ENCEPHALARTOS

JOURNAL OF THE
CYCAD SOCIETY OF
SOUTHERN AFRICA

TYDSKRIF VAN DIE
BROODBOOMVERENIGING
VAN SUIDELIKE AFRIKA

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VOORBLAD/COVER

Encephalartos

barteri

EDITORIAL

The goal of nature conservation legislation, we assume, is to protect the natural habitat. As far as cycads are concerned, this obviously means the protection of cycads where they occur in nature. As we understand it, all aspects of the legislation concerned should be aimed at the achievement of this goal. We, and the Cycad Society as a whole, fully support this objective - it is written in our constitution for that matter.

There will probably always be discussion and argument about the detail of nature conservation legislation and the application of such laws. We do not have any problem with that, provided the primary objective of the legislation is always kept in mind.

Something about which there does not seem to be a need for much further discussion, is the unpleasant situation that the different provinces of South Africa have different sets of laws on cycads, as is evident from the article "Broodbome en die Wet" which appears elsewhere in this edition of ENCEPHA-

REDAKSIONEEL

Die doel van natuurbewaringswetgewing, so neem ons aan, is om die natuurlike habitat te beskerm. So ver dit broodbome aangaan, beteken dit klaarblyklik die beskerming van broodbome waar hulle in die natuur voorkom. Soos ons dit verstaan, behoort alle aspekte van die betrokke wetgewing daarop gemik te wees om hierdie doel na te streef. Ons, en die Broodboomvereniging in sy geheel, steun hierdie doelstelling volkome - dit staan trouens in die Vereniging se grondwet geskrywe.

Oor die detail van natuurbewaringswetgewing en die toepassing daarvan sal seker altyd gepraat en geredeneer word. Daarmee het ons nie 'n probleem nie, mits die primêre doel van die wetgewing altyd in die oog gehou word.

Iets waaroor daar seker nie meer baie gepraat hoef te word nie, is die onsmaaklike situasie dat die verskillende provinsies van Suid-Afrika verskillende stelle wetgewing oor broodbome het, soos duidelik blyk uit die artikel "Broodbome en die Wet", wat elders in hierdie uitgawe van ENCEPHALARTOS

EDITORIAL
- CONTINUED -

LARTOS. This situation not only leads to great confusion but, because it does not make sense to anyone, creates a negative approach towards the legislation in general, which in turn harms the whole conservation ideal.

In which ever way one looks at it, it simply does not make sense that Encephalartos latifrons is an endangered species at Vryburg, where a permit is required to possess even a seedling ,while 70 km to the east, at Schweizer-Reneke, no permit is required to possess even a mature plant of this rare species. It makes even less sense that in the Cape Province a permit is required to possess a seedling of a Transvaal species such as E.inopinus, while it is not necessary in the Transvaal. And what sense does it make that someone from Cape Town may legally buy a seedling in Kimberley, put it in his car and take it home, but if he legally buys a seedling in Durban, puts it in his car and takes it home, he transgresses the law and must first obtain an import permit?

We are aware that there is talk of attempts to standardise legislation. It is of the utmost importance, however, also for the sake of the conservation ideal, that this man-made obstacle be removed as soon as possible. We look forward to the day when legislation affecting cycads will be the same all over the country.

REDAKSIONEEL
- VERVOLG -

verskyn. Hierdie situasie skep nie net groot verwarring nie, maar omdat dit vir niemand sin maak nie, skep dit 'n negatiewe gevoel teenoor die wetgewing in die geheel, wat die hele bewaringsideaal groot skade berokken.

Op watter manier 'n mens ook al daarna kyk, dit maak eenvoudig nie sin dat Encephalartos latifrons op Vryburg 'n bedreigde spesie is waarvoor 'n permit selfs vir 'n saailing vereis word, terwyl daar 70 km oos, op Schweizer-Reneke, nie 'n permit nodig is om selfs 'n volwasse plant van hierdie skaars spesie te besit nie. Nog minder maak dit sin dat in die Kaapprovinsie 'n permit vereis word om 'n saailing van 'n Transvaalse spesie soos E.inopinus te besit, terwyl dit nie in die Transvaal nodig is nie. En watter sin is daarin dat iemand van Kaapstad 'n saailing op Kimberley wettiglik mag koop, in sy motor mag laai en huis toe mag neem, maar as hy die saailing wettiglik in Durban koop, dit in sy motor laai en huis toe neem, hy die wet oortree en eers 'n invoerpermit moet kry?

Ons weet daar is sprake dat pogings aangewend word om wetgewing te standardiseer. Dit is egter van die grootste belang, ook vir die ideaal van natuurbewaring, dat hierdie mensgemaakte struikelblok so gou as moontlik verwyder word. Ons sien uit na die dag wanneer wetgewing wat broodbome raak oral in die land dieselfde sal wees.

Opinions which are expressed in the editorial are those of the Editor and do not necessarily represent the policy of the Cycad Society. Likewise are opinions expressed in articles published in ENCEPHALARTOS those of the authors and not necessarily those of the Cycad Society or the Editor.

Menings wat in die redaksionele artikel uitgespreek word, is dié van die Redakteur en verteenwoordig nie noodwendig die beleid van die Broodboomvereniging nie. Ingelyks is menings uitgespreek in artikels wat in ENCEPHALARTOS gepubliseer word, dié van die skrywers en nie noodwendig dié van die Broodboomvereniging of die Redakteur nie.

ENCEPHALARTOS IN PERTH

by Alan Lane

The city of Perth is situated on the Western seaboard of Australia at much the same latitude as Cape Town and Port Elizabeth in South Africa. We have hot dry summers with temperatures ranging from about 20 degrees C at night to the mid-thirties during the day. Our winters are cool and wet and this is when we receive most of our annual rainfall of 880 mm. Our average minimum in winter is 9 degrees C and the average maximum is 18 degrees C. The lowest temperature we had this winter was 3,6 degrees C and there were frosts in some areas. The soil is generally sandy with good drainage; conditions which seems most suitable for cycads.

The history of cycads in Perth started about 17 years ago when a local nurseryman, Archie Glass, imported a few seeds from a contact in South Africa. At the time the seeds were identified as E. altensteinii and E. horridus. I believe that only three of the "E. horridus" and a few dozen of the E. altensteinii germinated. At the time Archie found them very hard to sell, but one by one, over many years, they found their way into private collections. To the best of my knowledge these were the only South African cycads in Perth until the past few years.

A few years ago, I noticed these cycads here and there and made the effort to start a collection. I now have three of Archie's original batch of E. altensteinii, two of which had been grown in tubs for their lifetime, and a much larger plant which had been grown in the ground for the same period. At the same time, I approached another nurseryman, Ray Aitken, about an "E. horridus" I spotted in his garden some months previously. He was extremely obliging in allowing me to dig it up and shift it to my garden. It now seems these few specimens may have been mis-identified for the past 17 years and they are almost certainly specimens of E. ferox.

Recent interest in South African cycads has been initiated by the Palm and Cycad Society of Western Australia and will undoubtedly grow rapidly in the future.

(Alan Lane's address: 39 Vincent Road, Wanneroo, Western Australia 6065, Australia.)

E. ferox growing in Perth.

BROODBOME EN DIE WET

deur Maans Kemp

INLEIDING

Die Broodboomvereniging en sy ampsdraers ontvang voortdurend 'n groot aantal navrae ten opsigte van wetgewing oor broodbome en die toepassing daarvan. Ons het dus besluit om die mees algemene vrae in die vorm van 'n artikel in ENCEPHALARTOS vir ons lede te beantwoord.

Wat die oorgrote meerderheid van ons lede betref, is die enigste wetgewing wat van belang is die ordonnansies oor natuurbewaring van die verskillende provinsies van Suid-Afrika. Daarom konsentreer ons in hierdie artikel op hierdie aspek. Lede moet egter ook daarop let dat die invoer en uitvoer van broodboomplante en -saad, oor die nasionale grense van Suid-Afrika, deur ander wetgewing beheer word. Opsommend kan gesê word dat sodanige in- en uitvoer slegs met toestemming van die Afdeling Plant- en Saadbeheer van die Departement Landbou mag plaasvind. Lede wat meer inligting in hierdie verband verlang, kan direk met hierdie Afdeling in verbinding tree. U sal hulle adres en telefoonnommer onder die staatsdepartemente in die telefoongids van u naaste groot sentrum kry.

Ons het 'n lys vrae oor broodboomwetgewing aan die natuurbewaringsowerhede van die drie "broodboomprovinsies" (Kaap, Natal en Transvaal) voorgelê. Hulle antwoorde word hieronder verstrek. Ons sê graag baie dankie aan die personeel van die betrokke drie departemente (die Kaapse Hoofdirektoraat Natuur- en Omgewingsbewaring, die Raad vir die Bewaring van Natalse Parke, Wild en Vis, en die Transvaalse Afdeling Natuurbewaring) vir hulle flinke en vriendelike samewerking om die inligting aan ons te verstrek. Alhoewel in die meeste gevalle direk op die vrae geantwoord is, moes ons hier en daar die betrokke ordonnansie self interpreteer. Indien hulle nie met die interpretasie saamstem nie, of as daar intussen veranderinge was, word die betrokke natuurbewaringsowerhede versoek om met ons in verbinding te tree. Regstellings of wysigings sal dan in 'n volgende uitgawe van ENCEPHALARTOS gepubliseer word. Lede word aangemoedig om met hulle betrokke natuurbewaringsdepartement te skakel as hulle meer inligting verlang.

VRAE EN ANTWOORDE

Vraag 1: Het 'n persoon wat in u provinsie woon 'n permit van u departement nodig om:

1.1 'n Volwasse broodboom te besit?

Antwoord:

KAAP - Ja, behalwe in die geval van eienaars van grond waarop broodbome in hulle natuurlike staat voorkom.

NATAL- Nee, maar die eienaar moet te alle tye 'n wettige en redelike verduideliking kan verskaf oor hoe hy in besit van die plant gekom het.

