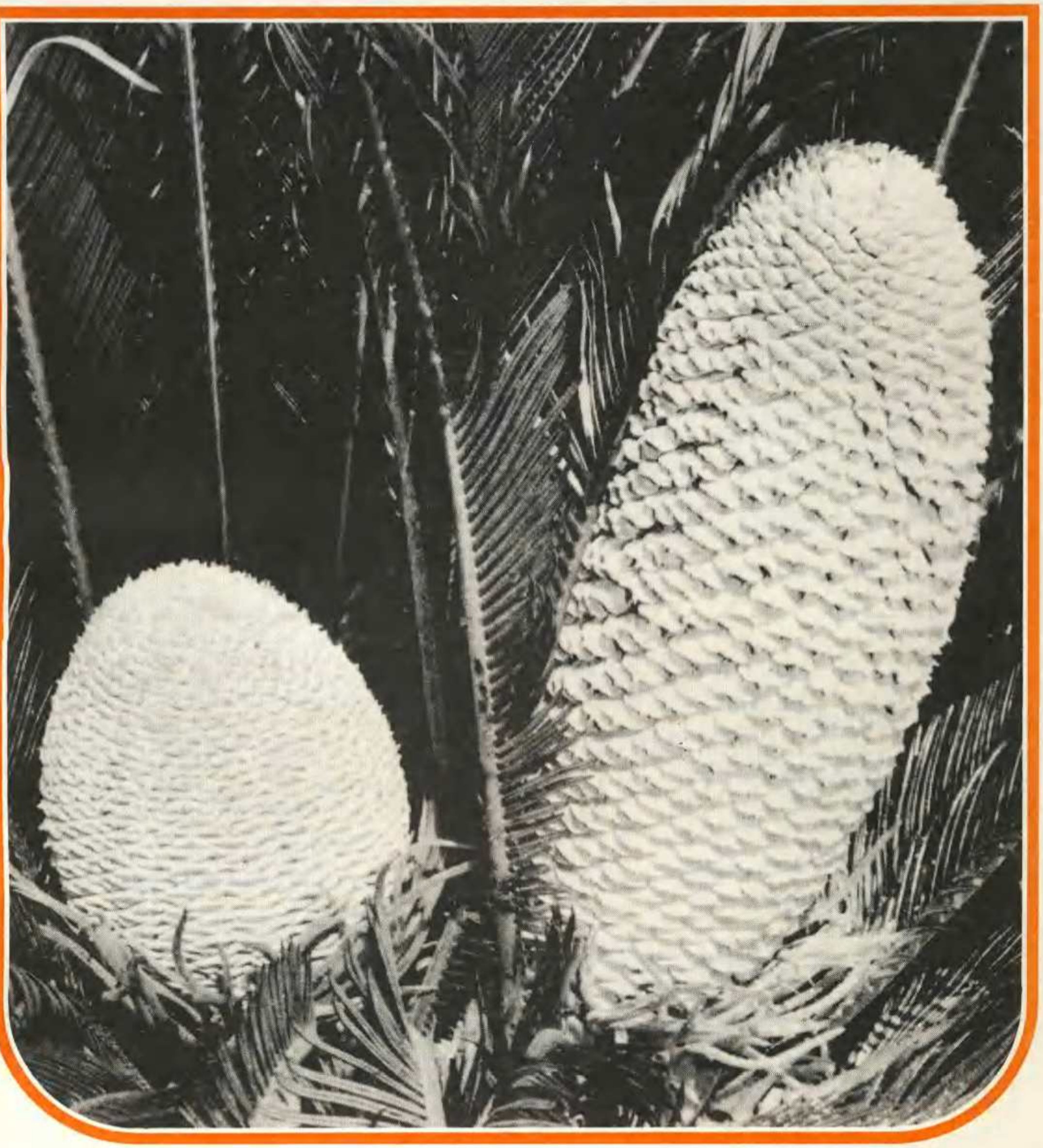
ENCEPHALARTOS

JOURNAL OF THE CYCAD SOCIETY OF SOUTH AFRICA

TYDSKRIF VAN DIE BROODBOOM VERENIGING VAN SUID-AFRIKA

NO. 40 DECEMBER / DESEMBER 1994 ISSN 1012-9987



CYCAD SOCIETY OF SOUTH AFRICA

BROODBOOM VERENIGING VAN SUID-AFRIKA

Council members / Raadslede

President
Prof. Hannes Robbertse
167 Astrid Street / Astridstraat 167
0184 Meyerspark
Tel.: 012-833964

Secretary-treasurer
Sekretaris-tesourier
Giel Fourie
9 Hobson Street / Hobsonstraat 9
2550 Stilfontein
Tel.: 018-4841565

Editor of "*Encephalartos*"
Redakteur van "*Encephalartos*"
Isabella Claassen
P.O. Box / Posbus 11322
0011 Brooklyn
Tel.: 012-453350

Printing & dispatch officer
Druk- en versendingsbeampte
Piet Vorster
Botany / Plantkunde Dept.
University / Universiteit
Private Bag / Privaatsak X5018
7599 Stellenbosch
Tel.: 021-8083056

Back copies officer
Beampte vir vorige uitgawes
Roy Shooter
21 Channel View Road / -weg 21
4052 Fynnlands
Tel.: 031-4662976

Regional officers / Streeksverteenwoordigers

Eastern Cape / Oos-Kaap

Frank Marx
29 Kurumanskloof
Summerstrand
6000 Port Elizabeth
Tel.: 041-532870

Natal

Danie Nel
P.O. Box / Posbus 4726
4000 Durban
Tel.: 031-442505

Transvaal

Koos Oosthuyzen
P.O. Box / Posbus 17078
0116 Pretoria North / -Noord
Tel.: 012-5041745

Pollen- and seedbank officers / Stuifmeel- en saadbankbeamptes

Eastern Cape / Oos-Kaap

Corrie Meyer
20 Ralston Road / -weg 20
6045 Fernglen
Tel.: 041-313102

Natal

Ollie Minnie
P.O. Box / Posbus 137
3935 Mtubatuba
Tel.: 035-5500646

Transvaal

Vacant / Vakant

Overseas correspondents / Buitelandse skakelbeamptes

Australia

Paul Kennedy
21 Sierra Road
Engadine
New South Wales 2233
Tel.: 02-520-7690

U.S.A. and Canada

Willie Tang
Fairchild Tropical Garden
11935 Old Cutler Road
Miami, Florida 33156
Tel.: 305-667-1651

CHANGE OF ADDRESS / ADRESVERANDERING

When changing address, please notify the Secretary-treasurer, not the Printing & dispatch officer.

Wanneer u van adres verander, laat weet asseblief die Sekretaris-tesourier, nie die Druk- en versendingsbeampte nie.

ENCEPHALARTOS

JOURNAL OF THE CYCAD SOCIETY OF SOUTH AFRICA

TYDSKRIF VAN DIE BROODBOOM VERENIGING VAN SUID-AFRIKA

NO. 40 DECEMBER / DESEMBER 1994 ISSN 1012-9987

COVER / VOORBLAD : *Cycas revoluta* male cones.

Plant bearing two male cones indicates that the crown has already divided into two branches; and subsequently both branches produced clearly separate whorls of leaves.

Photo: Piet Vorster

CONTENTS / INHOUD

CONTENTS / INHOUD (continued / vervolg)

RENEWAL OF MEMBERSHIP

PLEASE READ "FROM THE PRESIDENT" ON PAGE 3

HERNUWING VAN LIDMAATSKAP

LEES ASSEBLIEF "VAN DIE PRESIDENT" OP BLADSY 3

FROM THE PRESIDENT

Attention of members is again drawn to the notice on the first coloured page of this issue, reminding us that membership fees for 1995 are due before the end of 1994 to ensure that your membership is not terminated. Make use of the renewal form at the back of this issue. Please also note that membership fees had been increased and make sure that the correct amount is enclosed.

There seems to be a misconception amongst some new members as to the time of first renewal of membership. In the application/renewal form (coloured page at the back of this issue) it is mentioned that new members will receive all four issues for the year, irrespective of the date of joining the Society. Since the cost to produce the journal is our main expenditure, it implies that the cost of the four issues of the journal will more or less balance the amount paid for membership fees. When membership fees were due annually before the end of March it meant for example that if a person joined the Society on 1 December 1993, that person received the four 1993 issues of the journal, but would have had to renew his/her membership for 1994 before 31 March 1994. This means that irrespective of the month of the year in which a person enlisted as a member of the Society the date of renewal of membership is the same for all members. Therefore accounts are not sent to individual members and all members are referred to the notice regarding "Renewal of membership" (first coloured page in the journal). In the "New membership application/Renewal of membership" form on the coloured page at the back of the journal the membership fees for a specified year are given. As annual membership fees are now due before the end of December of the previous year, a person who wishes to join the Society and for example completes the "New membership application" form that appears in the September 1994 issue of the journal, will only qualify for the 1995 membership.

Retrospective to what has been published in the four issues of our journal during the past year, I am urged to thank all the contributors for, not only supporting the journal, but also for the high standard of the contributions. Without your interest and support it would not have been possible to keep members interested and informed. Thanks also to members who recruited new members for the Society or just inspired other persons to become interested in cycads. My appreciation also goes to members of the Board and other functionaries for their generous contributions to keep the Society going. The Festive season is close at hand and I would like to wish all members and their families the best for the Season and hope that all your expectations for 1995 will realize.

Hannes Robbertse

VAN DIE PRESIDENT

Alle lede se aandag word net weer gevestig op die kennisgewing voorin die tydskrif dat ledegeld vir 1995 voor die einde van die jaar (1994) betaal moet word om te verseker dat u lidmaatskap nie getermineer word nie. Maak gebruik van die hernuwingsvorm wat agter in hierdie uitgawe voorsien word. Let ook asseblief daarop dat ledegeld verhoog is en maak seker dat u die korrekte bedrag insluit.

Daar bestaan blykbaar by sommige nuwe lede onduidelikheid ten opsigte van die hernuwing van lidmaatskap. In die aansoek/hernuwingsvorm (laaste gekleurde bladsy agter in die tydskrif) word daar genoem dat 'n nuwe lid al vier die uitgawes van die tydskrif vir die jaar waarin die persoon aangesluit het, sal ontvang, ongeag die datum van aansluiting. Aangesien die koste van die tydskrif ons grootste uitgawe is, impliseer dit dat die koste van die uitgawes van die tydskrif die betrokke jaar se ledegeld balanseer. Toe ledegeld jaarliks voor die einde van Maart betaal moes word, het dit byvoorbeeld beteken dat al sou 'n persoon op 1 Desember 1993 as nuwe lid by die Vereniging aansluit, die persoon al vier die 1993-uitgawes van die tydskrif sou ontvang, maar dat die persoon voor 31 Maart 1994 sy/haar lidmaatskap vir 1994 sou moes hernieu. Dit beteken dat ongeag die maand van die jaar waarin 'n persoon as lid by die Vereniging aangesluit het, is die datum van hernuwing van lidmaatskap vir alle lede dieselfde. Dus word rekeninge nie aan individuele lede uitgestuur nie en alle lede word verwys na die kennisgewing oor die "Hernuwing van lidmaatskap" op die gekleurde bladsy voorin die tydskrif. In die "Nuwe lidmaatskap aansoek/Hernuwing van lidmaatskap"-vorm, op die gekleurde bladsy agterin die tydskrif, word die ledegelde vir 'n bepaalde jaar aangedui. Omdat ledegelde nou jaarliks voor die einde van Desember van die voorafgaande jaar betaal moet word, sal persone wat as nuwe lede by die Vereniging wil aansluit en byvoorbeeld die aansoekvorm wat in die September 1994-uitgawe van die tydskrif verskyn, gebruik eers vir die 1995 lidmaatskap kwalifiseer.

In 'n terugblik na wat gedurende die afgelope jaar in die vier uitgawes van die tydskrif gepubliseer is, wil ek graag die persone wat bydraes aangebied het bedank en nie alleen vir die ondersteuning nie, maar ook vir die hoë standaard van die bydraes. Sonder u belangstelling en ondersteuning sou dit nie moontlik gewees het om lede se belangstelling te behou en hulle in te lig nie. Dankie ook vir lede wat nuwe lede gewerf het of net ander persone geïnspireer het om in broodbome belang te stel. My waardering gaan ook aan lede van die Raad en ander funksionarisse vir hulle onbaatsugtige bydraes om die Vereniging aan die gang te kon hou. Die Feesseisoen is amper op hande en ek wil graag aan al die lede en hul families my beste wense vir die Feestyd oordra en die hoop uitspreek dat al u verwagtinge vir 1995 sal realiseer.

Hannes Robbertse

FOCUS ON ... FOKUS OP ...

In each edition of ENCEPHALARTOS, we focus on one southern African 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 suider-Afrikaanse broodboomsoort, in die vorm van 'n in-diepte-artikel in leketaal. In hierdie uitgawe val die kollig op:

ENCEPHALARTOS HEENANII R.A. Dyer

Johan Hurter
P.O. Box 1024, 1200 Nelspruit

INTRODUCTION

The Makonywa, Ngwenya and Big Buffalo ranges form part of the most eastern outliers of the south eastern Transvaal Drakensberg. These ranges are steeped in cultural, historical, palaeontological and geological history. They are also the home to many endemic animal and plant species, including three of southern Africa's rarest cycads, *Encephalartos paucidentatus, E. laevifolius* and *E. heenanii*.

