ENCEPHALARTOS

Plants either male or female with unbranched or branched trunks growing above or below ground level and covered by alternating series of bracts and persistent leaf-bases. *Leaves* produced in whorls, few to many together, 40–250 cm long, with numerous leaflets in two rows along the leaf-stalk; the leafstalk with a swollen base or pulvinus which persists and protects the stem; leaflets of seedlings toothed round the apical part of margin, becoming modified as plant matures, with entire, toothed or lobed margin, light green, dark green or with bluish bloom for several months, with or without hairs, reduced in size towards the base, sometimes into a long series of prickels. *Pollen-* and *seed-scales* aggregated into dense spirals, forming cones. *Cones* on stout peduncles either male or female on a plant, 1–several together from the apex of the stem (rarely produced at the same time as leaves); male scales with numerous pollen-bearing bodies on under surface of basal half and produced into a sterile apical beak: female scales producing two large seeds lying above the stalk of the scale and directed towards the central axis, apical expanded portion or bulla with an upper, lower and a variously prominnent terminal facet and incurved lateral lobes which protect the seed. *Seeds* oblong to somewhat rounded with a variably fleshy beak and a hard inner shell surrounding the large endosperm (food reservoir).

Encephalartos is restricted in its distribution to the African Continent south of the Sahara but does not occur in S.W. Africa.

The name is derived from the common name Bread-tree or Broodboom referring to reports by early travellers of the making of crude bread by the Hottentots and Bantu from the starchy pith within the trunks.

Key to Species of Encephalartos

For those who have not had experience with ' keys to species ' it may be well to say that it is at best a guide or aid to the identification of the species. It has not been thought practical to present this one in any more simplified form. An identification made by way of the key must be checked against the full description, illustrations, distribution records and any other means available.

An effort has been made to arrange and number the species in the key in a sequence to indicate the assumed relationships. But a key necessitates a linear arrangement, whereas the relationships of the species of *Encephalartos* are two or three or more dimensional and one cannot guess how far back in the history of evolution of the various groups of species one would have to go to find the common ancestor.

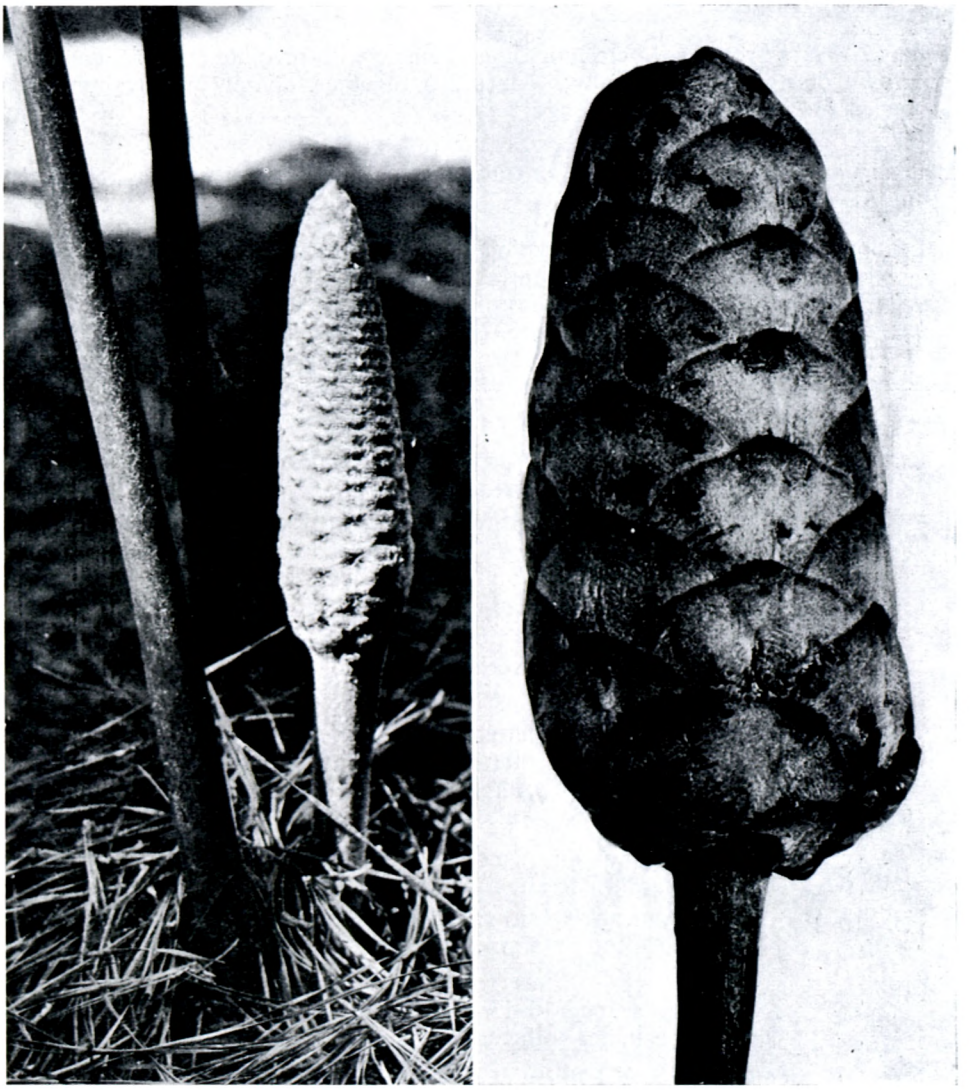

Fig. 20.—*Stangeria eriopus*: left, male cone; right, female cone showing the scales tightly overlapping those above.

Thus in the 26 species listed, we find that *Encephalartos inopinus* is somewhat of an enigma at the moment as regards its closest affinity because female cones are as yet unknown: *E. ferox* is without any close relatives among the other South African species, and the small group of species including *E. villosus* and *E. caffer*, mainly with subterranean stems, seems rather isolated from all others. Yet when *E. villosus* meets *E. altensteinii* under natural conditions, hybridization seems as good as proved. The key does not provide for the identification of hybrids or aberrant forms. A natural hybrid between *E. altensteinii* and *E. villosus* is unlikely to ' run down ' to either parent in the key and would be more likely to lead one to *E. natalensis* or *E. lebomboensis*, because of the combination of characters. Similar confusion may arise with other natural hybrids such as between *E. altensteinii* and *E. trispinosus*. Of all species *E. trispinosus* is the most difficult to define.