TRANS=
VAAL- Ja, in die geval van Encephalartos cupidus en E. humilis, asook vir alle ander Transvaalse Encephalartos-spesies met 'n stamdeursnee van 150mm en groter.

1.2 'n Broodboomsaailing te besit?

Antwoord:

KAAP - Ja, behalwe in die geval van eienaars van grond waarop broodbome in hulle natuurlike staat voorkom, asook in die geval waar sodanige saailing gekoop of ontvang is van 'n kweker wat in besit is van 'n permit van die Kaapse natuurbewaringsowerheid om gekweekte broodbome te verkoop. In laasgenoemde geval moet die koper of ontvanger in besit wees van 'n dokument wat die volle naam en adres van die verkoper of skenker, die volle naam en adres van die koper of ontvanger, die nommer en datum van die magtigingspermit en die name en getalle van die betrokke saailinge bevat.

NATAL- Dieselfde as op vraag 1.1.

TRANS=
VAAL - Nee, behalwe in die geval van E.cupidus en E.humilis. 'n Saailing word beskou as 'n plant met 'n stamdeursnee van hoogstens 150mm.

1.3 Broodboomsaad te besit?

Antwoord:
KAAP - Dieselfde as op vraag 1.1

NATAL- Dieselfde as op vraag 1.1

TRANS=
VAAL - Ja, maar aangesien dit onpraktikies is om permitte vir saad uit te reik, word dit nie toegepas nie. Iemand wat saad besit moet egter die wettige verkryging daarvan kan bevestig.

1.4 'n Volwasse broodboom aan 'n ander persoon te skenk/verkoop?

Antwoord:
KAAP - Ja

NATAL- Ja, in die geval van verkoop. Nee, in die geval van skenk, maar die skenker moet die ontvanger voorsien van 'n skenkingsbrief wat die volgende moet bevat: aantal plante, spesiename, plantgroottes, datum, name, adresse en handtekeninge van beide partye.

TRANS=
VAAL - Ja

1.5 'n Broodboomsaailing aan 'n ander persoon te skenk/verkoop?

KAAP - Ja

NATAL- Dieselfde as op vraag 1.4

TRANS=
VAAL - Ja, in die geval van verkoop. Nee, in die geval van skenk (behalwe in die geval van E.cupidus en E.humilis), indien dit aangeplant is op grond wat uitsluitlik vir die kweek daarvan afgesonder is (dit sluit privaattuine in).

1.6 Broodboomsaad aan 'n ander persoon te skenk/verkoop?

Antwoord:
KAAP - Ja

NATAL- Dieselfde as op vraag 1.4

TRANS=
VAAL - Ja

1.7 'n Volwasse broodboom uit sy natuurlike habitat te verwyder?

Antwoord:
KAAP - Ja. Daar is besluit om in die toekoms geen sodanige permitte uit te reik nie, behalwe vir bona fide-navorsingsdoeleindes.

NATAL- Ja

TRANS=
VAAL - Ja, behalwe vir bona fide-boerderydoeleindes. Broodbome wat vir hierdie doel uit die natuur verwyder word, mag nie sonder 'n permit geskenk of verkoop word nie.

1.8 'n Broodboomsaailing uit sy natuurlike habitat te verwyder?

Antwoord:
KAAP - Dieselfde as op vraag 1.7

NATAL- Ja

RRANS=
VAAL - Dieselfde as op vraag 1.7

1.9 Broodboomsaad in die natuurlike habitat te versamel?

Antwoord:
KAAP - Ja

NATAL- Ja

TRANS=
VAAL - Ja

2. Indien die antwoord op enige van die vrae in vraag 1 "ja" is, is dit ook op geregistreerde kwekers van toepassing?

Antwoord:
KAAP - Ja

NATAL- Ja

TRANS=
VAAL - Ja

3. 'n Vakansieganger uit 'n ander provinsie toer deur u provinsie. Hy sien 'n kwekery langs die pad wat broodboomsaailinge wettiglik verkoop. Hy koop 'n saailing, laai dit in sy motor en neem dit saam huis toe. Ootree hy die wet? Indien wel, wat sou die wettige manier gewees het?

Antwoord:
KAAP - Ja. Hy benodig 'n uitvoerpermit om broodbome uit die provinsie te neem.

NATAL- Nee, solank die plant 'n stam-deursnee van nie meer as 100mm het nie.

TRANS=
VAAL - Nee, behalwe in die geval van E.cupidus en E.humilis. In hul-le geval word 'n permit vereis.

4. 'n Persoon woonagtig in u provinsie toer deur 'n ander provinsie. Langs die pad koop hy 'n broodboomsaailing by 'n geregi-streerde kwekery in die ander pro-vinsie en bring dit saam huis toe. Oortree hy die wet? Indien wel, wat sou die wettige manier gewees het?

Antwoord:
KAAP - Ja. Hy benodig 'n invoer- en vervoerpermit om die plant in die provinsie in te bring.

NATAL- Dieselfde as op vraag 3.

TRANS=
VAAL - Dieselfde as op vraag 3.

5. 'n Persoon in u provinsie wat 'n volwasse broodboom wettiglik besit, verwyder 'n suier van die basis van die broodboom en plant dit in sy tuin. Oortree hy die wet? Indien wel, wat sou die wettige manier gewees het?

Antwoord:
KAAP - Nee, maar hy moet dit in die teenwoordigheid van 'n natuur-bewaarder doen. Hy moet ook aansoek doen om 'n aparte besit-permit vir die nuutgeplante suier.

NATAL- Nee

TRANS=
VAAL - In die geval van alle suiers van E.cupidus en E.humilis en ander suiers van Transvaalse broodbome met 'n deursnee van meer as 150mm, moet 'n permit bekom word om die nuutgeplante suier te besit. In die geval van suiers van Transvaalse broodbome klei-ner as 150mm (behalwe E.cupidus en E.humilis) moet 'n besitper-mit bekom word sodra die geplan-te suier 'n deursnee van 150mm bereik. Dit is verkieslik dat daar altyd vooraf met die Afde-ling Natuurbewaring geskakel word.

6. 'n Broodboom, wettiglik in die besit van 'n persoon in u provin-sie, vorm bevrugte saad. Hy plant die saad in sy tuin of in sakkies, waar dit ontkiem en saailinge vorm. Oortree hy die wet? Indien wel, wat sou die wettige manier gewees het?

Antwoord:
KAAP - Nee, maar hy moet 'n permit be-kom om die saailinge te besit.

NATAL- Nee

TRANS=
VAAL - Nee. In die geval van E.cupidus en E.humilis moet 'n permit eg-ter bekom word om die saailinge te besit.

7. Die persoon in vraag 6 genoem, neem 'n aantal van die sade en pos dit aan 'n vriend in 'n ander provinsie. Oortree hy die wet? Indien wel, wat sou die wettige manier gewees het?

Antwoord:
KAAP - Ja. Hy moet 'n uitvoerpermit bekom.

NATAL- Ja. Hy moet 'n uitvoerpermit bekom.

TRANS=
VAAL - Ja. Hy moet 'n skenkings- en uitvoerpermit bekom.

8. 'n Persoon in u provinsie ontvang broodboomsaad van 'n vriend in 'n ander provinsie. Hy plant die saad in sy tuin of in sakkies. Oortree hy die wet? Indien wel, wat sou die wettige manier gewees het?

Antwoord:
KAAP - Ja, behalwe as hy vooraf 'n invoerpermit bekom het.

NATAL- Nee, mits hy 'n skenkingsbrief kan toon.

TRANS=
VAAL - Ja, behalwe as hy vooraf 'n invoerpermit bekom het.

9. Indien 'n persoon in u provinsie 'n permit van u departement benodig om 'n broodboom te besit, moet die permit periodiek hernu word? Indien wel, hoe gereeld?

Antwoord:
KAAP - Ja. Die permit is geldig vir 12 maande en moet dus jaarliks hernu word.

NATAL- Waar permitte van toepassing is, moet dit jaarliks hernu word.

TRANS=
VAAL - Nee. Die permit is geldig vir so lank as die persoon in besit van die broodboom is.

ALGEMEEN

Lede wat broodbome by kwekerye koop, moet seker maak dat hulle 'n kwitansie ontvang. Soos uit bostaande antwoorde blyk, is so'n kwitansie 'n uiters belangrike dokument en kan 'n persoon in 'n baie moeilike situasie beland as hy nie so'n bewysstuk het nie. So'n kwitansie van 'n kwekery moet minstens al die inligting bevat wat in die antwoord van die Kaapse owerheid op vraag 1.2 genoem word.

GIVE AND TAKE GEE EN NEEM

-Roy Osborne (20 Maryvale Road, Westville 3630; tel. no. 031-866953) wants to continue collecting data on Encephalartos seeds (see ENCEPHALARTOS 13, pages 26 to 30). Roy needs ten representative seeds from each of the following species: Encephalartos arenarius, E.caffer, E.cupidus, E.cycadifolius, E.eugene-maraisii, E.friderici-guilielmi, E.heenanii, E.humilis, E.inopinus, E.laevifolius, E.latifrons, E.paucidentatus, E.transvenosus and E.umbeluziensis. Correct identification of the parents is more important than seed viability for this project.

-Mr M. O'Flaherty (24 Sammells Drive, Chermside 4032, Brisbane, Australia) would be very grateful for a few seeds of Encephalartos caffer, E.ferox, E.latifrons, E.lehmannii, E.heenanii, E.cupidus, E.hildebrandtii, E.gratus, E.transvenosus, Stangeria eriopus, Microcycas calocoma and Cycas thouarsii, in exchange for Australian Cycas, Macrozamia, Lepidozamia and Bowenia seeds.

-Troos van der Merwe (Bekkerstraat 38, Faunapark, Pietersburg 0699) is 'n skolier wat begin het om broodbome te versamel. Hy sal saad van enige spesie waardeer.