Figure 1 *E. heenanii* in habitat, showing suckering habit and reclining stem.

The first indications of the latter species' existence came from the exploration work of Mr. Denis Heenan in the Piggs Peak district of Swaziland in 1969. The new taxon was found growing in close proximity to large populations of *E. paucidentatus* and *E. laevifolius*, and the first thought, which could not be ignored, was that it could be a hybrid between these two unlike species. No supporting evidence for this idea was found, however, and the lack of fresh cones hampered the description of the species. It was not until 1971 that patient fieldwork by Mr. Heenan and his son David were rewarded with the discovery of fresh cone material, which were sent to the late Dr. A. Dyer at the then Botanical Research Institute.

The description of *E. heenanii* was published in 1972 and honours the role played by Mr. Heenan in its discovery.

DESCRIPTION

This cycad together with *E. inopinus* is probably one of the most distinctive species to be described from South Africa.

1. STEM

Well-developed (Figure 1), suckering or branching from the base. Mature trunks erect or procumbent with age, up to 3 m long and 400 mm in diameter. Cataphylls linear-lanceolate, often persisting in a dry brittle form on the upper half of the trunk, very densely woolly with long golden brown hairs in the crown.

2. LEAVES

Leaves 1-2 m long, rachis incurved (Figure 2) and often slightly twisted at the apex, giving a "cup-like" appearance to the plant's crown. Petiole up to 200 mm long, round in cross section. Median leaflets succubously orientated, ascending in the plane of the rachis and markedly reflexed from the rachis. Leaflets oblong-lanceolate in outline, 100-150 mm long and up to 20 mm broad, margins entire or with 1-2 teeth. Lower leaflet surface with prominently raised veins and upper leaflet surface often with small wart-like protuberances. Lower leaflets reduced but not to a series of prickles.

Figure 2 *E. heenanii* in habitat, showing the characteristic "wine glass" or incurved leaf orientation.

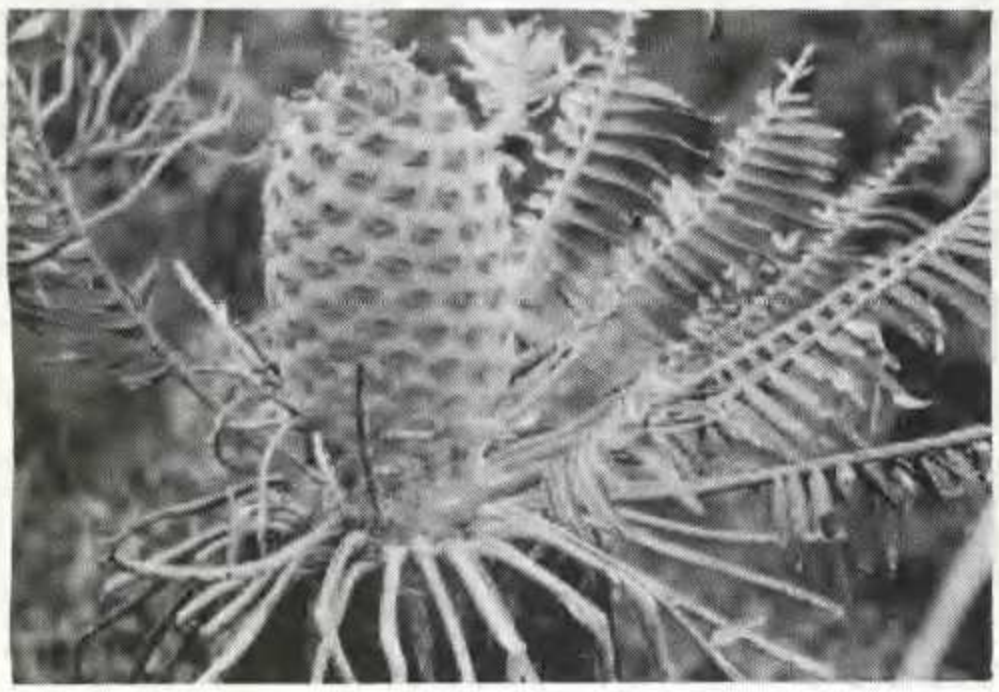


Figure 3 Male cone of *E. heenanii* and leaves showing damage by *Zerenopsis leopardina* larvae.

3. CONES

Male cones (Figure 3) single or in groups of 2-4, sub-cylindrical, pedunculate, 270-300 mm long and 120-180 mm in diameter, covered with dense brown wool, seldom glabrous. Similar in appearance to that of the female cone.

Female cones (Figure 4) usually single, rarely 3, broadly ovate, pedunculate, 200-350 mm long and 170-200 mm in diameter, covered with dense shaggy golden hair but often a glabrous yellow (Figure 5).

AFFINITIES

This species has clear affinities with the *E. transvenosus/E. paucidentatus* group. It shares similar characteristics, although the plants are much smaller in

Figure 4 Typical woolly female cone of *E. heenanii*.

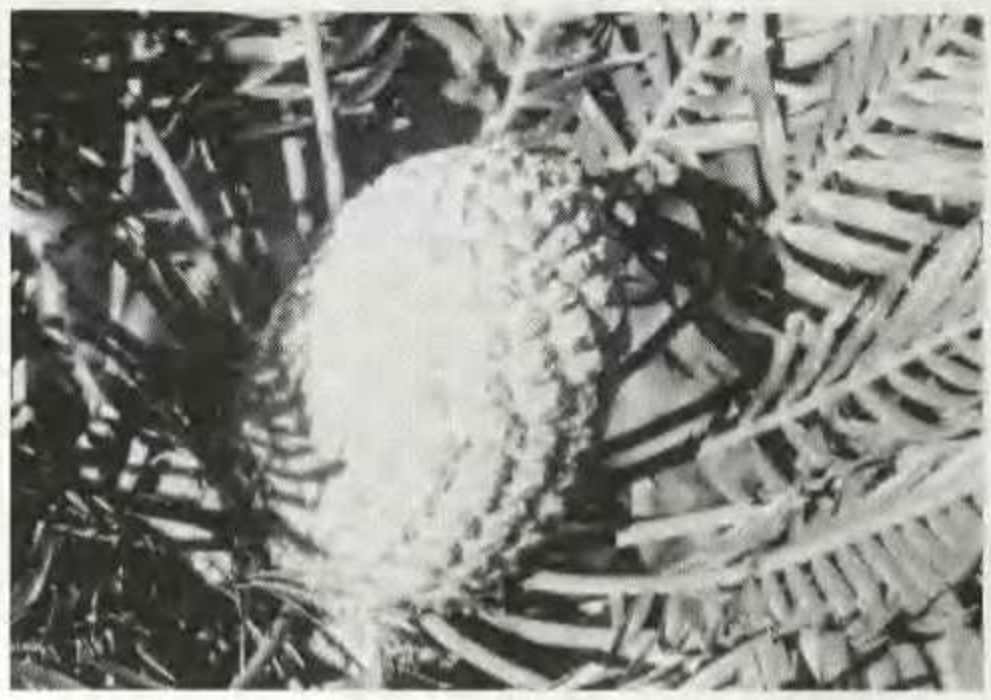


Figure 5 Atypical glabrous female cone of *E. heenanii*.

stature. *E. heenanii* is probably most closely allied to *E. paucidentatus* and several natural hybrids between the two species have been noticed. The two species share such characteristics as the reflexed leaflets (in some *E. paucidentatus* specimens at least) and the prominently raised veins on the lower leaf surface. The relationship of *E. heenanii* with plants from the Lebombo Mountains east of Stegi in Swaziland needs some investigation. These plants have inflexed leaflets, densely golden woolly cataphylls and the veins are also prominently raised on the leaflet abaxial surface, but the leaves are straight in comparison with the characteristic incurved leaves of *E. heenanii*.

Figure 6 *E. heenanii* in habitat amongst quartziferous boulders.

DISTRIBUTION

This species is known with certainty from a very small mountainous area on the border between Swaziland and the Republic of South Africa.

ECOLOGY

E. heenanii occurs as isolated individuals or discreet colonies on steep grassy slopes (Figures 6-8). The associated vegetation is North-Eastern Mountain Sourveld. Plants occur almost exclusively on acidic soils derived from feldspathic quartzites with bands of shale of the Moodies system.

Fires are frequent in this high mountain habitat, with a large resultant loss of seedlings, which has in recent times led to poor recruitment of the species. Prior to conserving the area, the grasslands were heavily grazed by sheep farmers leasing the government farms on which the plants occur, which might also have led to the loss of plants through overgrazing. The area is also a prime forestry area and many plants were probably lost under exotic pine trees which now cover most of the area. Historically the area is renowned for its gold and mining activity, especially in the previous century. These activities might have contributed to the loss of plants.

E. heenanii grows in close association with *E. paucidentatus* and several hybrids between the two species have been recorded. The mother plant is usually *E. heenanii* and this might also account for the glabrous cones on certain individuals. Pollination most probably takes place through an insect vector, one or all of which is shared with *E. paucidentatus*.

The frequency of fertile seed production in nature is

Figure 7 *E. heenanii* in habitat showing trunk and frond orientation.

Figure 8 *E. heenanii* in habitat on the steep south-east facing slopes of the Makonywa mountain range.

poor, as plants of different sexes seldom occur in proximity to each other. Seed is distributed mainly by water run-off and baboons, which often damage plants in their quest for food. The recruitment rate is very slow and plants probably only persist in habitat through the formation of basal suckers.

CONSERVATION

It appears as if this species was never abundant and illegal collecting, even in the years before formal description, has reduced numbers in the wild to near extinction.

Plants are presently conserved in the Somgimvelo Nature Reserve (RSA) and the Malolotja Nature Reserve in Swaziland, some plants are also protected by royal decree in the vicinity of the King's Forest in Swaziland. Other plants occur on private land in Swaziland and must be considered for active protection. During a survey in 1985, it was found that fewer than 500 plants existed in the wild and that numbers were dwindling even as the survey was in progress.

Few cycads have captured the imagination of collectores as *E. heenanii* has. It appears as if the inaccessibility of the terrain is no deterrent to poachers who even hire helicopters to remove mature specimens. It is a sad state of affairs that there are more mature specimens of this species in cultivation than in nature.

This species must be considered as **endangered** and close to extinction by conservation authorities. This is mainly due to the taxon's severely restricted distribution, intensive pressure from collectors, its inability to reproduce sexually, inter specific hybridization, encroachment on it's habitat by forestry activities, cultural and medicinal use and the presence of possibly introduced fungal pathogens.

An intensive *ex situ* conservation project has been started in the Lowveld National Botanical Garden and it is hoped that this species will timeously be saved from extinction.

CULTIVATION

This species has little horticultural potential and is notoriously difficult to cultivate. Mature plants seldom survive transplanting and desiccate easily after removal. Plants are also prone to fungal attack after transplanting. Seedlings are rare in trade, due to the fact that plants seldom cone in cultivation.

Plants are rarely seen in cultivation and will probably always be a sought after collectors item.

REFERENCES

DYER, R.A. 1972. A new species of *Encephalartos* from Swaziland. *Bothalia* 10(4): 539-546.

GOODE, D. 1989. Cycads of Africa, pp. 128-131. Struik Winchester, Cape Town.

ARTICLES / ARTIKELS

THE PORTICI BOTANICAL GARDEN

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

Received 8 June 1994

Figure 1 Part of the imposing Royal Palace of Portici. The botanical garden is to the rear of the Palace buildings.

Figure 2 Some of the many *Welwitschia* plants growing in raised beds in one of the Portici glasshouses.

Figure 3 *Cycas rumphii* (?) at the Portici Garden.

Visitors to the south of Italy would do well to include in their itinery a trip to the Portici Botanical Garden (l'Orto Botanico dell'Università di Napoli - Portici). The garden is situated within the large parklike grounds (Parco Grussone) of the Royal Palace of Portici (La Reggia di Portici) (Figure 1) on the lower slopes of Mount Vesuvius. The palace is itself both internally and externally a most impressive building, constructed between 1738 and 1742 at the command of Bourbon ruler Carlo III, and has been used by the University's Faculty of Agriculture since 1872. At that date too, the Botanic Garden of Portici was founded within the

quadrangle at the rear of the Palace, the high walls still present today and adorned with objects d'arte. The garden, having experienced a succession of good and bad times, is presently supported by a capable and enthusiastic staff under the direction of Professor Paolo Pizzolongo.