Leaflets 2–4 mm broad, 8–14 cm long, linear, entire with revolute margins, dark green; crown of stem brown woolly; cones 2–5 together, densely woolly; male cone scales on stipe 1–1·5 cm long.....1. *ghellinckii.*

Leaflets 4 mm or more broad, margins usually thickened and sometimes recurved but not revolute:

Leaflets towards the base of the petiole deflexed in relation to the rhachis, the basal leaflets reduced to a short or long series of prickles, those about the middle of the rhachis spreading at right angles to the axis and recurving, 14–21 cm long, 8–13 mm broad, linear, attenuate, 13–21-veined on the under surface and glaucous (silvery or bluish) on under surface when young, stems branched from the base, up to 2 m long, rarely longer; face of male cone scales moderately greyish pubescent..... 7. *inopinus.*

Leaflets spreading at right angles or ascending in relation to the axis of the rhachis, none deflexed, glaucous or green:

Leaflets 4–8 mm broad, linear, entire, glaucous or somewhat silvery when young, sometimes yellowish with age, rarely reduced to more than one prickle at base, venation conspicuous on under surface; cones densely woolly or only moderately so in *E. laevifolius*, seeds light brown or brown-madder to ochre-yellow:

Cones with dense woolly covering:

Stems well developed above ground:

Stem crown conspicuously and rather persistently brown woolly; trunk 35–60 cm diam. up to 3 m or more tall; cones 3–several together; median leaflets 10–17 cm long and about 7 mm broad, 7–9-nerved on under surface.....3. *friderici-guilielmi.*

Stem crown not conspicuously brown-woolly, trunk rarely up to 30 cm diam. and not often up to 2 m tall:

Median leaflets 9–13 cm long, 4–5 mm broad, 5–6-nerved on under surface; margin somewhat recurved; cones often single 2. *cycadifolius.*

Median leaflets 10–13 cm long, 6–8 mm broad, finely 10–14-nerved on under surface, flat; cones 1–4 together.....4. *lanatus.*

Stems rarely up to 20 cm above ground, forming dwarf branched clumps; cones single; median leaflets 9–13 cm long, 4–6 mm broad, finely about 9-nerved on under surface.....5. *humilis.*

Cones with short greyish tomentum, not conspicuously wooly; median leaflets up to about 12 cm long, 5–7 mm broad, 10–12-nerved on under surface; trunk 1–3 m tall, rarely more than 30 cm diam..6. *laevifolius.*

Leaflets 1 cm or more broad, if less than 1 cm broad then bright green not glaucous; margins entire or toothed; cones glabrous or apical part of scale face with reddish or brownish hairs:

†Stems usually well developed above ground if subterranean then leaves glaucous as in *E. horridus*:

Leaves glaucous with bluish bloom when young and persisting so for several months at least, contrasting with the old leaves:

Leaves positively glaucous when young, leaflets rarely reduced to more than one prickle at base, median leaflets usually less than 2·5 cm broad:

Median leaflets mainly entire or occasionally with 1 or 2 teeth on lower margin:

Leaves slightly or markedly incurved near the tip; female cone-scales with slightly rugose face..8. *eugene-maraisii.*

Leaves slightly or markedly recurved towards tip:

Female cone-scales with irregularly warty face, the pulvinus of petiole often partly hidden by stem bracts, leaves often pilose when young, leaflets usually overlapping above middle of rhachis.....9. *princeps.*

Female cone scales with smooth or slightly rugose face, pulvinus of petiole exposed and prominent, with brown collar, leaves glabrous, leaflets often not overlapping. 10. *lehmannii.*

Median leaflets, some or most, with 1–3 spine-tipped lobes on the lower margin, glabrous:

Stems mainly above ground; median leaflets 1·5–2·5 cm broad, some or all with 1 or 2 spine-tipped lobes on lower margin, and lobes sometimes twisted out of the plane of the leaflet; female cone-scales yellowish-green, rugose on face with the lateral incurved lobes 2–3 cm long..... 11. *trispinosus.*

Stems mainly subterranean, occasionally up to 45 cm tall; rarely taller, median leaflets rarely less than 2·5 cm broad, deeply 1- or 2-lobed on lower margin and lobes twisted out of plane of the leaflets, female cone-scales blackish or reddish-brown, ridged towards terminal facet but otherwise with a fairly smooth face, with the lateral incurved lobes about 1 cm long.....12. *horridus.*

Leaves light or medium green, faintly glaucous; median leaflets usually more than 2·5 cm broad; lower margin with 3 or occasionally 4 spine-tipped lobes:.....13. *arenarius.*

Leaves light or dark green, with or without prickles or lobes along one or both margins, not glaucous except sometimes in young stage of *E. longifolius* and *E. arenarius*:

Lower margin of median leaflets with 2–4 triangular pungent lobes, upper margin without lobes or teeth:

Leaves medium green, faintly glaucous, glabrous; leaflets not prominently veined on under surface.....13. *arenarius.*

Leaves dark green, finely pubescent when young, rigid, leaflets prominently veined on under surface.....14. *latifrons.*

Lower and upper margin of median leaflets entire or with one or more prickles or teeth:

Leaflets reduced in size towards base of rhachis but not to more than one or exceptionally 2 prickles:

Leaves 1–1·5 m long, suberect-spreading and recurved or arcuate in the upper half; leaflets dark green often with bluish lustre and sometimes glaucous when young, finely pubescent when young, median ones mainly oblong-lanceolate, up to 20 cm long and 4 cm broad, generally overlapping on upper half of rhachis, margins not or sparingly toothed.....15. *longifolius.*

Leaves 1–1·5 m long, nearly straight; leaflets bright green, median ones oblong-lanceolate to lanceolate up to 15 cm long and 2·5 cm broad, rarely overlapping, variably toothed on margins; incurved lateral lobes of cone scales lacerate-winged, about 3 cm long and extending nearly to axis.....16. *altensteinii.*

Leaflets reduced to several or many prickles towards base of rhachis:

Leaflets with a single terminal spine or point, broadest below or occasionally near middle:

Leaflets often showing veins on lower surface but not in regular raised formation:

Leaflets spreading and straight from the rhachis, stems often branched from base, rarely up to 7 m tall:

Leaves curved, bow-shaped giving an umbrella-like canopy; median leaflets dark green, more or less ovate-lanceolate, up to 20 cm long and 5 cm broad.....17. *woodii.*

Leaves erect, spreading straight or slightly curved in the upper third:

Median leaflets lanceolate to ovate-lanceolate, 16–23 cm long, 2·5–4·5 cm broad; face of female cone-scales with prominent blunt rugosities; incurved lateral lobes toothed or laciniate, 2–3 cm long....18. *natalensis.*

Median leaflets mainly narrowly lanceolate, 12–17 cm long, 1·2–2·2 cm broad; face of female cone scales without prominent excrescences; incurved lateral lobes, laciniate, about 1·8 cm long.....19. *lebomboensis.*

Leaflets spreading-recurved from rhachis, lanceolate to ovate-lanceolate, sometimes somewhat falcate, 10–20 cm long, 2–3·5 cm broad; stems rarely branched, many over 6 m tall.....20. *transvenosus.*

Leaflets with about 20 regular conspicuously raised longitudinal veins on lower surface, median leaflets linear-lanceolate, straight or somewhat falcate, 15–25 cm long, 2–3 cm broad, rarely more.....21. *paucidentatus.*

Leaflets with 3–5 almost equal pungent lobes at the end, usually 3–4 cm broad, broadest above or sometimes near middle, slightly narrowed to the base; cones salmon or shrimp-pink to scarlet.....22. *ferox.*

††Stems dwarf, subterranean or rarely up to 20 cm exposed above ground, unbranched or sometimes branched; leaflets light or dark green, not glaucous, linear or linear-lanceolate, with or without marginal teeth:

Leaflets reduced to many prickles towards base of petiole; median ones averaging 15–20 cm long, usually with one or two prickles on both margins: female cone scales with the terminal facet extending almost to the basal margin of the bulla face or overlapping slightly the scale below; male cones 6·5–12 cm diam.....23. *villosus.*

Leaflets reduced to one or two prickels at the base or sometimes none:

Leaflets, some or nearly all with one or two prickles on the margin, average length 12–14 cm, occasionally up to 30 cm, 8–15 mm broad, female cone scales with terminal facet generally slightly below central, rarely overlapping scale below, male cones 6–8 cm diam.....24. *umbeluziensis.*

Leaflets (except on juvenile plants) mostly entire, average length 6–8 cm long, 8–11 mm broad:

Female cone scales with terminal facet on the face indistinct and with the lower margin as low as or slightly overlapping the scale below; male cones less than 8 cm diam.; median leaflets usually toothed on lower margin (Natal).....25. *ngoyanus.*

Female cone scales with terminal facet on the face distinct, not extending to basal margin; male cones 6–11 cm diam.; median leaflets usually without prickles on lower margin (Cape).....26. *caffer.*

1. **Encephalartos ghellinckii** *Lem.*, Ill. Hort. 14, Misc. 80 (1867).

FIG. 21, 22.

Plant unbranched or branched from the base; stems up to about 3 m tall, often leaning with age, 30–40 cm diam. with open brown woolly crown. *Leaves* somewhat yellowish-green up to about 1 m long, straight or spreading-incurved and sometimes twisted, at first densely greyish woolly but hairs fall with age, leaflets dense, spreading with revolute margin; the median ones 8–14 cm long and 2–4 cm broad, pungent. *Cones* 2–5 together on short stout storks and densely brown woolly: *male cones* more or

less cylindric becoming curved, about 25 cm long and 6–7 cm diam., narrowed slightly to both ends; the nose of the scales projecting only slightly: *female cones* up to about 22 cm long and 14 cm diam., rounded at the top; the scale face projecting only slightly. *Seeds* golden-yellow, about 2·5 cm long and of similar width.

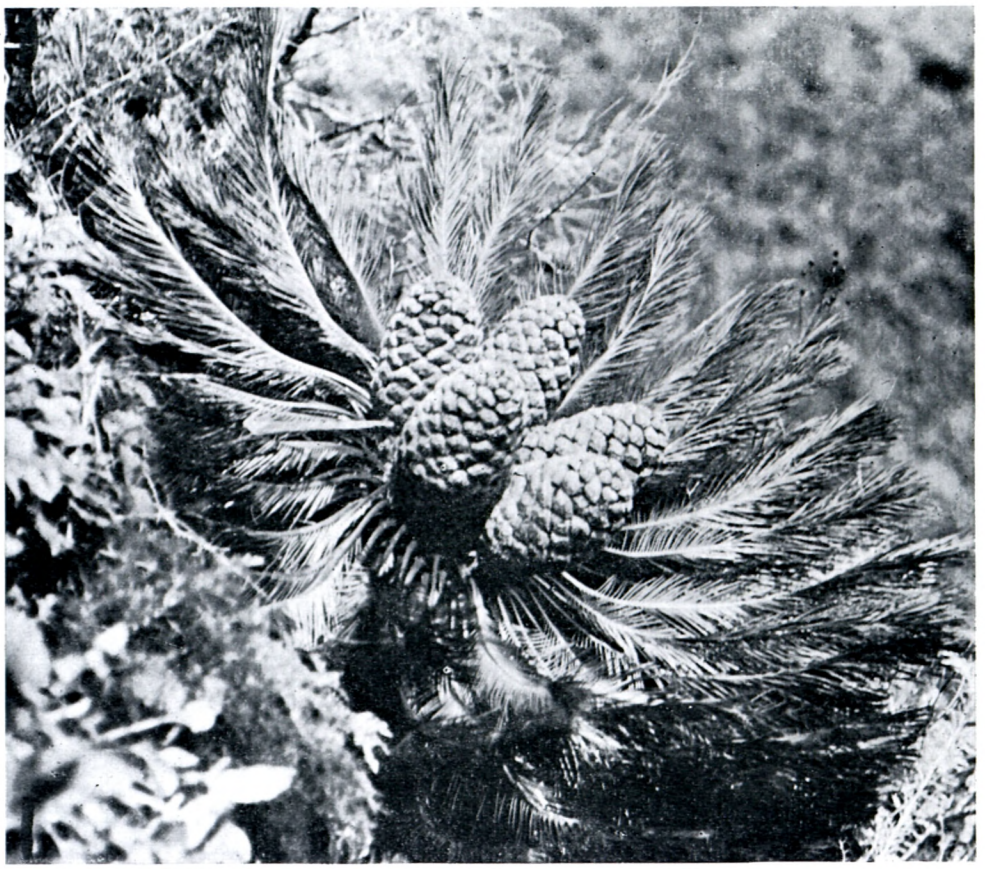

FIG. 21.—*Encephalartos ghellinckii*: a female plant in cone on the Drakensberg, Natal. Photo: Dr. A. O. D. Mogg.

