

1996 sub
due June

ISSN1311419

**ASSOCIATED SOCIETIES FOR GROWING AUSTRALIAN PLANTS STUDY GROUP
NEWSLETTER 70**

CYCAD, ZAMIAD and PALM STUDY GROUP - APRIL-MAY 1996

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Relevant facts of the Cycadales.....

By this time it is expected we all know that palms, no matter how similar to Cycads, being Angiosperm (enclosed seeds), can in no way have even a close relationship to Cycads, which are, of course, Gymnosperms (unenclosed seeds). The great seed ferns which first rose in the Devonian ages existed and dominated till the Permian age were unique among the early plants, having both spores as well as seeds, and are so closely allied to ferns that the botanical name given is Cycadafilicales. They played a large part in laying down the forests from which our present coal is derived. Just to even contemplate those days makes the mind boggle!

The age of ferns, as it was once known, was long before the era of the dinosaur, when life was crawling out of the seas, and giant horsetails grew alongside the pteridosperm vegetation. The mere fact that practically all parts of the present existing branches of the order Cycadales is named with fernlike nomenclature, and although the modern Cycadaceae are now dioceous, the linkage with their 300-million-year-ago cousins is apparent to most of us.

Among the Gymnosperms, a section of which is our study, the conifers make up a clearly related group. The remaining orders: the Cycadales, the Ginkgoales, and the Gnetales, are far less cohesive, and their classification continues to be a subject of controversy. This problem need not concern us here. All we need to know is that, although Gymnosperms have grown apart in their course of evolution, they are all branches of one and the same family tree; the particular plant class that concerns us being the Cycadopsida, the order being Cycadales, and the family Cycadaceae.

Just at this time to emphasise how close yet far apart the family is, in about 1900 botanists were completely surprised to find that the fertilisation mechanism of both *Cycas* and *Ginkgo* depends on motile spermatozoids. This does occur among the ferns, but was not thought to have survived in higher plants. The ovules within a megasporophyll of the Cycadales cannot develop until pollinated.

Before the ovules can begin the process, the scales of the cone move slightly and briefly apart. Pollen was once thought to be dispersed by the wind, but now we know there are several agencies to carry this out. Animals, weevils, other forms of insects - all play a part. Pollen in male form is produced in enormous amounts.

Thus while even the really large female cones rarely contain more than a few hundred ovules, a single male strobilus can produce up to 500 million pollen grains. The successful pollen grains reaching a female ovule are caught by a droplet of moisture (pollination drop) exuded from a special beak in the ovule, and sucked into the pollen chamber at the tip of the ovule. Here the pollen grains send out pollen tubes which enter the nucellus in the middle of the ovule and feed on its tissue during the coming weeks and months.

Meantime, a number of egg cells develop within the ovular tissue until they eventually come to be beneath the pollen chamber. Several cell divisions have taken place within the pollen tubes. They now release two ciliated spermatozoids with fluids which propel them toward the egg cells. Every one of these can be fertilised and develop into an embryo. However, only one embryo survives to become the seed with two cotyledons, rudimentary leaves and radicle.

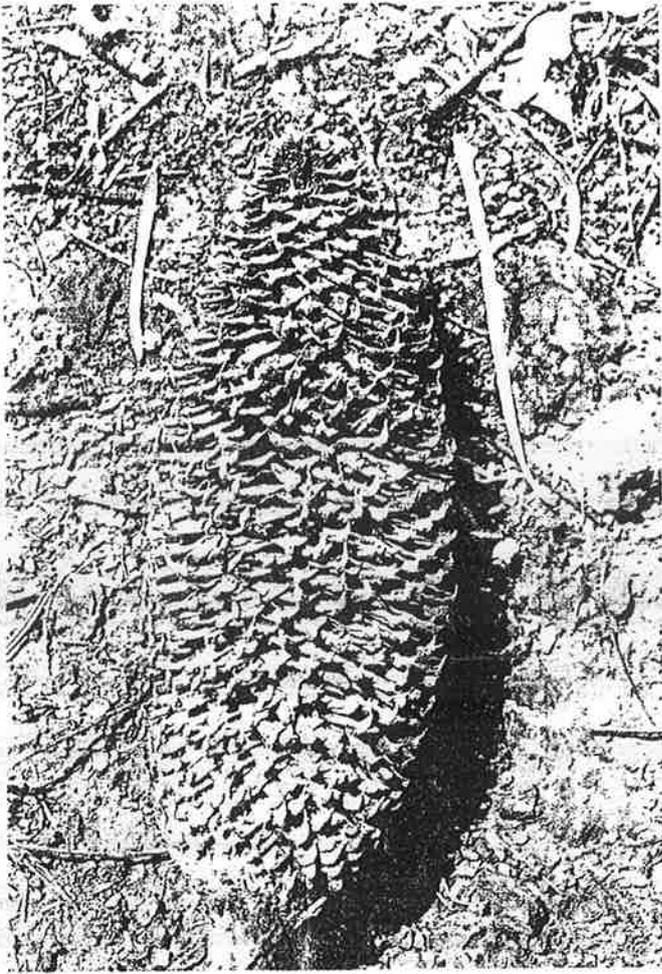
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CYCAS DESOLATA