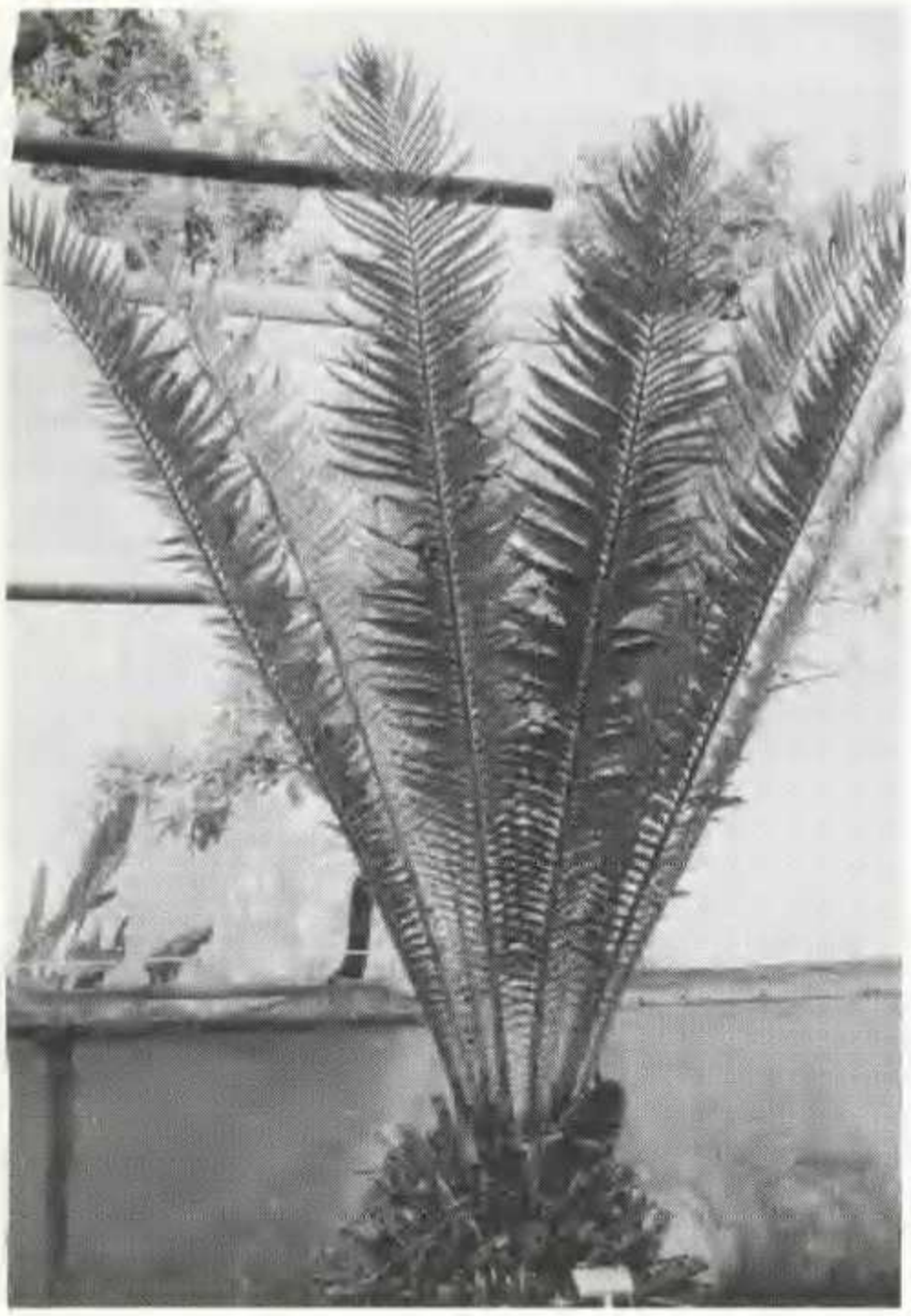


Figure 4 *Encephalartos laurentianus* female plant at Portici.

The Portici Botanical Garden has impressive collections of palms, ferns, cacti and succulents, including a large representation of Madagascan plants. Furthermore, I was amazed to find a large number of *Welwitschia* plants (Figure 2) growing in one of the many glasshouses; head gardener Silvio Russo tells that many of the younger *Welwitschia* specimens were raised from the original plants as a result of artificial pollination experiments.

There are about 73 cycad specimens in the Portici garden, many being *Cycas revoluta* but also including representatives of *Ceratozamia*, other *Cycas* spp. (Figure 3), *Dioon, Zamia* and *Encephalartos* (Figures 4-6). It is said that the main *Encephalartos* accessions were obtained as a donation from the gardens at Sorrento where they had been looked after on behalf of a wealthy Russian princess (regrettably, unnamed) who fled to the south of Italy from her homeland, together with her

Figure 5 *Encephalartos bubalinus* male plant at Portici.

Figure 6 *Encephalartos horridus* thriving in an outdoor bed at Portici.

cycad collection and other possessions, during the Bolshevik Revolution in 1917.

ACKNOWLEDGEMENT

I thank Silvio Russo and Salvatore Cozzolino for their assistance in the preparation of this text.

REFERENCE

PIZZOLONGO, P. 1990. In: F.M. Raimondo (ed.), Orti botanici, giardini alpini e arboreti Italiani. Società Botanica Italiana, pp. 135-140.

A NOTE ON THE CYCADS IN YUNNAN, SOUTH-WESTERN CHINA

Si-Lin Yang[1] and Si-Yuan Yang[2]

[1]Department of Horticulture, Southwest Agricultural University, Chongqing, Sichuan 630716, China

[2]Department of Horticulture, Bing-chao-gang, Panzhihua, Sichuan 617000, China

Received 22 August 1994

Figure 1 *Cycas "multipinnata"* in cultivation. It is another native in southern Yunnan cultivation, possibly extinct in the wild. Photo: S.L. Yang.

The first author recently finished an isozyme study on Chinese and Asian cycads at Fairchild Tropical Garden in collaboration with Terrence Walters. We examined samples from 55 populations (18 from Yunnan Province of China) representing 19 *Cycas* taxa. The results support early proposal of at least two new species from

Figure 2 *Cycas "parvulus"* in cultivation. Photo: W. Tang.

Yunnan. All the populations of the undescribed species found during our 1993 research expedition (supported by the Montgomery Foundation [Miami, USA] and Cycad Gardens [Los Angeles, USA]) had been decimated by locals. We would hereby like to provide a brief note on those species before describing them fully later. This finding of two new species brings the number of native cycad species for Yunnan to seven; the other five species are *Cycas panzhihuaensis* (in the north), *C. guizhouensis*

(in the middle south), *C. "multipinnata"* (location unknown) (Figure 1), *C. pectinata* (in the south-west), and *C. simplicipinna* (in the south and west).

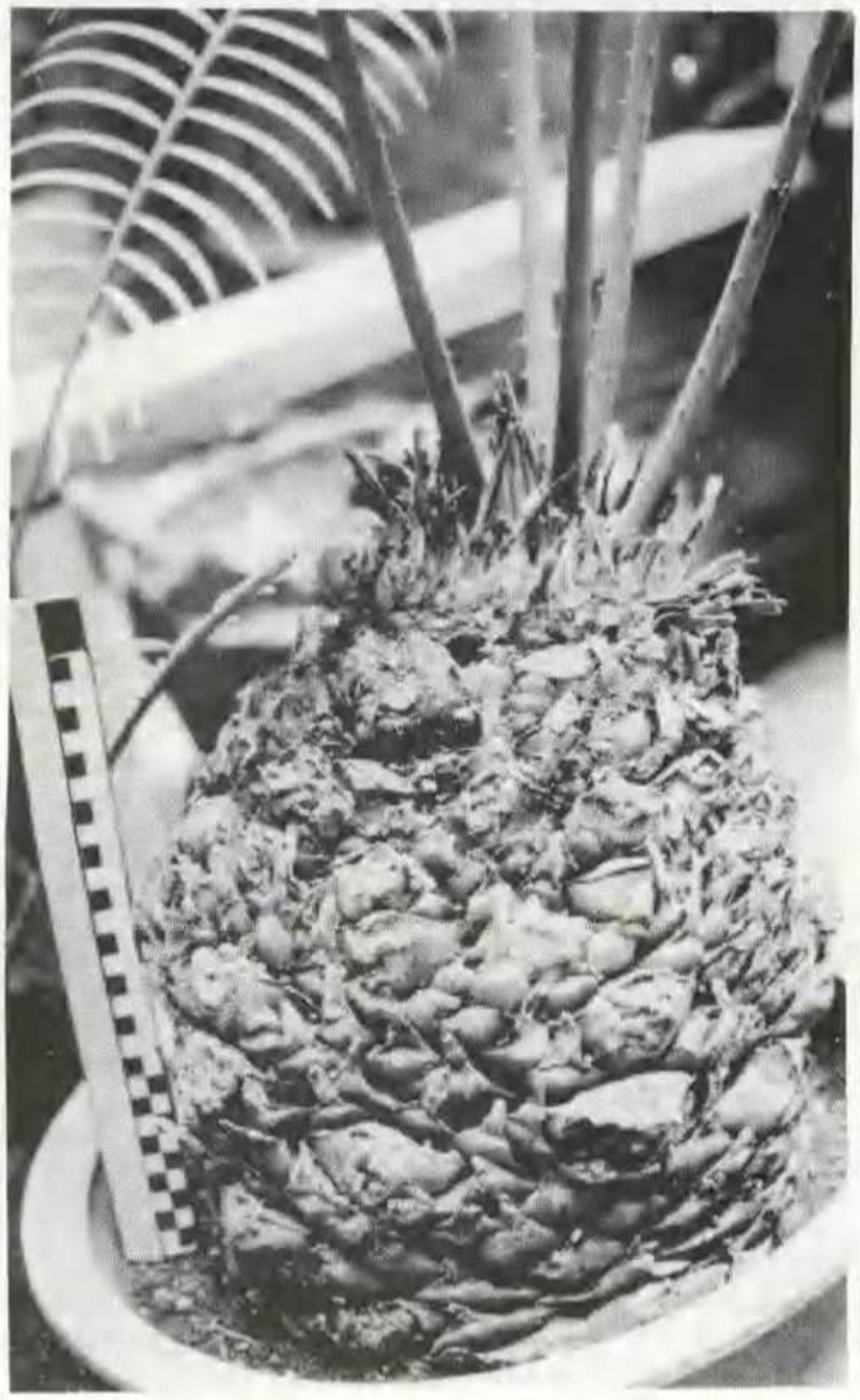


Figure 3 *Cycas "parvulus"* trunk. Photo: S.L. Yang.

Cycas "parvulus" S.L. Yang occurs in the region of Honghe (Red River Valley) (Figures 2, 3). Trunk subterranean or <300 mm above ground, width 150-300 mm, heavily covered by leaf base remains. Leaves 10-20 in the terminal crown, 1.6 m long; petiole 500-700 mm long, 10-13 mm in diameter, spines ca. 20 pairs on whole petiole, 20-35 mm distant; leaf flat; pinnae 70 pairs, median pairs 250-350 mm long, 13-18 mm wide, flat in cross section, margin flat or slightly wavy, dark green, papyraceous, tip pungent, midrib 0.9 mm wide, raised on both sides. Cataphylls long, triangular, 40-60 mm long, 13 mm wide at the base, brown tomentose, tip soft. Female cone composed of 5-10 loosely overlapping megasporophylls, megasporophylls green, 70-120 mm long, slightly brown tomentose, stalk 30-50 mm long, 5-9 mm in diameter; terminal sterile part pectinate, 50-60 mm long, 30-50 mm wide, deeply divided, 7-9 pairs of lobes, lobes 20-30 mm long, 1-2 mm wide. Ovules 1-2 pairs, seeds yellow, ovoid to ellipsoid, 18-20 mm long, 15-18 mm in diameter, surface woody, verrucose. *Cycas "parvulus"* was considered identical to *C. simplicipinna* by local horticulturists. After carefully comparing its morphological features and isozyme data with those of three populations of *C. simplicipinna* (Figure 6) from Mengla, Yunnan, we were able to distinguish *C. "parvulus"* by its pungent tipped pinnae, persistent leaf bases on its trunk, more leaves, rough seed, megasporophylls with deeply divided terminal part and longer lobes. The geographical distribution of *C. "parvulus"* is between that of *C. guizhouensis* and *C. simplicipinna*. *C. guizhouensis* can be distinguished by its smooth seeds and larger trunks. Allozyme analysis indicates that *C. "parvulus"* is not a natural hybrid but a distinct species. Genetically it is more closely related to *C. guizhouensis, C. inermis* and *C. micholitzii* rather than *C. simplicipinna*.

The specific epithet, "parvulus = small", is for the small verrucose seeds.

Endangered status: near extinct.

Figure 4 *Cycas "hongheensis"* in habitat. Photo: S.L. Yang.

Cycas "hongheensis" S.Y. Yang & S.L. Yang is found along the northern bank of Red River, southern Yunnan (Figures 4, 5). Trunk 1-2 m tall, sometimes up to 7 m,

Figure 5 *Cycas "hongheensis"* in cultivation. Photo: S.L. Yang.

often branched, base usually swollen; main trunk 300-400 mm in diameter, branches less than 200 mm wide, trunk smooth, whitish grey, some with prominent rings; apex glabrous; leafbases persistent only near apex; leaves numerous, 500-900 (-1200) mm long, keeled in cross-section; pinnae opposite, inserted V-shaped at 80-120° on rachis; petiole 100-200 mm long, with 9-14 pairs of spines above the middle part; pinnae 50-70 pairs, median pair attached at 45-75° to rachis, 80-160 mm long, 60-80 mm wide, margin recurved, leathery, waxy (bluish) on the upper surface, yellow-green below, light brown tomentum beneath, apex attenuate ending in a spiny tip; midrib not raised above, prominent below. Cataphylls hard, 30-45 mm long, 10 mm wide at the base, apex spiny, covered by yellow-brown tomentum on abaxial surface, inner surface smooth.

Cycas "hongeensis" has a trunk similar to that of *C. pectinata* but its leaves are shorter and its cataphylls are sharper than those of *C. pectinata*. The keeled leaves and compact crown of *C. "hongeensis"* resemble those of *C. revoluta*; however, its pinnae margins are less recurved than those of *C. revoluta*. Unlike *C. revoluta*, the trunk apex of *C. "hongeensis"* lacks a brown tomentum.