-Edward Verhage (1274 Burnette Street, Hatfield, Pretoria 0083; tel. no. 012-3422551(H), 2982651(W) is looking for plants of Encephalartos heenanii, E.latifrons and E.woodii.

FOCUS ON... FOKUS OP...

In this edition we do not focus on a Southern Africa cycad species, as usual, but on that more distant species from West Africa:

In hierdie uitgawe fokus ons nie, soos gewoonlik, op 'n Suidelike Afrikaanse broodboomspesie nie, maar op daardie spesie van verder weg, uit Wes-Afrika:

ENCEPHALARTOS BARTERI

by Roy Osborne

INTRODUCTION

The West African cycad, *Encephalartos barteri* Carruthers, is one of the few gymnosperms indigenous to that area. It is known by several vernacular names, the most common of which is "pardi attar" which translates to "palm of the spirits", in apparent reference to its superficial resemblance to the more commercially-useful oil palm, *Elaeis guineensis*. The name "ghost palm" has a similar derivation while the term "hosanna palm" refers to use of the foliage for festive decorations in school and churches, especially on Palm Sunday.

The West African cycad was discovered by Barter in 1858 and an investigation into a variant of the species led to the naming of *E. barteri* subspecies *allochrous* in 1978. Although plentiful in habitat and fairly well-known in Europe and America, *E. barteri* is hardly ever seen in South African collections. It is hoped that more interest will be taken in this species by cycad enthusiasts in the future.

DISCOVERY

The Scottish explorer, Mungo Park, is immortalized in history as being one of the first Europeans to travel to inner Africa. Tragically, his life ended during the second Niger expedition in 1806. Less well-known is the fact that several other Niger expeditions followed and those under the leadership of Dr Baikie, surgeon, naturalist and early colonial administrator, concern us particularly.

On the second of these expeditions in 1851 Baikie was joined by C. Barter who was charged with the responsibility for collecting botanical specimens for the herbaria at Kew and Dublin. Barter collected much of his material in the vicinity of Jebba, near the site where Mungo Park met his fate 50 years previously. It was on the track between Jebba and Ilorin in Nigeria that Barter first came across a large group of unusual palm-like plants. Samples of these were despatched to Kew in 1858 but sadly Barter himself died the following year. The botanist Carruthers suggested that the cycad was named in memory of Barter, thus in 1868 the name *Encephalartos barteri* Carruthers was added to botanical literature by Prof Miquel. (Although it now appears that Prof Miquel somehow had material from two African species muddled together, his description and name have been accepted as valid). (Barter's name is also commemorated in the genus *Barteria* of the family Passifloraceae).

With further explorations, more reports came of these cycads from other West African localities. In 1865, the Rev. C. Schönfeld of the Basel Mission in Ghana (then the Gold Coast) found a population of cycads on the upper reaches of the Volta River, sending specimens to Kew a few years later. Naval Commander R. M. Ramsey and Lagos Governor Sir Alfred Moloney, sent material to Kew in 1882 and 1890 respectively. W.H.Johnson, Director of Agriculture, collected specimens in 1898. French botanist Poisson located a population about 500 km from the coast in Benin (then Dahomey), and further discoveries followed in the early part of this Century.

Only fairly recently, attention was called to odd reports of a West African cycad similar to *E. barteri*, but much more robust in form. Horticulturalist S.H.Wimbush of Jos in Central Nigeria found a few large thriving colonies of the plants near the village of Tokkos.

Professor L.E.Newton determined that there was sufficient difference between the "Tokkos" plants and others to warrant a new subspecies, hence in 1978 *Encephalartos barteri* Carruthers subspecies *allochrous* L. E. Newton was validated.

A longitudinally dissected specimen of E. barteri in habitat in Ghana.
From Hall and Jenik (1967)

DISTRIBUTION

Encephalartos barteri occurs on sandstone and granite outcrops in the savanna vegetation throughout a wide area of tropical West Africa. Generally at

Cycads amongst savanna vegetation on the slopes above Lake Volta, Ghana.
From Hall and Jenik (1967)

E. barteri in habitat in Nigeria, with Prof. Bevan of Ibadan University. Note the number of plants and the complete absence of leaves from the previous season. Photograph by Prof. D.A.H. Taylor.

fairly low altitudes (about 400 meters), this habitat experiences warm conditions throughout the year (ca. 24^0 - 30^0C), with alternating wet and dry seasons.

In Nigeria, the main concentrations occur between Ilorin and Jebba in the Western part of the country. In Benin, populations are recorded from the Borgu Province and at Savalou. In Ghana, the plant is widely distributed in the Volta River catchment area. Recorded localities here are Akosombo, Krobo, Kwahu, Anum, Drome, Lalolabo, Aburi, Odumasi and the North Bandai Forestry Reserve. Almost certainly the cycad also occurs in Togo.

A record of the occurrence of *E. barteri* in the West Nile district of Uganda has never been substantiated and appears to be incorrect.

The variant *E. barteri*, subspecies *allochrous*, occurs at much higher altitudes (1200-1400 m) on the granite-based Jos Plateau in Central Nigeria. The only three known localities, Gilli Village, Kaldo Peak and Kadun Peak are all within about 10 km from the village of Tokkos.

E. barteri in habitat 30km north of Ilorin on the Jebba Road, Nigeria. Photograph by D.A.H. Taylor.

E. barteri as understory vegetation in Nigeria. Photographed at the end of the dry season (February). The crown of older leaves is beginning to spread. From Berrie and Berrie (1956)

Many specimens have been transplanted from habitat and contribute to the horticultural decor of the University of Nigeria campuses at Ibadan and Zaria. Similarly, a collection of plants grows in the grounds of the University at Kumasi, in Ghana. Specimens of *E. barteri* are found in the Harare Botanic Gardens in Zimbabwe and in South Africa at the Botanic Research Institue in Pretoria.

In Europe, examples of this cycad are found in the gardens of Copenhagen University, at the Les Cedres garden on the French Riviera, at Cambridge University, St Andrews and Kew, and in the Botanic gardens at Naples. In the USA, *E. barteri* is amongst the cycad collections at Fairchild Tropical Garden in Florida, Huntington Gardens in California and the Foster Gardens in Honolulu, Hawaii.

DESCRIPTION

1 Stem

The stem of *E. barteri* is mainly subterranean and, in common with many other cycads of this habit, has strongly contractile roots. This appears to be an adaptive advance against the effects of the droughts and fires which occur regularly in the savanna grasslands in the dry season. Fairly slow growing, the caudex of a mature plant seldom exceeds 30 cm in length and 20 - 25 cm in width. (An unfortunate typographical error in the 1957 *Kew Bulletin* implies trunks up to 30 m in height have been recorded!)

Often, what appears to be a clump of several plants is found on excavation to be the multiple branches from a common rootstock. The caudex is covered by swollen leaf bases and is clothed by a layer of grey hairs.

An investigation by Hall and Jenik (1967) into one typical caudex, measuring 30 cm x 25 cm showed the remains of 1400 leaf bases and, calculating on the premise of 12 leaves per flush and one flush per year, puts the age estimate at over 100 years.

The central pith is abundant in starch and, despite the apparently pleasant nutty taste, even when eaten raw, is not used as a source of foodstuff by the local inhabitants.

Stems of the more robust *E. barteri* subsp. *allochrous* extend well above ground level. Typically about 1 meter in length, they can reach up to 2,6 meters. As with many other cycads, the taller stems become procumbent and substantial branching follows from the base.

2 Leaves and Leaflets

Mature *E. barteri* plants produce a flush of 10 to 20 (typically 12) bright green leaves in December/January each year. These darken somewhat on maturity and eventually wither and die in the dry season. Leaves arise at ground level and extend to between 100 and 180 cm in length. Each leaf carries about 80 pairs of leaflets rather closely set on a

E. barteri in habitat in Nigeria. A new flush of leaves has arisen after older leaves were burnt off in a fire some months previously.
From Berrie and Berrie (1956)

deeply grooved rachis. Median leaflets are typically 9 - 15 cm long by 11 - 17 mm wide and have 20 - 24 parallel veins. The leaflet margins are slightly irregular bearing up to 6 small teeth. Leaflet size diminishes down the rachis to end in a series of weak spines on the petiole.

Leaves and leaflets of the subspecies *allochrous* differ from those of subspecies *barteri* in colour and size. Leaves of subspecies *allochrous* are brown on emergence and become dark green at maturity. Indeed, the subspecific epithet is derived from the Greek word "allochrous" meaning changing colour. Leaves are typically 100 - 200 cm in length with median leaflets 13 - 26 cm long and 13 - 22 mm wide.

3 Cones

Mature plants of *E. barteri* usually produce 2 male cones per annum which ripen during the later part of the wet summer season. The green cone scales with brownish tips give an overall pale green colour to the cones. Typical measurements for the male cones are 8 - 23 cm long (without the stalk), 3 - 5 cm wide and supported on a pale green peduncle 8 - 20 cm in length.

The female plants produce 1 or 2 cones per annum which are dark olive-green in colour. These are usually 12 - 35 cm long, 8 - 15 cm in diameter and supported on a peduncle 5 - 12 cm long.

Nearly-mature female cones of E. barteri, approximately 45cm tall (including the peduncle). Photographed in Nigeria in July. From Berrie and Berrie (1956). The same photograph was used on the front cover.

The seeds are crimson to scarlet when ripe and the dry seeds 2,5 - 3 cm long, 2 cm wide and have a volume of about 6 mls. The hard internal seed coat is irregularly 4-sided and has about 13 parallel veins along the long axis (measurements by the author on seeds from Ghana).

Cones of subspecies *allochrous* are said to be slightly longer and wider than those of subspecies *barteri*.

The geometry and arrangement of the cone scales is distinctive and used by Melville as a diagnostic feature in keying out this plant amongst the central African cycads.

