing in cycads — and fined R15 000 (or nine months in jail).

Regional Court magistrate C J R Naude fined Jan Gabriel Vermeulen, 34, of Gooddale Street, Bloemfontein, a further R22 000 conditionally suspended for five years.

Vermeulen's co-accused Theodore Gustav Opperman, 37, of Sarel Pretorius Street, Bloemfontein, was found not guilty after Mr Naude found no evidence to suggest Mr Opperman was involved in the illegal transaction.

The court found the State had failed to prove beyond reasonable doubt that Mr Opperman knew about the transaction involving the purchase of the cycads.

Vermeulen and Mr Opperman had both pleaded not guilty to illegally purchasing the plants in Bathurst in June last year, and transporting them to another province, the Free State, without a permit.

Bathurst farmer Daniel Jacobus Potas, 45, who sold the rare species, pleaded guilty to illegal cycad dealing and was fined R10 000 or 18 months' in jail — with a further R20 000 conditionally suspended for five years — on June 16 last year.

Nature Conservation Department employee and author of a book about cycads Cynthia Giddy, of Maritzburg, told the court the plants were valuable.

She said removing the plants from their wild environment was not a conservation measure and they would have difficulty adapting to the Bloemfontein climate.

Mrs Giddy said she had gone to Bloemfontein to identify and evaluate the cycads but did not know where they had been found.

Cape Provincial Administration conservationist Jacobus Cornelius Basson said the plants had been retrieved and returned to the Eastern Cape to be replanted.

In passing sentence, Mr Naude said Vermeulen knew he was involved in an illegal transaction.

He said Vermeulen had used Potas' weak financial standing to buy the cycads at a fraction of their value.

The 14 cycads Mrs Giddy saw were valued at R225 000.

Mr Naude said Vermeulen had to be punished so others who intended committing the same offence would think twice.

He said he was prepared to concede that Vermeulen, a first offender, would probably not commit a similar offence again.

Mr Naude said it was clear from the evidence before him that the plants involved were extremely scarce and conservationists did all in their power to protect them.

He said authorities adopted a serious attitude to illegal dealings in cycads, and their protection.

Prosecutor Martin le Roux appeared for the State. Advocate M H Wessels appeared for Vermeulen.

The Natal Mercury Friday December 2, 1994

Neville Hawkey, of the KwaZulu Nature Conservation Department, with rare Msinga cycads and colleagues Malinda Mtetwa, Douglas Vilane and Dumisani Pandela.
Picture by TONY CARNIE

Rare Tugela cycads plucked to safety by helicopter

SEVERAL specimens of an extremely rare cycad species were plucked by helicopter from a remote part of the Tugela Valley yesterday.

The rescue operation was mounted by the KwaZulu Department of Nature Conservation, which is concerned at the alarming rate at which two cycad species have been disappearing.

The two species — Encephalartos Msinga and Encephalartos Cerinus — occur only in the Buffalo river valley near Tugela Ferry.

Collectors are willing to pay hundreds of rand for them, encouraging some residents in the valley to clamber up rocky cliffs to steal the cycads. — (Environment Reporter)

AUTHORS OF FORMAL DESCRIPTIONS OF NEW CYCAD TAXA AND NEW NAME COMBINATIONS:

Please Read "INSTRUCTIONS TO AUTHORS", paragraphs 5 and 6, at the back of this issue.

EAST LONDON DAILY DISPATCH

December 15, 1994

Plan to sell off EL cycads

by GUY DE MARIGNY

EAST LONDON — Many of the city's cycads, worth up to R1 million, might be sold to the highest bidders, a senior municipal official here said.

"American buyers have expressed interest and we could start selling tomorrow," the director of cultural and environmental services, Mr Albert Janse, said.

East London has 324 landmark cycads, slow-growing plants with origins in pre-historic times, in various spots around the city. There are 154 in the Queen's Park Zoo area, 146 in other parts of the city, and 24 in Lukin Road.

The latter, in traffic islands near the top of Oxford Street, had been there for up to 80 years, the municipal street tree supervisor, Mr Benny Fleming, said.

"I have been delegated authority to sell plants and each cycad could bring between R5 000 and R10 000 into the municipal coffers," Mr Janse said.