Allozyme data support *C. "hongeensis"* as a distinct species. Of 13 loci studied on Asian cycads, Pgd-1 (6-phosphogluconate dehydrogenase) and Pgm-2 (phosphoglucomutase) were observed only in *C. "hongeensis"* populations. *Cycas "hongeensis"* has very low genetic identity values with other species in China.

Note: until the manuscript was written, no good reproductive specimens were obtained. But the locals said that the seeds of *C. "hongeensis"* are large (30-40 x 40-50 mm). A. Lindström observed an immature male cone in Yunnan: length 150 mm, width 60 mm, shape close to that of *C. pectinata*; microsporophylls 22-24 mm long and 10-11 mm wide, the acumen 2 mm long, that is quite different from the 40 mm long acumen of *C. pectinata*.

The specific epithet, from "honghe", is the Chinese name for the Red River and also the name of Southern Yunnan Region where the species occurs.

Endangered status: near extinct. Since its compact fronds resemble those of *C. revoluta*, which can be sold at high prices in markets, local people have dug out and cut up most plants found in the wild. In the five populations we located in 1993 only large old trunks without apices remained (Figure 4), most likely because they were too large to remove and local people cut off the apices in an attempt to propagate them vegetatively.

KEY TO SOME *CYCAS* SPECIES IN YUNNAN AND SPECIES RELATED TO THEM

1a. Cataphyll tip sharp
  2a. No tomentum on trunk apex ..... *C. "hongheensis"* S.Y. Yang & S.L. Yang
  2b. Brown tomentum on trunk apex
    3a. Pinna margin revolute ..... *C. revoluta* L.
    3b. Pinna margin flat ..... *C. taitungensis* C.F. Shen, K.D. Hill, C.H. Tsou & C.J. Chen
1b. Cataphyll tip soft, not sharp
  4a. One or two short lobes below ovules on megasporophyll stalk .... *C. szechuanensis* C.Y. Cheng & L.K. Fu
  4b. No lobes below the ovule on megasporophyll stalk
    5a. Seeds 15-22 x 18-22 mm

6a. Pinnae leathery, seeds glabrous
7a. Large, cylindric trunk, spiny petiole ..... *C. guizhouensis* K.M. Lan & R.F. Zou
7b. Small, swollen trunk, smooth petiole ..... *C. miquelii* Warburg
6b. Pinnae papyraceous, seeds verrucose or glabrous
8a. Leaves 10-20; deeply divided megasporophylls, lobes 20-30 mm long, pungent pinna apex ..... *C. "parvulus"* S.L. Yang
8b. Leaves 1-4; slightly divided megasporophylls, lobes 5-20 mm long, cuspidate pinna apex
9a. Forked pinna ..... *C. micholitzii* Thiselton-Dyer
9b. Non-forked pinnae ..... *C. simplicipinna* (Smitinand) K.D. Hill
5b. Seeds 35-45 x 40-50 mm ..... *C. pectinata* Hamilton

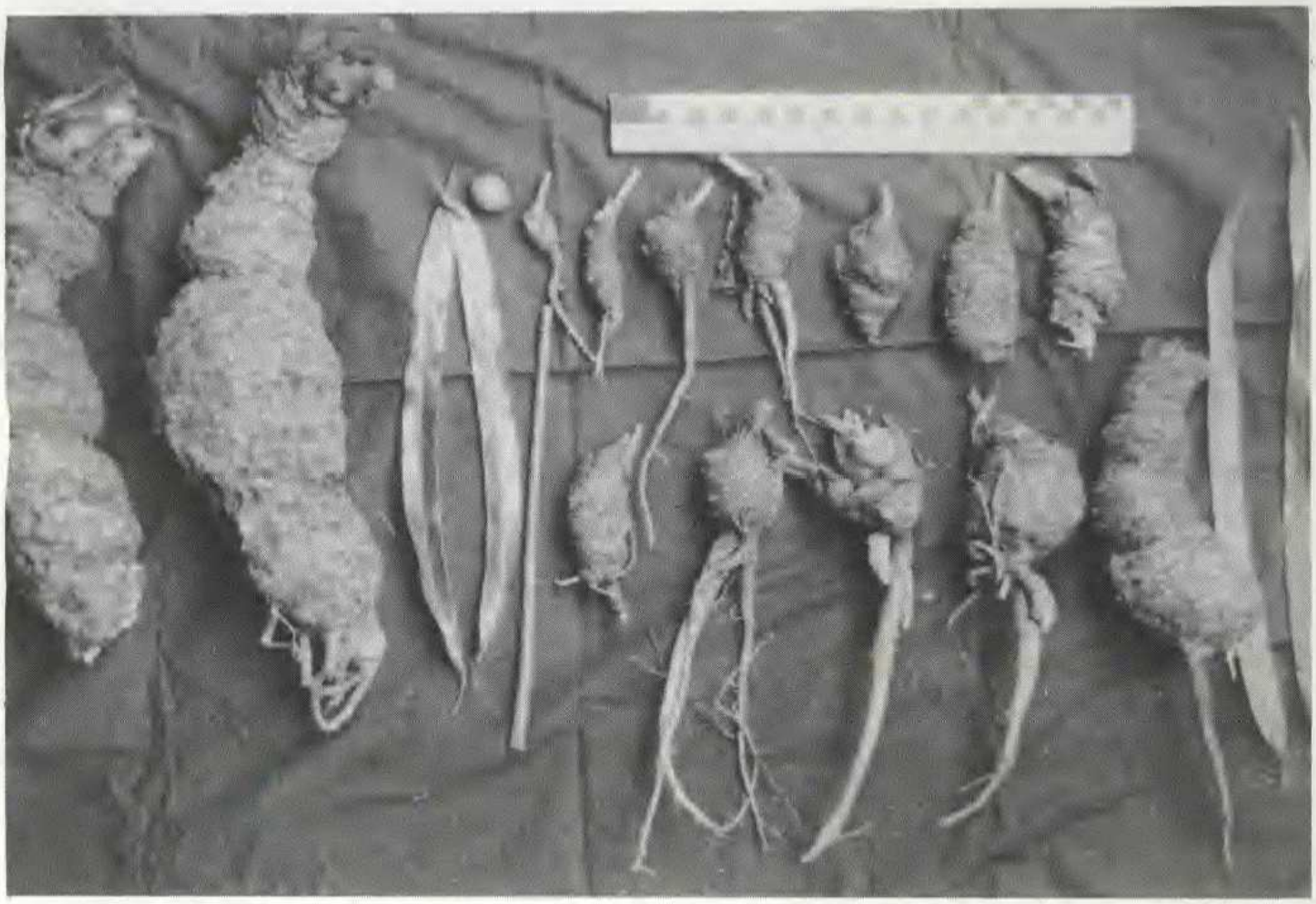


Figure 6 *Cycas simplicipinna* trunks collected from the habitat in southern Yunnan, showing the smooth surface which is distinct from those of *C. "parvulus"*. Photo: S.L. Yang.

BRANCHED LEAFLETS IN *CYCAS*

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

Received 22 September 1994

The leaflets on most cycads have a simple, undivided shape, ranging from the nearly oval leaflets found in some *Zamia* species to the long strap-shaped leaflets in many *Cycas* species. There are, however, a few

departures from this pattern.

In Australia at least three species of *Macozamia*, namely *M. diplomera, M. heteromera* and *M. stenomera*, have leaflets which branch, often more than once (see Jones 1993). In Africa two species of *Encephalartos*, namely *E. horridus* and *E. trispinosus*, have leaflet spines that are so large, their leaflets may be considered branched (see Goode 1989).

There is one other genus which displays regularly branched leaflets. This is *Cycas* and the species in question occur within Asia. There are three species or varieties within the *Cycas micholitzii* complex which have consistently divided leaflets. These are *C. micholitzii* var. *micholitzii* (Figure 1), an as yet undescribed variety "*stenosis*" identified recently by Yang and Pu (1994) and *C. "multipinnata"*, being described by Chia-jui Chen (Figure 2).

Figure 1 Leaf of a *Cycas micholitzii* var. *micholitzii* plant collected in southern China. Notice the branched leaflets.

In a recent examination of the literature and of living specimens I discovered a number of specimens of other *Cycas* species which possessed branched leaflets. One manuscript from the 19th century illustrates a leaf of *C. inermis* (from south-east Asia) with branching leaflets

Figure 2 *Cycas "multipinnata"* in cultivation in Zimbabwe. This species has leaflets that divide up to six times.

Figure 3 An illustration of a leaf of *Cycas inermis* from *Analecta Botanica Indica*, Pars II by F. Miquel (circa 1850).

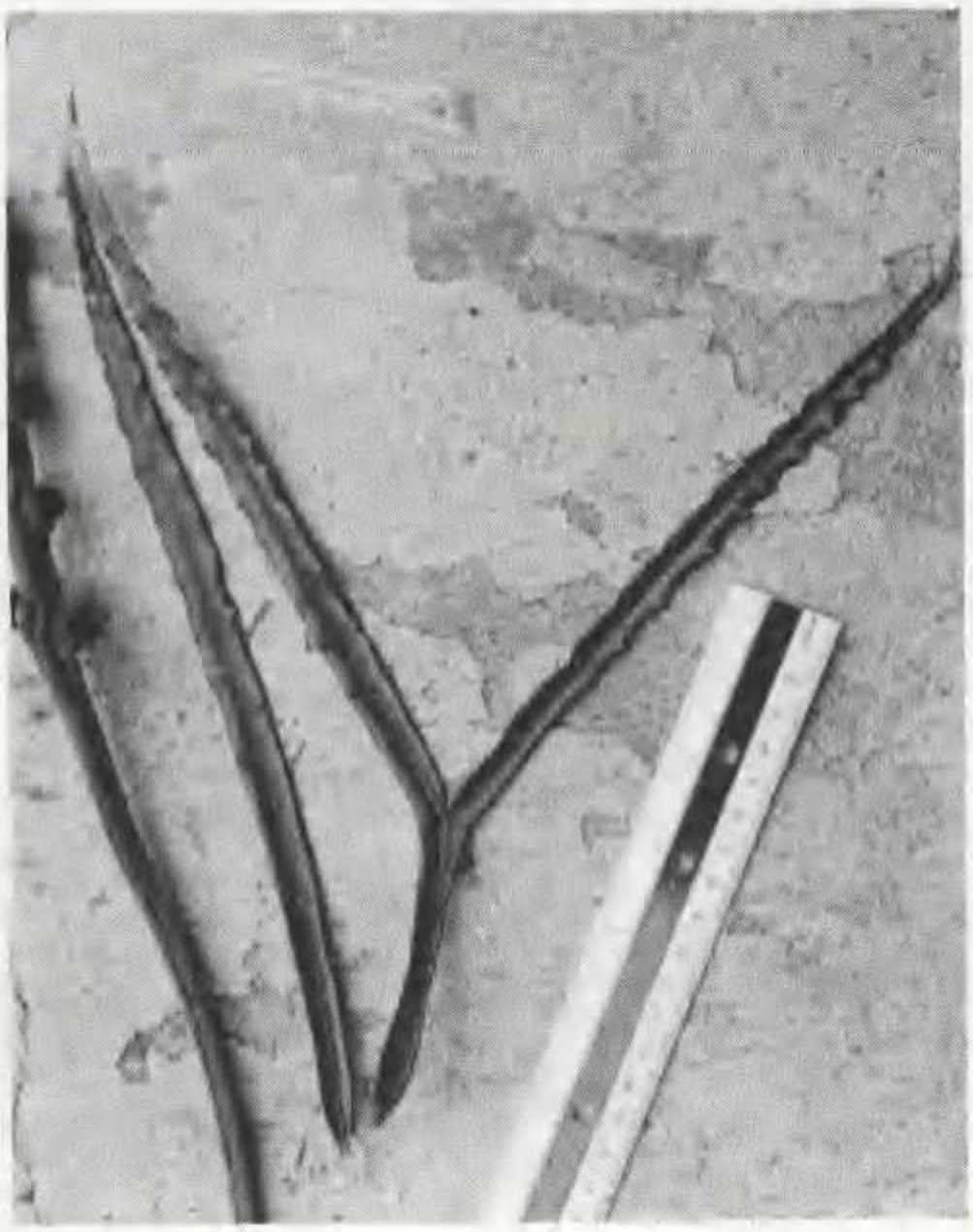


Figure 4 Photograph of a branched leaflet of *Cycas scratchleyana*.

(Figure 3). Recently I have observed branched leaflets in *C. scratchleyana*, a New Guinea species (Figure 4), *C. revoluta* (Figure 5) and *C. calcicola*, an Australian species (Figure 6). These last two species are not known to have leaflets that branch regularly, suggesting that the specimens in question are mutants. The presence of branching leaflets in these geographically separate and morphologically distinct species, suggests that this character may not be a rare feature in *Cycas*. Branched leaflets may result from a mutation which occurs with relative ease in this genus and may arise from a simple point mutation on a single gene.

One current worker on the genus *Cycas*, D.J. DeLaubenfels, has proposed that the branched-leaflet *Cycas* including *C. micholitzii* and its relatives be placed in a new genus, "*Epicycas*", based solely on this leaf character (Walters *et al.*, in press). There are apparently no other vegetative or reproductive characters that would support this proposition. A recent genetic study by Walters *et al.* (in press) indicates that *C. micholitzii* is closely related genetically to other *Cycas* species with undivided leaflets. Thus the genetic evidence also does not support the establishment of a new genus. Given these results and the above observations the placement of divided leaflet *Cycas* species into a new genus would seem unwarranted.