Encephalartos ghellinckii occurs on the southern foothills of the Drakensberg in the eastern Cape Province near Flagstaff, extending to higher altitudes northwards along the mountain range in Natal to Mont-aux-Sources.

Because of its narrow leaves with revolute margins there is little chance of misnaming *E. ghellinckii* among South African species. It is most nearly related to *E. cycadifolius* and *E. friderici-guilielmi*, both of which are eastern Cape species with similar woolly cones but broader leaflets. It could be confused, however, with the sometimes cultivated species *Cycas revoluta*, which occurs naturally in Japan, but this has its seeds in a loose cluster, which is quite different from the compact woolly cones of *Encephalartos ghellinckii* and its allies.

FIG. 22.—*Encephalartos ghellinckii*: habit view on the Drakensberg, Natal; trunks usually hidden by lower vegetation.

2. **Encephalartos cycadifolius** (*Jacq.*) *Lehm.*, Pugill. 6 : 13 (1834). *Zamia cycadifolia* Jacq., Fragm. 27, t. 26 (1801). *Encephalartos eximius* Verdoorn in Bothalia 6: 426 (1954).

FIG. 9, 23, 24.

Plants usually branching from the base; stems up to about 1·5 m tall and 25 cm diam. *Leaves* 60–90 cm long, often somewhat twisted, greyish or slightly silvery and somewhat woolly when young; median leaflets 9–13 cm long, 4–5 cm broad, entire, with a thickened, slightly recurved margin and with 5–6 prominent veins on under surface. *Cones* 1 or 2 from a stem, closely off-white or tawny woolly; *male cone* more or less cylindric, narrowed to apex, 13–22 cm long, 4·7–7 cm diam., with the nose of the scales

FIG. 23.—*Encephalartos cycadifolius*: a relatively large plant for this species, which is little more than three feet tall and freely suckered from the base.

only slightly projecting: *female cones* more or less barrel-shaped with rounded top, 20–30 cm long, 16–18 cm diam., with the face of the scales much flattened. *Seed* orange-yellow to amber-brown, about 3 cm long and 2 cm broad.

Encephalartos cycadifolius is rather local on mountains of the Cradock and Bedford districts of the eastern Cape.

One should observe that in this species, as compared with *E. friderici-guilielmi*, with which it has been confused, the trunk shows practically no wool on top, further the middle leaflets are 9–13 cm long, 4–5 mm broad, 5–6-nerved on the under surface, the margins are slightly recurved and the woolly cones are usually produced singly and not more than two at a time on one stem.

Because of the similarity of the leaflets and other features, plants of *E. friderici-guilielmi* from Queenstown and Cathcart have been identified as *E. cycadifolius*, for example in Flora Capensis, 1933, although they had been recognized as distinct and described under the name *E. friderici-guilielmi* as early as 1834. It is necessary to reinstate the name *E. friderici-guilielmi* for the Queenstown–Cathcart communities as explained more fully in the Journal of South African Botany 31 : 116 (1965). Because of the confusion in the application of these names, the new name *E. eximius* was given to plants which have since proved to agree with the original *E. cycadifolius*. The name *E. eximius* is, therefore, redundant and must be dropped.

FIG. 24.—*Encephalartos cycadifolius*: female cones, one or two are produced from a stem, contrasting with the 3 to 5 or occasionally more per trunk produced by the closely allied species *E. friderici-guilielmi*. Photo: V. L. Pringle.

FIG. 25.—*Encephalartos friderici-guilielmi*: a group near Tsolo, Transkei, with D. Collett lost in admiration.

It is certainly curious that true *E. cycadifolius* remained so little known for so long after its first description in 1801. There appear to be two main reasons for this. Firstly, the areas in which it grows naturally are off the modern main roads between settlements, and secondly, the plants are not particularly robust and are not readily re-established in cultivation, that is according to experience in the garden of the Botanical Research Institute. This makes it all the more remarkable that a small plant should have survived the journey from its habitat before 1800, firstly to the Cape of Good Hope and from there by slow sea transport to Vienna. The plant was taken by the Viennese collector-gardener, Scholl, together with specimens of *E. horridus* and *E. longifolius* for cultivation in the Royal Garden at Schoenbrunn. Here they were described and illustrated by the famous botanist Jacquin.

Interesting observations by V. L. Pringle on the effects of fire on *E. cycadifolius* have been recounted in the introductory chapter of this account and facts about the germination of the seeds have also been mentioned.

3. **Encephalartos friderici-guilielmi** *Lehm.*, Pugill. 6 : 8, t.l, 2 & 3 (1834).

FIG. 12, 25, 26, 27, 28, 29.

FIG. 26.—*Encephalartos friderici-guilielmi*: not an abnormally large plant with a trunk of about 12 ft tall in Cathcart district, eastern Cape.

FIG. 27.—*Encephalartos friderici-guilielmi*: female plant in cone near Tsolo, Transkei.

FIG. 28.—*Encephalartos friderici-guilielmi*: male cones, a normal head for this species.

