ENCEPHALARTOS

JOURNAL OF THE CYCAD SOCIETY OF SOUTH AFRICA

TYDSKRIF VAN DIE BROODBOOM VERENIGING VAN SUID-AFRIKA

NO. 52 DECEMBER / DESEMBER 1997 ISSN 1012-9987

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COVER / VOORBLAD : ***Encephalartos lanatus***

Male cones, about ⅔ life size.

Photo: Piet Vorster

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With best wishes for a joyful Christmas and peace throughout the New Year

'n Wens van vreugde en vrede aan u met Kersfees en deur die Nuwe Jaar

FROM THE PRESIDENT

I hope that you all have noticed the personal, brightly coloured letter that was enclosed in the last issue of "*Encephalartos*". Please make sure that you respond to it before the end of December to make sure that you don't miss the first issue of 1998.

As retiring president of the Society, I would lake to express my deepest appreciation to all members and especially to Council members for your cooperation and contributions to the Society for the past four years. Except for a few administrative reorganisations, there were no drastic changes during my term of office. Due to the very competent office-bearers doing most of the work, it was an easy task and a pleasure to serve as President.

We are very fortunate that most of the Councillors were willing to serve for another term and even more fortunate to acquire the services of Prof. Frederick de Jager as new President. Prof. de Jager is Dean of Student Affairs of the Rand Afrikaans University. Although not a Botanist or cycad specialist, Prof. de Jager is a very good administrator and interested in cycads. He has his own private collection. With all the cycad specialists serving as Councillors, he will have no problems. Elsewhere in this issue (p. 23, 24) we supply more details of the incoming President.

In "*Encephalartos*" No. 50 we asked you to vote for an amendment to the Constitution. All the members who did respond, voted unanimously for the amendment. Details of the amendment can be found elsewhere in this issue (p. 30). The consequence of this is that back copies of "*Encephalartos*" will, as from January 1998, be issued by Guillaume Theron, the present Secretary-treasurer.

This being the last issue of "*Encephalartos*" for 1997, I would like to use this opportunity to wish all members a peaceful Christmas and all the best for 1998.

Hannes Robbertse

VAN DIE PRESIDENT

Ek hoop dat u almal die persoonlike, helder gekleurde brief ontvang het wat in die laaste uitgawe van "*Encephalartos*" ingesluit was. Maak asseblief seker dat u voor die einde van Desember op die brief sal reageer om seker te maak dat u nie die eerste uitgawe van 1998 se "*Encephalartos*" sal misloop nie.

As uittredende President van die Vereniging wil ek graag my innige dank en waardering betuig teenoor al die lede van die Vereniging en die Raadslede vir u samewerking en bydraes van die afgelope vier jaar tot die vooruitgang van die Vereniging. Afgesien van 'n paar organisatoriese veranderings, was daar geen drastiese veranderings aan die Vereniging tydens my ampstermyn nie. Die feit dat die bekwame ampsdraers van die Vereniging die meeste van die werk verrig het, was dit vir my 'n maklike en aangename taak om as President op te tree.

Ons was baie gelukkig dat die meeste van die dienende Raadslede gewillig was om vir 'n verdere termyn te dien en selfs meer gelukkig om die dienste van prof. Frederick de Jager as nuwe President te bekom. Prof. de Jager is Studentedekaan van die Randse Afrikaanse Universiteit. Alhoewel hy nie 'n plantkundige of 'n broodboomspesialis is nie, is prof. de Jager 'n uitstekende administrateur en stel hy wel aktief belang in broodbome. Hy het ook self 'n privaatversameling. Met al die broodboomspesialiste wat as Raadslede dien, sal hy geen probleme ondervind nie. Elders in hierdie uitgawe (bl. 23, 24) word meer besonderhede oor die nuwe President verstrek.

In "*Encephalartos*" Nr 50 is u versoek om te stem oor 'n voorgestelde wysiging van die Grondwet. Besonderhede oor die wysiging sal u elders in hierdie uitgawe vind (bl 30). Die gevolg van die wysiging is egter dat die vorige uitgawes van "*Encephalartos*" met ingang Januarie 1998 deur Guillaume Theron, die huidige Sekretaris-tesourier, hanteer sal word.

Siende dat hierdie die laaste uitgawe van "*Encephalartos*" vir 1997 is, wil ek van die geleentheid gebruik maak om aan al die lede 'n geseënde Kersfees en alles van die beste vir 1998 toe te wens.

Hannes Robbertse

FOCUS ON ... FOKUS OP ...

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

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

ENCEPHALARTOS HIRSUTUS Hurter

Johan Hurter[1], Hugh Glen[2] and Isabella Claassen[3]

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INTRODUCTION

Encephalartos hirsutus was recently described as a new species (Hurter & Glen 1996) and at present is known only from three widely separated localities in the Northern Province of South Africa. The specific epithet *hirsutus* means "covered with hairs". Plants of this species were formerly referred to as *Encephalartos* "decurrens".

DESCRIPTION

1. STEM

The trunks are decumbent (
the base, up to 3.5 or rarely 4.2 m long and 350–400 mm in diameter, leaf bases persistent (Figure 1), with a golden, densely tomentose (hairy) crown, turning greyish with age.

2. LEAVES

The numerous leaves (Figures 1, 2), arranged in a dense crown, are glaucous, subsessile, rigid with recurved apices, and 1.1–1.2(–1.4) m long. The petiole is bulbous at the base (Figures 3, 4d), tomentose (hairy) and up to 130 mm long. The rachis (Figures 3, 4b,d,f) is tomentose, becoming subglabrous with age. The leaflets are inflexed, with entire margins and the veins raised on the abaxial surface, directed towards the apex of the leaf at an angle of about 40° to each other, overlap with upper margins over the lower margin of the adjoining leaflets (Figures 3, 4b,d–f); the basal leaflets are gradually reduced in size but not to a series of spines;

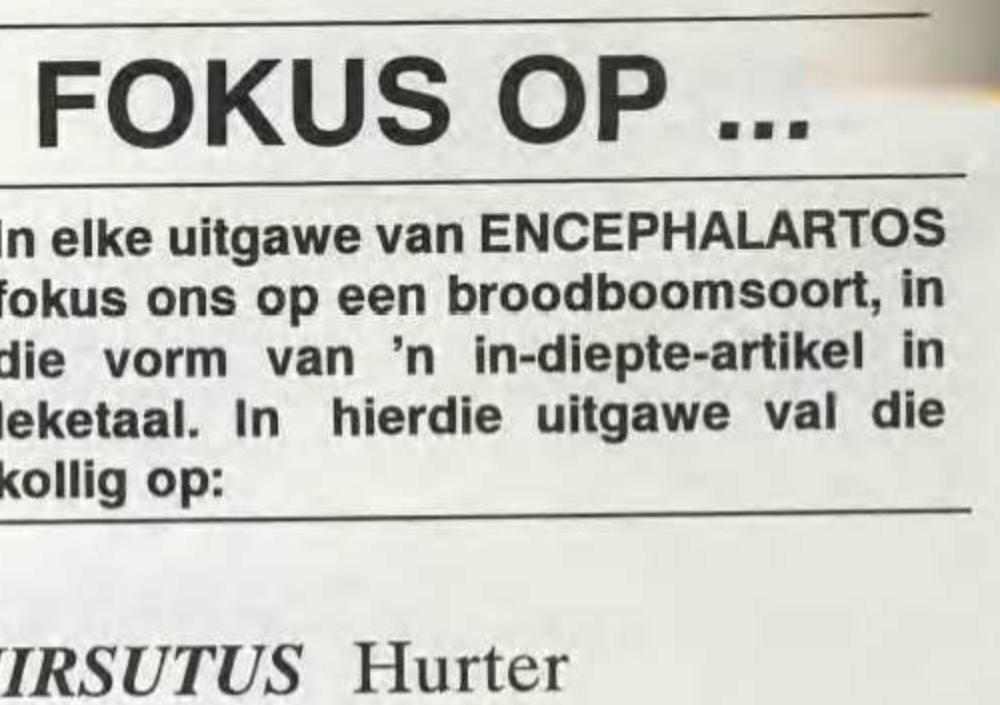

Figure 1 ***Encephalartos hirsutus*; a robust specimen in habitat. Photo: Johan Hurter.**

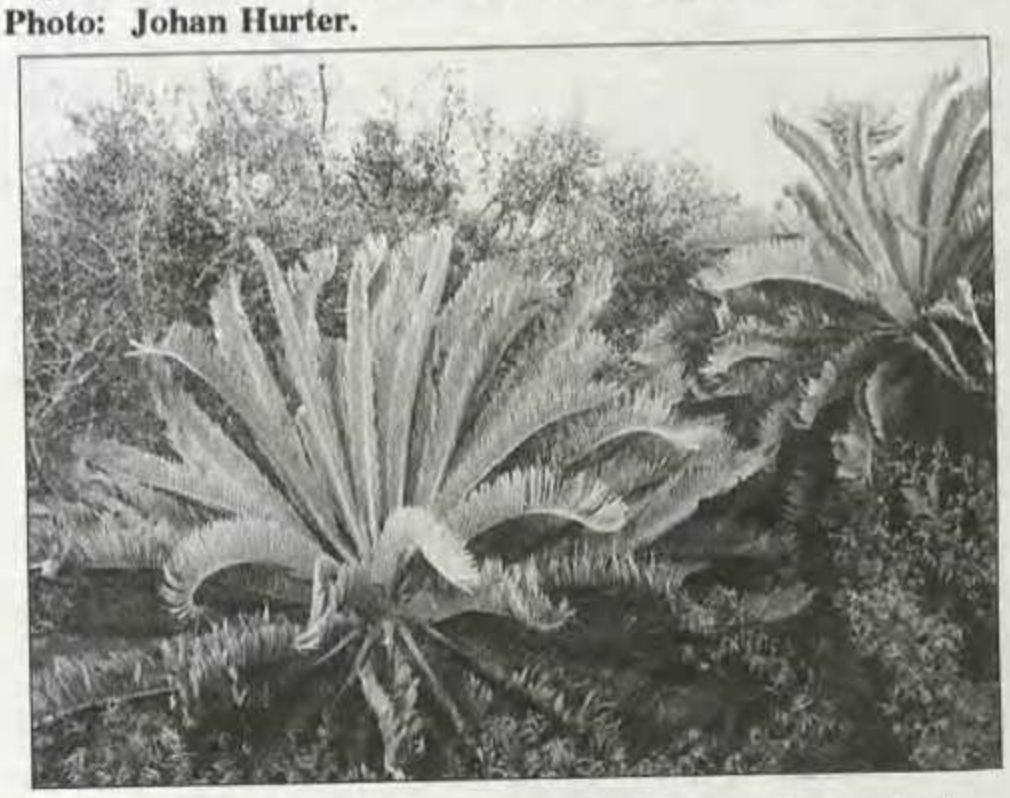

Figure 2 ***Encephalartos hirsutus* specimens in habitat; note the recurved apices of the leaves. Photo: Johan Hurter.**

the median leaflets are 130–170 mm long and 20–24 mm wide, narrowly elliptic and somewhat sickle-shaped, gradually acuminate with acute and pungent apices, decurrent (turning downward) basally on the rachis (Figures 4b,d), apices somewhat turned towards the leaf apex.

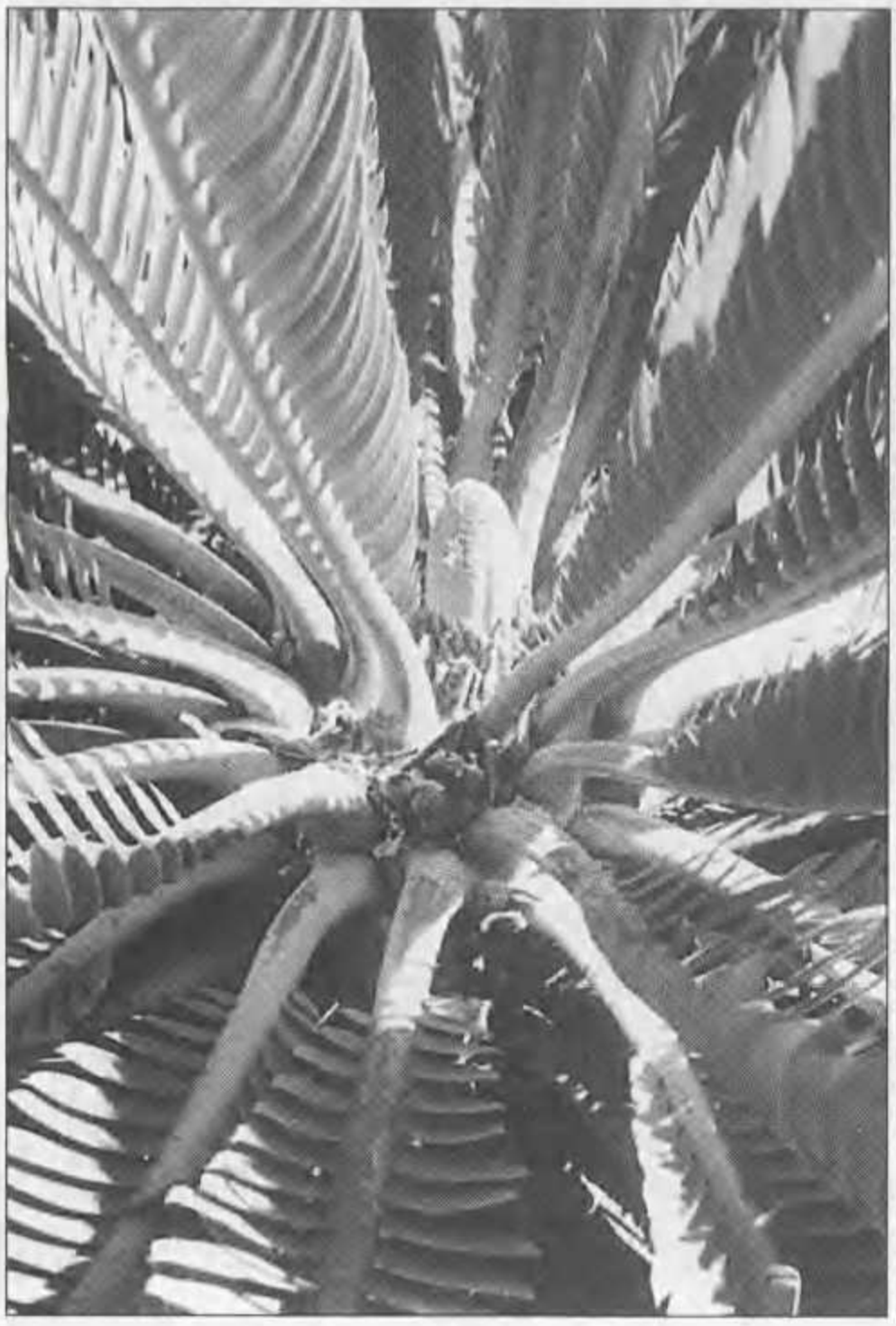

Figure 3 An *Encephalartos hirsutus* specimen with a juvenile male cone. Note the hairy petiole and rachis of the leaves. Photo: Johan Hurter.