Figure 5 A *Cycas revoluta* leaf with branched leaflets. Photo: Roy Works.

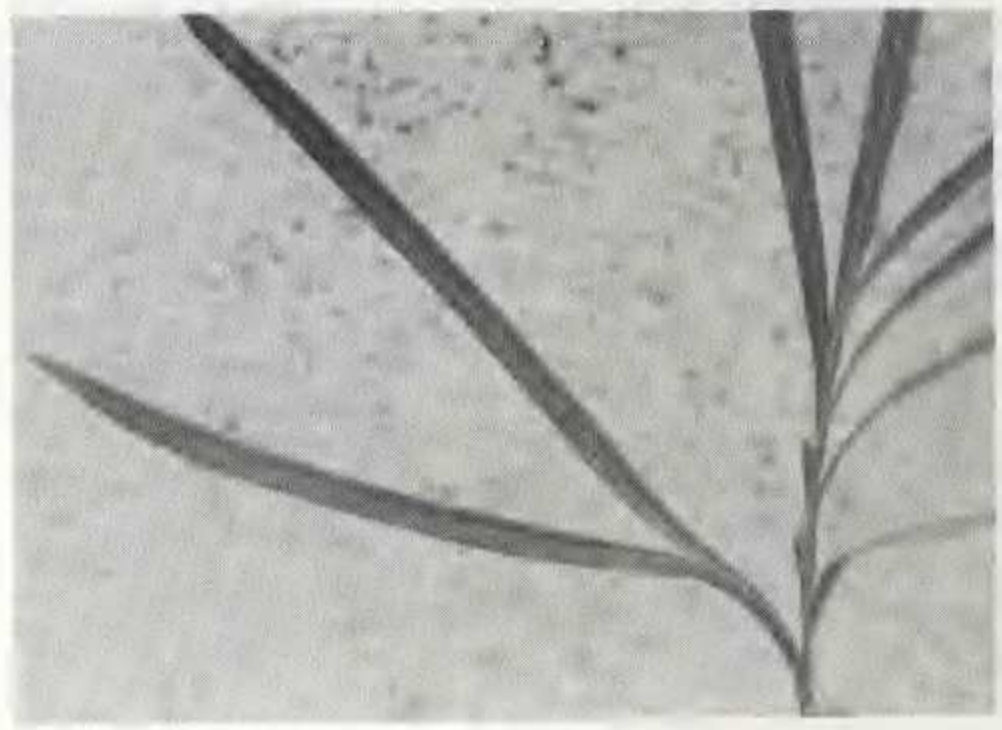


Figure 6 Seedling of *Cycas calcicola* with a branching leaflet growing at Fairchild Tropical Garden.

LITERATURE CITED

GOODE, D. 1989. Cycads of Africa. Struik Winchester, Cape Town.

JONES, D.L. 1993. Cycads of the World. Smithsonian Institution Press, Washington, D.C.

WALTERS, T., YANG, S.L. & DECKER-WALTERS, D. (In press). The systematic implications pf allozyme patterns in Chinese *Cycas*.

YANG, S.L. & PU, H. 1994. 1993 cycad expedition in China. *Journal of the Cycad Society* 1: 12-19.

CYCAD-ASSOCIATED GEOMETRID MOTHS IN SOUTHERN AFRICA

Hermann S. Staude
P.O. Box 5021, 1742 West Krugersdorp

Received 5 October 1994

INTRODUCTION

There is in Southern Africa a unique group of moths that are dependent on cycads for their existence. These attractive day-flying moths belong to a family called Geometridae - the earth measurers. This name is derived from the fact that their larvae, commonly known as inch worms, have a peculiar way of locomotion, in which they seem to be continually measuring the earth. The cycad-feeders are classified as the small subfamily Diptychinae.

There are only seven known species in this group, belonging to four genera (Figure 1):

- The genus *Zerenopsis*, to which the fairly common, and to cycad lovers perhaps notorious, Leopard Magpie Moth (*Zerenopsis leopardina*) belongs. This seems to be the only species in the genus.
- The genus *Callioratis* comprises the fairly large and attractive False Tiger Moths. Here there are two species known. The Dimorphic Tiger Moth (*Callioratis abraxas*), which is known to occur in a number of localities in the eastern Cape and Transkei and also on the Lebombo Mountains. The second species is Millar's Tiger Moth (*Callioratis millari*), a species once thought to be extinct but now known to still occur in the Krantzkloof Nature Reserve in Pinetown, Natal.
- The genus *Veniliodes* of which again only two species are known: the Panther Tigerlet (*Veniliodes pantheraria*) which is found from the eastern Cape northward to around Pinetown. The other species, the Inflamed Tigerlet (*Veniliodes inflammata*), has

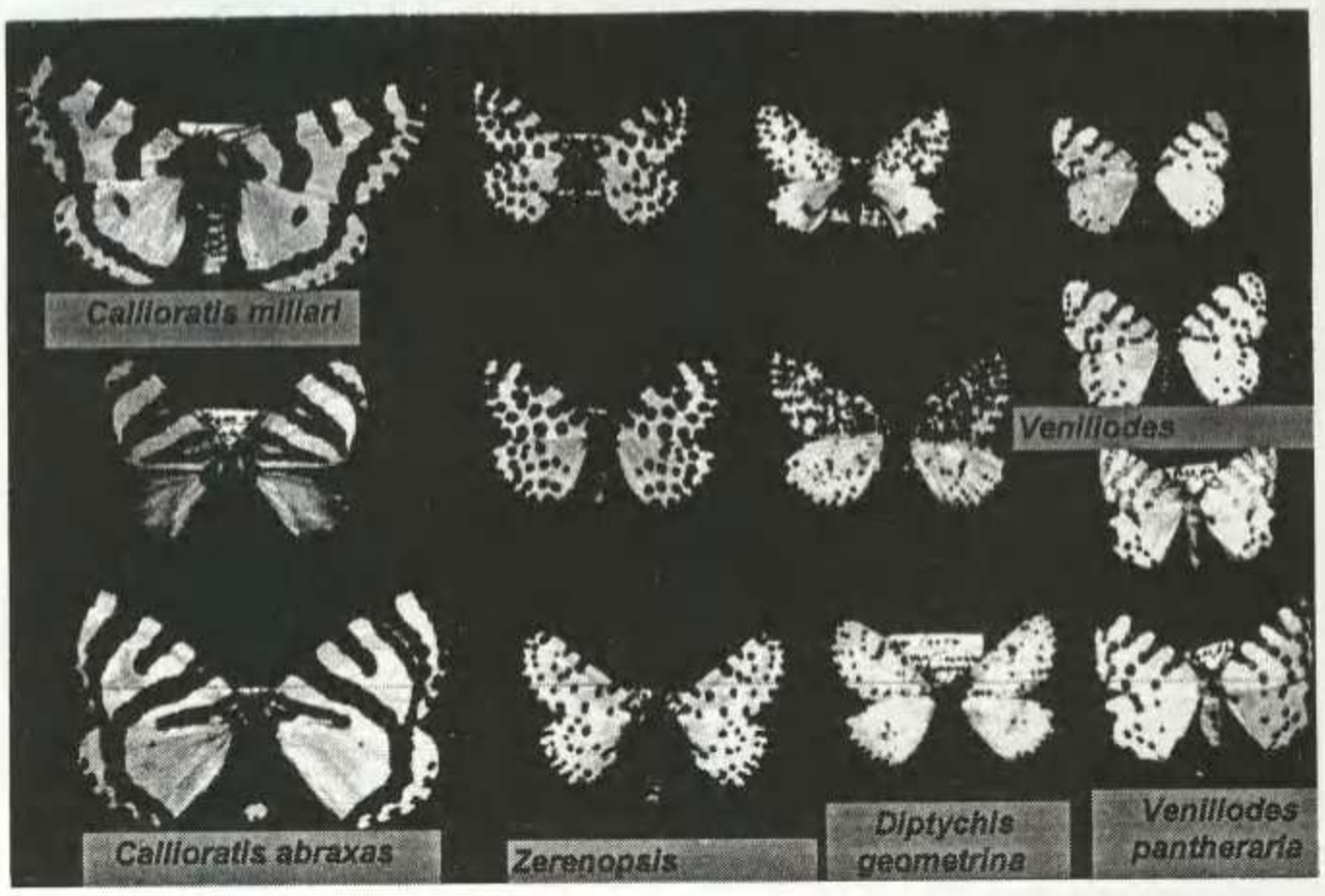


Figure 1 Specimens belonging to the genera *Zerenopsis, Callioratis, Veniliodes* and *Diptychis*.

been recorded from Amanzimtoti to Ubombo in Natal. Only the recently discovered colonies around Ubombo are still known to exist as no record for any other locality seems to have been made for more than fifty years.

- The genus *Diptychus* which includes the Geometric Leopard (*Diptychis geometrina*) which is known to occur from the eastern Cape to southern Natal and again in the Lebombo Mountains near Kosi Bay. The other species, *Diptychus meraca* from Mozambique, is only known from the type specimen.

Figure 2 **Top:** *Callioratis millari* 4th-instar larva. **Centre:** *Zerenopsis leopardina* final-instar larva. **Bottom:** *Veniliodes inflammata* final-instar larva.

LIFE HISTORY

Recent research on the early stages of these animals has shed some light in their unique behaviour, but much work still needs to be done. The diptychines, as indeed all moths, undergo a complete metamorphosis during their lifetime, passing through a clear egg, larval, pupal and adult stage. Dr John. S. Donaldson from the National Botanic Institute has shown through experimentation that the Leopard Magpie Moth is dependent on the toxin macrozamin, a cycad-specific toxin, in the early instars of its larval stage. Observations on the early larval instars of the other genera in the group show similar behaviour to that of the Leopard Magpie Moth, an indication that they are probably dependent on cycads as well. The diurnal females, after mating, lay their eggs on young cycad leaves. They sometimes lay them in neat rows on the underside of the leaf (*Zerenopsis leopardina* on *Stangeria eriopus*); sometimes loosely amongst the hairs of new buds (*Z. leopardina* on *Encephalartos villosus*); sometimes loosely around the leaf base (*Callioratis abraxas* on *Encephalartos altensteinii*). The larvae initially are gregarious and feed on new growth, often inside a loosely spun web. One species, *Veniliodes inflammata*, turns the leaf tissue into a black pulp that perhaps gives them the advantage of being able to feed on older leaves. From the third-instar the larvae of all the genera become less gregarious and are often encountered singly (Figure 2). From about the same time they no longer seem to be dependent on the cycads and mostly move off the cycads to feed on a number of other plants belonging to different families. This behaviour of changing foodplant midway through the larval stage seems to be unique to the group. The reasons for this are not clearly understood. The larvae pupate in the soil or in the leaf litter, spinning a loose cocoon to which soil and debris is attached. Some species seem single-brooded, producing only one generation annually (e.g. *Veniliodes inflammata*) and others are multi-brooded, producing several broods per annum (e.g. *Zerenopsis leopardina*).

MATING BEHAVIOUR

Virtually nothing is known about the mating behaviour of these diurnal cycad associated geometrid moths. Moths, being generally nocturnal in habit, usually attract their mates by making use of pheromones. Butterflies, being generally diurnal in habit, often display intricate visual mating behaviour. Some butterflies also make use of pheromones in addition to visual methods in finding their mates. The Dimorphic Tiger (*Callioratis abraxas*) derives its name from the fact that it is sexually dimorphic: the predominantly white male is strikingly different from the predominantly orange female. This dimorphism is suspected to be an aid in visual mating behaviour. Along the cliffs on the Lebombo Mountains near Jozini, where the Dimorphic Tiger flies, it was observed to behave in a distinctive way in finding a mate. The females are the wanderers and fly along the cliff edge, sometimes going over the top and sometimes stopping to feed on the nectar of flowering shrubs. The males, on the other hand, do not fly around the area. It was once speculated that they are crepuscular because they are never seen flying when the females are all over the place. In fact, the males were now observed on a number of occasions to select a suitable high tree, near a colony of cycads, on which they congregate. They defend this perch vigorously against other insects and even chase stones thrown at them. They seem to be relatively at peace with one another until they see a female pass. One could sometimes see by the increase in activity amongst the males that a female was near before the female was seen. It is then that the males chase each other, sometimes to quite a distance from their perch. When a female ventures close by the perch

(3-4 m), a male would fly straight at her and they would copulate in mid-air. Once in copula, the female flies away with the male hanging from her with his wings closed. Many females were observed to fly by the perch, with the resultant increase of activity by the males, but not coming in close, seemingly disinterested. On such occasions the males did not venture out to chase the females. This activity usually starts around mid-morning and continues until dusk. Very little is known about the mating behaviour of the other species in the group, and much research still needs to be done.

MIMICRY

The toxin macrozamin which these cycad-feeders acquire from their foodplant, probably renders them noxious to most predators. The bright orange, yellow and black markings that the adults display make them quite conspicuous. This enables potential predators to readily develop a recognition pattern and avoid them. It makes perfect sense, therefore, that the larger the amount of noxious individuals that display these warning patterns in an area, the quicker predators in that area would learn to avoid them and more of the moths would survive. If a number of different noxious species would display similar warning colours and patterns, it would be of benefit to all the species that participate. This phenomenon of noxious species developing the same warning coloration and patterns in an area occurs amongst insects all over the world and is called Müllerian mimicry.