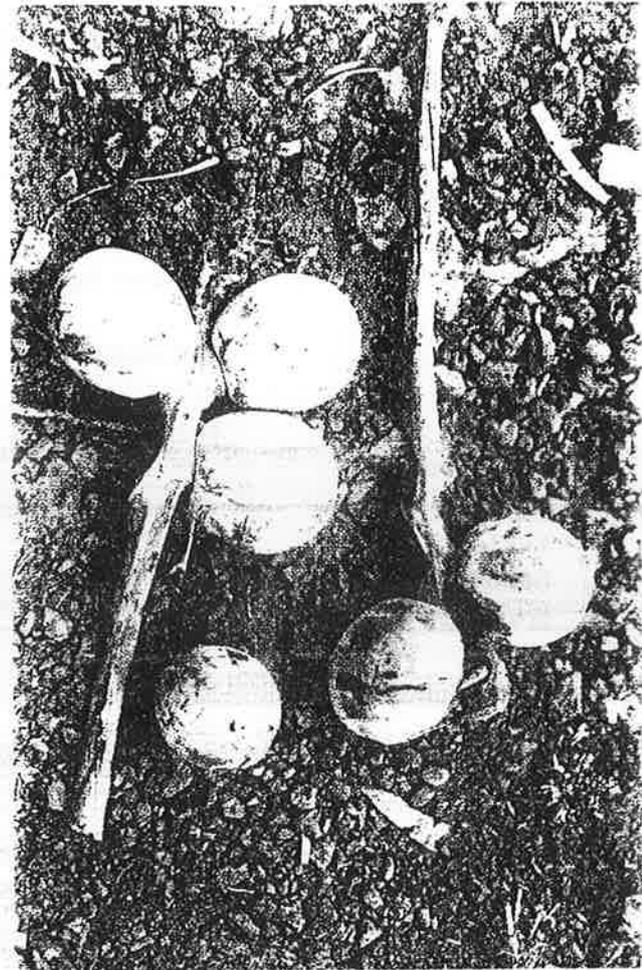
(PAUL FORSTER 1995)

This newly described *Cycas* is found in an area north-west of Charters Towers, and has clear affinity to both *C. cairnsiana* and *C. platyphylla* first mentioned in 1993 by R. Fensham of the Queensland Herbarium. As the record shows, it has clear differences from the other two, and so warranted investigation. Finally named *desolata*, for the desolate nature of its surrounds in habitat, Paul Forster quotes, it is unique in the Australian species of *Cycas* in respect to the blue foliage, fronds without basal spines on the petiole, leaflet margin recurved, leaflet margin renarrowing, proximally, leaflets straight and relatively long, and the small broadly triangular megasporophyll lamina.

C. desolata is a striking *Cycas* because of the blue coloration of the foliage and the large size of some individuals. One plant on location exceeded 7 metres in height.



Cycas desolata. Male Cone.



Cycas desolata. Megasporophylls



Cycas desolata habitat

Table 1. Comparison of morphological characters for *Cycas cairnsiana*, *C. desolata* and *C. platyphylla* (reproduced without change from Forster (1995)).

Character	<i>C. cairnsiana</i>	<i>C. desolata</i>	<i>C. platyphylla</i>
frond colour	glaucous light-blue	glaucous blue	glaucous blue becoming grey-green
cataphylls	lanceolate	linear-lanceolate	lanceolate
indumentum on cataphylls	base only	base only	all over
short teeth at base of frond petiole present (+) or absent (-)	+	-	+
pinnae number in frond	180-280	90-136	120-260
pinnae ± straight (+) or antrorse (-)	-	+	-
pinnae margins	recurved	recurved	+ flat
median pinnae angle (degrees) to rhachis	20° - 60°	30° - 50°	45° - 60°
median pinnae length x width (mm)	80-180 x 2.0-3.0	180-210 x 3.8-5.0	90-170 x 4.0-6.0
median pinnae base width (mm) (% of maximum width)	2.0-3.0 (80-100)	2.8-4 (70-80)	3.0-4.0 (65-85)
microsporophyll sterile zone length (mm)	12-15	8-12	7-10
microsporophyll apical spine length (mm)	6-9	3-4	6-9
megasporophyll lamina length x width (mm)	40-70 x 15 - 25	28-32 x 20-25	50-80 x 16-37
teeth development on megasporophyll lamina	poor	poor	strong
megasporophyll lamina spine length (mm)	15-20	5-15	20-25
seed dimensions length x width (mm)	36-42 x 30-37	35-39 x 32-35	30-40 x 27-38