"To me, it seems as if the public doesn't appreciate them. I have frequently seen people drive over, or park on, the traffic islands in Lukin Road."

The municipal northern districts horticulturalist, Mr Wimpie Cloete, said he knew of no damage reports to Lukin Street cycads in recent months.

The mayor, Mr Carl Burger, said the matter had not been discussed by the council.

He confirmed Mr Janse had authority to sell plants, but added: "I'm sure he would deem it necessary to go to the council before taking a decision."

The environmental services manager, Mr Michael Bentall, said he was against the sale of the cycads, some of which could be up to 300 years old.

Both Mr Fleming and Mr Bentall estimated the price of a medium to large cycad at R1 000, while Mr Bentall estimated a price of R1 500 to R2 000 for large ones.

Because they were protected, the municipality would have to apply to the Department of Nature Conservation for a permit to sell them.

"The cycads should be relocated for protection, if need be, but not sold," Mr Bentall said.

"Publicity literature points out that one of the attractions here is that we have them in city streets — few other places in South Africa can offer that."

A tall cycad outside the East London Technical College.

OUTEURS VAN FORMELE BESKRYWINGS VAN NUWE BROODBOOMSOORTE EN NUWE NAAMKOMBINASIES:

Lees asseblief "VOORSKRIFTE AAN OUTEURS", paragrawe 5 en 6, agterin hierdie uitgawe.

EAST LONDON DAILY DISPATCH
December 20, 1994

Council to apologise for cycad sale hoax

by GUY DE MARIGNY
Municipal Reporter

EAST LONDON — An ad hoc recess committee of the city council here yesterday resolved to apologise to the citizens of the city and to the Daily Dispatch in the wake of a nationwide cycad hoax by a senior municipal official.

Last week, the director of cultural and environmental services, Mr Albert Janse, said he intended to sell off more than 300 city cycads to the highest bidder.

Interviewed on radio shows around the country, Mr Janse said he intended to finalise the sale before the end of the weekend, probably accepting an East Londoner's offer.

He then claimed it had all been "a gigantic publicity ploy" to draw attention to alleged public apathy about neglect of the city's cycads.

Before yesterday's committee meeting, Mr Janse said the dual purpose of his hoax was to draw attention to "problems" experienced with the protection of cycads, and to put East London "on the map" as the nation's cycad capital.

The mayor, Mr Carl Burger, the deputy mayor, Mr Ken Pulford, and the acting director of the East London Metropolitan Tourism Association (Elmta), Mr Dave Wilson were, he alleged, all "in on it".

Contacted for comment prior to yesterday's meeting, the councillors concerned denied any collusion, saying they "knew of" Mr Janse's plan but had not taken it seriously or condoned it.

Mr Janse made his proposal during a management committee social function last week, but Mr Wilson said "it was so ludicrous I took no notice".

Conceding he could have blown the whistle on Mr Janse on Thursday, when approached by the nation's press for comment, Mr Burger said he had preferred to wait until the special committee meeting to discuss the cycad sale issue.

At the meeting, the mayor read out a letter from the editor of the Daily Dispatch, Professor Gavin Stewart, addressed to himself, councillors Pulford and Wilson, the town clerk, and Mr Janse, calling for an apology for deliberately misleading the newspaper.

Mr Janse said he accepted full responsibility, and had "no problem" with submitting an apology.

He described a meeting with the editor and news editor of the Daily Dispatch, at which he explained his motives, and claimed the letter was "contrary to the spirit" of that meeting.

Acknowledging that he had expected a range of responses, he added that he had intended to carry on the pretence for a week, but due to the pressure on his wife, he had relented.

The whole issue needed to be approached "with a certain sense of humour", he maintained — but most of the councillors present seemed unamused.

Questioned by Mr Eric Whitaker, Mr Janse admitted he was the initial anonymous caller to the Dispatch last week, to get the hoax underway.

"This is a sick joke," Mr Donald Card said, adding he had had calls from irate ratepayers, and that he was not satisfied with Mr Janse's explanation.

"You have such stories before the first of April, but not shortly before Christmas," Mr Card said.

Mr Card asked why, even if there were problems with the cycads in Lukin Road, or the palms in Botha Road, Mr Janse could not have used normal methods.