The cycad-feeding moths in southern Africa form part of such a mimetic complex, and in some areas they seem to form the basis of the mimetic complex. In the Krantzkloof Nature Reserve nine very similarly marked but different species, belonging to five different families of butterflies and moths, all fly together. So close is the mimicry that it was observed that a male of one species once chased and attempted to copulate with a female belonging to an unrelated species.

Often in such mimetic complexes some of the species that display warning patterns are quite palatable to predators, but benefit in that predators tend to avoid all species displaying these warning patterns. This is called Batesian mimicry. These palatable species are called mimics and the noxious species are called models. Should the number of mimics in an area become close to a number of models, then the effectiveness of the warning colours would diminish rapidly.

It is not known whether any of the species participating in the mimetic complex with the cycad-feeders is palatable to predators. An initial investigation of the species involved shows that there is evidence that all the species are probably noxious to most predators. Such a very effective mimetic complex would give the cycad-feeders the opportunity to develop a feeding strategy that allows them to switch to different foodplants during their larval stage. The diptychines have indeed developed such a feeding strategy. This move has been shown to diminish the amount of toxin that they possess, and would thus render them palatable to predators, but in a mimetic complex such as described above, they would become Batesian mimics and still be protected. This habit of moving off the host cycad to feed on other plants in the area enables them to increase their population size because they are no longer fully dependent on the supply of fresh young cycad leaves. The feeding pressure on the cycads is also reduced.

CONSERVATION

As illustrated in the above section, it is clear that the continued survival of the diptychines depends on a number of factors within the complexity of the ecosystem and to conserve them one has to conserve their habitat. These animals must have co-evolved with their cycad hosts for millions of years. In a relatively undisturbed habitat, large-scale destruction of cycads by these moths does not seem to occur. In places such as the Krantzkloof Nature Reserve and some areas in the Lebombo Mountains, where the Leopard Magpie Moth is plentiful, no excessive destruction of cycads has been observed. There are however, records of almost total destruction of cycad specimens in some areas, where the larvae of *Zerenopsis leopardina* were feeding even into the stem. In the light of information available on the life history and behaviour of diptychines, the question arises of why did these larvae not move off these cycads to feed on the leaves of other plants, that must have been more palatable than old leathery cycad leaves and stem tissue, as they usually do? To answer that question one can only but speculate at this stage. Possibly the vegetation around these cycads was removed, and there was simply no other food available. Possibly the mimetic complex in the area was disturbed and weakened, forcing the Leopard Magpie Moths to stay on the cycads in order to retain their noxiousness. Possibly parasites such as ichneumonid wasps that control moth numbers were reduced by pesticides. Much research is still needed before we will be able to understand what really makes these moths tick.

Most of the diptychines are rare and often known only from single localities, which makes them very vulnerable to at least local extinction. The conservation of these unique cycad-feeding moths is inextricably linked to the conservation of cycads in the wild. Because they cannot survive without cycads, any total eradication of cycad colonies would result in the destruction of these fascinating animals in that area and possibly lead to their extinction.

ACKNOWLEDGEMENTS

I thank Roy Osborne for initiating this article. I thank Rolf Oberprieler for his assistance in the preparation of this manuscript. I also thank John Donaldson, Chris du Plessis, Koos Liebenberg, and Nolan Owen-Johnston for the supply of material and/or information on cycads and moths. I especially thank Shortie and Lettie Grobler, of Krugersdorp, for the generous supply of young cycad leaves, from their magnificent collection, for breeding experiments over the past years. I would like to take this opportunity to appeal to anybody who has made any observations on these moths or larvae, or may come across any strange-looking caterpillars on cycads, to please contact me at my postal address or Tel. 953-1168 or Fax 953-4812 in Krugersdorp, code 011.

REFERENCES

DONALDSON, J.S. 1993. Proceedings of the Ninth Entomological Congress organized by The Entomological Society of Southern Africa : 25.

DUKE, A.J.H. & DUKE, N.J.S. 1988. *Journal of the Entomological Society of Southern Africa* 51: 144-146.

HENNING, S.F. 1985. *Insects of Southern Africa*. Edited by C.H. Scholtz & E. Holm : 378.

JANSE, A.J.T. 1932. The Moths of South Africa, Volume 1: 155.

JANSE, A.J.T. 1933-1935. The Moths of South Africa, Volume 2: 2-6.

PINHEY, E.C.G. 1975. Moths of Southern Africa : 92.

VÀRI, L. & KROON, D.M. 1986. Southern African Lepidoptera. A series of cross-referenced indices : 180.

SHORT COMMUNICATIONS / KORT MEDEDELINGS

VISITORS TO SOUTH AFRICA

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

Received 1 September 1994

Figure 1 Roy Works inspecting a particularly fine specimen of *Encephalartos ghellinckii* in the Natal Drakensberg.

Roy Works (Figure 1), an enthusiastic member from Tampa, Florida, U.S.A., spent July and August 1994 visiting cycads and cycad enthusiasts in South Africa, Swaziland and Zimbabwe. He presented a slide show to the staff of the Durban Parks Department and assisted in the identification of several central African *Encephalartos* specimens which are better known in Florida than in South Africa! He was hosted in South Africa by the Giddy family.

In August 1994, Aldo Moretti, Catherine Crosiers, Luciano Gaudio and Rosaria Patrone (Figure 2), variously associated with the University of Naples and the Naples Botanical Garden, visited the Cape, Natal and Transvaal, seeing cycads in the wild, in gardens and meeting cycad researchers in South Africa. Aldo Moretti presented a slide show on "Cycads of Mexico" to the Natal Regional Branch of the Society and spoke subsequently on "Cytotaxonomy of Cycads" to the Natal Evolutionary Biological Society. Luciano Gaudio presented a lecture on ribosomal inactivating proteins at the University of Natal. Part of the visit was to allow for the inspection of various *Encephalartos* populations in the wild and the collection of leaf samples for DNA analysis. The visit of the Italian team was co-ordinated

Figure 2 Clockwise: Aldo Moretti, Catherine Crosiers, Luciano Gaudio and Rosaria Patrone in Natal's Oribi Gorge.

by Roy Osborne who wishes to thank all those who assisted in making the venture a success.

FURTHER REPORTS OF CYCAD SEX CHANGES

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

Received 1 August 1994

In previous issues of this magazine, the author (Osborne 1990, 1991) has reported a total of 14 cases of sex changes in cycads. New cases of sex change in five plants, now bringing the total to 19, have come to light and are detailed below. The first case, reported by Agostino Formisano of the Orto Botanico at Naples, refers to a well established large female plant of *Cycas revoluta* growing in a private garden in Genoa, Italy, from which seeds had been collected and subsequently germinated in 1986. This plant suddenly produced a male cone in 1987. The illustration (Figure 1) shows the well-developed male cone on the stem bearing the residues of the female sporophylls from the previous season. There is no explanation as to why this change occurred.

The second case, reported by Johan Hurter, refers to four plants of *Zamia vasquezii* at the Lowveld

Figure 1 The specimen of *Cycas revoluta* at Genoa which produced a male cone after several years' of female sporophylls and seeds. Photo: Luigi Marrone.

National Botanical Garden, Nelspruit. The garden had a total of 19 plants of this species in a garden planting where they appeared to be doing rather poorly. Up to 1993, all 19 plants had coned as males. In 1994, 16 of the plants were potted into nursery container bags and moved to a more shady (40%→60%) position in the nursery complex. Of these plants, four produced female cones (Figure 2), ten were males while two did not cone. The three plants left in the garden planting remained male. This case appears to be entirely consistent with the resource limitation theory : ample resources (water, nutrition and shade) favour femaleness, while a deficit of resources promotes maleness.

REFERENCES

OSBORNE, R. 1990. Two reports on cycad sex changes. *Encephalartos* 23: 18-20.

OSBORNE, R. 1991. Evidence of a sex change in *Encephalartos middelburgensis*. *Encephalartos* 27: 33.

Figure 2 One of the four specimens of *Zamia vasquezii* at the Lowveld National Botanical Garden which had previously produced male cones but gave female cones after being potted up and moved to the nursery. Photo: Roy Osborne.

TWIN SEEDS AND SEEDLINGS

Avis Meresman
P.O. Box 4726, 4000 Durban

Received 15 September 1994

The two photos might interest readers of "*Encephalartos*". One of them (Figure 1) shows twin seeds. The uppermost twin seed is *Encephalartos ferox*. In the lower row the twin seeds are from left to right *E. gratus*, *E. gratus* and *Cycas thouarsii*. On the other photo (Figure 2) is a twin seedling of *Encephalartos aemulans*. We are continuously keeping these oddities. Oh and I might add that the scales of the *E. gratus* where these twins came out of were triplets - meaning one single seed and twins and the scales had adjusted accordingly. We are also going to plant all of these twins and see if we have more news for you in the future - maybe someone else would like to comment.

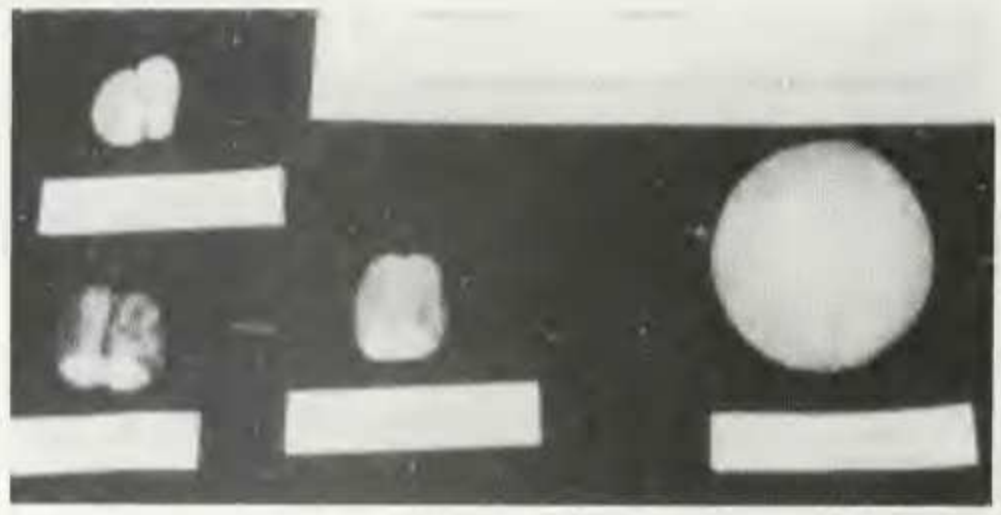


Figure 1 Twin seeds of *Encephalartos ferox*, *E. gratus* (two), and *Cycas thouarsii*.

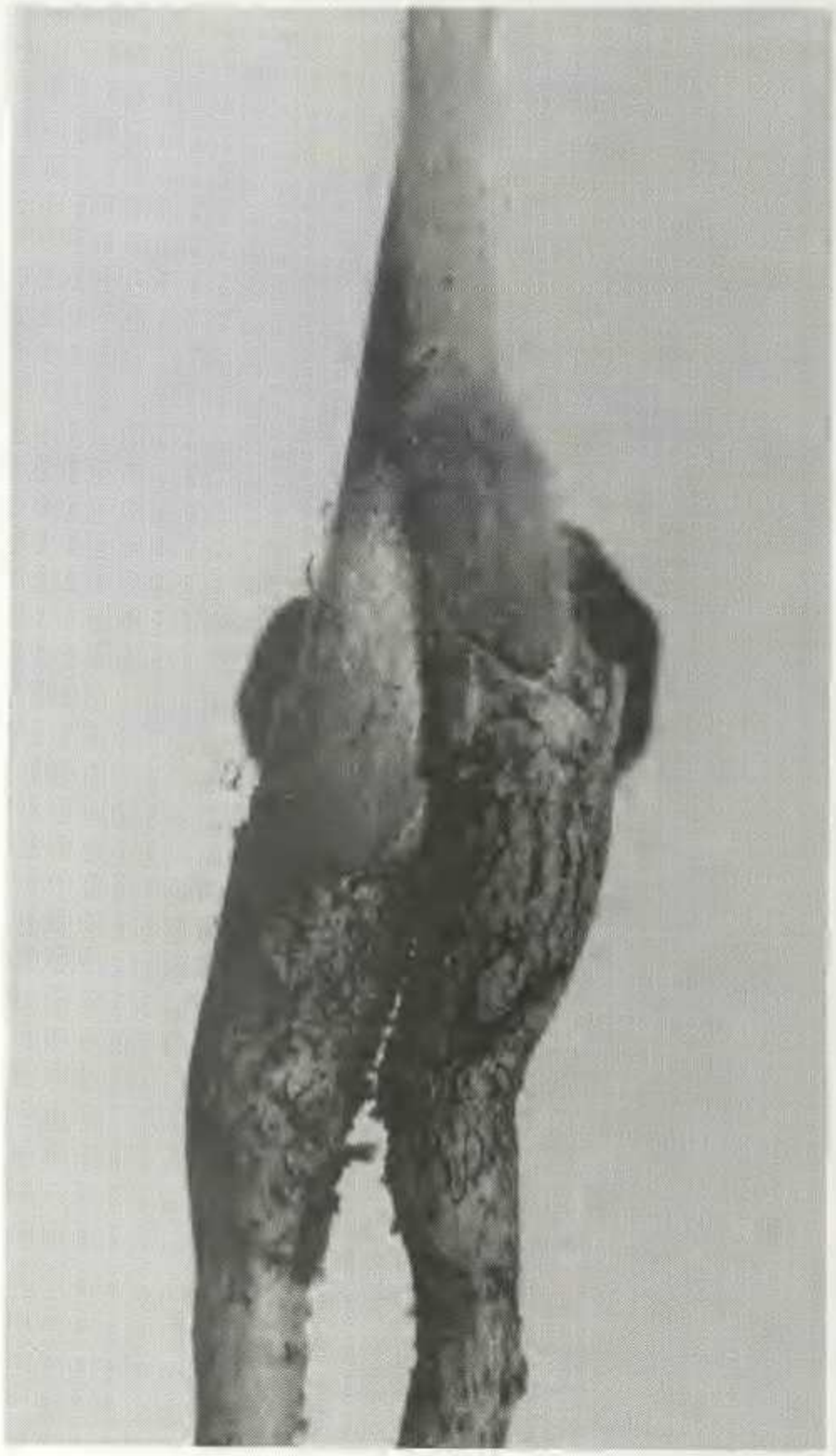


Figure 2 Twin seedlings of *Encephalartos aemulans*.