3. CONES

The cones are dimorphous, waxy bluish-green, glabrous and with smooth scale facets.

Of the male cones (Figure 3) up to 5 per stem were seen. They are narrowly ovoid, about 500 mm long and 90 mm in diameter, with peduncles about 120 mm long. The exposed faces of the median microsporophylls (male cone scales) [Figures 4c(i)–(iii)] are rhombic, about 29 mm wide, 30 mm long and 7 mm high, with the central facet flat or slightly concave.

The female cones are ovoid, 1-3 per trunk, about 400 mm long and 350 mm in diameter, appearing sessile but with a peduncle up to 60 mm long, hidden amongst cataphylls in the trunk crown. The median megasporophylls (female cone scales) [Figures 4a(i)–(iii)] are rhombic with four lateral and one central facet, about 50 mm wide, 44 mm long and 15 mm high with the central facet a third of the horizontal diameter of the bulla.

Seeds about 200 per cone, sarcotesta orange-red, kernel 30–35 mm long and 15–18 mm in diameter, ellipsoid, round and smooth.

DIAGNOSTIC FEATURES AND AFFINITIES

Encephalartos hirsutus superficially resembles *E. eugene-maraisii, E. lehmannii, E. princeps, E. dolomiticus, E. dyerianus* and *E. middelburgensis* in its stiff, pungent and glaucous leaves. However, even vegetatively it is easily distinguished from all six species by the decumbent habit of the trunk (prostrate with the tip rising upwards), decurrent bases of the leaflets and the raised veins on the abaxial (lower) surface of the leaflets. The morphology of the leaves in *E. hirsutus* is very distinctive; the leaflets are deflexed, overlap with upper margins over the lower margin of the adjoining leaflets (incubously) and the proximal part of the leaflet bases are shortly decurrent (turning downward), a character not yet observed elsewhere in the genus. In *E. eugene-maraisii, E. dolomiticus* and *E. princeps* the leaflets are also inflexed and overlap incubously but the veins of these three species are not raised on the abaxial surface of the leaflets and the leaflets are subsessile on the rachis. *E. lehmannii* and *E. dyerianus* also differ from *E. hirsutus* in that their leaflets are subsessile and overlap with the lower margins over the upper margin of the adjoining leaflets (succubously) orientated on the rachis, although their median leaflets usually do not overlap. *E. middelburgensis* differs strikingly from *E. hirsutus* in its subsessile, strongly succubous leaflets.

Profound differences are also observable in the cones of *E. hirsutus*. The male cones are narrowly ovoid, glabrous, waxy, with the median bulla drawn out but not into a drooping or lip-like structure, the median cone scales being flat and rhombic. In *E. eugene-maraisii* and *E. lehmannii* the male cones are covered by short hairs and the bulla is more drawn out than that of *E. hirsutus*. In *E. princeps* the surface of the bulla is strongly drawn out to form a beak-like structure, also evident to a lesser extent in *E. dolomiticus*. The male cones differ from those of *E. dyerianus* in the markedly waxy covering, which remains evident in herbarium material. In all six these species the male cone scales (microsporophylls) are much longer than broad, while in *E. hirsutus* the male cone scales are as broad as long or only slightly longer than broad.

In *E. hirsutus* the female cones are ovoid and bluish-

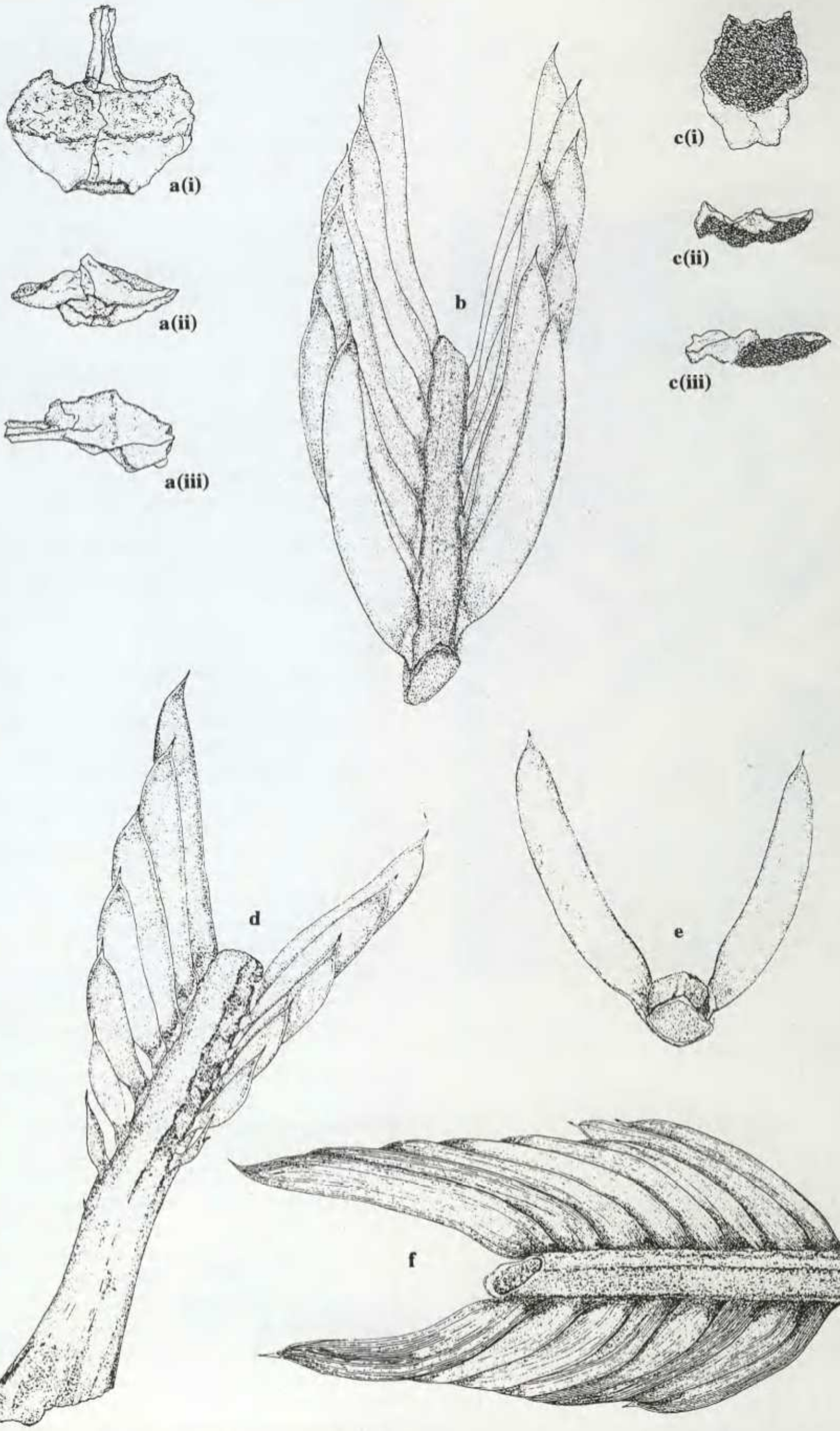

Figure 4 ***Encephalartos hirsutus.*** **(a) Megasporophyll, (b) median leaflets, (c) microsporophyll; (d) leaf base, (e) pair of leaflets showing the rhombic rachis in section and the angle of insertion of the leaflets, (f) sub-apical leaflets. Leaf details: 0.45x; cone details: 0.67x. Drawings by M.C. Hurter.**

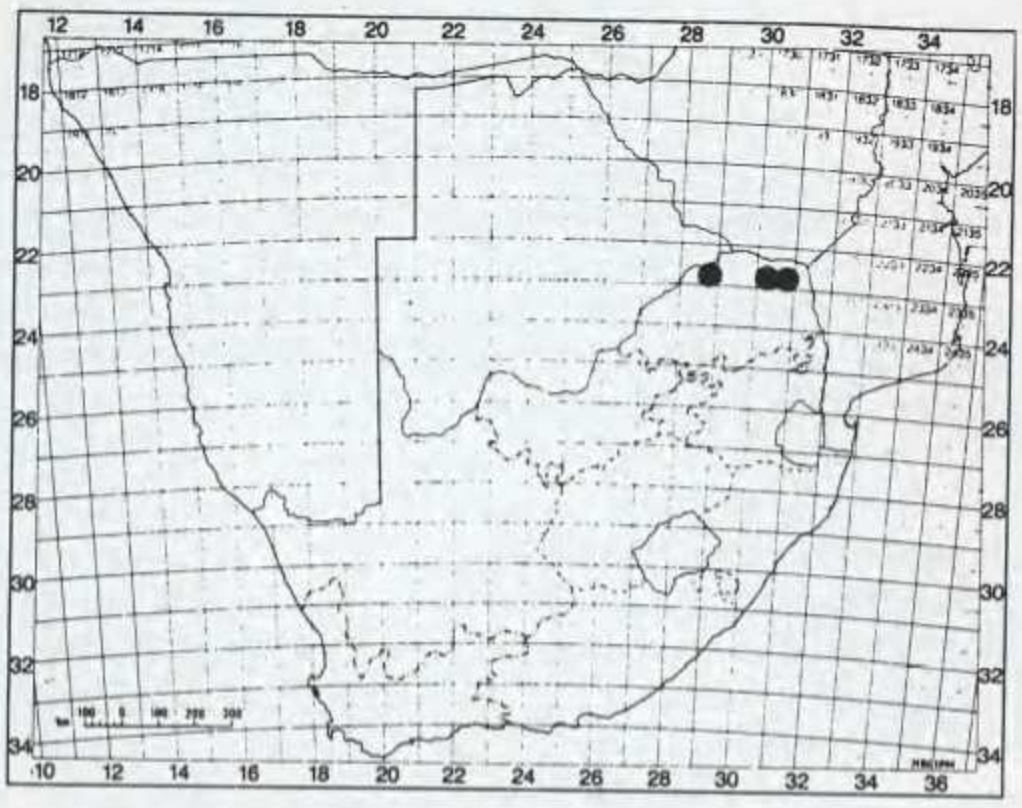

Figure 5 Distribution of *Encephalartos hirsutus*.

green, and the female cone scales (megasporophylls) are glabrous and smooth-surfaced. Female cone scales of *E. dolomiticus* and *E. princeps* differ from those of *E. hirsutus* in that the terminal facets of the bulla are markedly verrucose (warty). The female cones of *E. eugene-maraisii* and *E. lehmannii* differ from that of *E. hirsutus* in that they are usually covered by dense hairs. The female cones of *E. middelburgensis* and *E. dyerianus* are similar but are not as smooth-surfaced as those of *E. hirsutus* in that some ridges and papillae always occur on the lateral facets of the bullae.

HABITAT

Plants grow exposed on south-east-facing quartzite cliffs, in moist semi-deciduous mixed scrub where observation is often obscured by the dominant *Androstachys johnsonii* (Lebombo ironwood) trees. At the type locality, plants grow exposed on a dry south-facing cliff in association with *Androstachys johnsonii, Adenia spinosa* ("doringrige bobbejaangif"), *Barleria bremekampii* and *Eragrostis superba* (sawtooth lovegrass). The rainfall of some 350–650 mm per annum occurs in summer. Over the distribution range of this species (Figure 5) *Encephalartos transvenosus* is the only other *Encephalartos* species occurring nearby.

ACKNOWLEDGEMENT

Quoted passages and drawings from Hurter & Glen reprinted from the *South African Journal of Botany*, Vol. 62, No. 1: 46–48, February 1996, with permission from the editor.

REFERENCE

HURTER, P.J.H. & GLEN, H.F. 1996. *Encephalartos hirsutus* (Zamiaceae): a newly described species from South Africa. *South African Journal of Botany* 62(1): 46–48.

ARTICLES / ARTIKELS

CONSERVATION OF CYCADS WITH SPECIAL REFERENCE TO INDIAN CYCADS

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Received 10 May 1997

Professor E.J.H. Corner who was Professor of Tropical Botany in the Botany School, University of Cambridge has aptly said: "but the forests which show how trees were made are going, they are vanishing nowhere faster than from the alluvial plains where the vestiges of the last creative phase of plant life that prepared the way for the modern world may survive ..... Before machines the forest is defenceless. Human progress is clearing it with gathering speed to plant crops for quick returns." It is, therefore, necessary to conserve the plant cover of tropical forests. However, even among the plants of the tropical forests the cycads should rank very high in the

priority list of plants requiring conservation. Being relics of a bygone age they are handicapped by their slow growth, relatively short stature, disadvantageous dioecism, the ratio problems including less frequent coning of female individuals, frequently non-synchronous production of male and female cones, their inefficient pollination mechanisms, shedding of seeds with immature embryos and a long period of about 10 years required by seedlings to attain puberty for producing reproductive parts. Accordingly in various native countries of cycads, except India, there is public as well as governmental awareness about the need of conserving cycads against human interference.

My visits to Beaulieu-sur-Mer in southern France in 1987, to Australia in 1990 and my recent visit to China in May 1996 to attend the International Conferences on Cycad Biology have convinced me that other countries are far ahead of India in the conservation of cycads. The Cycad Societies of the U.S.A., South Africa and China and the Palm and Cycad Societies of Australia and New Zealand have played a vital role in creating such awareness about protecting their cycads *in situ* (in areas of their occurrence) and *ex situ* (under cultivation in gardens, parks and private collections).

In situ Conservation

As a result of this awareness all native countries have started protecting their natural populations of diverse cycads in protected areas. In China alone there are about 20 or more natural population reserves where cutting of any parts of cycads or even the collection of fallen seeds is prohibited. Australia and Central America have also taken steps to protect their rare cycads. South Africa in particular has already enacted legislation to protect its cycad populations and to punish the guilty with fine and imprisonment. Against such strong awareness of other native countries of cycads about the need of protecting their cycads, in spite of India's emphasis on environmental conservation, we cannot claim even a single Cycad Reserve anywhere in our country perhaps because we are over emphasizing biotechnology, agricultural production and applied science.