Plant unbranched or branched from the base; trunks stout, up to about 4 m tall on rare occasions, 35–60 cm diam., eventually leaning or procumbent with age, with open brown woolly crown. *Leaves* fairly stiff, straight or curved, often spreading lower than crown when stem has cones, 1–1·2 m long; the leaflets somewhat bluish or silvery when young, and yellowish with age, closely spaced and overlapping in the upper half of the leaf and reduced in size towards apex and base; median leaflets 10–17 cm long and about 7 mm broad, with 7–9 prominent veins on lower surface. *Cones* 3–several together, up to 10 on large male trunks, covered with yellowish-grey to brownish wool: *male cones* somewhat cylindric narrowed slightly to the apex, curved with age, 20–30 cm long, 6–7 cm diam., with the beak of the scales projecting about 5 mm: *female cones* barrel-shaped, with rounded apex, 25–30 cm long and 15–17 cm diam., with the face of the scales much flattened. *Seeds* pale yellow to pale orange-yellow, 3 cm long and about 2 cm diam.

Encephalartos friderici-guilielmi occurs on mountains and rocky hill-slopes of the Queenstown and Cathcart districts of the eastern Cape, extending eastwards at intervals to the neighbourhood of Kokstad. The more westerly records found in literature are almost certainly incorrect and due to some confusion.

One should look for the following features. The crown of the stem is usually open and conspicuously brown-woolly, the trunks are robust and 35–60 cm in diam., the middle leaflets are 10–17 cm long, about 7 mm broad, 7–9-nerved on the under surface and a few to several (up to 10) cones may be produced at one time.

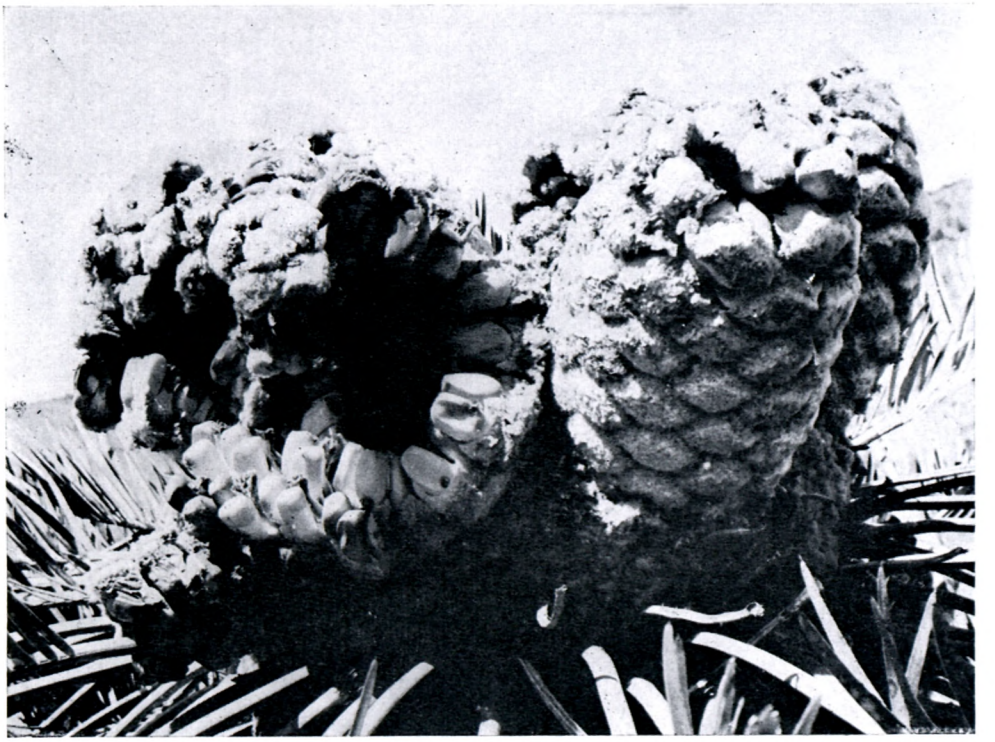

FIG. 29.—*Encephalartos friderici-guilielmi*: female cones breaking up on maturity to shed seeds. Photo: W. Everitt.

It is unfortunate that *E. friderici-guilielmi* has been confused with *E. cycadifolius* during the past half century and has been widely referred to under that name during this period. The name *E. cycadifolius* belongs correctly to plants on the mountains further west in the Bedford and Cradock districts. The distinguishing characters of *E. friderici-guilielmi*, particularly the very woolly crown of the stem, were remarked upon by Lehmann, when he described it in 1834. *E. friderici-guilielmi* is remarkable among its allies in the genus for its free coning; large male specimens bearing up to 10 cones at a time. It is far more robust and appears to be more adaptable to a change of environment and cultivation than *E. cycadifolius*, which is more exacting in its cultural requirements, judging by experience in the garden of the Botanical Research Institute.

One is diffident about saying that the species is locally frequent for fear that someone will take it as an invitation to remove specimens from their natural habitat. In its lower altitude range, near the junction of the White and Black Kei Rivers it was reported by Galpin to occur with *E. princeps*. In this connection Chamberlain (1919) remarked: "His warning prepared me for the striking variation which this species displays in different localities, and guarded me against confusing it with a nearly related species which closely resembles it and is associated with it in some places".

4. **Encephalartos lanatus** *Stapf & Burtt Davy* in Burtt Davy Fl. Transvaal & Sw. 1 : 40, 90, Fig 4 D (1926).

FIG. 30, 31, 32, 33.

FIG. 30.—*Encephalartos lanatus*: an exposed site near the Wilge River in the Bronkhorstspruit district, Transvaal.

FIG. 31.—*Encephalartos lanatus*: a dense stand in a sheltered kloof, in the Middelburg district, Transvaal.

FIG. 32.—*Encephalartos lanatus*: Male cones from a plant in the Middelburg district.

FIG. 33.—*Encephalartos lanatus*: female cones on a plant in the Middelburg district.

Plants unbranched or sometimes branched from the base; stems up to about 1 m tall and only very rarely up to 3 m long and then reclining, up to 25 cm diam. *Leaves* 60–95 cm long, white or greyish woolly when young except under surface of leaflets; recurved and often slightly twisted; leaflets with a light-silvery bloom when newly developed, entire, pungent, set in V formation above middle of leaf and usually overlapping; median leaflets 10–13 cm long, 6–8 mm broad, finely 10–14-nerved on under surface. *Cones* 1–4 together, covered by a dense light cream to greyish tomentum: *male cones* more or less cylindric, narrowed to both ends, 25–30 cm long, 5–6 cm diam; median scales with the face flattened and only slightly projecting: *female cones* barrel-shaped, 25–35 cm long, 12–15 cm diam. with the face of the scales only slightly protruding. *Seeds* yellow, 2·5–3 cm long, 2·25–2·5 cm broad.