HOPES FADE FOR A WILD *ENCEPHALARTOS WOODII*

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

Received 28 September 1994

The enigmatic *Encephalartos, E. woodii*, was dealt with in a "Focus on ...." article in this journal some time ago (*Encephalartos* 5: 4-10); the account of the discovery of the solitary male specimen in the Ngoye Forest, and its subsequent removal, is well known. Mention was made that Ian Garland, Natal's distinguished conservationist and naturalist, has spent a great deal of time further exploring the forest but has never come across any indication of a second "woodii". It is also on record that eminent botanists Brian Huntley, now Director of the National Botanical Institute, and Mike Wells, have mounted separate but fruitless expeditions to the Ngoye area in the 1960's and 1970's in search of the elusive plant.

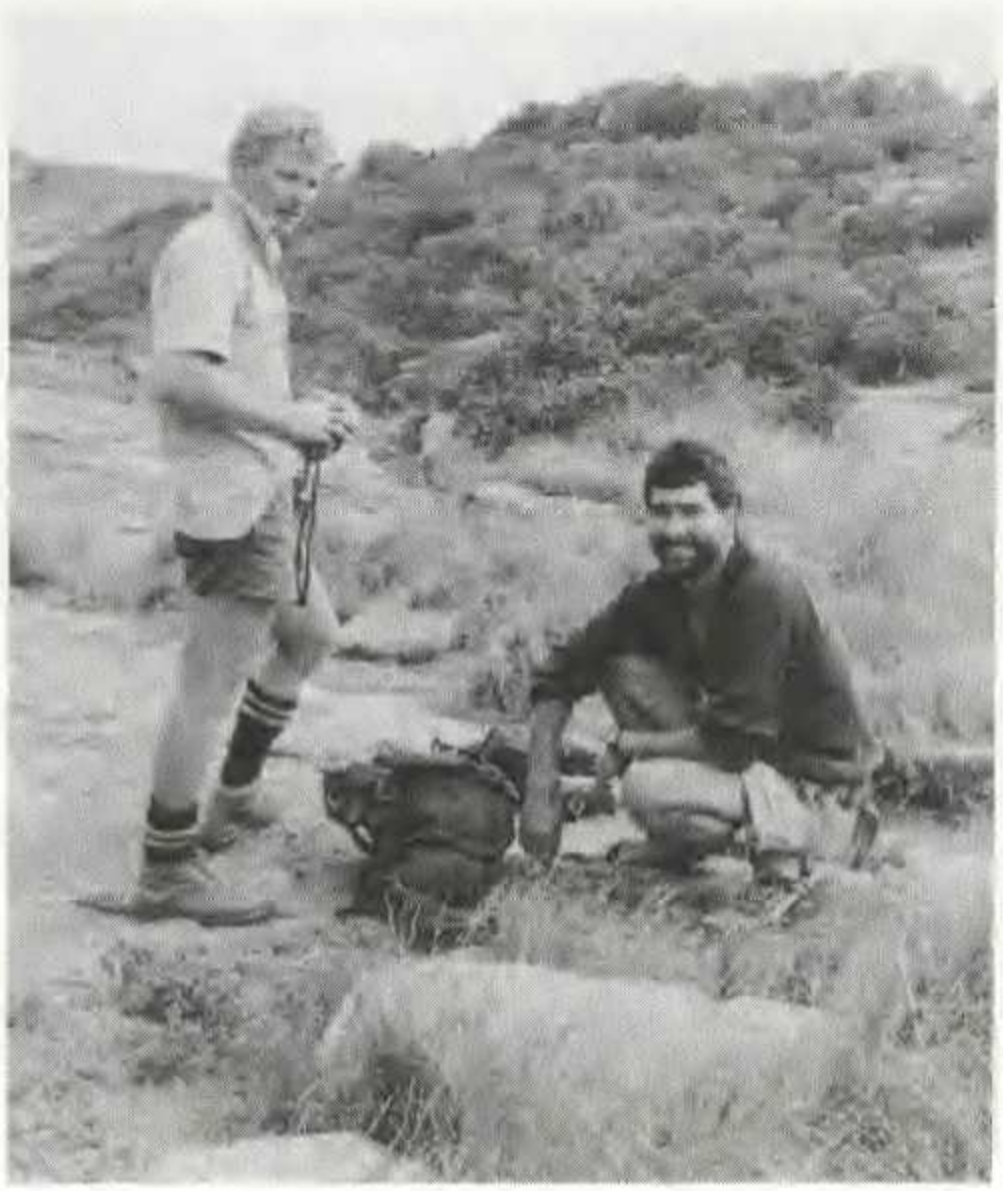


Figure 1 Botanists Rob Welsh (left) and Ernst van Jaarsveld (right) near the site of discovery of the solitary specimen of *Encephalartos woodii* in the Ngoye Forest, September 1994.

Current news is that a recent expedition, lead by botanist Ernst van Jaarsveld and sponsored by the Botanical Society of South Africa, has been similarly unsuccessful in finding *Encephalartos woodii* in the wild. Van Jaarsveld, accompanied by Kirstenbosch colleague Rob Welsh, spent seven days in September this year combing the less-accessible parts of the Ngoye Forest after identifying target sites where the topography was considered appropriate for the species (Figure 1). It is the sad conclusions that *E. woodii* is indeed extinct in the wild.

Figure 2 The *E. woodii* leaf cutting experiment underway at Durban Botanic Gardens, September 1994.

Despite the disappointment of not having located the cycad in natural habitat, there is cautious optimism for its survival in cultivation. Fortunately, the existing specimens produce basal suckers - although not in great quantity - which are easily rooted (*Encephalartos* 27: 34). Secondly, pollen from *E. woodii* is being used by Cynthia Giddy in a programme to back-cross to *E. natalensis* and carefully-selected female stock from each

successive generation, introducing more "woodii" character on each occasion. The first generation (F_1) of these plants is approaching reproductive maturity at present. The third initiative, to mass-propagate the species via tissue culture techniques (*Encephalartos* 2: 20-22) continues in the experimental stage at the University of Natal under the direction of Hannes van Staden, Anna Jäger and Roy Osborne.

A new experiment in the cultivation of *E. woodii* was commenced in the Durban Botanic Gardens in September 1994. This follows the protocol established by Nat Grobbelaar for the propagation of *Encephalartos* from leaf cuttings (*Encephalartos* 36: 41). One sucker from the parent plant was carefully dissected into 20 leaves which were treated with rooting hormone, potted in a sharp sand mixture and are being held in a controlled environment house under intermittent mist-spray irrigation (Figure 2). This experiment is under control of Roy Osborne and Chris Dalzell.

It is hoped that the combination of these various initiatives will ensure the survival, at least in cultivation, of Medley Wood's famous plant.

[See also "No forest Juliet found for the celibate cycads" on page 27 of this issue.]

BOOK REVIEW / BOEKBESPREKING

TREE ATLAS OF SOUTHERN AFRICA

F. & J. VON BREITENBACH

PRETORIA: Dendrological Foundation, 1992. xiv + 223 pages including 39 tables, 35 maps, 171 monochrome and 60 colour photographs, and 38 line drawings. Price: R274-50 to non-subscribers, available post free from the Dendrological Foundation, P.O. Box 104, 0001 Pretoria.

*Those r*eaders knowing the Von Breitenbach husband-and-wife team's scarce 5 volume *Trees of southern Africa*, have long yearned for either a reprint or an updated version. The *Tree Atlas of southern Africa* was indeed conceived as a successor to the earlier work, but through the years the accumulation of data has escalated so that the work is now envisaged as a 24 part work. After a lengthy gestation period the first part has just appeared, though it bears the publication date 1992.

This first part is of direct interest to our Society, because 103 of the 223 pages deal with the arborescent *Encephalartos* species of South Africa (the rest of the volume deals with tree ferns and the remaining arborescent gymnosperms). The dwarf cycad species and those with underground stems are not treated, which is fair considering that the book deals with trees; though the last species to be treated in this volume is *Welwitschia mirabilis*, which I would not consider to be more tree-like than *Encephalartos caffer*.

Each species is discussed in respect of scientific name (including synonyms some of which have not been used in the reviewers lifetime), vernacular names, a quite detailed description, a summary of the geographical distribution, ecology (meaning habitat preference), predation, conservation (mainly a list of all the laws under which the particular species is protected), cultivation (which is unlikely to tell members of our society much that is new); and oddly at the very end, the derivation of the scientific name. For each species there is a bibliography.

The text is accompanied by a wealth of monochrome photographs of cones and plants in habitat; as well as a line drawing showing the species' distinctive shape which is arguably unnecessary as this is usually also shown clearly by several photographs. The habitat photographs are especially welcome, telling much about the conditions under which the plants occur in nature, although there is perhaps unnecessary duplication. The photographs of the cones are not always appropriate; for instance, the single cone of *E. transvenosus* on p. 100 is immature and not typical at all. Some of the photos are also incorrectly captioned, such as those supposed to be of the female cones of *E. natalensis* (p. 88) and *E. paucidentatus* (p. 92), which in fact illustrate male cones.

In the generic treatment, 6 pages containing 31 colour photographs of plants in habitat are hidden away. Colour adds an extra dimension, but I cannot help wondering whether these don't perhaps unnecessarily add to the cost of the volume. In most cases these colour photographs don't show more than the monochrome photographs; and in some instances they are misleading, as in the case of *E. lanatus* (p. 33), *E. heenanii* (p. 36), and *E. dolomiticus* (p. 37, lower left) where they suggest totally untypical colour of the foliage.

There are no references to the colour photographs in the individual species treatments.

An oddity is the language: there are two parallel columns, English on the left and Afrikaans on the right. While I welcome the respect shown to Afrikaans, this practice doubles the amount of text and must accordingly increase both the bulk and cost of the book. One wonders whether the text of future volumes will be in all 11 official languages.

The work takes its title from the geographical distribution maps accompanying each species treatment. Each species is mapped according to the quarter degree system commonly used for botanical mapping in South Africa. The plum is the citation of a voucher specimen with precise locality for each quarter degree dot on the map. However, before we rush off to expand our collections according to this windfall, a word of caution: in the case of *E. aemulans*, for example, the locality was on purpose cited very vaguely with the original description, because the whole reproductive population is confined to a single hill. Now for the first time the full truth is revealed; but alas, the locality given in such detail is fictitious and wide off the mark.

The book is printed on high quality matt paper, in A4 format, and bound handsomely and sturdily in brown artificial leather with gold blocking on the spine and front cover. There is a glossy white dust jacket with green lettering.

The set is sold at cost price to subscribers, but at more than double this price to non-subscribers. Retrospective subscriptions are not accepted.

The tree atlas project is an enormous undertaking, which will add immeasurably to the knowledge of our flora. The authors are congratulated on the appearance of the first section. Although our first interest is cycads, we have a wide interest, and we look forward to the appearance of further instalments.

Piet Vorster
Botany Department, University of Stellenbosch.

LETTERS TO THE EDITOR / BRIEWE AAN DIE REDAKTEUR

Dear Editor

***CYCAS SILVESTRIS*?**

In 1982 I received from the Cycad Society (U.S.A.) seedbank three seeds labelled "*C. cairnsiana*", which measured ca. 30x24x22 mm. Two of the seeds germinated and I still keep one of the seedlings, which the photograph (Figure 1) shows. This plant has two new fronds (1 m long), now five weeks old. Usually the fronds last two years. The median leaflets now are ca. 190 mm long and 10-11 mm broad, flat and light green, never glaucous, not shiny, midrib underneath prominent, not yellowish. The width is at any rate too much for *C. cairnsiana* according to the descriptions of this species in literature. All told, my "cairnsiana" is a promising cycad.

Since I assume that I was not the only one who received some of these seeds, I would like to learn what other enthusiasts experienced with seeds of the same batch. Could it have been the then undescribed *C. silvestris*?

***Dr. med. Helmut Schlegel,** D-22359 Hamburg-Volksdorf, Wulfsdorfer Weg 112 C, Germany.*

Received 8 August 1994

Figure 1 The questionable *Cycas "cairnsiana"*.

Dear Editor

PSEUDO-DEVELOPMENT IN CYCAD SEEDS

I agree with Prof. Grobbelaar (*Encephalartos* 38: 40) that a suitable term needs to be found for the development of the gametophyte and testa in unfertilized ovules of

some cycad taxa (notably *Encephalartos, Lepidozamia* and *Macrozamia*). Problems with the term parthenocarpy, have already been addressed by Prof. Grobbelaar. However, I am not convinced that "embryoless seed development" is an appropriate alternative. Here are some comments on existing and alternative terms.