Ex situ Conservation

In spite of the limitations of cultivated collections of cycads, lasting conservation is offered to cycads, by various botanical gardens of the world. Some of these are situated in temperate or cold temperate countries (where the climate is not favourable for growth of cycads in the open), e.g., in the Royal Botanic Gardens at Kew in U.K., the St. Petersburg (Leningrad) Botanical Garden of Russia and the Glasnevin Botanical Garden of Ireland and they all have stupendous collections of the cycads of the world. Many South African Botanical Gardens, the New York Botanical Garden and the Fairchild Tropical Garden of Miami, Florida need special mention in this connection. Practically every important city in Australia has a botanical garden and many of them give particular attention to cycads. Among these the Royal Botanic Gardens in Sydney needs special mention. Many of the above mentioned gardens also give special attention to cycad research. The Chinese too seem to be ahead of us in the *ex situ* conservation of their cycads. Their South China Botanical Garden, Panzhihua Institute of Horticulture, Panzhihua Park and Shenzhen Fairy Lake Botanical Garden have special collections of cycads. In particular, the Shenzhen Fairy Lake Botanical Garden has an international centre for *ex situ* protection of cycads where not only Chinese cycads but those from all other cycad countries have been introduced. Against this background we cannot claim even a single botanical garden with a good collection of our own cycads, not to say of the diverse cycads of the world.

Indian cycads and the need of their conservation

Out of all the cycads in the world the Indian region can claim only six species of the genus *Cycas* as its natives. These are *Cycas beddomei, C. circinalis, C. nathorstii, C. pectinata, C. rumphii* and *C. siamensis*. Out of these *C. beddomei* is one of the most circumscribed endemics among all cycads and it grows only in the Cuddapah Hills of Andhra Pradesh (wherein Tirupathi Devasthanams is also situated) and nowhere else in the world. It is accordingly listed in Appendix I of the Convention on International Trade in Endangered Species of wild fauna and flora (CITES) which is administered by the United Nations Environment Programme. Its inclusion in Appendix I indicates that it is one of the most endangered plants of the world and international trade in the plants or their parts is prohibited by CITES. CITES cannot, however, protect it in India and that is our resposibility.

Our second species, *C. circinalis*, is relatively widely distributed from Kerala northwards up to Orissa. However, it seems to be having at least three varieties which have a more restricted distribution. One of its varieties on which the genus *Cycas* was founded by Linnaeus, *C. circinalis* var. *circinalis* grows in the Malabar region. Another variety, *C. circinalis* var. *swamyii* grows in the Hassan District of Karnataka, and a third, *C. circinalis* var. *orixensis*, in the Mals of Puri.

Among the remaining species, *C. nathorstii* is reported solely from Shri Lanka, *C. pectinata* occurs in the Someshwar Hills of Bihar, the Assam region, Eastern Nepal and Sikkim Terai, *C. rumphii* grows in the Andaman and Nicobar Islands and Shri Lanka and *C. siamensis* is reported rarely from Manipur and Bhutan.

The above mentioned restricted populations of our cycads are regularly ravaged by inhabitants of the surrounding areas for use of their leaves and sometimes the entire crowns of leaves and apical parts of stems for decorations of their temples, churches or graves and in marriage and funeral processions or for preparing wreaths for dead bodies. The plants are also used for medicine and food. Thatching and preparation of mats and broom sticks are other uses of cycad leaves. Cones are also used for driving away bed bugs or rice bugs.

However, the worst calamity which is overtaking our cycads is the wanton destruction of their entire populations for acquiring their habitats for human habitations including dwellings, fields and roads or for quarrying stones. In this process the habitats of cycads are rapidly shrinking and the species are threatened with extinction as happened in the case of *Encephalartos woodii* in Africa which has become extinct in nature and only its male plants survive in cultivation. These are vegetatively propagated from a multistemmed male which was the only plant ever collected from nature in 1895. In this connection it is necessary to mention that our *Cycas beddomei*, in spite of its being listed in Appendix I of CITES as one of the most endangered cycads, with an embargo on its international trade, has been mercilessly destroyed in Tirupathi where an entire hillside inhabited by its beautiful plants was cleared of the vegetation by the authorities of the Tirupathi Devasthanams for their buildings, roads and gardens.

At this point I can also recall with utmost pain and anguish the merciless cutting of a number of large female trees of *Cycas revoluta* which were growing in the old Government House of Allahabad. Each of these had about 60 or more large and small branches all round and these grew from the ground surface to a height of about four metres. The thickest of their trunks must have been about a metre in diameter. Their sight was so stupendous that I used to take my students and botanist friends to see them. Suddenly one day I came to know that all of them had been cut down and the branches thrown away because the State Government had decided to convert the Allahabad Government House into the Moti Lal Nehru Medical College. The trees must have been planted at least about two hundred years earlier. Obviously, no one, not even the Government cares for such valuable monuments of nature. If the authorities concerned had cared the trees could have been carefully dug out with the roots and transplanted. In other countries old cycads are valued and protected wherever they grow. The Chinese and Japanese plant cycads in their temples and some of their famous oldest and largest trees are situated there, e.g., the Ryugeji Temple near Tokyo has many old trees of *Cycas revoluta*. Surely we could emulate this practice in our temples and churches instead of decorating them with cut leaves and crowns.

Suggested methods for conservation of Indian cycads

The manner in which India could embark on a programme for the protection of its cycads is envisaged by me as follows:

1. A survey of the natural areas and population counts of all our cycads in an All-India basis along with a search for new forms.
2. Protection of their habitats by declaring some of their habitat areas as "Cycad Reserves".
3. A programme should be embarked for the education of the public in the areas of our cycads and also elsewhere on the need of protecting our cycads wherever they grow and if necessary we should embark on legislation for the protection of cycads in nature and old plants in cultivation. We should have a Cycad Society, if necessary subsidized by the Government, for education and research on cycads like the cycad societies of other countries. This could help us in developing our much needed research on different aspects of cycads.
4. India should have a few cycad gardens and special cycad sections in all botanical gardens. Indeed India needs many more botanical gardens in different parts of the country to preserve the diversity of its flora. We could encourage cultivation of cycads in parks, road sides and private gardens by providing a subsidy for the purpose.

In this connection it is important to point out that Indian scientists sitting in positions of power in Government Departments should take effective measures for the protection of our endangered species like *Cycas beddomei* and not merely write articles about their imminent extinction (see Ahmedullah and Nayar 1985). Such statements should also be backed by actual surveys of their distribution and numbers and by the establishment of "plant sanctuaries". India has a number of "National Parks" for the protection of animals facing extinction but not a single one for the protection of its endangered plants. Thinking back, perhaps I could also blame myself for this situation since I repeatedly refused to accept positions in Government Departments, once when I was offered the Directorship of the Botanical Survey of India by the Department of Science and Technology and the second time when the Director General of C.S.I.R. asked me to accept the post of the Director of the National Botanic Gardens now renamed as the National Botanical Research Institute. At the same time, I must also mention that with my experience of work on cycads for the last about fifty years, I submitted a project for cycad, bamboo and palm surveys and a garden with a research lab for their cultivation to the Department of Environment and Forests in May, 1991 and another for writing monographs on cycads and conifers and for research on these plants to the Department of Science and Technology both in the

Government of India. The first of these was rejected outright after keeping it in the files for three years and the second one was sanctioned after more than two years without any research staff or equipment. These problems of workers in science deserve the notice of all scientists.

REFERENCE

AHMEDULLAH, M. & NAYAR, M.P. 1985. A vanishing cycad of Indian peninsula. ***Bull. Bot. Surv. India*** **38(1–4): 169.**

THE CONE CRIME

Grant Gittleson
31 Sunnyside Road, 2192 Orchards

Received 10 May 1997

For me being a cycad lover, there is no better sight than a fat healthy female cycad bearing a cone or cones and nothing more disappointing than the same sight knowing that the cone has not been fertilized.

- On average a healthy mature cycad pushes a new set of leaves ± once a year and pushes a cone ± once every five years.
- A minimum of half of all mature cycads are male.
- The probability of missing the fertilization time (discussed later in this article) is more than likely.
- Many mature cycads are in gardens where the owners are unaware of their sex, let alone how to fertilize them.

For these reasons (and many more) I believe it is criminal to have a female cycad push a cone and not try to fertilize it. Apart from the fact that anyone who collects cycads and has not tried to fertilize his own cones is missing out a whole new experience. Ask anyone who has successfully fertilized and reared his/her own seeds. Also lets not forget the financial value of fertile seeds.

One exception is in the relocation of cycads. Sometimes when a mature cycad is relocated it pushes a cone for survival reasons. These cones should be removed whilst still small. Failure to do so could risk the life of the cycad itself, as all the relocated cycad's energies should go into the production of new roots.

There are two ways of fertilizing your own cones:

1. Get a professional to do it. Most cycad sellers will gladly come round to your house and fertilize your cones for you at no cost, although they do take a percentage of the seeds from you as a fee. (Which is fine for most collectors.)
2. Try it yourself. Please note lots of people, through experience, have fertilized their own seeds successfully and may do it differently. I'm sure after a few years you will come up with a few new ways of your own. Following are a few of the basic tips:

- Depending on which cycad a cone will appear usually around summer in place of the usual leaf push (or with it).
- First identify it as a female cone. You might have to wait for it to grow for a month or so before it is big enough for you to recognize. Female cones are usually bigger and the scales are more tightly connected (see Figures 1, 2). They tend to look like pineapples without the leaves. Male cones are usually more cylindrical (Figure 3).

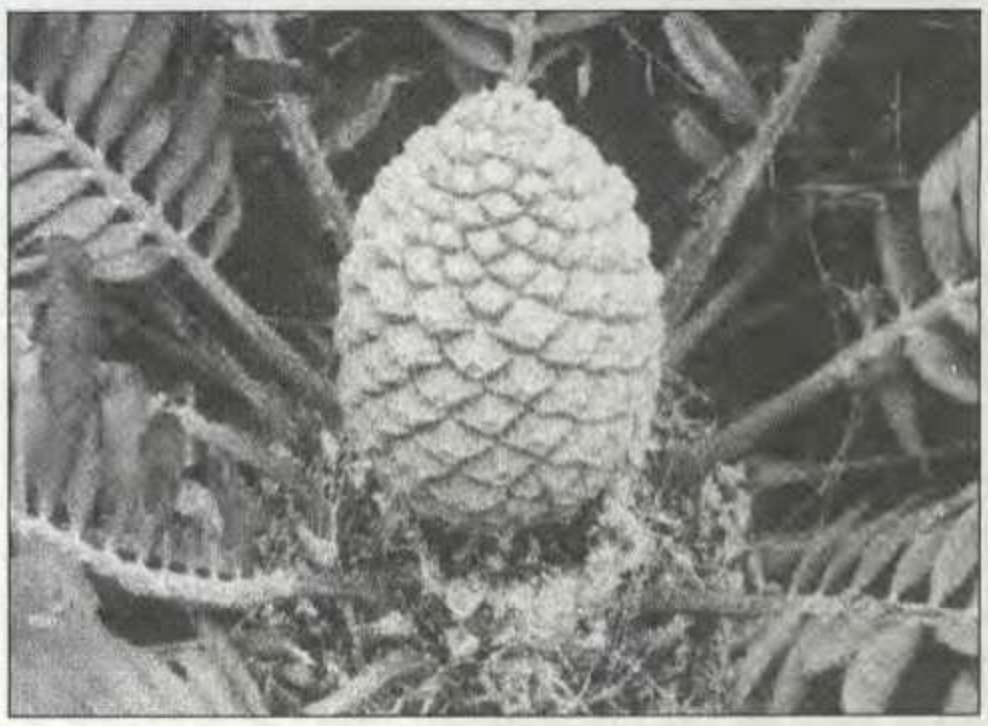

Figure 1 A female ***Encephalartos*** **specimen coning in the Kirstenbosch National Botanic Garden, Cape Town.**

- Make sure your cycad has adequate fertilizer. A female cone takes a lot out of the plant. Keep it as happy as possible.
- Once identified as a female, the hunt for some male pollen starts. This you can obtain from a male plant of your own or perhaps from someone you know.

Figure 2 A female *Encephalartos trispinosus* in cone.

The custom is that the male cone owner gets a percentage of the fertilized seeds. Sometimes, especially with rare specimens, you need to be resourceful - try the cycad pollen bank, or phone around to all cycad resellers. If necessary, start with the list of subscribers to the cycad journal. If you still cannot find the right pollen try pollen from another cycad species (some cycads will allow hybridization), however, do this as a last resort - try to keep the plant pure.

- *If you receive a male cone you need to remove the* pollen. Do as follows:
  - Remove the cone cleanly from the cycad. When the pollen is ready it starts falling out of the cone like powder. From this time and for approximately a week afterwards keep the cone in a cool well-ventilated area. Regularly tap the cone over a piece of clean paper with a crease in the middle and gently funnel the pollen into a small glass bottle. Label the bottle with the cycad name and keep cool in a fridge or freezer. Remember you do not want the pollen too long before the female is ready because the pollen has only a limited life span, ± 3 to 4 days*, about triple that in the fridge*, and nobody seems too sure how long in the freezer.
  - Depending on the type of cycad, approximately six months after emergence (usually autumn) your female cone will be ready. You have to now be very careful. Every day you have to feel the cone for "looseness". It is easy to miss this stage. Possible signs are:
    - If you have male cones of the same species, when their pollen is ready, the chances are the female cone is ready.
    - A crack-like opening appears between the upper rows of cone scales.
  - When the cone is receptive the cone scales become "loose" for approximately one week, the cone scales loosen up enough for pollination (in the wild either wind or beetle). In your case this is the time to get that pollen in. Use all methods, mix some of that pollen with distilled water and draw up into a 20 ml syringe. Break off a top scale carefully with a sharp knife. Keep the scale to replace as a plug. Squirt the pollen into the gap you created. Squirt in every which way you can but make sure it gets in. Squirt from the top and make sure it comes out at the bottom of the cone. If it comes out the side only the cone is probably not yet ready. If you still have the male cone leave it lying on top of the female cone. Some prefer dry pollination - blow the pollen in between the loose scales using a straw. Re-pollinate multiple times. Once the week is up the cone tightens up and then that's about all you can do for now.

Figure 3 Male cones of *Encephalartos umbeluziensis*.

