

for the protection of *E. humilis*, one of the smallest species in the genus. The largest species, *E. transvenosus*, the Modjadji Cycad near Duiwelskloof shown on the frontispiece, has been protected by the Bantu Rain Queen and her people from prehistoric times, with the result that the forest of large trunks is a unique sight in the Republic today. The Ida Doyer Nature Reserve has been established near Barberton where *E. paucidentatus* is indigenous. *E. longifolius* is similarly protected by the Port Elizabeth municipality and a reserved area was proclaimed at Monteseel to include the type specimen of *E. natalensis*. No doubt further good examples could be cited and this should be sufficient encouragement for other public bodies and private persons to take similar steps to preserve local species in their natural surroundings.

The desirability of abiding strictly by measures of conservation for all our Cycads must be abundantly clear to everyone.

MISCELLANEOUS INFORMATION

TOXICITY (POISONOUS PROPERTIES)

There are many references to the edibility of the fleshy outer covering of the seeds of some species of *Encephalartos*. Baboons, monkeys, rodents and some birds (Louries) are said to be particularly fond of them. Louries swallow some seed whole. There is no doubt that the bright red and amber-coloured seeds are most attractive to look at. It is *not* advisable, however, for humans to sample them and children should certainly be warned not to do so. The flesh of some species is toxic and it is not possible for children to discriminate between the poisonous and non-poisonous flesh.

Tests have shown that almost invariably the inner white kernels are poisonous. Those actually proved poisonous include the following: *E. cycadifolius*, *E. friderici-guilielmi*, *E. horridus*, *E. lehmannii*, *E. longifolius*, *E. villosus* and *E. eugene-maraisii*. It is a virulent liver poison, the chemical formula of which has not been established. The species most likely to have been the cause of illness in General Smuts and some of his men, when on commando during the Anglo-Boer war and recounted by Reitz in his book 'On Commando' is *E. longifolius*.

On February 3rd, 1965, M. J. Wells reported the death from *Encephalartos* poisoning of cattle on Mr. G. Pohl's farm near Riebeeck-East (north-west of Grahamstown). Two died and the post mortem showed that the stomachs of the animals contained large quantities of the partially digested seed of *E. longifolius*.

In parts of Australia, species of *Macrozamia* have caused extensive mortality among sheep and cattle, the former through eating the seed and the latter through the grazing of leaves. It is apparent that the extent and density of the Cycad growth in Australia is far greater than is the case in South Africa. The question of eradication has received serious consideration there in contrast to the strict protective laws passed in the Republic.

EDIBILITY (Starch)

As mentioned, the fleshy covering of the seeds is always suspect for human consumption and eating any part of a kernel might prove fatal. On the other hand many species of Cycad in different parts of the world are exploited by the aborigines for the

starch content of the pith within the trunks. Early travellers in southern Africa (1772–1779) Thunberg, Masson, Swellengrebel, Paterson, refer to the use of the pith from the stems of *Encephalartos* species for making crude bread. This gave rise to the common names Hottentot- or Kaffir-bread (Kaffirbroodboom) or simply bread-tree (broodboom). One may assume from the reports that all species of the eastern Cape Province were used for this purpose. The method employed amounted in essence to the splitting open of the trunks and the removal of the pith. This was placed in an animal skin and buried in the ground for a period of a month or six weeks to induce it to ferment partially. The fibrous mass was then ground between stones and mixed with water into a paste. The paste was divided into the desired sizes and roasted under glowing embers.

YEAST

A side-light on the economic aspects of the Cycads is the presence of primitive yeasts in the gut and frass of some of the inhabiting insects. A sample from a cone produced in the garden of Mr. G. G. Smith of East London, infected with a member of the *Cossidae* and possibly other insects, was supplied to Dr. J. P. van der Walt on the staff of the C.S.I.R. He found several strains of an unrecorded yeast which he described as *Endomycopsis wickerhamii* in *Antonie van Leeuwenhoek* Vol. 25 : 1959.

ROOT TUBERCLES OR NODULES

In addition to thick tuberous and thin fibrous roots, Cycads, including both *Stangeria* and *Encephalartos* produce roots with nodules which grow upwards to or near the soil surface (Fig. 17). These appear in the early seedling stage and may develop into a dense mass for a short distance round the base of old stems. They are somewhat spongy and harbour a green alga, and possibly a bacterium also, without doing any harm to the Cycad. The association is regarded as a symbiotic relationship from which all the organisms derive benefit. The Cycad is probably assisted in nitrogen assimilation and fixation. Little research has been done in this field in South Africa and the specific identity of the alga and bacterium in the different species has not been determined.

DECORATION

Cycads are cultivated the world over as ornamental plants and many of the species have the advantage of enduring wide temperature fluctuations. There is an extensive trade from the East to the United States of America and parts of Europe in the leaves of *Cycas revoluta*, mainly for wreaths. About 3 million are shipped to the United States annually.

INSECTS ON CYCADS

No systematic collection of insects has been made on Cycads throughout South Africa and there is little doubt that if this were done a greater range would be found. Nearly 200 years ago Thunberg described a weevil with a long slender snout as *Curculio zamiae* which was later transferred as *Anthiarhinus zamiae*. This insect consumes completely the endosperm from Cycad seeds before the adult insects emerge. Another type of weevil with a curved snout is *Phloeophagus hispidus* and its relative *P. ebeninus* and yet another is *Derelomus languidus*, all of which occur in the eastern Cape Province and

have been considered as agents of pollination. A cone of *E. eugene-maraisii* from the Transvaal yielded a new genus and species of insect, *Apinotropis verdoornae*, and in 1963 larvae, taken from cones of *E. laevifolius* at the Botanical Research Institute, proved to belong to a moth of the genus *Herculia* and is probably undescribed.



FIG. 17.—Root tubercles or nodules: here these are on *Stangeria eriopus* and also occur on species of *Encephalartos*: they contain a species of Alga and possibly also a species of Bacterium. Photo R. G. Strey.

The moth *Zeronopsis leopardina* lays its eggs on the young leaves of Cycads and the social worms which hatch soon eat the young foliage and make the plants look most unsightly. The moth is particularly active in Natal.

STANGERIA

There is only one species in this genus which occurs in the eastern Cape and Natal. The description of the species serves for the genus also. The genus is named in honour of Dr. William Stander who sent specimens overseas and who became surveyor general of Natal. g

Stangeria eriopus (Kunze) Nash in New York Bot. Gard. 10 : 164, pl. 62 (1909).
Lomaria eriopus Kunze in Linnaea 13 : 152 (1839).

FIG. 8, 18, 19, 20.