Encephalartos lanatus is found in sheltered valleys of the upper reaches of the Olifants River catchment in the Bronkhorstspruit, Witbank and Middelburg districts of the Transvaal: sometimes it is common locally.

This species has been confused with both *Encephalartos laevifolius* and *E. humilis* and falls between the two in stature. Its woolly cones are not unlike those of *E. humilis*, but are readily distinguished from those of *E. laevifolius* which are far less woolly. The young leaves are more woolly than those of either of the other two species and it is distinguished by the median leaflets being 10–13 cm long, 6–8 mm broad and having 10–14 veins visible on the under surface. Both the other two species occur in the upper catchment area of the adjacent Crocodile River.

In some areas of its native habitat from Bronkhorstspruit to Middelburg district, this species has to withstand grass fires annually. It is, however, one of the most sensitive species to removal from the veld and attempts to re-establish it in gardens often end in failure.

5. **Encephalartos humilis** *Verdoorn* in Bothalia 6 : 220, pl. 3, 241 (1951).

FIG. 34, 35, 36.

FIG. 34.—*Encephalartos humilis*: in the small reserved area of the Uitsoek Forest Station, Lydenburg district, Transvaal.

FIG. 35.—*Encephalartos humilis*: single mature female cone on a plant in the Uitsoek Forest Station Cycad Reserve. The early woolly covering has largely disappeared with age.

A dwarf plant branching from the parent root-stock and forming small clumps; stems subterranean or occasionally up to about 30 cm above ground and of a total length not exceeding about 50 cm and 13–18 cm diam. *Leaves* 30–50 cm long, loosely greyish-woolly when young, losing hairs with age, recurved and sometimes somewhat twisted in the upper part, with a greyish or silvery bloom when young; leaflets in V disposition above middle and sometimes slightly overlapping, entire; the median ones 9–13 cm long, 4–6 mm broad and finely about 9-nerved on the under surface. *Cones* single on a stem, densely greyish woolly: *male cone* 15–20 cm long, 4–5 cm broad, narrowed slightly to both ends on stalks about 10 cm long; the face of the cone scales only slightly projecting: *female cone* barrel-shaped, 25–30 cm long, 8–10 cm diam. on short stalk, the face of the scales very slightly projecting. *Seeds* orange-yellow, 2·5–3 cm long, 2–2·5 cm broad.

Encephalartos humilis is occasional on the mountains of the eastern Transvaal from the Carolina district to Lydenburg and Nelspruit, usually associated with grassveld and often wedged between sandstone rocks.

Prior to the recognition of *E. humilis* as a distinct species, specimens of it were usually classified as *E. lanatus*. Apart from its dwarf habit and a difference in hairyness (being less woolly and with straighter hairs on the leaflets) the median leaflets have only about 9 nerves on the lower surface as compared with 10–14 in *E. lanatus*. It is of interest also that it appears to be restricted in distribution to the catchment area of the Crocodile River, in contrast to the Olifants River for *E. lanatus*. Its nearest associate in the veld is *E. laevifolius* on the Kaapsehoop Mountain.

FIG. 36.—*Encephalartos humilis*: (left) an old male plant with cone, having survived the effects of grass fires over a long period; the protective leaf bases may be up to about 5 cm or 2 in. long; (right) a relatively young plant, mainly underground with fairly large tuberous roots.

6. **Encephalartos laevifolius** *Stapf* & *Burtt Davy* in Burtt Davy Fl. Transvaal & Sw. 1 : 40 & 99 (1926).

FIG. 37, 38, 39.

FIG. 37.—*Encephalartos laevifolius*: specimens on Kaapsehoop Mountain in the Nelspruit district, the trunks attaining a height of 8–12 ft.

FIG. 38.—*Encephalartos laevifolius*: specimens on Kaapsehoop Mountain; the very spreading old leaves indicate that a new whorl of leaves or a cluster of cones is likely to be produced shortly.

Plants unbranched or branched from the base; stems 1–3 m tall, occasionally up to 3·5 m and 25–35 cm diam. *Leaves* up to about 1 m long, nearly straight or slightly recurving and sometimes twisted in the upper half, with a greyish or silvery bloom when young and at first with a short dense woolly covering except on the under surface of the leaflets; leaflets in V disposition above middle of leaf, dense but not or only slightly overlapping, pungent, entire, up to 12 cm long and 5–7 mm broad, rarely up to 1 cm, with 10–12 nerves on under surface. *Cones* 2–4 together, thinly covered by short whitish woolly hairs: *male cones* subcylindric, tapering slightly to apex and base, 30–40 cm long and 10 cm in diam., curved with age; the beak of the scales projecting about 1 cm: *female cone* barrel-shaped with rounded apex, 20–30 cm long 10–13 cm diam.; the scale-face progressively less hairy towards its base, flattened and not very prominent. *Seeds* orange-yellow, 2·5–2·7 cm long, 2–2·3 cm broad, with short fleshy apex.

Encephalartos laevifolius is fairly local on the Kaapsehoop Mountains in the Nelspruit district, and within the catchment area of the Crocodile River. It also occurs near Havelock Mine in Swaziland.

Because of the similarity in the general appearance of the leaves, this species has been largely confused with *Encephalartos lanatus*. It is normally far more robust than the latter and is readily distinguished when in cone, the cones being far less woolly. The number of nerves (10–12) on the under surface of the median leaflets, also helps to distinguish it from *E. lanatus* and *E. humilis*. In the absence of cones the latter might be mistaken for a young stage in its life history. The plants are hardy and attractive and their numbers have been depleted considerably for cultivation and also to make way for afforestation. The nearness of the Kaapsehoop Mountains to Barberton may have given rise to the statement that the species occurs in the Barberton district. On the other

hand it has recently been recorded near Havelock Mine in Swaziland near the Barberton district border. *E. paucidentatus* occurs occasionally on the mountains and in valleys above Barberton but this is very different in character.