- After approximately six months the cone will start to disintegrate (some take longer). This is when you collect your seeds. Unfortunately the cone continues maturing whether or not the seeds are fertile, so you do not know at this stage whether or not you were successful.
- Depending on the size and number of cones you should have a good number of seeds - anywhere from 20 to 50 to 500. Take the seeds and remove the fleshy outer covering. Pre-soaking in water for a couple of days will make it a lot easier. Then leave the kernels to dry. Please note most cycad seeds are poisonous. Use gloves and keep out of reach of pets and children.
- At this stage, you can perform a fertlity test by dropping the seeds into a glass of water. If they float there is a good chance they are not fertile, however, it is bit early for this test.
- Dust the seeds with some fungicide and insect powder and place the seeds in a dry wood box in a cupboard and wait for the next spring.
- Next spring take out your seeds and repeat the float test as it will now be a more realistic test. If you want to know for sure cut open one seed. You will be able to see the embryo in a fertile seed.

To grow the seeds would be another article on its own but basically:

- Use vermiculite, perlite or a well-drained mixture of potting soil.
- Put the seeds out onto a seed tray vertically half embedded.
- Soil nutrients are unimportant at this stage; the embryo is still providing the nutrients.
- Keep in a warm moist place out of the full sun (avoid excessive heat or cold).
- Be patient - wait for that root.
- When the root appears move to individual pots or bags.
- After a few weeks you will see your first leaf.

Raising small cycads of your own is a truly rewarding experience. Although I am a relative beginner at the game, I battled to find adequate information and advice on the topic when I came round to fertilizing my cones. I found most of the information I read from books too theoretical. I hope that this helps, if one cone out there gets fertilized from this article it was well worth the effort.

Good luck.

[*I disagree with the author on his estimate of the life span of cycad pollen (see Osborne, Robbertse & Claassen: "The longevity of cycad Pollen", *Encephalartos* **28**: 10–13, December 1991). I have successfully pollinated female cones with 1-month old pollen kept at room temperature in a glass vial, and 2-year old pollen kept in glass vials either in a fridge or in a freezer. - **Editor.**]

NOTES ON THE BIOLOGY OF *LEPIDOZAMIA HOPEI* REGEL (ZAMIACEAE)

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Received 18 August 1997

INTRODUCTION

The cycad *Lepidozamia hopei* Regel is restricted to the forests of tropical north-east Queensland. It is notable for its size; Bailey (1886) and later Chamberlain (1919) indicated that individuals of the species grew to 60 feet, a figure regularly repeated in the literature, and Forster (1996) records a specimen 17.5 m (57 feet) in height. These data suggest that it is the largest, at least in terms of height, of the cycads. The species has a conservation coding of COMMON (Forster 1995, 1997).

Jones (1993) notes that *L. hopei* grows in rainforests, along their margins, and on stream sides from near sea level to c. 1000 m. The area in which *L. hopei* grows occupies less than 0.1% of the surface area of Australia and whilst some populations are secure in the Wet Tropics of Queensland World Heritage Area others are at risk as clearing of suitable habitat continues. There are many references in the literature to aspects of *L. hopei* (see Forster 1995, 1996 and references therein) but to the best of our knowledge no systematic study of the species has been undertaken. These notes are intended to contribute to an understanding of the ecology of the species, particularly stand structure, coning phenology, seed dispersal and insect associations.

Table 1 Size classes of a population of twenty two *Lepidozamia hopei* at Moresby, FNQ.

Size class	descriptor	# (%) of plants	height		# of live leaves	
			$\bar{x}$	range (m)	$\bar{x}$	range
I	no caudex visible[1]	10 (45.5)	-	-	4.0	1 - 7
II	caudex 10-25cm in diam	11 (50.0)	2.1	0.1- 4.75	21.4	9 - 35
III	caudex 25-40cm in diam	- -	-	-	-	-
IV	caudex >40cm in diam	1 (4.5)	8.3	-	left = 35, right = 20	
		22 (100)				

1. excavations about Class I plants revealed a mean basal diameter of 8cm.

STUDY SITE AND METHODS

This study was conducted in Mesophyll Vine Forest (MVF) (Rainforest Type 2a, Tracey 1982) at Moresby (17°39'S 146°01'E) near Innisfail in North Queensland. *Lepidozamia hopei* constituted a sub-canopy element of the forest and frequently had the cycad *Bowenia spectabilis* Hook. ex Hook.f. (Stangeriaceae) as an understorey. The study site was located on the eastern slopes of the Basilisk Range on shallow alluvial soils derived from metamorphic rocks, the altitude was 125 m, the annual rainfall c. 3000 mm (>75% falling in the period October – May), and the mean annual minimum temperature 18°C. The height of tall plants was measured using a 30 m tape drawn to the crown using a string line thrown over it, and the caudex diameter was measured to an accuracy of 0.5 cms. Insects collected from *L. hopei* at the site were lodged with the Australian National Insect Collection (ANIC) in Canberra.

RESULTS

Distribution and density

The plants at Moresby were distributed from creek banks, through the rainforest slopes to a rainforest - wet forest ecotone on a 50° slope of 20 m width along the ridgelines. The plants were most dense ($\bar{X}$ = one per 23 m^2) in the ecotone where soils were shallow, light levels higher than deeper in the rainforest, and burns had occurred on an irregular basis over the past 100 years but have been excluded for the past ten years.

Size Classes

The plants surveyed were allocated into four size classes with the caudex diameter being recorded at mid-height for small specimens and at breast height (dbh) for larger plants (Table 1).

The Class IV plant had dual caudices, the main caudex branching 1.65 m above the ground. A second plant in this size class (dbh = 40 cm), c. 50 m distant and not in the study population, branched 2.5 m above the ground and had a total height of 7.2 m (Figures 1a, 1b).

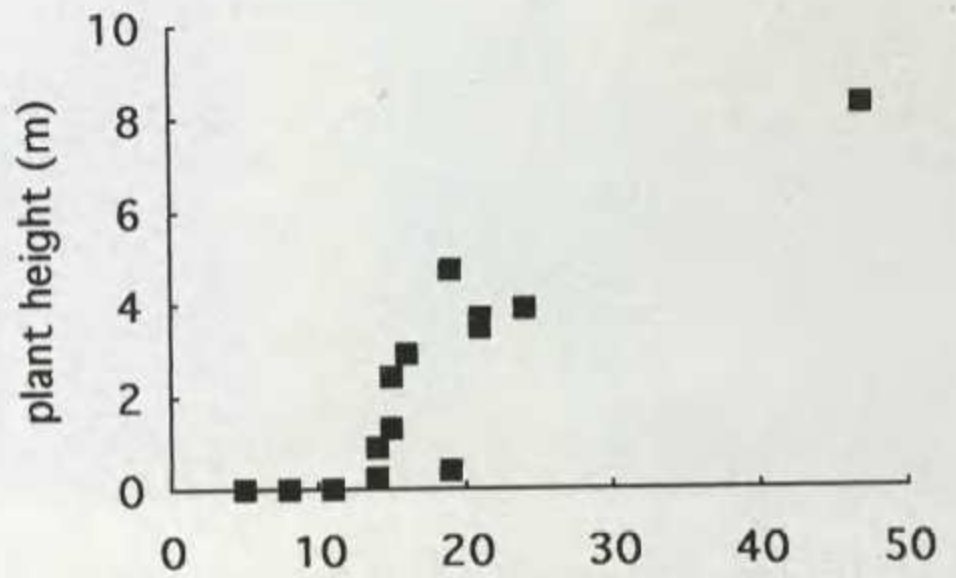

Figure 1a Comparison of caudex diameter and height of twenty two *Lepidozamia hopei* at Moresby, FNQ.

Table 2 Production of cones in 1996 of a population of twenty two *Lepidozamia hopei* at Moresby, FNQ.

Size class	number of plants in size class	male cones # (%)	female cones # (%)
I	10	0 (0)	0 (0)
II	11	5 (71.4)	0 (0)
III	-	-	-
IV	1	2 (28.6)	0 (0)

Figure 1b Peter Rowles at the base of the *Lepidozamia hopei* with a dbh of 47 cm.

Cone production

A survey of 22 plants in December 1996 revealed that six (27%) had produced a cone that year, all of the cones were male (Table 2). The branched Class IV plant produced a male cone on each caudex.

Male cones were apparent from August and prior to female cones elsewhere at the study site, pollen dehiscence occurred during late November and early December, prior to the onset of the Wet Season, and whilst female cones were still small (c. 200 mm in height).

Male cones opened in a distinctive spiral fashion (refer to page 228 of Jones, 1993 for a photo of the habit in a cone of *L. peroffskyana*) and collapsed within a week of shedding pollen; the collapse of the cone was hastened by the activities of weevil larvae boring in the tissue of the cone axis and microsporophylls.

Plant - Insect Associations

Four species of insects were found in association with *Lepidozamia hopei*, three species with the reproductive structures and one with the foliage. The insects associated with the cones were the weevil *Tranes insignipes* Lea (Curculionidae: Molytinae); a native bee *Trigona* species (Apidae), and the Green Tree Ant *Oecophylla smaragdina* (Formicidae). All three species were found on the dehiscing male cones. The weevil was found to oviposit into the axis and microsporophylls of the cone and the larvae to eat the parenchyma tissue of them, and to pupate in cavities in the distal ends of the microsporophylls. The activities of the larvae reduced the cone to a mass of undifferentiated material save for the distal and abaxial sori-bearing surfaces of the microsporophylls. The weevils were observed to carry heavy loads of *L. hopei* pollen with small "balls" of pollen being very obvious on hairs on the lower tarsi of adult weevils for periods of two days after their removal from cones. Damage by either the larval or adult forms of the weevils to the pollen-containing sori was not observed and the sori were in place at the time of collapse of the cones.

The Trigonid bees were observed to collect pollen from

the sori of male *L. hopei* cones and the ant to eat the sugar-rich mucilaginous exudate resulting from wounds in the tissue of the cones. The ants prevented the bees from landing on microsporophylls occupied by them and we observed ants catching and eating pollen-laden bees and weevil larvae.

An as yet unidentified beetle (Coleoptera: Cerambycidae) was found to browse on the dead pinnules of leaves still attached to the plant and its larvae to eat the pith of the leaf and pupate in the proximal end of them. An examination of ten fallen leaves revealed that the pith of all had been excavated by the beetle larvae and that adult larvae had exited the leaf via a hole in the abaxial proximal end of the leaf; no larvae, pupa or adult beetles were found in the base of fallen leaves but Green Tree Ants were frequently present in the cavity formed by them.

Seed production and dispersal

The female *L. hopei* cones produced seeds with a shiny red sarcotesta; at the study site the cones were often disrupted by animals once the red sarcotesta of the seeds became obvious between the megasporophylls of the cone. Some seed germinated under the canopy of the parent plant but much of it was spread, some of it upslope from the parent plant, by animal agents including the White-tailed Rat *Uromys caudimaculatus* and feral pig *Sus scrofa*. The Rat is a fastidious eater of the seeds and one was observed by PCR to broach the testa of one seed and carefully eat all of it before progressing to another seed. We found no evidence to suggest that the large, frugivorous ratite the Southern Cassowary *Casuarius casuarius* fed upon or dispersed the seeds of *L. hopei*.

DISCUSSION

Distribution and density

This study indicates that the preferred habitat for this species is the rainforest/wet forest ecotone. However, as the margin and the subcanopy light regime of the rainforest changes with changing environmental parameters (Kershaw 1981) including those of human-mediated fires, the location of this ecotone and thus of the diverse size class assemblage of *Lepidozamia hopei* is likely to be a transient feature. This transient nature of the ecotone may explain the occurrence of large and isolated plants of the species in the rainforest, they being the only survivor of a once larger group. Light appears to be a limiting resource for this species and low levels are likely to reduce recruitment within the forest; elsewhere the species occurs along the sides of streams where light levels are also higher.

Size classes

The data in Table 1 and Figure 1 indicate that *L. hopei* plants attain a diameter of c. 10 cm before gaining height but do not increase dramatically in diameter whilst growing to a size and mass where the production of a cone is possible. The presence of a 4.75 m plant with a 19 cm caudex diameter in a Class II plant indicates that the age of a single Class IV plant is considerable; the absence of plants with a caudex in the diameter range of 25–40 cm suggest that very large plants of this species are suryivors of environmental events such as cyclones that are likely to fell most taller plants. In the populations of *L. hopei* to the north of the current study site there appears to be a greater preponderance of larger/taller individuals perhaps indicating that these populations are not as subject to damage from cyclones. Based on our experience in the area, observations of the effects on plants of cyclones, and the position of the plants near the ridge line on a coastal range, we suggest that the two Class IV plants were damaged in a severe cyclone in 1918. The suggestion compliments that made by Bosworth (1993) for similar size bifurcated plants. If this was the case the subsequent mean growth rate of the two has been 8.5 cm per year for the male and 6.0 cm per year for the female; such figures are not inconsistent with the value resulting from the annual addition of a rosette of leaves, bur are considerably greater than that suggested by Bosworth (1993).

Cone production

The data presented here are for one breeding cycle only and as such do not contribute a great deal to the discussion of reproductive strategies in cycads, however, they do indicate a bias towards the production of male cones in this population. The height of plants producing cones in the study population is not indicative of the minimum required for the species as we have observations (unpublished data) of smaller plants doing so, albeit in more open conditions where light may not be a limiting resource. It is of interest that all plants but one over 2.43 m produced cones in 1996; the exception was a 4.75 m specimen which had two distinct whorls of leaves, six in the lower and 14 in the upper, separated by a distance of *c*. 10 cm.

Plant - Insect Associations

The association between *Lepidozamia hopei* and the weevil *Tranes insignipes* is of interest in that the weevil breeds in the tissue of the mail cone. This may indicate a tolerance or avoidance of the toxins found in its tissue and that this species may have a co-evolutionary association with *L. hopei*. These data, the pollen-carrying hairs on the tarsi, and comparison with other Queensland rainforest cycad species (see Wilson 1993)

suggest that the weevil is the pollination vector of *L. hopei*. All *Tranes* weevils are associated with cycads (Zimmerman 1994). The identification of *T. insignipes* as the likely pollination vector of *L. hopei* supports the suggestion by Oberprieler (1997) that this is likely to be the case.