AFFINITIES

E barteri, including the subspecies *allochrous*, is so far geographically removed from any other cycads that it is unlikely that close relatives exist. There is a superficial resemblance in leaf appearance between *E.barteri* and *E.villosus* and the deciduous habit is perhaps similar to that of *E. ngoyanus*. Until further data, particularly biochemical analyses, become available it is futile to speculate on the phylogenetic position of this species.

Because of its geographical isolation, there are no natural hybrids between *E. barteri* and any other species. The possibility exists of intermediate forms between the two subspecies. To my knowledge there has never been any artificial hybrid produced between *E. barteri* and any other species.

CULTIVATION AND CONSERVATION

E. barteri is easily grown from seed and plants are transplanted without difficulty in West Africa. The species appears to grow well in tropical and sub-tropical gardens. It seems to be less successful in glasshouse cultivation than other species, but nevertheless at least one plant at Kew has developed to a coning stage.

Both subspecies of *E. barteri* are described as plentiful in habitat, and they are classified as "not threatened" by the Threatened Plant Committee of the International Union for the Conservation of Nature (Gilbert, 1984). Fears that the construction of the great Volta Dam might exterminate large numbers of the plants in Ghana led to a proposal for their salvage and re-establishment; regrettably this was never done and a substantial quantity of plants were thus lost. Despite this, great numbers are still found on the western slopes of the Volta gorge and in grasslands north of the dam as far as the Afram confluence..

An encouraging report from Professor Newton is that he found a number of seedlings and young plants in the cycad populations of *E. barteri* subsp. *allochrous* near Tokkos, a good indication of successful regeneration.

A male plant of E. barteri, showing immature cones. The scale rule is 25cm long. Photographed in Nigeria in July. From Berrie and Berrie (1956).

ACKNOWLEDGEMENTS

A number of people assisted in providing the information and photographs which made preparation of this article possible. I record my appreciation to Mr Doug Atwater, Mr Albert Enti, Mr Doug Goode, Prof L E Newton, Prof F Malaisse, Mr Brian Schrire and Prof D A H Taylor for their kind assistance in this regard.

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A clump of E. barteri thriving in cultivation at Fairchild Tropical Garden. Photograph by the author.

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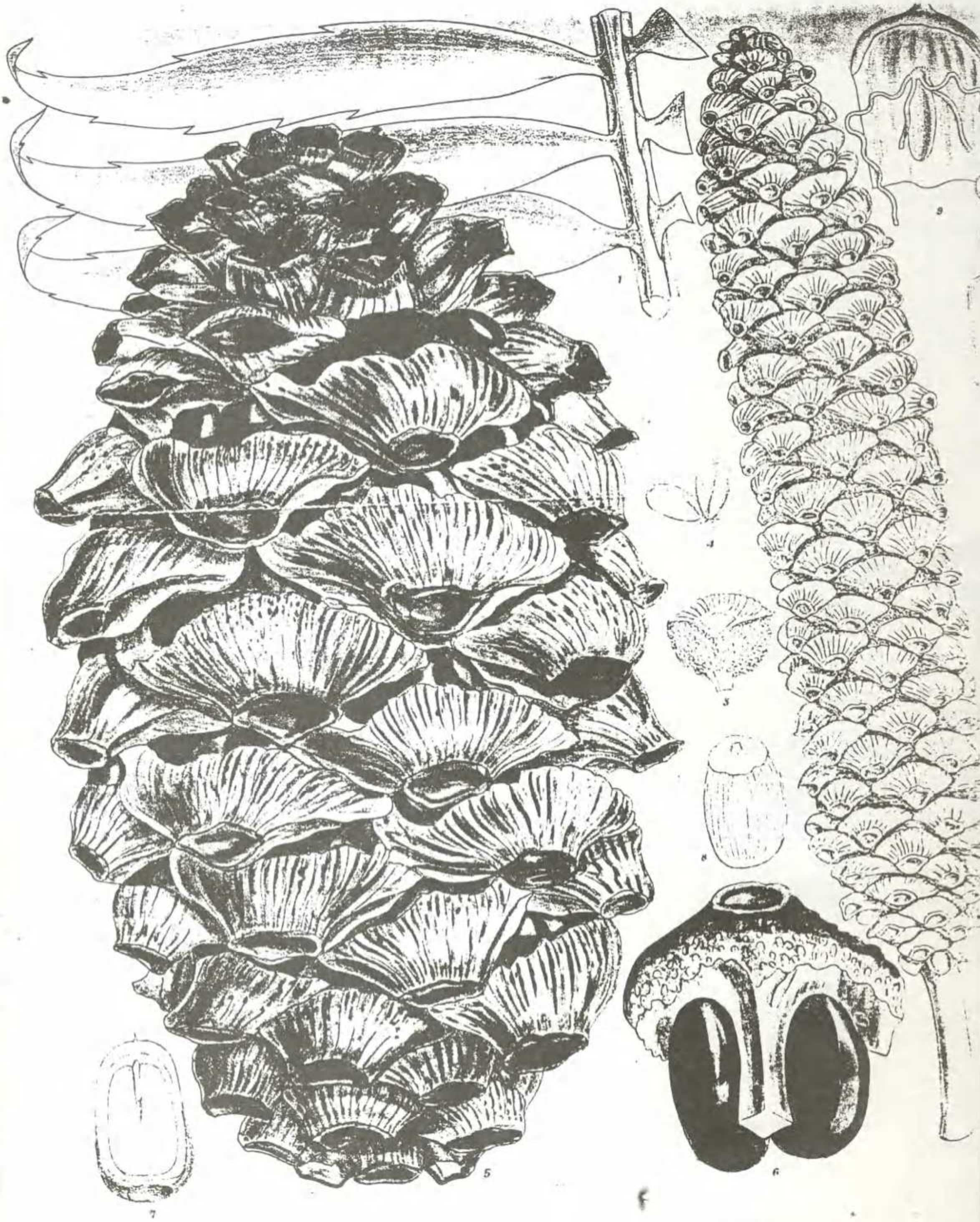
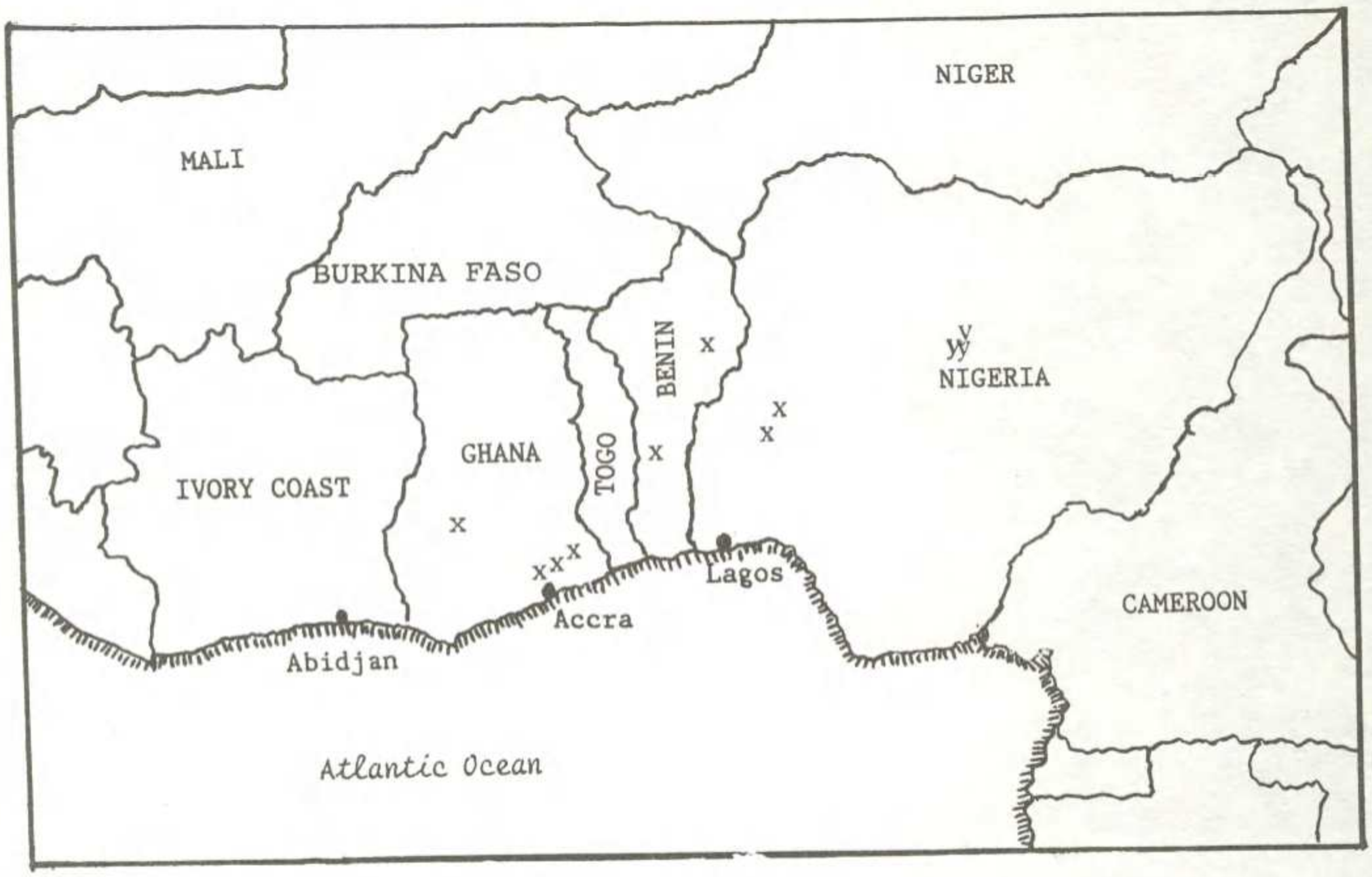


Female cone (left), male cone (right) and other portions of *Encephalartos barteri*. From the original illustration in Curtis Botanical Magazine of 1909.