FIG. 39.—*Encephalartos laevifolius*: A cluster of female cones with only a thin covering of woolly hairs on the face of the scales.

7. **Encephalartos inopinus** *R. A. Dyer* in Bothalia 8 : 169 (1964).

FIG. 40, 41.

Plant freely branched from base with the stems up to about 2 m long, rarely up to 3 m and then spreading or reclining, 17–25 cm diam. *Leaves* 0·8–1·5 m long with the rhachis nearly straight or slightly upcurved and twisted near the apex; leaflets with a silvery or bluish bloom on the under surface when young, mainly entire or occasionally with a minute prickle on lower margin; those above the middle directed slightly upwards and curving outwards, those about the middle spreading and recurving gracefully more or less at right angles from the rhachis, those below descending and curving slightly downwards and gradually reduced in size to 2–6 prickles on either side of the rhachis; the middle leaflets 14–21 cm long and 8–13 mm broad in the lower half and tapering gradually to the slender pungent apex, with 13–21 veins on under surface. *Cones*: male, immature, 2 or more together, on peduncles about 5 cm long and 1·5 cm thick, 8–10 cm long, 4–4·5 cm diam.; scales dense (few showing some dehiscence) about 2 cm long (tips all damaged) 1·7–2 cm broad, with acute lateral margin, maximum vertical thickness 5 mm; microsporangia dense on lower basal half; beak projecting about 1 cm, with upper facet humped in middle; lower facet nearly flat; glabrous round base of beak, shortly greyish scurfy-pubescent towards apex: female not yet discovered.

Encephalartos inopinus is known only from the Lydenburg district of the Transvaal, the positive records being from the Olifants and Steelpoort River Valleys between Penge and Kromellenboog Asbestos Mines.

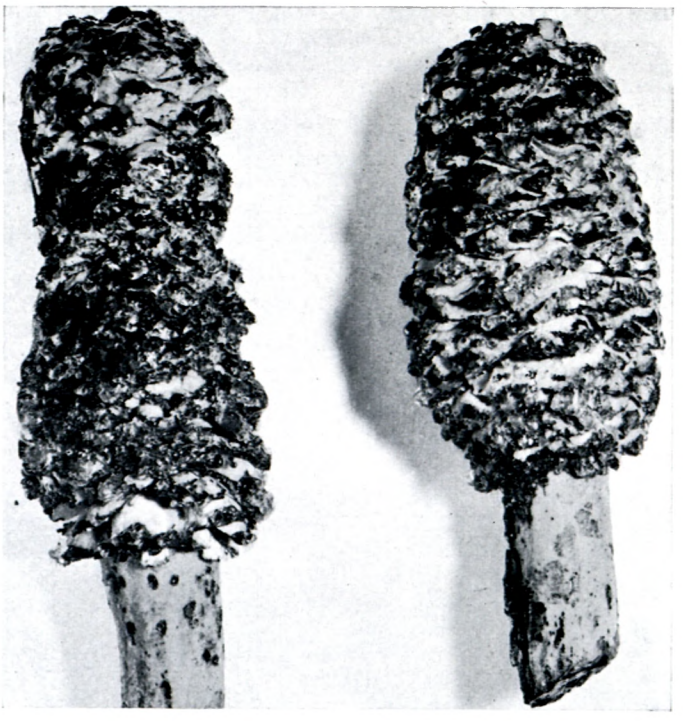

FIG. 40.—*Encephalartos inopinus*: young male cones; the only fresh cones seen so far, from plant in the Lydenburg district, Transvaal.

FIG. 41.—*Encephalartos inopinus*: the type plant from near Kromellenboog in the Lydenburg district.

The finding of this species is one of the major botanical discoveries in South Africa in recent times. *Encephalartos inopinus* differs in several details from all other local species and at first glance reminds one of a Mexican *Dioon*. It is the deflection of the lower leaflets and the graceful spreading of the long tapering upper leaflets which makes this immediately distinctive among South African species of *Encephalartos*.

So far female cones of this plant have not been recorded and until this has been done one cannot be sure of its correct classification. It may sound strange that, with a plant of this size, only a few have been localized in the wild state. The first descovery to be registered was made casually by a hiking party in 1955, when Dr. H. van Hoepen fortunately brought home a small sucker for cultivation in Johannesburg. This was not examined botanically until 1964. This led to the finding of a second one by Mr. Els, another member of the original hiking party. He found it on a krans near Kromellenboog but could not locate the first one in the wild and it may be that it has died, been removed or destroyed in the past few years. However, since then several more have been investigated not far distant. The disappearance in living memory of a species from the wild state is recorded in the case of *E. woodii* and it is trusted that no other is destined to suffer the same fate through wanton destruction by man.

8. **Encephalartos eugene-maraisii** *Verdoorn* in Journ. S. Afr. Bot. 11 : 1 (1945).
FIG. 42, 43, 44.