This is the first record of Trigonid bees taking pollen from a *L. hopei* cone but members of the genus have previously been observed doing the same in cones of *Cycas media* in the Cycadaceae (Ornduff 1991) and *Zamia fairchildiana* (De Vries 1983) and *Macrozamia machinii* (as sp. aff. *plurinervia* Forster *et al.* 1994) and *M. miquelii* (G. Wilson unpub. data) in the Zamiaceae. Ornduff (1991) speculates that the members of this genus which is known to have existed in the Cretaceous (Michener & Grimaldi 1988) may have utilized cycads as a pollen source in the early stages of their evolution. Our observations of Green Tree Ants catching *Trigona* bees feeding on the pollen of *L. hopei* parallel those by Ornduff (1991) of this species taking Trigonid bees on *Cycas media* pollen.

The activities of the chrysomelid beetle in and on the leaves of *L. hopei* indicates that this species tolerates or avoids the toxins found in them. The fact that the beetle restricts its activities to dead leaflets indicates that it may be at or approaching its physiological limits in eating the tissue of *L. hopei* and is able to do so only when toxin levels are low. The lack of larval and pupa forms in the bases of fallen leaves suggest that the beetle emerges from pupation prior to leaf drop to lessen the chance of predation by ants.

Seed production and dispersal

The production of seed by *L. hopei* occurs in cones that are large and often well elevated i.e. to 16 m above the ground and by plants that are on steep slopes, the latter factors facilitating their spread due to the effects of gravity. However, gravity alone does not explain the distribution of plants that occur. We have documented the spread of seeds by two animal agents and there are anecdotal records of other taxa, e.g. macropods carrying cycad seeds in the rainforests of north Queensland. The White-tailed Rat arrived in Australia less than 15 million years ago (Strahan 1983) and post-dates *Lepidozamia* (Jones 1993) and the pig is a feral exotic species introduced in the past several hundred years and it is likely that other taxa are or have been involved in seed dispersal of this cycad. These taxa may now be extinct being lost in recent contractions of the rainforest or in previous extinction events in the previously existing "megafauna" or if extant not yet recognised as dispersal agents of seeds of *L. hopei*. The bright red sarcotesta of the seed is typical of many animal-dispersed rainforest fruits. In northern Australia tropical rainforests the Cassowary is an important dispersal agent of seeds (including many toxic to mammalian species) and it is of interest to note that neither we nor other rainforest ecologists or Cassowary biologists (T. Valentine, J. Bentrupperbäumer and D. Storch, *pers. comm.* 1997; and Verhey *in* Van der Pijl 1982) have recorded this species eating or dispersing the seed of cycads. Elsewhere in Australia the Emu, another ratite, has been recorded (Noble 1975) as eating and dispersing seeds of *Macrozamia* species. Further work is required on this aspect of the ecology of *L. hopei*.

SUMMARY

This paper presents details of a small population of the Queensland cycad *Lepidozamia hopei* and describes aspects of the ecology, reproductive biology and insect associations of the species. Three species of insects were found to be associated with the male cones and one with the foliage of *L. hopei*, the weevil species *Tranes insignipes* is implicated as a pollination vector of the cycad. The data are the result of the initial studies of one population of this species and further work both on this population and others is required, this work is currently in progress and the results will be reported in future papers.

ACKNOWLEDEMENTS

We wish to acknowledge the assistance given by Tom Weir of the CSIRO Division of Entomology in the identification of the insects described in this paper and Paul Forster of the Queensland Herbarium for discussion of aspects of the study and useful comments on the contents of this paper.

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CONING FREQUENCY, GENDER RATIO AND POLLINATION OF *ENCEPHALARTOS TRANSVENOSUS* (ZAMIACEAE) AT THE MODJADJI NATURE RESERVE, SOUTH AFRICA AND THE GERMINATION OF THIS CYCAD'S SEED - an abbreviated version of a paper delivered to the 4th International Conference on Cycad Biology

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Received 8 September 1997

INTRODUCTION

Only one paper (Grobbelaar *et al.* 1989) appears to have been published on the gender ratio of an *Encephalartos* species. The results in that paper were based on a single year's coning of a large, undisturbed population in the wild and yielded a gender ratio for *Encephalartos transvenosus* of 2.5 males to 1 female.

Because it is possible that male and female plants cone with different frequencies, as was found for *Zamia skinneri* by Clark & Clark (1987) and for *Z. pumila* by Tang (1990), it is likely that the gender ratio from a single year's observation may be quite incorrect. At present, the only reliable method of determining the natural gender ratio of a species would entail marking a large randomly chosen sample of the plants in an undisturbed population and determining the gender of all the marked plants when in time they happen to cone. Such an experiment, involving 668 plants, was set up for *E. transvenosus* in 1987 at the Modjadji Nature Reserve. Although all the labelled plants have not coned during the following 10 years, the results obtained from the 93% that have coned, are presented in this paper.

MATERIAL AND METHODS

Coning intensity and frequency

During June, 1987, 668 *E. transvenosus* plants varying in height from 0.1 m to 9.5 m were permanently labelled with metal tags and the gender of the individuals that were in cone was recorded. During June of the subsequent years all the labelled plants were inspected for new live cones. In the case of branched or multistemmed plants, the plant was recorded as having coned if one or more cones could be detected on any of its stems.

Pollination

Male and female cones at various stages of development were collected on several occasions and examined for insects during dissection. All the insects that were encountered were deposited with Dr Rolf Oberprieler at the National Insect Collection, Pretoria, for identification.

During the first three years, pollination studies were carried out. In each of the three years a plant that bore three female cones on a single stem at a comfortable height was selected. A different plant was used in the different years. A few weeks before the cones became receptive to pollination, one of them was completely enclosed in a denim cloth bag. The lower edge of the bag was tightly closed around the base of the cone by means of soft wire. The second cone was draped in a loosely fitting denim cloth bag but the bag was left open at the base of the cone to permit easy access to the cone by insects but obstructed wind-blown pollen from easily reaching the apex of the cone. The third cone was left untreated. The cones were protected from vervet monkeys by a cage constructed of wire netting which enclosed the whole crown of the plant.

About a year after the treatments were initiated, the cones were removed from the plant and left in the laboratory to disintegrate spontaneously. One hundred omnules (true seeds and unfertilized ovules) (Grobbelaar 1995) were randomly sampled from each cone and sectioned to ascertain whether it had been fertilized or not.

Seed germination

To determine the optimal temperature for the germination of the omnels (kernels of the true seeds and unfertilized ovules) (Grobbelaar 1995), 50 omnels (in duplicate) were incubated at various temperatures on moist sand from the beginning of October in the year in which the seeds were shed. Germination was recorded at weekly intervals. The experiment was terminated after 13 weeks. The ungerminated omnels were sectioned and the number of embryoless omnels determined.

Because the seeds normally germinate above ground level, the germination trials were conducted in weak light only.

Growth rate

The longitudinal growth rate of the plants' stems was monitored using 15 single-stemmed individuals with trunks between 1 m and 2 m in height. In 1991 a 100 mm nail was driven horizontally into each stem some distance from the stem apex. The vertical distance between the nail and the stem apex was measured in 1991 and 1996.

RESULTS AND DISCUSSION

Coning intensity and frequency

During the ten year period 1987–1996, 620 of the 668 labelled plants coned at least once. Of these 339 were found to be males and 281 females. The percentage of the labelled plants that coned in the different years is listed in Table 1. From the results it is clear that the number of plants that coned varied considerably from year to year. During 1989 and 1990 approximately 70% (Table 1) of the 668 labelled plants coned. Up to six male and five female cones were simultaneously produced per stem. It was commonly found that several stems of a multi-stemmed individual coned simultaneously during this period. Many plants were also found to produce cones on the same stems during both years. In the case of female plants this resulted in up to six cones (three cones per year) being found on a single stem during 1990 because the female cones disintegrate only about 18 months after first becoming visible. By contrast, only one of the 668 labelled plants (a male) coned during 1994.

With only one pronounced coning peak (1989–1990) during the study period, it would be highly speculative to attempt to ascribe that coning peak to a particular environmental factor. From the data obtained from the weather station on the Modjadji Nature Reserve, it would appear that neither the total annual rainfall nor the variations in the monthly rainfall patterns appear to be correlated with the coning behaviour of the plants. The variations in the average monthly minimum and maximum temperatures also do not appear to be responsible for the annual variation in the coning intensity of the plants.

During the experimental period a small section of the Reserve was subjected to a control burn during 1994 and 1996. During 1992 another part of the Reserve experienced an accidental burn. Several cycads were badly damaged by the burns but no significant effect of the burns on the coning of the plants manifested itself.

The frequency with which individual plants coned is summarized in Table 2. It varied considerably for different individuals. In general, the coning frequency was 1.6 times greater for the males than for the female plants. On average, the 339 male plants that coned, did so once every 3.5 years while the 280 female plants that coned did so every 5.5 years during the experimental period. One multi-stemmed male plant coned no fewer than eight times during the 10 year experimental period whilst six other labelled male plants coned seven times during the same period. Only one female plant coned six times during the experiment and this was the highest coning frequency for that gender.

The only other similar studies on the coning frequency of cycads are the ones by Clark & Clark (1987) on *Zamia skinneri* and Tang (1990) on *Z. pumila*. In both cases the coning frequency of the male plants was found to be higher than for female plants. In the case of *Z. pumila* it was found that on average the male plants coned once every 1.6 years whilst the females on average

Table 1 Percentages of labelled *Encephalartos transvenosus* that coned in the different years and the gender ratio of those plants at the Modjadji Nature Reserve.

	Year										
	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Mean
Male	10	4	39	43	6	12	2	0	10	17	14
Female	5	4	31	26	3	1	0	0	1	6	8
Total	15	8	71	69	9	13	2	0	11	22	22
Sex ratio	2.1	1.1	1.3	1.6	2.0	8.0	6.5	---	11.2	3.1	1.9

Table 2 Frequency with which individual *Encephalartos transvenosus* plants coned during the 10-year experimental period at the Modjadji Nature Reserve

Number of times that the same plant coned during 10 years	Number of individual plants	
	Males	Females
1	53	122
2	98	107
3	97	35
4	45	12
5	28	3
6	11	1
7	6	0
8	1	0

coned once every 3.7 years.

Gender ratio

Because the male plants, on average coned more frequently than the female plants, the gender ratio of males to females, if based on the coning results of a single year, can vary considerably. In the present study (Table 1), it varied from infinitely great in 1994 or 11.2 in 1995 tot 1.1 in 1988. During the ten year study period the gender of 93% of the labelled plants was established and this yielded a gender ratio of 1.2 males per female. Because the majority of the plants whose gender is still unknown should be females, it is likely that the true sex ratio of the population is even closer to unity than the 1.2 calculated from the existing data.

From the six-year study of Clark & Clark (1987) on *Zamia skinneri*, they concluded that their results do not necessarily indicate a male bias in the true adult sex ratio of the plants. In the eight-year study by Tang (1990) on *Z. pumila* the gender of 87% of the non-seedling plants was established and this yielded a sex ratio of 1.8 males per female. From the coning results of individual years sex ratios of 2.7 to 12.0 males per female were obtained.

Pollination

The results of the three insect exclusion experiments are provided in Table 3. The low fertility of the omnules in the control treatment of the first two trials was probably the result of the low coning percentage that was experienced during those two years (see Table 1 for coning percentages). However, with the high efficiency of insect pollination, such poor results would favour the contention that insects are not involved. The third trial, which was carried out during 1989 when there was an abundance of cones available, also strongly suggests that insects are not involved in the pollination of *E. transvenosus* at the Modjadji Nature Reserve.

The fact that the completely sealed cone contained fertilized omnules suggest that the pollen that was involved were not brought into the bag by beetles of the size that are normally considered to be involved in cycad pollination. The fertilized omnules probably derived their pollen from material that was deposited on the

Table 3 The effect of different insect exclusion treatments on the percentage of *Encephalartos transvenosus* ovules that were fertilized at the Modjadji Nature Reserve

Year	Insect exclusion treatment	% of ovules fertilized
1987	Control (cone not covered)	12
	Bag draped over cone	0
	Cone sealed in bag	0
1988	Control (cone not covered)	8
	Bag draped over cone	0
	Cone sealed in bag	0
1989	Control (cone not covered)	92
	Bag draped over cone	5
	Cone sealed in bag	7

Table 4 The effect of various temperature treatments* on the germination of *Encephalartos transvenosus* seeds

Temperature treatment	Percentage germination of embryo-containing omnels after			Percentage embryoless omnels
	4 weeks	7 weeks	13 weeks	
35°C	7	50	64	30
35°C/25°C	8	62	100	35
30°C	13	44	69	20
30°C/20°C	20	70	90	25
25°C	67	100	100	40
25°C/15°C	12	29	71	15
20°C	100	100	100	40
20°C/10°C	18	33	67	40

* In cases where alternating temperatures were applied, the higher temperature was applied for 9 hours and the lower tmperature for 15 hours.

female cones before the cones were sealed. In such a large cycad population as occurs at the Modjadji Nature Reserve, there are always male individuals that cone surprisingly early and late relative to the average plant.

No insects or insect damage was observed with the unaided eye on or inside any of the cones when the experiment was terminated. Insects also were never found on or inside other female cones that were collected for morphological studies and the collection of omnules. It must, however, be conceded that cones were never examined or collected in the wild at night.

The pollen-shedding male cones were, however, always found to harbour large numbers of beetles. The insects were described as a new species by Endrody-Younga (1991) and given the name *Metacucujus transvenosi*. From personal observations Endrody-Younga writes: "Only cones that are releasing pollen from their pollen sacks are visited by adult beetles, which lay their eggs in the cone. The larvae feed and develop in the cone and drop to the ground for pupation. *Metacucujus* adults were neither found on female cones nor on the fleshy fermenting seed they produce. Apparently these beetles, which are the most numerous insects present in male cones, play no role in the pollination of these plants."

Seed germination

The results of the omnule germination experiment are summarized in Table 4. One hundred percent of the embryo-containing omnels germinated in the 35°C/25°C, 25°C and 20°C treatments at the close of the experiment. However, germination was fastest at 20°C where all the embryo-containing omnels germinated within 4 weeks compared to the 7 and 13 weeks that was required by the 25°C and 35°C/25°C treatments respectively.

Growth rate

The mean growth rates of the 15 plants for the 5 years

(1991 to 1996) varied between 49 and 56 mm per year with an overall average growth rate of 52 mm per year. This figure agrees well with the results obtained by Vogel *et al.* (1995). From radiocarbon dating, they concluded that the average growth rate of a 7 m *E. transvenosus* individual at the Modjadji Nature Reserve was 55 mm per year. Similar work on an *E. transvenosus* individual from the gardens of the University of Pretoria, where growing conditions are probably more favourable than at the Modjadji Nature Reserve, gave an average growth rate of 75 mm per year.