DISTRIBUTION OF *ENCEPHALARTOS BARTERI* (X) AND *E. BARTERI* SUBSP. *ALLOCHROUS* (Y) IN TROPICAL WEST AFRICA.

REGIONAL NEWS STREEKNUUS

Oos-Kaap / Eastern Cape

Die eerste vergadering van die tak vanjaar is op 17 Maart in Port Elizabeth gehou. Mnr. Donald Flynn, 'n bekende kweker van Port Elizabeth, het die lede toegespreek oor die plant en voeding van broodbome, sowel as die gebruik van gifstowwe om plae te bestry. Mnr. Flynn, wat homself by die Parkedepartement van Port Elizabeth as kweker bekwaam het en daarna vir 20 jaar hoofkweker by 'n groot kwekery in Port Elizabeth was, werk tans by die Weltevrede-kwekery in die stad, wat onder andere vir hulle kaktusse baie bekend is. Hy het baie handige wenke met die teenwoordiges gedeel.

CYCADS OF AUSTRALIA

by Len Butt

Small cycads of N.S.W.

continued

MACROZAMIA PAULI-GUILIELMI

Two of the subspecies of this Macrozamia occur in New South Wales. Both have pronounced spiral twisting throughout the rachis and few fronds from a subterranean caudex. Like all plants of M. pauli-guilielmi, the caudex is sometimes visible to 15 cm high. They occur on the central and north coast of New South Wales. The subspecies flexuosa is so similar to the Queensland type subspecies that it is often listed as the latter, but it may be distinguished by the petioles that are longer and narrower than the type species. The common name given to both species is "kangaroo nut" or "blackfellow's pineapple".

MACROZAMIA FAWCETTII

Found on the far north coast of New South Wales, M. fawcettii is also closely related to M. pauli-guilielmi. The pinnae, however, are much broader and more definitely toothed near their apex. The strongly spiralling rachis, which is similar to the Queensland M. pauli-guilielmi, has often caused it to be mistakenly identified as a form of the latter. Districts reported as habitats are Upper Richmond River, Grafton and north west of Woolgoolga, New South Wales.

MACROZAMIA PLATYRACHIS - THE LITTLE CYCAD

The small but unique M. platyrachis has a completely subterranean caudex, and short, thick petioles, possibly only up to about twelve in number. Specimens examined had only four fronds. The pinnae are thick and falcate, extremely wide for this kind of plant, but typical of Section Parazamia

M. fawcettii with female cones

This species may never really get into cultivation as its main area of occurence is within a National Park. The female cones are cylindrical and about 15 cm long, the pinnae leathery, and the fronds semi-erect and slightly twisted. Living in a comparatively small habitat and often on the edge of rainforests, it is not listed as being dangerous to stock, but this would mainly be because it is inaccessible to them.

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

CAESARIANS FOR CYCAD SEEDS

by Cynthia Giddy

It is always a thrill when a battered parcel covered in foreign stamps arrives with the triumphant red sticker "Cleared by Plant Inspector". Once the parcel is opened, you marvel at the enormous goose egg-sized Macrozamia macdonellii seeds, weighing 50 g each. I soak them in water for three days and they are always very grateful as Alice Springs gets less than 125 mm per year. Then they are planted in the hotbed and the pleasurable wait for the first sign of their roots emerging and their settling in their new country begins.

Until recently we imported seed by air mail but this has become prohibitively expensive as many of the Australian cycad seeds, such as Macrozamia macdonellii, M. moorei, Lepidozamia peroffskyana and L. hopei are considerably larger and heavier than our Encephalartos seeds. M. macdonnellii seeds weigh in at 20 to the kilogram compared to 250 E. ferox or 180 E. longifolius.

Lately we have requested that seed be sent by surface mail. I am not sure how long it took the Tall Ships to get to Aussie 200 years ago, but in 1988 it takes five months from Sydney back to Durban (probably has to do with Reverse Air Flow or some such metereological phenomenon). The bottom line is that Australian seeds often arrive here post mature, which means that when they arrive, the radicle is growing Down Under the seed coat and that they have missed the hole, so to speak. So would you, if you spent five months in a hot, dry, dark, airless hold of a ship.

After suffering an almost 80% loss a year ago on a batch of Lepidozamia peroffskyana which were water-heavy but refused to germinate, we cut a few open and found a very twisted and angry radicle curled up in the top quarter of the seed. Angry, because as I cut open the seed, the tightly coiled radicle literally sprang out and yelled "G'day, glad to see you mate, get me out of here!".

After the first hour, during which he nearly lost a thumb and the air was pretty blue, Ted went to town and bought a small burr which he clamped onto the end of an electric drill. Now, with me as theatre assistant to hold the seed (this stops it squirming when the drill bites into the sclerotesta), Dr Giddy dons a surgical gown and mask and happily performs caesarians.

Cycad seed caesarian operation technique

The surgical procedure is quite simple. Two longitudinal cuts on each side allows you to peel open the seed with minimal damage to the radicle inside. You know it needs help when a little pink protuberance, like a hernia, appears at the micropyle end and does not develop into a root.

Post operative care in the Recovery Room consists of soaking them in Dip and Grow (indole-buteric acid) and planting them in a hotbed kept at 25 C in sterile vermiculite to prevent fungal attacks in case you were careless with the scalpel. The loose vermiculite also helps the convoluted root to straighten out somewhat. Three to four weeks later they are all in leaf and can be moved from Intensive Care to a General Tunnel.

To date we have performed almost 500 caesarians and we have had a survival rate of more than 90%.

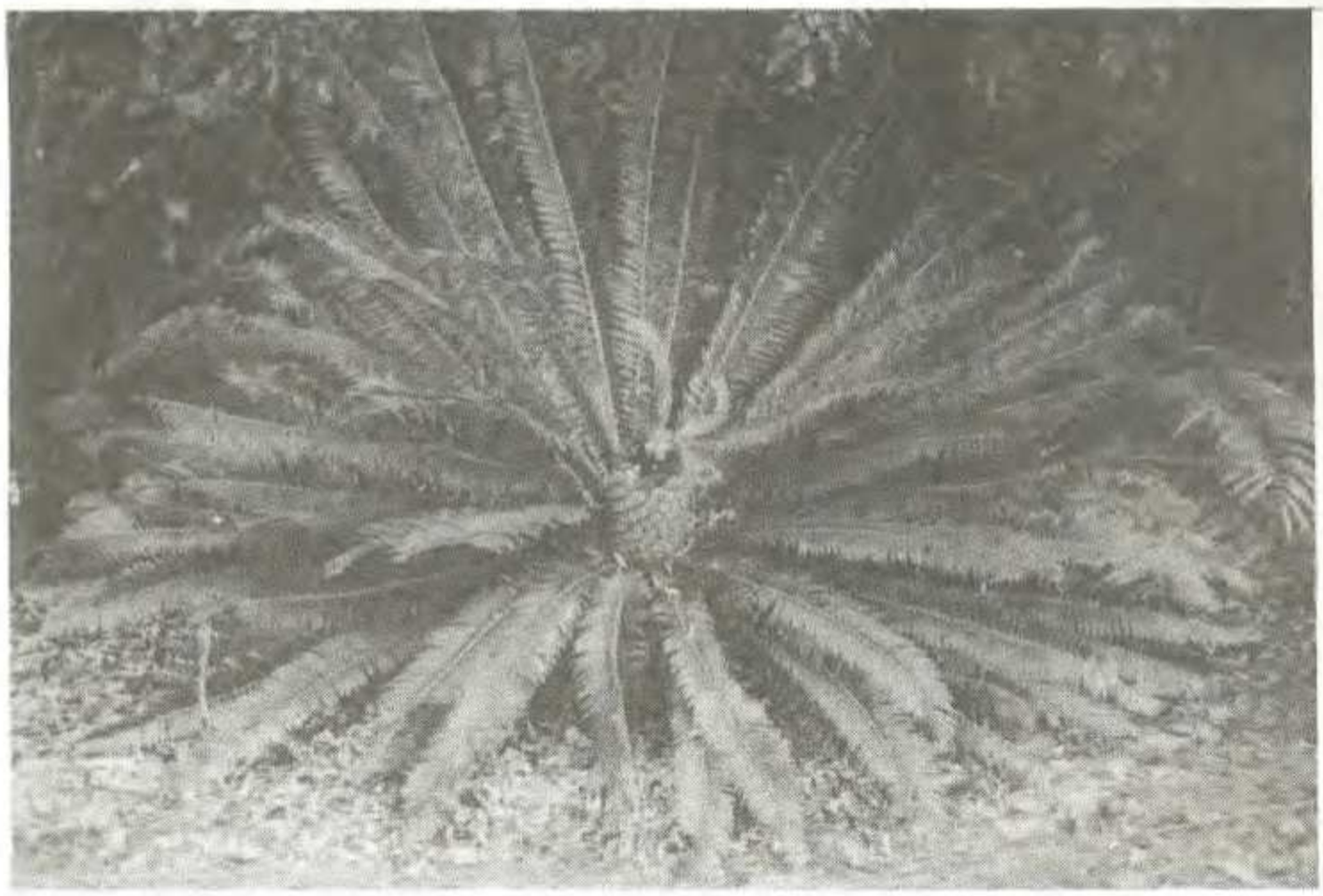
KEËLREKORD ?

KEËLREKORD?

Die meegaande foto, ingestuur deur mev. J.M. Scholtz van Natal, 'n lid van die Vereniging, toon 'n Encephalartos villosus-plant in haar tuin wat nie minder as 15 manlike keëls gelyk gevorm het nie. Sou dit nie 'n rekord wees nie? Weet enige van ons lesers van meer keëls in enige Encephalartos-spesie? Laat gerus weet.