Mr Janse said that making the issue newsworthy had ensued maximum media coverage.

Saying the city as a whole had been "embarrassed", Mrs Joy Fennell added the publicity had been more negative than positive.

Mr Pulford said the mayor and he had both heard what Mr Janse proposed, but treated it "lightheartedly".

"I told Mr Janse 'it sounds interesting, but be careful that it doesn't backfire on you'," Mr Pulford said.

It was resolved that on behalf of the council, the town clerk — the human resources manager, Mr Ron Ortlieb, as acting town clerk — was to make a formal apology for Mr Janse's actions to the citizens of East London and to the Daily Dispatch.

Also agreed to was an amended proposal by Mr Card, seconded by Mr Wilson, that in future when press statements were made on policy issues, they should be channelled through the town clerk's office.

Mr Janse said a resolution excluding the sale of cycads from his delegated authority to sell plants was a "gesture", and he had never really intended to to sell them as they were a "pet concern" of his.

Pine 'dinosaur' lurks in gorge

24/31 December 1994

Ian Anderson, Melbourne

FORTY specimens of a previously unknown pine tree that may date back to the age of the dinosaurs have been found at the bottom of a deep gorge within 200 kilometres of Sydney. Botanists are staggered by the find—some are calling it one of the most important botanical finds of the century—but they have no idea where the bizarre-looking tree fits into the evolution of pine trees.

The existence of the tree was revealed last week by the New South Wales environment minister, Chris Hartcher. The grove of trees, covering about 5000 square metres, is in the Wollemi National Park in the Blue Mountains west of Sydney. Hartcher said it was "like finding a dinosaur in your back yard".

Bob Hill, a palaeobotanist at the University of Tasmania, says it is astonishing that a relic of the past could be found so close to a major city. "It makes you wonder what else is out there."

The tree was discovered in August by David Noble from the National Parks and Wildlife Service in New South Wales. Noble abseiled down a 600-metre gorge in the park—and found the trees at the bottom. He took a branch back to Sydney where scientists at first did not believe that the leaves came from a tree 40 metres tall. They insisted they came from a fern. After several trips to the site, Wyn Jones from the NPWS, botanist Jan Allen, and Ken Hill from the Royal Botanic Gardens in Sydney identified the tree as a new genus of the family Araucariaceae. It has been given the popular name of Wollemi pine, but will be given a scientific name early next year.

The family has two other genera: *Araucaria*, which includes the Chilean monkey puzzle, the Norfolk Island pine, and the hoop pine and bunya pine of Australia and New Zealand; and *Agathis*, which includes the kauri from New Zealand and islands in the Pacific. "Wollemi pine has some similarities to both the other genera but it is also markedly different," says Hill.

The trunk has spongy bark covered in small nodules. "I've never seen anything like it," says Hill. The foliage varies in shape, colour, size and texture between the juvenile and mature tree, which is not the case in the other genera. The mature foliage, arranged in rows of four, is also unique. And while most pines tend to be dark green, the leaves of Wollemi pine vary from bright lime green on younger foliage to a yellow-olive green on mature trees.

"We have seedlings, saplings and mature trees. The oldest would be about 400 years," says Hill. But he believes the genus dates back to between 100 million and 50 million years ago. This age is based on its similarity to fossils from this age of an extinct genus of Araucariaceae called *Araucariodies*, found in Tasmania and New Zealand.

AFP/Press Association

Strange survivor: fern-like fronds and round cones

"I think we are looking at a sister of the *Agathis* which split off at least 60 million years ago," says Hill. But Mike Pole, a palaeobotanist from the University of Tasmania, says it is too early to call Wollemi pine a living fossil. "We have no evidence to say that. This is a new genus. It's unique. We have no fossil record of it. It could predate *Agathis* and *Araucaria* or it could have split off from them 10 million years ago."

Bob Hill says the significance of the find in terms of conifer evolution was "mind-boggling". "It is not obvious at all where it fits in." Pole, who found the fossil *Araucariodies* in New Zealand, has fossilised cones which he wants to compare with those of Wollemi pine.

DNA studies of the pine will help to establish the tree's relationship with the other genera. After last week's announcement, the Royal Botanic Gardens in Sydney has received requests for seeds from botanic gardens around the world. ❑