GENERAL

During the 10 year experimental period five of the labelled *E. transvenosus* plants died. They all had stems longer than 4 m and they did not have well-developed suckers. The main stem of a further 22 plants were badly damaged during the experimental period. Due to an abundance of suckers, these plants did, however, all survive.

ACKNOWLEDGEMENTS

The Foundation for Research Development, the former Lebowa Nature Conservation Department and the Cycad Society of South Africa are thanked for financial assistance.

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SHORT COMMUNICATIONS / KORT MEDEDELINGS

CHOOSING A CYCAD

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Received 22 May 1997

I get so many telephone calls from people wanting to know the monetary value of cycads. Invariably I have to tell the caller that it is a matter of how fervently someone desires a particular plant. Almost invariably my callers are only interested in the monetary value of a plant of a certain size, but they seldom pause to think how the plant will subsequently perform.

We all want large plants, so that our gardens can look as if the plants have been growing there for a hundred years. The reason for the popularity of large plants is probably the same as that for other antiques. But is a large plant really better than one with a short stem? One should keep in mind that no plant can keep growing in length, simply because the distance between the roots and the growing tip becomes so large that it becomes uneconomical to transport nutrients between these two points. Were it not for this factor, one would have cycads with kilometer-long stems, even if these were reclining because of their weight-strength ratio. Large plants tend to be less vigorous than younger plants, producing leaves and cones far less frequently. For probably the same reason, large plants do not transplant as readily as small ones, so that there is a proportionally higher risk in losing a large plant than a small plant when transplanting. Lastly, the larger plants are the oldest; and though few people are prepared to admit this, a large plant has a much shorter future than a small one. About the only real advantage of a large over a small plant is that it is useful in landscaping. A small

plant completely occupies the area covered by its leaf spread, whereas a long-stemmed plant allows one to grow something else under its canopy and perhaps some epiphytes on its stem if one is so inclined. In addition landscaping on a flat plot is much easier when the plants are of different lengths than when they are all the same size.

Too often the size of the trunk is the only criterion taken into account when setting a price on a plant. However, there is a vast difference between a bare stem of uncertain history, a plant growing somewhere where one will have to remove or damage roots and leaves when moving the plant, and a plant with leaves and a strong root system growing in a pot. Who knows how a rootless trunk have been bashed about since it was dug out in the middle of nowhere, transported goodness knows how, stored in the sun in a heap, and kept out of the ground until an interested buyer came along? Rootless plants take a long time before they are themselves again, and even smallish plants can easily take ten years before they are perfect again, except arguably under more favourable climatic conditions than experienced by most of us..

The recent history of a plant should also be taken into account. There are a considerable number of large and otherwise desirable plants around, which are literally in circulation. These are plants which are sold at auctions at exhorbitant prices, or parts of collections which are bought and sold as "investments". A lot of these plants get re-sold and moved every few years. The problem is that each time they are moved, at least part of the root system and foliage is lost, and often the plants are sold again before they have regrown the missing parts. Such plants look good, but are in fact sorely weakened, eventually to such an extent that they succumb to diseases, eelworms, burrowing beetles, or stress. So often these factors are exacerbated by the plant being large and in reality past its prime.

What then is safe to buy? The obvious choice is to grow one's plants from seed. Seedlings are not slow at all, and most species will have produced their first cones at an age of twelve years. The drawback is that not all seedlings in a batch are equally vigorous with some refusing to put on growth, so that one has to keep several in order to pick out the best ones, which translates into a lot of space in the end. A less cheap, but not really prohibitively expensive, way is to buy larger seedlings which have already proved their vigour, from other growers. This is also a good way to save time and sidestep the first few years of agonizingly slow growth, but is far less fun. Finally, if one is already past one's best years but has made one's fortune, one can look out for large specimens, well rooted, in containers. Often these would be seedlings which were repeatedly transplanted into ever larger pots without damage to roots or leaves until the owner got tired or frightened of them, and provide a good way of creating an instantaneous mature cycad garden.

A last pitfall, which sometimes cannot be avoided, is that plants which should be fully exposed to the elements are sometimes grown in at least some degree of shade because under such conditions the leaves appear to be larger and lusher. Leaves which developed under shade conditions ***never*** get used to direct sunlight. When moved to a sunny location, those leaves get burnt and the plant only regains its looks after producing new leaves. However, a plant usually only starts looking good after having produced about three sets of leaves, so it may be a long time before such a plant is no longer an eyesore.

Whatever one decides, it is my considered opinion that one should avoid the removal of roots and foliage like the plague, unless one is very young, or very rich with scant regard for the plant. A healthy plant with a strong intact root system and a dense crown of leaves, is any day to be preferred to a bare stem, whatever its size.

GROWTH OF CYCAD FEMALE CONES AND THEIR OMNULES AFTER THE CONES HAVE BECOME RECEPTIVE TO POLLINATION - an abbreviated version of a paper delivered to the 4th International Conference on Cycad Biology

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Received 30 June 1997

INTRODUCTION

Although no time-course studies appear to have been carried out on the growth of the corruptules (unfertilized ovules which superficially resemble seeds) (Grobbelaar 1995), seeds (fertilized ovules) or female cones of cycads after the cones have become receptive to pollination, several aspects about it appear to be common

knowledge. So, for instance, it is generally assumed that the seeds as well as the female cones of all the cycad genera except *Encephalartos*, enlarge considerably after the cones have been pollinated. In the case of the genus *Encephalartos*, it is generally thought that the corruptules, seeds and female cones do not enlarge significantly after the female cone has become receptive to pollination.

From work reported on here, it is, however, clear that the corruptules, seeds and female cones of at least one *Encephalartos* species, namely *E. inopinus* do in fact enlarge significantly after the female cone has become receptive to pollination. Although the same may be true for a few other *Encephalartos* species, it is not typical for the genus.

MATERIAL AND METHODS

From December 1994 the solitary female cone of an *E. inopinus* growing in a Pretoria garden was closely monitored. When its sterile apical scales separated slightly during February 1995, it was considered to be receptive to pollination and was duly pollinated by blowing fresh dry *E. inopinus* pollen into the cone through the slits between the apical scales. The cone was measured and two adjacent scales with their attached ovules were carefully excised from the central part of the cone. The ovules, of which the "sclerotestas" were still soft, were measured and the cavity in the cone was filled with paper towels.

The cone was thereafter measured at monthly intervals. When it began to disintegrate spontaneously in May of the same year, the scales from the middle third of the cone were removed for the measurement of their omnules (true seeds and corruptules) (Grobbelaar 1995). The omnules were divided into two clear groups, viz (i) relatively large olive brown omnules with hard sclerotestas of which 80% were true seeds and 20% corruptules, and (ii) smaller whitish corruptules with soft sclerotestas. Representative samples of both groups were measured. During the same season, a similar experiment was conducted on two *E. lehmannii* female cones whilst only cone measurements were taken of a female *E. ferox* cone.

RESULTS AND DISCUSSION

For *E. inopinus* the diameter and length of the female cone increased by 31% and 33% respectively after pollination. The corresponding figures for the *E. lehmannii* cones were 6% and 1% and for the *E. ferox* cone 6% and 2% respectively.

The length and width of the *E. inopinus* omnules with hard sclerotestas increased by 86% and 94% respectively after pollination. Those with soft sclerotestas increased by 46% and 65% respectively. By contrast, the length and width of the *E. lehmannii* omnules, which were all of about the same size and colour and consisted for 90% of true seeds, increased by less than 1% and 7% respectively after pollination.

It is clear that the female cones, ovules and seeds of *E. inopinus*, unlike those of most *Encephalartos* species, enlarge considerably after pollination. From earlier observations on *E. inopinus*, the relatively slight post pollination growth of the omnules with soft sclerotestas is probably independent of whether the cone is pollinated or not. The additional growth of the omnules that developed hard sclerotestas does, however, appear to be dependent on a stimulation that is derived from the pollen irrespective of whether successful embryo development was achieved or not.

REFERENCE

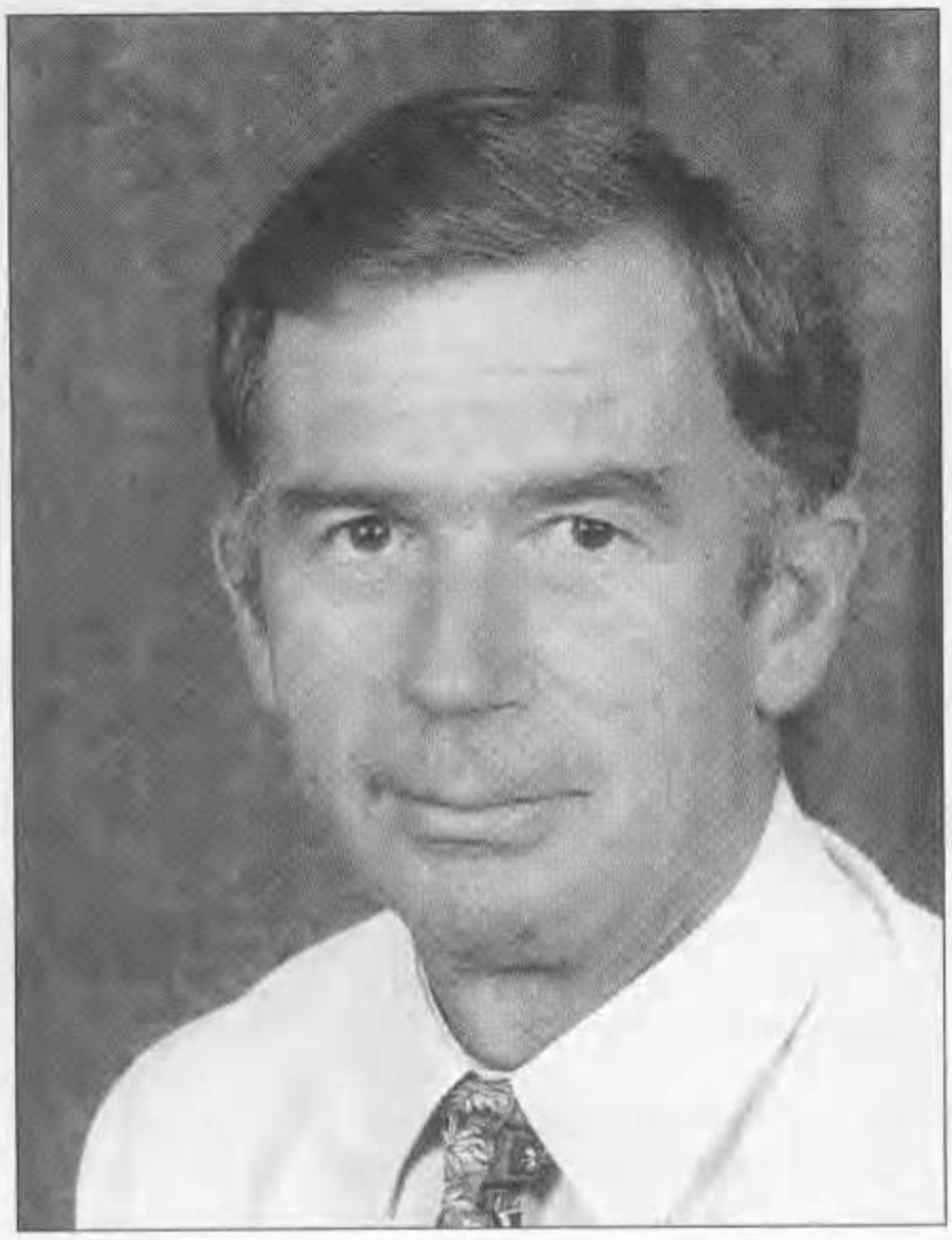
GROBBELAAR, N. 1995. Cycads: their corruptules, omnules and omnels. *Encephalartos* 41: 36–37.

MEET OUR NEW PRESIDENT / ONTMOET ONS NUWE PRESIDENT

Hannes Robbertse
167 Astrid Street, 0184 Meyerspark, Pretoria

Prof. Frederick Johannes de Jager was born on 20 September 1943 in the garden city George. He matriculated at Villiersdorp and studied law at Stellenbosch. He did his LLM at the University of South Africa and obtained his LLD from the Rand Afrikaans University where he started his career in 1969 in the Faculty of Law. In 1978 he became Professor in Criminal Law and Procedures and became Dean of Student Affairs in 1995. He is married to Julie and they have four daughters.

His own words about his interest in cycads read as



follows: "My interest in cycads is a mere three and a half years. In cycad terms I am but a "seedling". My first real acquaintance with cycads was in the garden of my colleague, Prof. Piet Nieuwenhuizen. I could not understand why, on every possible spot in his garden he had planted a cycad. He explained that he loved cycads and that he and his cycads were in continuous conversation. The next day I started wondering, later I started reading and still later, in retrospect, I realized that it was love at first sight. That what started as a mere disorder has now developed in a terminal disease. Together with the cycads came the people: the cycad collectors and fanatics, the scientists and the traders. I can actually write more about these people and their special qualities than on the cycads that brought us together. Conclusion: If cycads can bring together such wonderful people, there must, most definitely, be something noble in these fascinating plants".

Prof. Frederick Johannes de Jager is op 20 September 1943 in die tuindorp George gebore. Hy matrikuleer op Villiersdorp en studeer in die regte aan die Universiteit van Stellenbosch. Hy behaal sy LLM-graad aan die Universiteit van Suid-Afrika en sy LLD-graad aan die Randse Afrikaanse Universiteit. Vanaf 1969 is hy verbonde aan die Fakulteit Regsgeleerdheid, Randse Afrikaanse Universiteit en word in 1978 bevorder tot professor vir Straf- en Strafprosesreg. Vanaf 1995 tot op hede is hy Studentedekaan aan dieselfde Universiteit. Hy is getroud met Juie en het vier dogters.

In sy eie woorde lees sy belangstelling in broodbome soos volg: "My broodboom-belangstelling is 'n skamele drie en 'n half jaar oud. In broodboomterme is ek dus niks meer as 'n saailing nie. My eerste werklike kennismaking met broodbome was in die tuin van my kollega, prof. Piet Nieuwenhuizen. Ek kon eintlik nie verstaan waarom hy op elke moontlike plek in sy tuin 'n broodboom geplant het nie. Hy het verduidelik dat hy lief is vir hulle en dat hy en sy broodbome in voortdurende gesprek met mekaar verkeer. Die volgende dag het ek begin wonder, later oor hulle begin lees en nog later terugskouend besef dat dit 'n geval van liefde met die eerste oogopslag was. En wat aanvanklik niks meer as 'n geringe afwyking was nie het intussen in 'n terminale siekte ontwikkel. Saam met die broodbome het die mense gekom: die ander broodboom-versamelaars en fanatici. Oor hulle en al hulle goeie eienskappe kan ek eintlik meer skryf as die broodbome wat ons bymekaar gebring het. Gevolgtrekking: As broodbome sulke wonderlike mense aantrek, moet daar seer sekerlik in die fassinerende plante ook iets edels wees".