The E. villosus plant with its record number of 15 female cones

BITS AND PIECES STUKKIES EN BROKKIES



E. transvenosus at Fairchild Tropical Garden.

CONE LEAVES

Member Marion Debruyne sent in the accompanying photographs which she received from the Curator of Cycads and Palms at Fairchild Tropical Garden, Florida, USA. They show a very healthy specimen of Encephalartos transvenosus growing at FTG ,bearing a female cone. The close-up of the cone shows the development of a small "plant" on top of the cone. (Also see ENCEPHALARTOS no. 11 - p.16, no. 12 - p.4 and no. 13 - pp.18 and 19.)

FTG ANNIVERSARY

That well-known international cycad mecca, the Fairchild Tropical Garden in Florida, USA, celebrates its 50th anniversary this year. Since its official opening on 23 March 1938, FTG has grown in size and stature to an extent probably way beyond that envisaged by its founders. We are honoured that our Society has such close links with FTG and we take this opportunity to extend to FTG Director, Dr John Popenoe, and his staff, our congratulations and best wishes on their notable achievements.

The small "plant" on top of the female cone.

One of the specimens of E. laurentianus in Malaga. Photograph by Dick Endt.

The expensive specimen of Z. furfuracea on a Dutch market. Photograph by Dick Endt.

CYCADS IN EUROPE

Prominent New Zealand horticulturist and active member of the New Zealand Palm and Cycad Society, Dick Endt, has written to tell us of some interesting aspects of his recent European visit.

Whilst travelling through Spain, Dick found a great variety of palms but not many cycads, except perhaps Cycas revoluta. The only other cycads he spotted were two large specimens of Encephalartos laurentianus in Malaga (on the Mediterranian coast, just east of Gibraltar). These had leaves about 3m long and were thought to be from the same clone. Apparently a third plant is growing somewhere on the Canary Islands.

Another interesting observation was made by Dick at the well-known Plant Auction Market in Holland. Palms were fairly well supplied but cycads were few and far between. Most common is Cycas revoluta, imported from Japan for the European market. A well-grown specimen with the trunk the size of a small football sells for about R850, although smaller ones fetch around R150. The most expensive cycad on offer at the time was a large Zamia furfuracea, about 12 years old, with a price tag at the phenomenal figure of Dfl 2500 (about R2 500 in South African currency).

On a personal side, Dick tells us that his son Gerald is rapidly becoming the New Zealand cycad expert. Gerald has spent several months in USA cycad gardens, including the well-known Lotusland at Santa Barbara, California and Longwood Gardens in Pennsylvania.

C. thouarsii in the Pamplemousses Garden on Mauritius. Photograph by Prof. D. Taylor.

CYCADS ON MAURITIUS

Prof. and Mrs David Taylor, recently retired from the University of Natal, have just returned from a short holiday in Mauritius, during which they acted as cycad scouts for the Society. Their trip included a visit to the well-known Pamplemousses Garden about 10km north of Port Louis. Here they came across several large plantings of Cycas thouarsii (C. circinalis), many of which probably date back to the last century. A very large variety of palms is present in the gardens, and on the Island generally, but no other cycads were seen.

INOPINUS INQUIRY

Member Helmut Hanaczeck has written to tell us that he has had exactly the same experience with a female cone of Encephalartos inopinus as that mentioned by George Norval (ENCEPHALARTOS no. 13, p. 41).

The accompanying photograph, sent in by Helmut, shows how the cone axis split and threw off the seeds. He also mentioned that the cone definitely did not open for pollination.

The female cone of E. inopinus.

MALE CONE METABOLISM : MORE HOT NEWS

Readers of ENCEPHALARTOS will now be familiar with member Willie Tang's work on cycad biology (see ENCEPHALARTOS no. 7 p 4-6, no. 8 p 16-19, no. 9 p 8-11, no. 10 p 33 and no. 12 p 6). We are pleased to congratulate him on yet another publication. Willie's latest paper, entitled "Metabolic aspects of thermogenesis in male cones of five cycad species", is written in conjunction with University of Miami colleagues Leonel Sternberg and David Price and appears in vol. 74 no. 10 p 1555-1559 of the AMERICAN JOURNAL OF BOTANY of 1987.

The first section of the paper shows the cyclical heating pattern in male cones of Macrozamia moorei - both an intact cone and one cut and tested under laboratory conditions. The cone temperature reached a maximum of just less than 30 degrees C at about 8 pm in the 24-hour cycle. A second experiment measured the rate of carbon dioxide evolution by the cone. This varied in an almost exactly parallel manner with the cone heating pattern, confirming the view that the thermogenesis is associated with intense respiratory metabolism. The final aspect of the work addressed the question of what substrate provided the energy for this metabolism. Here a system of carbon isotope ratio measurements was used. Results showed that starch was indeed the major source of energy but that a contribution was also made by the lipid fraction. The starch consumption was further evaluated by comparing the starch level in male cones of Dioon edule, Encephalartos ferox, E. hildebrandtii, Macrozamia moorei and Zamia pumila before and after pollen shedding. In general the starch level was significantly lower after pollen dehiscence. This was particularly true for Dioon edule microsporophylls, where the starch content dropped from about 17% to about 2% over a seven-day period.

This paper, added to his other scientific publications, must surely warrant Willie being ranked amongst the world's leading cycad biologists.

Willie Tang, David Price and Leonel Sternberg with Dioon cone and mass spectrometer equipment at the University of Miami

LEBOMBOENSIS THEFTS

We have been informed by officers on the survey staff of Escom that there appears to be a large-scale removal of plants of Encephalartos lebomboensis from habitat in the Ubombo Mountains. On two occasions during 1987 the Escom survey team discovered caches of 20 to 30 of the cycads which had been dug up and had the leaves removed, presumably awaiting collection by truck. Some of these plants are said to be two metres in trunk length.

It is not certain whether the area concerned falls within the jurisdiction of the Kwazulu or the Natal Conservation authorities, as the site of this removal is apparently situated on the Kwazulu-Natal border. The matter has been verbally reported by Escom staff to officers of both Departments.

The Society has reported these instances to the Head Offices of both Natal and Kwazulu Conservation authorities and has asked that special vigilance be maintained in this area. Any members knowing of large plants of E.lebomboensis being offered for sale are asked to contact the President or any committee member of the Society. The interest of Escom in this matter is commendable.

Peter Lindblad collecting coralloid roots from a cycad at Naples Botanic Garden (photograph: Roy Osborne)

CORALLOID ROOT METABOLISM

Member Peter Lindblad of the University of Uppsala in Sweden is well known for his work on characterising the symbiosis between nitrogen-fixing cyanobacteria (blue-green algae) and cycads. Together with co-workers Amar Rai and Birgitta Bergman, he has just published a paper entitled "The Cycas revoluta - Nostoc symbiosis: enzyme activities of nitrogen and carbon metabolism in the cyanobiont", which appears in the "Journal of General Microbiology", vol. 133, no. 7, pages 1695-1699 of 1987. This paper gives details of a comparative study of enzymes involved in nitrogen and carbon metabolism in the symbiotic cyanobacteria directly isolated from C. revoluta coralloid roots, versus free-living cultured Nostoc species.

Any members interested in obtaining a copy of this paper are invited to contact Peter at the Department of Physiological Botany, University of Uppsala, P.O. Box 540, S-751, 21 UPPSALA, Sweden.

UNUSUAL GROWTH FORM

The accompanying photograph shows the prolific suckering on a mature specimen of Encephalartos longifolius which occurred after the growing terminal apex was damaged and died. (Photographed by Roy Osborne in the garden of Bruce and Joan Bursey at Kei Road.)

Prolific branching on E. longifolius specimen

Thefts result in cycad trail closure

Daily News Correspondent

JOHANNESBURG: The daring theft of priceless cycad palms by a gang of professional plant thieves — who are believed to be exporting them — has led to the cycad trail north of Middelburg being closed.

The owner of the farm on which the 60 kilometre trail is situated, Mr Piet Bosman, said the trail had been hit by the thieves regularly since last winter.

Large numbers of priceless cycads had been stolen and Mr Bosman estimates that each of the ancient plants — which are up to 2 000 years of age — could be worth hundreds of rand to collectors.

Last week Mr Bosman caught the gang red handed as they tried to load rare species of cycads on to a truck.

The police were called and they are investigating the incident.

Mr Bosman said the gang sent labourers to the trail during the day to dig out the cycads. They then drove in with trucks at night.

The farm is known throughout the country for its huge number of rare cycads.

Mr Bosman said that since he opened the cycad trail six years ago, there had been an average of 5 000 hikers a year. Many of these were nature enthusiasts who came especially to study the cycads.

THE DAILY NEWS

10 MARCH, 1988

Man gestraf oor broodbome

'n BLANKE man van Theunissen is gister in die landdroshof op Hankey deur landdros F. Goosen tot 'n boete van R1 000 of 100 dae gevangenisstraf gevonnis nadat hy 61 broodbome van 'n plaas naby Loerie verwyder het.

Mnr. Johannes Jacobus Ahlers (56) van Sandrivier, Theunissen, is skuldig bevind ingevolge die Wet op Bedreigde Flora van 1974.

Die aanklaer was mnr. Brian Smith. Die saak spruit uit inligting wat konst. D.M. Butler van die polisiekantoor op Hankey op 27 Februarie ontvang het. Volgens inligting was mense besig om broodbome van die plaas Geelhoutboom naby Loerie, van mnr. A.C. van Wyk, te verwyder.

Konst. Butler het saam met sers. C.R.R. Cowley en konst. M. Booyens ondersoek ingestel en vier mense in hegtenis geneem. Beslag is gelê op elf groot broodbome en vyftig jonger broodbome. Die bome is na die Hankey-aanklagkantoor geneem.

Die klag teen drie ander beskuldigdes is teruggetrek.

Volgens Fauna en Flora is die waarde van die bome ongeveer R120 000.