Parthenocarpy is unsuitable since it refers specifically to development of fruit without fertilization of the egg cell. The fruit is therefore seedless (e.g. bananas). This condition appears to be somewhat different to what happens in cycads.

Embryoless "seed" development is a contradiction in terms since a seed is by definition usually the product of a fertilized ovule and has an embryo.

Parthenogenetic development would not be appropriate since parthenogenesis implies that the egg cell develops and gives rise to an embryo in the absence of fertilization. However, we are looking for a term to describe a condition where the embryo does not develop.

Pseudo seed development implies that the condition is false but that it closely resembles seed development. This overcomes the problem inherent in the term "embryoless seed development".

Pseudo seed maturation implies that the unfertilized ovule appears to become a fully developed seed.

Of the various terms, I believe that Pseudo seed development most aptly describes the condition found in cycads. The only problem is that, unlike parthenocarpy, it is not a good descriptive term, i.e. it says nothing about why true seed development does not take place.

***John Donaldson**, National Botanical Institute, Private Bag X7, 7735 Claremont.*

Received 5 October 1994

NEW SCIENTIFIC REPORTS

Hirayama, B., Hazama, A., Loo, D.F., Wright, E.M., & Kisby, G.E. 1994. Transport of cycasin by the intestinal Na^+/glucose cotransporter. *Biochim. Biophys. Acta* 1193: 151-154.
[Using tissue material from rabbits and frogs, the authors studied the ability of the cycad toxin, cycasin, (i) to inhibit Na^+/glucose uptake and (ii) to generate current by the Na^+/glucose cotransporter. They conclude that cycasin is a low affinity substrate for the transporter and suggest that this is part of the process by which the toxin enters the brain.]
Authors' address: Department of Physiology, UCLA School of Medicine, Los Angeles, California, U.S.A.

Malaisse, F.*, Sclavo, J.P. & Crosiers, C. 1993. Recherches sur les *Encephalartos* Lehm. (Zamiaceae) d'Afrique Centrale. 2. Apport de la morphologie foliare dans la différenciation spécifique. *Bull. Jard. Bot. Nat. Belg./Bull. Nat Plantentuin Belg.* 62: 205-219.
[The authors summarize Melville's work on cone scale morphology for *Encephalartos* and proceed to construct a list of 22 charcteristic points for comparative studies of vegetative material. This is followed by a description of *Encephalartos delucanus* (previously published in Part 1 of the same paper) and, more importantly, by the taxonomic treatment of *E. schaijesii* Malaisse, Sclavo & Crosiers. Named for Michel Schaijes of the Kolwezi herbarium in Zaire, the new species occurs in wooded savannah in the Kolwezi district, Shaba Province, Zaire. It is related to *E. schmitzii* which occurs slightly to the north-east.]
**Author's address: Professor F. Malaisse, U.R. Ecologie, Faculté des Science agronomiques, Passage des Déportés 2, B-5030, Gembloux, Belgium.*

Shen, C.F., Hill, K.D., Tsou, C.H. & Chen, C.J. 1994. *Cycas taitungensis* C.F. Shen, K.D. Hill, C.H. Tsou & C.J. Chen, sp. nov. (Cycadaceae), a new name for the widely known cycad species endemic in Taiwan. *Bot. Bull. Acad. Sin.* 35: 133-140.
[*Cycas taitungensis* is the new name for the *Cycas* endemic in Taiwan; *C. taiwaniana* correctly refers to the species from Guangdong in mainland China - see the review by Nat Grobbelaar in *Encephalartos* 39: 20.]

Vovides, A.P.*, Vázques Torres, M., Schutzman, B. & Iglesias, C.G. 1993. A new species of *Ceratozamia* (Zamiaceae) from Querétaro and Hidalgo, Mexico. *Novon* 3: 502-506.
[A new species, *Ceratozamia sabatoi* Vovides, Vázques Torres, Schutzman & Iglesias, is described and illustrated. This small-trunked plant, named in honour of the late Sergio Sabato, occurs in pine-oak forest in Querétaro with a second population in mixed oak forest on the Hidalgo side of the border. The new species is related to *C. kuesteriana* Regel from Tamaulipas but

differs in habit, leaf, female cone characteristics and the light green colour from emergent leaves. The chromosome number is 2n = 16 and the karyotype is similar to other *Ceratozamia* species. The new species is considered endangered and representative material is being established at the Jardín Botánico Clavijero at Xalapa in Veracruz.]

**Author's address: Andrew P. Vovides, Instituto de Ecología, A.C., Apartado Postal 63, 91000 Xalapa, Veracruz, Mexico.*

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

NEWSPAPER CLIPPINGS / KOERANTUITKNIPSELS

Saturday Aug. 6, 1994
The Daily Commercial
LEESBURG, FLORIDA U.S.A.

BOB MORRIS

On King Sago

Treasure still lurks deep in Fla.

It was five years ago when the Palm Hunter first spotted the tree. Poison sumac and tickweed had grown up all around it. Bigger trees had crowded in, robbing it of sun. Most people wouldn't have paid it even passing notice.

It was a happy case of botanical attraction parlayed into a profession. High-end developers, theme parks and upscale shopping centers lust for that stereotypical image of palm-shrouded Florida. And for the past 15 years Jacobus, 41, has made his living roaming the peninsula in pursuit of trophy palms.

But the moment the Palm Hunter saw the tree he knew two things: It was an object of beauty that deserved a showcase. And it would probably bring him $10,000, easy.

"It is just like an antique car or a Tiffany lamp," he says. "There is always a collector looking for one."

It was a cycad, the kind known as a King Sago palm. Your standard, front-yard variety King Sago might have two or three crowns and stretch as high as the family mini-van. This one fanned out like some cartoon tree from a Dr. Seuss book. It had 15 crowns and stood upwards of 11-feet tall.

Considering that King Sagos are among the plant kingdom's slowest growers — maybe an inch per year — it was likely planted just after the Civil War, when steamboats plied south on the St. Johns River from Jacksonville, carrying that earliest wave of settlers seeking paradise in Florida.

"A lot of them were botanists, or at least amateur horticulturists. For them, Florida was this giant Garden of Eden," says the Palm Hunter. "They planted palm trees all over the place."

And there's not a day goes by that the Palm Hunter — a.k.a. Sean Jacobus — doesn't thank them for it.

Jacobus — a bearded, bear of a man — was born in Lakeland and first smitten by palm trees as a teen-ager, when he spent his summers working at a plant nursery.

"I was just fascinated by their diversity, how there are hundreds and hundreds of different kinds," he says. "When I first saw some that were really old, 100 years or so, I felt drawn toward them in a way I can't even begin to explain."

He has his best luck in small towns, settled before the turn of the century. When he finds a likely specimen in someone's yard he offers them anywhere from $500 to $2,500 depending on the species, size and condition. He has paid as much as $8,000, for a hybrid date palm in Melbourne.

Occasionally, there is controversy. In one north Florida town, the local weekly newspaper editorialized against the "palm plunderer" from out-of-town who was robbing the city of its horticultural heritage. The result — even more townspeople contacted him with palms to sell, including the pastor of a church.

"He offered to sell me five palms," said Jacobus. "And they were growing in the church cemetery."

Jacobus can rationalize his deeds. Often, he says, the palms are ill-kept and headed for premature death. He puts them where they are appreciated. And he has nixed deals that didn't consider what was best for the palms. Earlier this year he was hired to plant six large date palms at the Miami home of Sylvester Stallone. But after surveying the grounds, Jacobus decided the coral rock wouldn't be conducive to date palm well-being. He turned down the job.

When he strikes a bargain, Jacobus doesn't just dig up a palm and haul it away to the highest bidder. It typically takes anywhere from nine months to a year of gently nursing the tree along, digging slowly around its roots and preparing for the transplant.

Please see MORRIS, B2

Bob Morris is a resident of Central Florida and a Leesburg native. His column appears each Saturday on this page.

MORRIS

Continued from B1

In Crescent City, it took him five years to finally secure the prized King Sago. He had to track down the absentee owner of the vacant lot where the tree grew.

Then there was substantial bickering over a price. Afterwards, Jacobus spent nearly two years digging progressively deeper trenches around the tree, getting it ready to move to a ritzy golf course community near Orlando.

It took five years to secure the prized King Sago

"You spend that much time on a tree and you become attached," he says. "It's a member of the family. You can't let it die."

And let it be known that the Palm Hunter sows what he reaps. Over the years he has accumulated a vast assortment of palm seeds. Wherever he travels he plants a few.

"Part of me feels like I owe it," he says. "The other part of me can't wait to get old and see those palm trees grown big. That way when I die there's still a little part of me scattered everywhere."

Call it the legacy of the Palm Hunter.

Staff photo by Bob Morris

Sean Jacobus, a.k.a. The Palm Hunter, seeks out Florida's fabled King Sago palms. (*Cycas revoluta*).

No forest Juliet found for the celibate cycads

SUNDAY TIMES,

September 18 1994

By DIANA STREAK

A GENERATION of lonely male cycads is doomed to remain celibate after a fruitless search for a female of the species in a Natal forest.

In an attempt to play Cupid, Kirstenbosch botanist Ernst van Jaarsveld searched 10 000ha in the Ngoye forest.

He could not find the elusive female. His failure means that over 100 *encephalartos woodii* will have to forgo sexual reproduction until a partner is found.

The father of them all was rescued from the wild by Mr Medley Wood in 1895. Muti doctors had mutilated the rest and the species now seems to be extinct in nature.

The extant ones are all male, because they were propagated by botanists from Mr Wood's original plant.

The genetically identical bachelors have no option but to continue their 100-year wait for a mate.

"Obviously we are disappointed we didn't find the plant" said Mr van Jaarsveld.

"But we haven't given up. We hope we have stimulated other people to search for *woodii*," Mr van Jaarsveld said.

Meanwhile several other initiatives are under way to revive the population.

The University of Natal is researching tissue culture of leaf material, using modern molecular technology, which, if successful, could result in the first sex change of a plant.

The *woodii* is also being "back bred" with a closely related Natal cycad.

"Pollen from this 'male in captivity' is being used to breed it back and every generation is closer to the original," said Professor Roy Osborne of the University of Natal

Ultimately a generation of pure *woodiis* could be bred back, some of which will be female.

A remnant from prehistoric times, cycads are revered by collectors who see them as a status symbol and a financial investment. The plants are often stolen out of their natural environment.

"We want to make these plants so common that they are no longer threatened," said Mr van Jaarsveld.

Die Perdeby *TUKS SE EIE KOERANT*

23 SEPTEMBER 1994

Boomdiewe slaan toe

R1000 beloning uitgeloof

Carolize Jansen

Tukkies se broodboomversameling word tans ernstig deur ingeligte diewe in gevaar gestel.
Oor die afgelope maand is al agt broodbome ter waarde van R5 200 uit die tuin rondom die Plantkundehoofgebou gesteel. Dit wil voorkom of die dief weet wat hy of sy doen, aangesien net die skaarsste broodbome gesteel word. Die Plantkundedepartement poog om 'n volledige versameling van alle Encephalartos-spesies in Afrika op te bou, maar hulle word deur dié diefstalle gedwarsboom. Die situasie word vererger deur die verlies van die versigtig gekweekte sade wat in die gesteelde plante oorgeplant is en weens die diefstalle het hulle ook noodsaaklike genetiese elemente verloor wat die versameling sou voltooi.

Die departement bied 'n beloning van R1 000 aan vir enige inligting wat tot vervolging kan lei. Persone met inligting kan die volgende persone by K3-34 of K3-18 in die NW2-gebou kontak: prof Albie van de Venter (tel.: 4202522) of mnr Fanie de Meillon (4202798).

BEELD, WOENSDAG, 5 OKTOBER 1994

Tukkie het glo nege broodbome gesteel en R400 'verdien'

Santa Holtzhausen

DIE Tuks-student wat na bewering nege broodbome ter waarde van sowat R7 700 van die Universiteit van Pretoria (UP) se departement plantkunde gesteel het, het die bome teen slegs R400 verkoop.

Al die bome wat in Augustus en September van die kampus verdwyn het, is deur ondersoekbeamptes van die UP se kampusbeheer teruggevind.

Beeld het ook betroubaar verneem dat 'n teologie-student verantwoordelik gehou word vir die verdwyning van die bome ('n bedreigde spesie).

Die student, wat eersdaags voor 'n tugraad van die UP sal verskyn, het volgens 'n berig in Die Perdeby, die UP se studentekoerant, dié bome verkoop aan mense aan die Oos-Rand.

Nadat hy darroor gekonfronteer is, het hy saam met beamptes van kampusbeheer na die huise van die kopers gery om die huise aan die beamptes uit te wys.

Die kopers was glo nie daarvan bewus dat die broodbome gesteel is nie. Hulle was onder die indruk dat permitte binnekort aan hulle uitgereik sou word.

Prof. J.J. Stadler, vise-rektor, het gister gesê die datum van die tugverhoor is nog nie vasgestel nie.

Volgens hom is enige verdere klagte wat moontlik by die Polisie teen die student ingedien kan word, nie in die hande van die universiteit nie.

Die departement plantkunde wil graag 'n volledige versameling van alle *Encephalartos*-spesies in Afrika opbou.

Die departement het reeds 44 spesies uit 'n moontlike 56 versamel.