NUUS OOR DIE TRANSVAALSE STREEKTAK VAN DIE VERENIGING (NEWS: TRANSVAAL REGIONAL BRANCH)

Hanneke Grobbelaar
Posbus 15357, 0039 Lynn-oos

Ontvang 30 September 1997

Saterdag 7 Februarie 1998: Uitstappie na *Encephalartos humilis* lokaliteit.

Saturday 7 February 1998: Excursion to an *Encephalartos humilis* locality.

Ons vergader om 09h00 op die N4 by die afdraaipunt na Waterval-boven (tussen Machadodorp en die tonnel op pad na Nelspruit). Die staproete is heel gemaklik en daar is talle *E. humilis*-plante te sien. Koste is R20.00 per persoon vir dagbesoekers. Stel Hanneke **asseblief voor 31 Januarie 1998** by telefoon (012) 808 0995 in kennis as u die uitstappie wil meemaak.

Saterdag 2 Mei 1998 om 14h00 in die hoofgebou van die Nasionale Botaniese Instituut, Pretoria: Lesing deur **Dr John Donaldson** Hoof van die Navorsingsprogram vir Bewaringsbiologie te Kirstenbosch Botaniese Tuin oor: **Life in slow lane: The biology of cycad populations.**

We meet at 09h00 on the N4 at the branch off to Waterval Boven (between Machadodorp and the tunnel on the road to Nelspruit). The hiking route is easy and many *E. humilis* plants are to be seen. Charges for daily visitors R20.00 per person. Please inform Hanneke **before 31 January 1998** at telephone (012) 808 0995 if you intend to take part in the excursion.

Saturday 2 May 1998 at 14h00 in the main building of the National Botanical Institute, Pretoria: Lecture by **Dr. John Donaldson**, Head of the Conservation Biology Research Programme at Kirstenbosch National Botanic Garden on:
Life in slow lane: The biology of cycad populations.

Verslae oor onlangse aktiwiteite

Op 6 September 1997 het **mnr John Baker**, Hoofnatuurbewaarder van die Gautengse afdeling Natuurbewaring, ons toegespreek oor die:

NUWE TUSSENTYDSE REËLINGS VIR HANDELINGE MET SPESIAAL-BESKERMDE PLANTE BINNE DIE PROVINSIE VAN GAUTENG

Hy het ons meegedeel dat, in afwagting op deregulering en nuwe flora wetgewing vir die Gauteng Provinsie, die Hoof, Natuurbewaring besluit het dat daar voortaan nie meer permitte uitgereik gaan word vir die besit, verkoop, koop, skenk of ontvangs as geskenk, van spesiaal-beskermde plante (soos broodbome) binne die Provinsie van Gauteng nie. Die verkoop van broodbome op openbare veilings kan ook sonder die toestemming van die Direktoraat van Natuurbewaring binne die Gauteng Provinsie plaasvind.

Persone wat spesiaal-beskermde plant(e) verkoop of skenk, moet wettiglik in besit van die plant(e) wees, en 'n skenkingsbrief aan die ontvanger daarvan oorhandig wat die volgende inligting bevat:

(a) die naam en fisiese adres van die verkoper of skenker;
(b) die nommer van die permit waarop die plant was (indien van toepassing);
(c) die naam en die fisiese adres van die koper of ontvanger;
(d) besonderhede van die soort en hoeveelheid plante wat verkoop of geskenk word;
(e) die datum van die lewering van die plant(e); en
(f) die handtekening van die verkoper of skenker.

U word aangeraai om bogenoemde skenkingsbrief veilig te bewaar as bewys van die wettige besit van die plant(e).

Permitte word steeds benodig vir die versameling van broodbome of hul saad in die veld asook vir die vervoer van broodbome oor die Gauteng Provinsie se grense.

Reports on recent activities

On 6 September 1997 **Mr. John Baker**, Chief Nature Conservation Officer of the Gauteng Division of Nature Conservation, addressed us on:

NEW INTERIM REGULATIONS ON PROCEEDINGS REGARDING SPECIALLY PROTECTED PLANTS WITHIN THE GAUTENG PROVINCE

He told us that, pending the deregulation and new flora legislation for the Gauteng Province, the Head, Nature Conservation, has decided that permits will no longer be issued for possession, selling, buying, donation or receipt of specially protected plants (e.g., cycads) within the Gauteng Province. The sale of cycads on public auctions within the Gauteng Province may also take place without the consent of the Directorate of Nature Conservation.

A person selling or donating a specially protected plant(s) must be in legal possession of the plant(s), and has to provide the new owner with a letter of donation containing the following information:

(a) name and physical address of the seller or donor;
(b) the number of his/her permit on which the plant was registered (if applicable);
(c) the name and physical address of the buyer or recipient;
(d) particulars of the species and number of plants sold or donated;
(e) the date of delivery of the plant(s), and
(f) the signature of the seller or donor.

You are advised to keep the above-mentioned letter of donation in a safe place as proof of your legal ownership of the plant(s).

Permits are still needed to collect cycads or cycad seed in the wild, as well as for the export/import of cycads from/to the Gauteng Province. Such permits would be

Sodanige permitte word oorweeg op skriftelike aansoek aan die:

Direktoraat van Natuurbewaring (Vir aandag van mnr J. Baker)
Privaatsak X209
0001 Pretoria

Mnr Baker se amptelike faksnommer is (012) 303 3525
amptelike telefoonnommer is (012) 303 3433
amptelike selfoonnommer is 082 891 1733

considered on application in writing to the:

Directorate of Nature Conservation (For Attention Mr. J. Baker)
Private Bag X209
0001 Pretoria.

Mr. Baker's official fax number is (012) 303 3525
official telephone number is (012) 303 3433
official cellular phone number is 082 891 1733.

Kontakpersone vir natuurbewaringspermitte in die verskillende provinsies van die Republiek van Suid-Afrika is soos volg:
(Contacts for nature conservation permits in the various provinces of the Republic of South Africa are as follows:)

Gauteng: Mev/Mrs Lorraine van Heerden
(012) 303 3000

Kwazulu-Natal: Mev/Mrs Sharon Hughes
(0331) 47 1961

Mpumalanga: Mnr/Mr Jan Muller
(013) 759 4141

Noordelike Provinsie/Northern Province:
Mnr/Mr Deon von Wielligh
(0152) 295 9300

Noordkaap/Northern Cape:
Mej/Miss Synja Kenny
(0531) 822 143

Noordwes/North West:
Mnr/Mr Deon Swart
(0148) 297 7429

Ooskaap/Eastern Cape:
Mnr/Mr Jaap Pienaar
(0531) 22 143

Vrystaat/Free State:
Mnr/Mr Willem Jansen
(051) 447 0407

Weskaap/Western Cape:
pos vakant/situation vacant
(021) 483 4098

LETTERS TO THE EDITOR AND SECRETARY / BRIEWE AAN DIE REDAKTEUR EN SEKRETARIS

Geagte Redaktrise

GRONDMENGSEL VIR BROODBOME IN POTTE

Al my broodbome is vanaf saailinge in groot potte geplant. Ek het nou 'n *Encephalartos villosus* wat na 22 jaar 'n vroulike keël dra. Die mengsel wat ek gebruik om my broodbome in potte te plant is een deel grond, twee dele baie growwe gewaste riviersand, twee dele kompos en 'n handvol superfosfaat. Ek gee ook elke plant elke twee maande twee eetlepels beenmeel. In die droë tyd gee ek vir hulle twee keer per maand water.

Ek dink dit is 'n goeie idee van mnr P.J.C. Kuun om 'n ruilhoekie in ENCEPHALARTOS te skep want almal kan nie die hoë pryse vir broodbome betaal nie. Baie dankie vir die groot werk wat u verrig om die tydskrif te laat verskyn.

Dirk Crous, 32 ste Laan 940, 0186 Villieria, Pretoria.

Ontvang 11 Julie 1997

Summary

SOILMIXTURE FOR CYCADS IN CONTAINERS

The writer has grown all his cycads as from seedling

stage in large pots. His *Encephalartos villosus* recently produced a female cone after 22 years. He recommends the following growing medium: one part soil, two parts coarse washed river sand, two parts compost and a handfull of superphosphate fertilizer. In addition two tablespoons of bone meal are added to each plant every two months. During dry periods the plants are watered twice monthly.

In his opinion a column for the bartering of cycads, as suggested by Mr P.J.C. Kuun in a previous issue of the journal, is a good idea as not everybody can afford the exorbitant prices.

. . . . . .

Geagte Redaktrise

VRUGBARE PLANTE

Ingesluit vind u twee foto's van broodbome wat in die tuin van vriend van my en medelid van die Broodboom Vereniging, mnr P.M.S.J. Erasmus, groei.

Figuur 1 Die manlike *Encephalartos transvenosus*-plant in 'n tuin in Pretoria. / Figure 1 The male *Encephalartos transvenosus* specimen in a Pretoria garden.

Die manlike *Encephalartos transvenosus* (Figuur 1) is 35 jaar oud en het die volgende afmetings: stamlengte 1,5 m, stamomtrek 2,4 m, lengte van blare 1,9 m. Die plant het soos volg gekeël: 1994 - 5 keëls, 1995 - 8 keëls, 1996 - 14 keëls, en 1997 - 5 keëls.

Die tweede foto (Figuur 2) is van 'n vroulike *E. munchii* met vier keëls.

Figuur 2 Die vroulike *Encephalartos munchii*-plant in dieselfde tuin. / Figure 2 The female *Encephalartos munchii* specimen in the same garden.

Dirk Crous, 32 ste Laan 940, 0186 Villieria, Pretoria.

Ontvang 11 Julie 1997

Summary

FERTILE PLANTS

The writer contributed two photographs of cycads growing in the garden of a friend and fellow member of

the Cycad Society, Mr P.M.S.J. Erasmus.

The male *Encephalartos transvenosus* (Figure 1) is 35 years old, the stem is 1.5 m high with a girth of 2.4 m, and the leaves are 1.9 m long. This plant coned as follows: 1994 - 5 cones, 1995 - 8 cones, 1996 - 14 cones, and 1997 - 5 cones.

The second photograph (Figure 2) shows a female *E. munchii* with four cones.

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Geagte Redaktrise

VERMINDERING VAN LEDETAL

In *Encephalartos* **50**: 3 is die kommer uitgespreek oor die probleem dat daar lede is wat nie ledegeld betaal nie. Dit veroorsaak dat sulke lede nie meer as lede beskou kan word nie en dat die Vereniging dus sulke lede verloor. Dit wil voorkom asof dit werklik 'n probleem gaan word wat die Vereniging gaan benadeel.

Die rede vir die vermindering van lede is dat sommige lede die tydskrif bloot vervelig vind en nie meer langer wil lid wees nie. Een van die klagtes handel oor lede wat voel dat *Encephalartos* te wetenskaplik is en dat hulle eerder artikels vir die "leek" sou verkies. Die meeste artikels word deur kenners geskryf wat goeie agtergrond het en dit is soms sulke artikels wat as "droog" beskou word. Tog sal die lede wat dan daaroor gekla het nie self 'n poging aanwend om die tydskrif te verbeter nie. Dit is opmerklik om te sien dat dit maar altyd dieselfde lede is wat die tydskrif ondersteun. Baie lede mag nou as verskoning opbring dat hulle nie die agtergrond het om artikels te skryf nie, maar as artikels vir die "leek" versoek word is dit mos nie nodig om 'n kenner te wees nie.

Die president moes ook al vele kere vra dat lede die tydskrif moet ondersteun, maar dit wil voorkom dat lede eenvoudig nie gehoor gee nie. As elke lid net een keer per jaar 'n eenvoudige bydrae instuur sal die ledetal moontlik groei en die tydskrif meer waardeer word. *Encephalartos* word verbeter deur elke lid se bydrae en ek glo dat alle bydrae waardeer sal word. Dit verbaas my dat daar so baie lede is, maar die ondersteuning so swak is. Wat egter ontstellend is, is dat daar 'n menigte lede is met baie groot versamelings en werklik interessante plante het, maar mens hoor eenvoudig nooit van hulle nie. Dan is daar ook baie lede wat gereeld uitstappies onderneem en dan maar liewer alles opkrop en nie 'n woord vertel nie. Dit is gewoonlik die eenvoudige artikels wat die meeste aandag trek.

As die houding van baie lede gaan bly soos dit is kan dit die agteruitgang van die Vereniging veroorsaak. Dan bestaan die Vereniging eintlik net om homself te vernietig.

***Erik Rouwenhorst**, Posbus 620, 2940 Newcastle.*

Ontvang 17 Julie 1997

[Ek stem saam met Erik en wil lede aanmoedig om bydraes te lewer. 'n Mens kan nie aanvaar dat die gereelde bydraers oor 'n onuitputlike bron van inligting beskik om oor en oor artikels te skryf nie. Verder wil ek 'n klip in die bos gooi en beweer dat baie lede nie eers die tydskrif lees nie. - **Redaktrise.**]

Summary

DECLINE OF MEMBERSHIP

In "*Encephalartos*" **50**: 3 the president stated that many members did not renew their membership and can no longer be regarded as members until they are fully paid up. In Erik's opinion this will become a problem to the disadvantage of the Society.

He thinks the decline in membership is because some members find the journal to be boring and therefore are no longer interested to be members. One of the complaints is that the journal is too scientific and that they would rather prefer articles for the lay person. Most of the articles are written by authorities with the necessary background on the subject and some of these contributions are regarded as "dull". However, members complaining about this do not themselves make an effort to improve the journal. It is remarkable to note that only the same few members support the journal regularly. As an excuse many members may say that they do not have the necessary background to write articles, but when articles for the "layman" are requested it is not necessary to be an authority on the subject.

More than once the president called on members to support the journal with letters and articles, but it seems that members just don't heed his request. If every member submits just one popular contribution every year it could possibly lead to an increase in the membership number and appreciation of the journal. Erik believes that the journal is improved by each member's contribution and that all contributions would be appreciated. He is surprised that notwithstanding the large number of members the journal is poorly supported. Even more distressing is that many members own large cycad collections and really interesting plants, but no one ever hears from them. Furthermore many members undertake excursions on a regular basis and keep all the interesting information gained to themselves. It is usually the more simple contributions

that attract attention.