OOSTERLIG

1 MAART 1988

VISITING MACROZAMIA PLATYRACHIS

by Joe Perner

One of Australia's rarest cycads, Macrozamia platyrachis, grows only on the top of Blackdown Tablelands, a National Park (also tied in with the Forestry Commission of Queensland), on top of a mountain in the plains inland from Rockhampton on the Central Queensland coast. The surrounding plains are dry lands. As you drive up the steep mountain nearing the top, you enter a plateau over 1000 feet (300 m) above the surrounding plains. The plateau is covered with rainforest trees, including palms of Livistonia "Blackdown Tablelands" species. When I was there in December 1985, the mountain was shrouded in mist and rain. I began my search for the rare M. platyrachis.

I had previously learned from a friend in Brisbane of an area with plants that he located several years before. There are approximately 40 to 50 km of tracks over the Tableland and I drove over most of them looking for the cycads. There was only one track that I found with plants growing alongside it. They grew singly or in very sparse colonies with kilometres in between. No seed could be found. I searched for half a day and could not find more than 100 plants in the bush.

To my horror, in this National Wildlife and Fauna Park, logging of trees was taking place and this restricted area of cycads that I found, was being ground into dirt by caterpillar tractors and trucks. When making a complaint to the park ranger, I received a blank look. When I explained the demise of the cycads, all he said was "what is a Macrozamia?" I returned to the site and saved some of the specimens from destruction and added them to my collection without feeling guilty for removing them from their natural habitat.

These plants only cone very rarely. I could find no evidence of cones and saw only some very old seed fragments in the colonies. The specimens I collected proved to be very hardy, being moved from a temperate zone to a tropical climate. All the plants survived the five weeks on the roof of my four wheel-drive car and the climatic change. They put out their first leaves seven months after being planted in the ground and in pots.

M. platyrachis specimen in its natural habitat on Blackdowns Tableland

M. platyrachis with male cone

This species is subterranean and the caudex does not exceed an average pineapple in size. No plants in the wild that I have seen, or in my collection, have carried more than four to six leaves. The leaves are not more than 400 mm long, with leaflets 20 mm wide and numbering up to 28 leaflets per leaf. The leaves are dark green on top and grey-green underneath. The leaves are recurved backwards towards the ground and the leaflets stand in a strong "V" formation upwards along the leaf, looking like a comb. The plants grow in white, deep, sandy soil between open forest Eucalyptus trees and wattles.

I have donated three plants to the Adelaide Botanic Gardens in South Australia. At last report they were doing well. I have also donated three plants to Darwin Botanic Gardens, Northern Territory. These are also doing well.

(Joe Perner's address: 16 Stutterd Street, Katherine, N.T. 5780, Northern Territory, AUSTRALIA)

NURSERY NEWS

Marion Debruyne, operating as Sumatra Nursery (18 Jakkalsbessie Crescent, Phalaborwa, 1390) offers a variety of indigenous and exotic cycads. These are 2 to 3 years-old plants, established in 51 plastic bags, and are priced from R10 to R25. Presently available are Encephalartos altensteinii, E.arenarius, E.caffer, E.ferox, E.friderici-guilielmi, E.horridus, E.lanatus, E.lebomboensis, E.longifolius, E.natalensis, E.paucidentatus, E.princeps, E.transvenosus and E.villosus. Amongst the exotics are Macrozamia heteromera, M.lucida, M.moorei, Lepidozamia peroffskyana, Bowenia serrulata, B.spectabilis, Cycas kennedyana, C.media, C.revoluta, C.thouarsii and Zamia furfuracea.

Please telephone 01524-2357 to make an appointment to visit.

FROM THE PRESIDENT

Membership of the Society has shown a slight drop (to 488 at the time of writing), due to the 134 members who regrettably failed to renew their subscriptions for 1988. Offsetting this loss is the enrollment of 52 new members, to whom we extend our usual warm welcome. Amongst those joining, we are particularly pleased to welcome the Botanic Garden of the University of Bonn, West Germany, as well as Dick Endt from New Zealand.

Your Committee is addressing the matter of production and printing delays in the issue of ENCEPHALARTOS. If the situation can be improved within the constraints of our budget, this will be done. Meanwhile, we echo the plea for patience expressed by Maans Kemp in ENCEPHALARTOS no. 13 (page 40).

Your Committee is also considering further changes in the system of seed allocations by the Seed Bank, to increase both the variety of offerings and the participation by members in seed issues.

The Society has recently extended contacts with other organisations having interests similar to ours. Apart from liaison with the other palm and cycad societies, we have established informal working relationships with several botanic gardens and research centres, as well as with bodies such as the Threatened Plant Unit of the International Unit for the Conservation of Nature and Natural Resources, the South African Nature Foundation and the South African Association of Botanists. In this context we are pleased to report further progress in liaison with the various provincial nature conservation authorities. It is through this type of interaction that your Editor has been able to prepare the most useful text on the present legal situation concerning cycads in South Africa, which you will

VAN DIE PRESIDENT

Lidmaatskap van die Vereniging het 'n geringe daling getoon (tot 488 ten tye van hierdie skrywe), as gevolg van die 134 lede wat ongelukkig nagelaat het om hulle lidmaatskap vir 1988 te hernu. Daar word tot 'n mate vir hierdie verlies vergoed deur die 52 nuwe lede wat aangesluit het, aan wie ons ons gebruiklike hartlike woord van verwelkoming rig. Onder die wat aangesluit het, is ons besonder bly om die Botaniese Tuin van die Universiteit van Bonn, Wes-Duitsland, te verwelkom.

U Komitee skenk aandag aan die saak van vertragings in die produksie en druk van ENCEPHALARTOS. As die situasie binne die perke van ons begroting verbeter kan word, sal dit gedoen word. Intussen sluit ons aan by die versoek om geduld deur Maans Kemp in ENCEPHALARTOS no. 13 (bladsy 40).

U Komitee oorweeg ook verdere veranderinge in die stelsel van saadtoekenning deur die Saadbank, ten einde beide die verskeidenheid van aanbiedinge en die deelname van lede aan die uitreikings te verhoog.

Die Vereniging het onlangs kontakte uitgebrei met ander organisasies wat oogmerke soortgelyk aan die van ons het. Behalwe skakeling met die ander palm- en broodboomverenigings, het ons informele werkverhoudings aangeknoop met verskeie botaniese tuine en navorsingsentrums, sowel as met liggame soos die Bedreigde Plant-eenheid van die Internasionale Eenheid vir die Bewaring van die Natuur en Natuurlike Bronne, die Suid-Afrikaanse Natuurstigting en die Suid-Afrikaanse Vereniging van Plantkundiges. In hierdie verband is dit vir ons aangenaam om verdere vordering te rapporteer in ons skakeling met die verskillende provinsiale natuurbewaringsowerhede. Dit is deur hierdie soort interaksie dat u Redakteur in staat was om die baie handige artikel voor te berei oor die huidige wetlike situasie ten opsigte van broodbome in Suid-Afrika, wat u in hierdie

find in this issue. We hope that the present spirit of co-operation will continue to the mutual advantage of all parties and, more importantly, to the advantage of the plants to which the Society is dedicated.

ROY OSBORNE

uitgawe sal vind. Ons hoop dat die huidige gees van samewerking sal voortduur in die onderlinge belang van alle partye en, nog belangriker, ten bate van die plante waaraan die Vereniging toegewy is.

ROY OSBORNE

FROM THE BOOKSHELF

CYCAD RESEARCH AND PUBLICATIONS OF THE UNIVERSITY OF FLORIDA

Active in the field of cycad research at the University of Florida's Gainesville campus are Prof. Bijan Dehgan, with Bart Schutzman and other co-workers. Although largely concerned with taxonomic studies, their work also encompasses horticultural techniques.

On the taxonomic front the team has studied seed, pollen and leaflet morphology, using electron-microscope techniques. One conclusion drawn is that Dioon seems to be sufficiently different from other genera in the Zamiaceae to warrant recognition as a separate family. This may have an effect on the status of Encephalartos, Lepidozamia and Macrozamia. The taxonomy of Cycas has also received their interest, with about half of the species so far described being botanically invalid. On the basis of present studies, Dehgan and colleagues see two broad groups in Cycas; one including C. circinalis, C. micholitzii and C. media and the other including C. revoluta and C. siamensis.

On the horticultural side, the Gainesville workers have reported on improved seed germination in Zamia furfuracea and Zamia floridana after treatment with concentrated suphuric acid and a gibberellin solution. A second recent suggestion, supported by experimental evidence with Zamia floridana, is that chopping off the primary root of seedlings and treating the cut surface with rooting hormone, leads to a branched root system which is better suited to cultivation in nursery containers.

Copies of the following papers by these workers may be obtained from Roy Osborne:

DEHGAN, B. (1983). Progagation and growth of cycads - a conservation strategy. Proceedings of the Florida State Horticultural Society 96: 137-139.

DEHGAN, B. and SCHUTZMAN, B. (1983). Effect of H_2SO_4 and GA_3 on seed germination of Zamia furfuracea. Hort.Science 18: 371-372.

DEHGAN, B and JOHNSON, D.R. (1983). Improved seed germination of Zamia floridana (sensu lato) with H_2SO_4 and GA_3. Scientia Horticulturae 19: 357-361.

DEHGAN, B and YUEN, C.K.K.H. (1983). Seed morphology in relation to dispersal, evolution and propagation of Cycas L. Botanical Gazette 144: 412-418.

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ROY OSBORNE

SEED DISPAYS IN CYCADS

by Willie Tang

INTRODUCTION

Cycads depend on various animals to disperse their seeds. Their fleshy edible seed coat is the basis of this relationship. Seed colour, cone construction and colour, and foliage pattern may aid indirectly in dispersal by making the seed more noticeable.

IMPORTANCE OF SEED DISPERSAL

Cycads, like other plants, are not strictly sedentary in the sense that in every generation some progeny must find new homes. The vehicle for this migration is the seed.

Whether a seed survives or not often depends on where it is transported. If it falls below the mother plant, as most seeds do, the seedling that emerges will have to compete with other seedlings and the mother for light, water and nutrients. A high density of seedlings under the mother may also make them more prone to predators (9). For example, baboons are known to eat Encephalartos seedlings (12) and a group of seedlings is probably more noticeable and thus is a more likely victim of predation than a single seedling.

Because of such density dependent mortality and the fact that suitable sites for the survival of a seedling are often discontinuous or patchy, it is advantageous for seeds to be dispersed, for this will increase their probability of survival. A site with the right microclimate (i.e. moisture, shade and protection from the elements) is required for the survival and growth of a seedling. An example of a safe site for a seedling of a savanna cycad may be the crevices of rocks.

PRIMARY FEATURE FOR SEED DISPERSAL

All species of cycads produce seeds with edible fleshy coats (not suitable for human consumption!). These coats, which are brightly coloured in most species, are believed to function as food rewards for vertebrates, which in feeding on them, aid in dispersing the seed (1, 5, 6, 7). Species of Encephalartos are known to be dispersed in this method by birds, baboons, vervet monkeys, hyraxes, rodents and fruit-eating bats (6). Possums and kangaroos are reported to disperse seeds of Macrozamia reidlei (3) and mockingbirds are probably involved in dispersing Zamia pumila in Florida and the Caribbean Isles (5).

The kernel of cycad seeds, which contains the embryo and its food supply, is known to be toxic to vertebrates (13). This dissuades seed dispersers from becoming seed predators and restricts them to feeding on only the seed coat. The fleshy coat of cycad seeds is what actually entices animals to visit the plant; it is the "reward" that potential seed dispersers seek. Therefore I will call the seed coat a primary feature for seed dispersal.

SECONDARY FEATURES FOR SEED DISPERSAL

There are other features of seeds and reproductive parts which indirectly help in seed dispersal by making seeds and their edible coats more noticeable to animals. Such features are seed colour, cone form and colour, and foliage pattern. These I will call secondary features for seed dispersal.

1. Seed Colour: Most cycads have glossy seeds that are red, orange or yellow; colours which diurnal birds, reptiles and some mammals are particularly sensitive to. These colours are effective in displaying the seeds, not merely by being vivid, but also because they contrast well with the green of vegetation.

2. Cone Form and Colour: Cycad cones have been given little recognition in helping to disperse seeds, despite the fact that many species have brightly coloured female cones. Baboons are known to feed on the fleshy coats of cycad seeds and may pull female cones apart to obtain them. Often they pull off unripe cones in which the seeds are undeveloped and unexposed (4,12).

Giddy (1974) reports that several species of hornbills, as well as other species of birds, feed on and disperse Encephalartos seeds. She quotes observations on the crowned hornbill: "A cycad, Encephalartos (species probably E. altensteinii), provides a food item of some importance from late August till late December, the period over which cones of the species mature. Much hammering with the sharp bill breaks down the large cones and exposes the drupaceous red seeds which are sought principally for the piece of semi-dry flesh detached from one end by pecking and biting... Paying constant attention to the ripe cones, the family may limit its hunting all day to the near vicinity of an Encephalartos tree."

These observations suggest that baboons and hornbills become aware of the seeds by first recognizing the presence of cones. Since cones are larger than seeds, animals may use them as search images to locate the seed indirectly. If this is so, shape, texture and colour of ripe female cones may be important in helping animals find the seeds.

Many species of Encephalartos have bright yellow, orange or red cones, again colours that are especially attractive to vertebrates. To be most effective in displaying and helping to disperse seeds, these cone colours should help make seeds most noticeable when the seeds are ripe. Below are three possible methods by which female cone colour, in conjunction with cone form, may do this:

a. Cone and seed colours constrast to make both more vivid.
An example of this is given by Berrie and Berrie (1956) who describe the ripe female cone of the West African cycad, Encephalartos barteri: "The whole cone is a beautiful sight when ripe with the pale green of the tips of the scales, the rich honey-coloured edges and the glossy scarlet (of the seed) just visible between." A list of species that may use this display "strategy" is given in table 1.

b. Cone colour augments seed colour.
When a ripe female cone disintegrates, the cone scales, if they are the same colour as the seed, will make the number of seeds appear greater and therefore more noticeable. Table 2 lists some Encephalartos species that may use this kind of display.

c. Cones arrange the seed in an attractive pattern.
Upon ripening, the female cone disintegrates from the apex downward and the seed within that are exposed, are arranged in a circular pattern around the axis. In many species of Macrozamia (10,11) and Zamia (14) the inner parts of the ripe cone are salmon pink while the seeds are red, so that the circular pattern of the seed is enhanced and is especially attractive.

3. Foliage: Foliage of plants is rarely credited in helping to display fruit and seeds, except, as mentioned earlier, in providing a contrasting background. In cycads the leaves often relax into a more horizontal position when cones form. This not only allows room for the new growth but also makes the cones more visible from the side as well as from above the plant.

Most species of cycads have leaves arranged in a radially symmetric rosette. When the leaves of such plants are splayed out in anticipation of cone growth, the foliage is disk-shaped, with the leaves and their rachises radiating inward to the stem apex. This foliage pattern is particularly apparent when the plant is viewed from above.

When a female cycad is in cone, the disk-shaped foliage around it may accentuate the presence of the cone. The cones and foliage together may form a target pattern for birds flying overhead. The rachises of the leaves arranged like the spokes of a wheel may help guide a bird's attention toward the axis of the plant where the cones are situated. In Encephalartos ghellinckii, E. inopinus, E. humilis, E. transvenosus and E. paucidentatus the rachises of the leaves are markedly

SPECIES	FEMALE CONE COLOUR	SEED COLOUR
Encephalartos altensteinii, E. caffer, E. hildebrandtii, E. ngoyanus, E. trispinosus.	yellow	red
E. cupidus, E. umbeluziensis.	yellow	apricot
E.arenarius, E. laurentianus, E. manikensis.	green	red

Table 1. Some species of cycads having contrasting cone and seed colours. Data from 6 and 14.

SPECIES	FEMALE CONE COLOUR	SEED COLOUR
Encephalartos cycadifolius, E. laevifolius, E. lanatus.	yellow	yellow
E. ferox, E. gratus, E. lebomboensis.	orange	red

Table 2. Some species of cycads having similar cone and seed colours. Data from 6 and 14.

yellow and the spoke pattern they form is particularly apparent.

GENERALITY OF SEED DISPLAY PATTERNS

The display patterns mentioned above are not evident in all cycads; different species may employ them to different degrees. In many species of cycads the cones or leaves may play a negligible role in displaying the seed. The subterranean-stemmed and low-growing species of Zamia, Macrozamia section Parazamia, Stangeria and Bowenia usually do not form symmetric rosettes of leaves and their foliage probably does not help their animal dispersers locate the seeds. In Dioon spinulosum the mature female cone is stalked and hangs upside down out of the crown. When the cone disintegrates upon ripening, the seeds fall quickly to the ground so that the foliage and cone play virtually no role in displaying the seed.

CONCLUSION

Living cycads depend on various vertebrates for dispersal, and the fleshy edible coat of their seeds is the basis of this dispersal mechanism. Seed colour, cone colour and form, and foliage pattern may all aid indirectly in dispersal by displaying the seeds to their vectors. The variety of seed display patterns exhibited by cycads suggests that each species has evolved to attract its own unique set of dispersers. Since different animals effect dispersal in different ways and with different results (8), knowledge of which particular animals disperse each species may help us to understand or predict the distribution patterns and reproductive success of cycads.

ACKNOWLEDGEMENTS

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14. Observations by the author at Fairchild Tropical Garden, Florida.

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LETTERS BRIEWE LETTERS BRIEWE

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

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

Dear Sir

I wish to comment on Mr Dave Tate's letter in ENCEPHALARTOS no. 12 (December 1987) concerning the hydroponic growing of cycads: This method of cultivation was tried to my knowledge for the first time in this country in 1980 by the renowned houseplant author, Margot Schubert, using a young seedling of Cycas revoluta.

My own experiments started in 1982. The successful ones are listed in the table below. Imported plants, obtained from Giddy's nursery, were probably about three years old at the time of arrival. All plants were, as you can see, switched from earth to hydro - a risky practice according to German hydro experts. The fertilizer used all the time was the ion-exchange resin "Lewatit HD 5", made by BAYER/Leverkusen.

Bad results were obtained with Cycas armstrongii, Dioon spinulosum, Macrozamia communis, M,miquelii, M.moorei and M.riedlei. Not all of them were lost, but all experienced long-lasting damage to the root system. As can be seen from the table, I recently started a new experiment with M.communis, using two 6 to 7-year old plants, which before had sent healthy roots right into the water reservoir of a wick-watering system. Nevertheless, in hydroponic growing of cycads the water level should be as low as feasible, as is the practice with orchids.

nr.of specimens	species	yr.of germination	yr.of import	yr.of start of hydroponics
1	B.serrulata	-	1982	1986
1	C.mexicana	-	1982	1986
1	C.revoluta	1980	-	1982
1	C.revoluta	1982	-	1987
1	E.lebomboensis	1982	-	1986
1	L.hopei	1984	-	1986
1	L.peroffskyana	1982	-	1983
2	M.communis	1981/82	-	1988
1	S.eriopus	-	1982	1986
1	Z.debilis	1982	-	1983
1	Z.fairchildiana	1982	-	1986
4	Z.furfuracea	1982	-	1983
2	Z.furfuracea	1985	-	1986
1	Z.latifoliolata	1982	-	1983
1	Z.portoricensis	1983	-	1983
1	Z.pumila f.umbr	1982	-	1983

The specimen of Zamia "portoricensis", grown from seed obtained from the American Cycad Society seed bank, is of a broad-leaflet type, similar to the Z.pumila group.

DR. HELMUT SCHLEGEL
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Dear Sir

I wish to extend my thanks and appreciation for the excellent service the Society provides to members.

I have gleened much useful information from the various issues of ENCEPHALARTOS, and find the varied content most stimulating.

Brian Ubsdell
RANDBURG

The Cycad Society Of Southern Africa

Die Broadboomvereniging Van Suidelike Afrika

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