Erik is of the opinion that if the attitude of many members remains as it is at present, it could cause the decline of the Society. Then the Society only exists to destroy itself.

[I agree with Erik and request members to support the journal with contributions. One cannot assume that our regular contributors have at their disposal inexhaustible sources of information to write about repeatedly. Furthermore, I would like to allege that many members do not even read the journal. - **Editor.**]

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Dear Editor

THANK YOU FOR THE ENGLISH SUMMARIES OF THE FEATURES IN AFRIKAANS IN "*ENCEPHALARTOS*" NO. 50

I thought I would drop you a line to congratulate you on the latest issue of "*Encephalartos*" and more specifically for the English summaries of the features in Afrikaans.

I have all the issues of the journal, and though I wouldn't expect you to remeber, did say hello when I attended the wonderful CYCAD 93.

It seemed that recently there were more articles appearing in Afrikaans which was frustrating as they "looked" interesting. It is perplexing to see the names of cycads in a text you can't follow! You can imagine how good it was then to see the summaries appearing for such articles in the current issue ..... well done and a big thank you.

The "Focus on ... " feature by my friend Willie Tang was also first class and showed he has a great knowledge of the subject chosen. Written in clearly understood English for the layperson and FULL of useful information, it was a pleasure to read.

As I guess people are quick to complain to you, I wanted to redress the balance and thank all those involved in implementing the change and translations. It will keep the journal as the top, regular, cycad publication in the world.

Thank you again.

Tony King, 34 Keats Avenue, Romford, Essex RM3 7AR, United Kingdom.

Received 7 August 1997

. . . . . .

Dear Membership Secretary

MANY ARTICLES WRITTEN IN AFRIKAANS REASON WHY MEMBERS DO NOT RENEW THEIR MEMBERSHIP

Please note your Foreign Members List that my address is as stated in this letter. The magazine has been coming to that address for a considerable time.

It would be appreciated if you could pass on my annoyance at the increasing number of articles written in African.

In magazine 50 the president states that unfortunately members come and go at a tremendous rate.

I am certain that a major reason is that a lot of your subscribers cannot read African and eventually decide not to pay for a magazine they cannot read.

I have read numerous times of other complaints on this issue which have been totally disregarded.

I believe for the Cycad Society of South Africa to survive or even prosper it must inform the multitude of world cycad enthusiasts in a universally used language, i.e. English.

I am certain if you continue to include more and more articles written in African more and more members will simply not renew membership.

Please pass on my concerns to the president and the editor.

P.L. Dumont, P.O. Box 862, Campbelltown, 2560, Australia.

Received by editor 12 August 1997

[Sir,
In the June 1996 issue of "*Encephalartos*" (No. 46) the president called on members to support the journal with letters and articles. Some members, mostly Afrikaans-speaking, complied with the request. As a mouthpiece of the Cycad Society of South Africa "*Encephalartos*" is sensitive to the needs of especially the South African members of the Society of whom no fewer than about 67% (48% of all members) are Afrikaans-speaking. We often get complaints from our Afrikaans members about the paucity of Afrikaans material in "*Encephalartos*". From its inception the magazine was bilingual (and will continue to be so). We value our foreign members very highly and to accomodate them we have recently started to provide extensive English summaries of the relatively few Afrikaans contributions that we receive for publication. We trust that this will satisfy virtually all our readers. It is, therefore, a pity that your annoyance

so clouded your mind that you failed to see in "*Encephalartos*" No. 50 that each Afrikaans feature was followed by a summary in English. - **Editor.**]

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Geagte Lidmaatskap Sekretaris

BAIE DANKIE VIR VYFTIGSTE UITGAWE VAN "*ENCEPHALARTOS*"

Ek het pas verlede week die Junie 1997, vyftigste uitgawe, van "*Encephalartos*" ontvang en bewonder die toegewyde aandag wat die entoesiaste aan hierdie saak gewy het.

Baie dankie aan almal betrokke.

Trebot Barry, Pieter Bouwerstr. 35, 0084 Riviera, Pretoria.

Ontvang deur redaktrise 12 Augustus 1997

Summary

THANK YOU FOR "*ENCEPHALARTOS*" NO. 50

The writer has just recently received his copy of "*Encephalartos*" No. 50 and he admires the dedication that enthusiasts devoted to this task. He thanks all persons concerned.

CONSTITUTION / GRONDWET

Of the 55 members who voted on the proposed amendment of Clause 5.1.2 of the Constitution, 55 members (100%) voted in favour of the amendment. The proposed amendment has, therefore, been duly approved. The duties of the Secretary-Treasurer and Back Copies Officer may, therefore, be combined.

The whole Clause 5.1.2 should now read as follows: **The duties of the President may be combined with that of the Secretary or the Treasurer. The duties of the Secretary-Treasurer may also be combined with that of the Back Copies Officer.**

Hannes Robbertse
President.

Van die 55 lede wat aan die stemming oor die voorgestelde wysiging van Klousule 5.1.2 van die Grondwet deelgeneem het, het al 55 (100%) ten gunste van die wysiging gestem. Die voorgestelde wysiging is dus na behore goedgekeur. Die pligte van die Sekretaris-Tesourier kan ook nou met die van die Beampte vir vorige uitgawes gekombineer word.

Die hele Klousule 5.1.2 behoort nou soos volg te lees: **Die pligte van die President mag met dié van die Sekretaris of Tesourier gekombineer word. Die pligte van die Sekretaris-Tesourier kan ook met dié van die beampte vir vorige uitgawes gekombineer word.**

Hannes Robbertse
President.

NEW CYCAD PUBLICATIONS

HILL, K.D. 1996. **Cycads in the Pacific.** In: Keast, A. and Miller, S.E. (Editors) The origin and evolution of Pacific Island biotas, New Guinea to eastern Polynesia: Patterns and processes. Academic Publ., Amsterdam. ISBN 90-5103-136-X. pp. 267–274.

[Cycads are an ancient and taxonomically isolated group with low dispersal potential and largely relictual distributions. Both Pangean and Gondwanan disjunctions are evident in present-day distributions. Extensive middle and late Tertiary speciation has occurred in Australia and a Gondwanan genus (*Macrozamia*) and a Laurasian genus (*Cycas*). All modern distributions are associated with ancient continental crustal fragments except for *Cycas* subsection *Rumphiae*, which has gained characters facilitating long distance dispersal by water, and has dispersed widely through the western Pacific region in relatively recent (Tertiary) times.]

Author's address: Natl. Herb. of New South Wales, Mrs Macquaries Rd., N.S.W. 2000, Australia.

HU, J-H., HUANG, J-Y. & WANG, C-S. 1997. **Identification of ovule-enriched-specific proteins in *Cycas taiwaniana* using two-dimensional electrophoresis and blotting.** *Botanical Bulletin of Academia Sinica (Taipei)* 38(2): 109–114.

[Two-dimensional polyacrylamide gel electrophoresis, coupled with silver staining, was used to identify five polypeptides that are abundant in, and three that are specific for the ovules of *Cycas taitungensis* (incorrectly labelled *C. taiwaniana* Carr. in the paper). All eight these proteins have acidic pI-values in the 4.8–6.4 range. Polyclonal antiserum to an ovule polypeptide (CTO-22) was prepared and affinity-purified to investigate the specificity of the protein. Immunoblot analyses of total protein from the vegetative organs and from organs of the strobili demonstrated that the CTO-22 polypeptide was ovule-specific. The amino terminal sequence of the CTO-22 protein exhibits no similarity with any known protein. This appears to be the first ovule-specific protein reported in gymnosperms.]

First author's address: Agric. Biotechnol. Lab. Natl. Chung Hsing Univ., Taichung, Taiwan.

KONDO, K., KOKUBUGATA, G. & HONDA, Y. 1996. **Marking and identification of certain chromosomes in wild chrysanthemums and cycads by fluorescence in situ hybridization using pTa71 rDNA probe.** *Journal of Applied Genetics* 37A (0): 24–26.

[Unfortunately a summary of the publication which is in English is not available. It was presented at the International Conference on Perspectives in Plant Genetics, Warsaw, Poland, Sept. 16–17, 1996.]

First author's address: Lab. Plant, Chromosome Gene Stock, Fac. Sci., Hiroshima Univ., 1-4-3 Kagamiyama, Higashi-Hiroshima City 739, Japan.

KVACEK, J. 1997. ***Microzamia gibba* (Reuss) Corda: A cycad ovulate cone from the Bohemian Cretaceous Basin, Czech Republic - micromorphology and a reinterpretation of its affinities.** *Review of Palaeobotany and Palynology* 96(1–2): 81–97.

[The ovulate cone *Microzamia gibba* (A.E. Reuss) Corda, from the Bohemian Cenomanian (Czech Republic, Central Europe) is described. The genus *Microzamia* Corda is newly amended and compared with the fossil genera *Beania* Carruthers, *Zamiostrobus* Endlicher and the extant genera *Zamia* L., *Chigua* Stevenson, *Macrozamia* Miquel, *Ceratozamia* Brongniart and *Encephalartos* Lehmann. The genus *Cycadeostrobus* Carruthers might be synonymous with *Microzamia*. The typification of *Microzamia gibba* is discussed resulting in the designation of a neotype. It is demonstrated that the stony layers of *Beania gracilis* and *M. gibba* have a similar anatomy. A reconstruction of the ovulate cone *M. gibba* is proposed, showing large cataphylls on the cone peduncle. The ovulate cones appear in association with the leaves *Jirusia jirusii* (Bayer) Domin.]

Author's address: Natl. Museum, Prague, Dep. Palaeontol., Vaclavske nam. 68, Prague, Czech Republic.

PAN, M., MABRY T.J., BEALE, J.M. & MAMIYA, B.M. 1997. **Nonprotein amino acids from *Cycas revoluta*.** *Phytochemistry* 45(3): 517–519.

[Two nonprotein amino acids, cycasindene and cycasthioamide, along with eight known nonprotein amino acids, were isolated from the seeds of *Cycas revoluta* Thunb. The structures of cycasindene and cycasthioamide were elucidated as 3-(3'-amino-indenyll-2')-alanine and N-(glycinyl-alaninyl-1-thio)-5-one-pipecolic acid by chemical and spectral methods.]

First author's address: Dep. Botany, The Univ. Texas at Austin, Austin, TX 78713, U.S.A.

ROWE, T. & ROWE, C. 1995. **Transplanting *Cycas ophiolitica*.** *Palms & Cycads* No 47: 15–19.

[Large specimens of *Cycas ophiolitica* were transplanted by trenching up to 1 m deep around the plants and removal of the plants with a large front end loader. Damaged roots were treated with a systemic fungicide (Fongarid). After 18 months the success rate was nine out of nine.]

First author's address: P.O. Box 445, Yeppoon 4703, Queensland, Australia.

TANG, W. 1995. **Pollination drops in female cycad cones.** *Palms & Cycads* No. 48: 20–22.

[Most cycad species have cones that produce fruity or sweet fragrances. Male cones do not produce nectar-like fluids. Micropyle droplets were observed in the female cones of six species at the time when the cones are receptive to pollination. The species concerned are *Ceratozamia robusta, Cycas rumphii, Dioon spinulosum, Encephalartos ferox, Macrozamia lucida* and *Zamia pumila* (Florida form). The droplets range from a sheen of moisture on the micropyle tip to hemispherical drops up to about 1 mm in diameter. The droplets were found within a specific period of the day: from the evening to late morning. The droplets contain 5–14% sugar and apparently some amino acids as well.]

Author's address: Fairchild Tropical Garden, 11935 Old Cutler Road, Miami, Florida 33156, U.S.A.

YANG, S-L. 1996. **Vietnam cycad and palm expedition.** *Palms & Cycads* No. 50: 10–19.

[*Cycas bellefonti* was located on limestone cliffs east of Hanoi, just off the coast from the port of Haiphong on the Cat Ba Islands. Near the town of Chi Ni, south of the area known as Tonkin, plants of what is believed to be *C. miquelii* was encountered on the southern face of a cliff. Farther south, in the neighbourhood of Nghia Dan, *C. siamensis* was found but no trace of *C. chevalieri*, which was reported from this area, could be

found. Near An Kne, 70 km from Quin Nhon on the Southern Central Highlands of Vietnam, specimens of *C. pectinata* var. *elongata* as well as *C. micholitzii* var. *micholitzii* were found. The latter species was also found further west towards Playcu. In the Ron Doc National Park near Buon Ma Thout City in Dac Lac Province, *C. siamensis* was observed growing under dry, rocky open forest. Farther south, near Nha Trang, a population of *C. pectinata* var. *elongata* was visited. In the Lam Dong Province another population of cycads, a form of *C. pectinata* was encountered. In the vicinity of Ca Na, the type locality of *C. pectinata* var. *elongata*, a population of this cycad still covers large areas of rocky open forest close to the sea. Farther south in Thuan Hai Province, a population of a dwarf, apparently undescribed *Cycas* was found in the sandy bush. It has a subterranean trunk with short leaves and very narrow female sporophylls. In the Cat Tien National Reserve along the Dong Nai River, 175 km north of Saigon (now officially called Ho Chi Minh City) a cycad was found which is closely related, if not identical to *C. macrocarpa* from the lowland rainforest of southern Thailand.]

Author's address: Fairchild Tropical Garden, 11935 Old Cutler Road, Miami, Florida 33156, U.S.A.

YELAMOS, T. & KANAAR, P. 1997. **Histeridae (Coleoptera) associated with cycads in South Africa, with taxonomic notes on Afrotropical Exosternini.** *African Entomology* 5(1): 149–154.

[*Pachycraerus chalybeus* (Fahraeus), *P. desidiosus* Marseul and *Diabletes fossistoma* (Marseul) are recorded from cones and stems of several species of *Encephalartos* Lehmann (Gymnospermae: Cycadales) from South Africa. *Pachycraerus spatiosus* Lewis, formerly a synonym of *P. cyanescens* Erichson, is proposed as a new synonym of *P. alluaudi* Marseul. The genus *Diabletes* Reichardt is transferred from the tribe Platysomatini to the tribe Exostemini, based on the structure of the antennal club. *Diabletes fossistoma* (Marseul) is redescribed. A key to the Afrotropical genera of Exosternini with S-shaped tarsal grooves on the protibiae is also provided.]

First author's address: Museu. Zool., Aspartat 593, 08080 Barcelona, Spain.

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

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