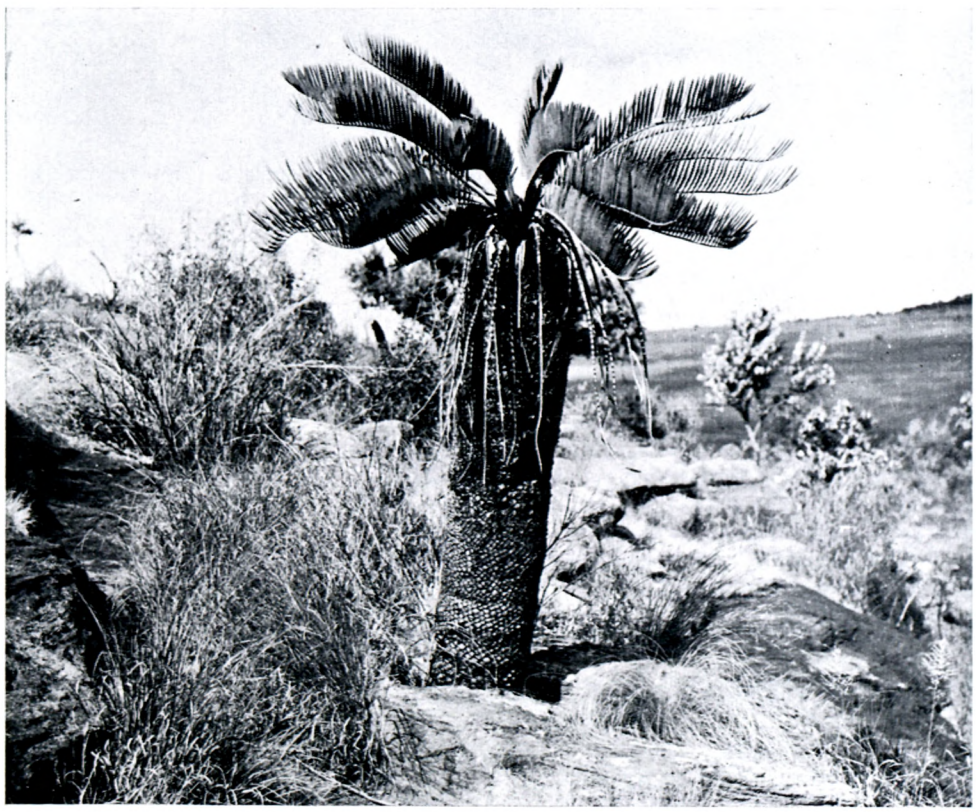

FIG. 42.—*Encephalartos eugene-maraisii*: a speciman from near the type locality of the species in the Waterberg, Transvaal, showing the typical up-curved tips of the leaves; older and longer trunks often recline.

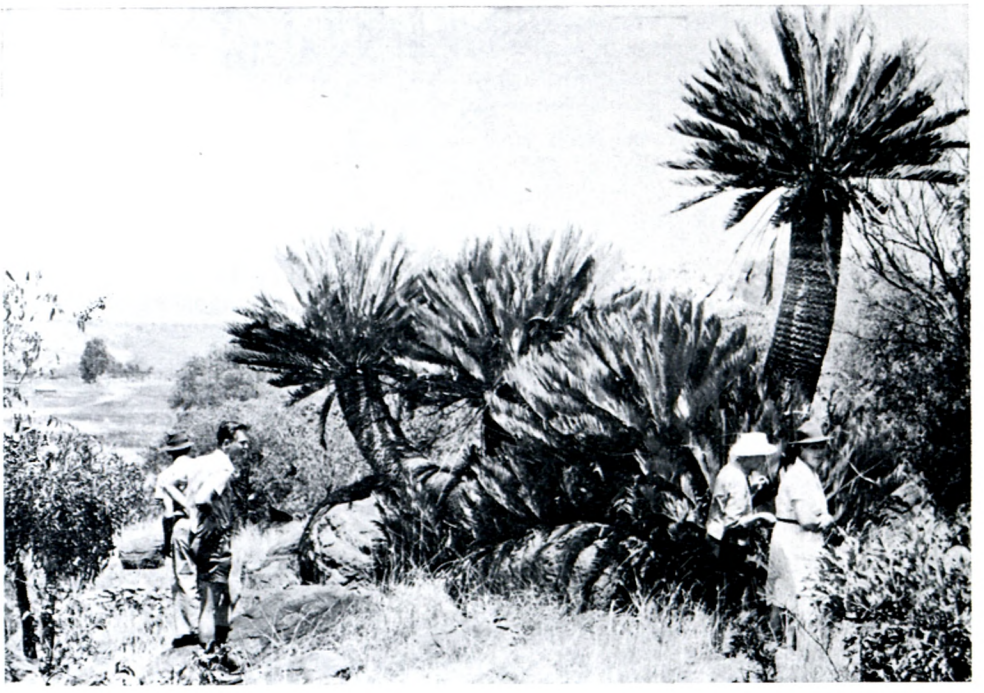

FIG. 43.—*Encephalartos eugene-maraisii*: a large clump in the Middelburg district, Transvaal, where the trunks are generally more robust and are known to have reached a reclining length of nearly 30 ft; the leaves are generally straighter than the typical form.

Plants unbranched or more often branched from the base with stems 2–4 m tall, rarely more, but up to about 10 m long in some procumbent stems, 30–45 cm diam. *Leaves* ·7–1·8 m long, nearly straight with the apical portion of the rhachis slightly or markedly up or inward-curved, with bluish or silvery bloom for some considerable time; leaflets reduced in size towards base but not to more than one prickle: median leaflets 15–20 cm long, 1·3–1·5 cm broad, cuneate at base, shortly narrowed to the pungent apex, entire or occasionally with a single tooth on the lower margin. *Cones* 1–4 together: *male cone* subcylindric, 22–42 cm long, 6–8 cm broad, median scales with the face projected into a beak 7 mm long: *female cone* more or less egg-shaped, 30–50 cm long, 16–20 cm broad, median scales with face slightly wrinkled and pimply, minutely hairy. *Seed* light brown or date-coloured, 3·5–4 cm long and 2·3–3 cm diam.

Encephalartos eugene-maraisii occurs in rather remote mountainous areas in the Waterberg, Pietersburg, Witbank and Middelburg districts of the Transvaal.

In some instances a critical eye is needed to detect the slight upcurve of the tip of the leaves (rhachis) which is the characteristic feature of this species and distinguishes it from *Encephalartos lehmannii* and its allies. *Encephalartos eugene-maraisii* is the only one of its group in the Transvaal and it is already rare in parts of its distribution area. In parts of the Middelburg district young plants are very scarce, which cannot be due entirely to the depredations of collectors, and suggests that the strictest protective

measures will have to be taken to ensure its survival in those areas. Natural causes seem to have diminished its numbers in the Pietersburg district even more than near Middelburg, while in the Waterberg the species has been observed to regenerate tolerably well under favourable conditions. It is in the Witbank and Middelburg districts that the largest specimens are found, and here also that the leaves are on the average straighter than they are in the Waterberg district. Mr. Jimmie Hall records one procumbent trunk to have reached the extraordinary length of 28 ft. A terminal 18 ft piece of trunk, placed on top of the ground in Johannesburg, rooted and produced leaves for the first time after four years.

In parts of the Middelburg district *E. eugene-maraisii* is found only a few hundred yards distance from groups of *Encephalartos lanatus* but no evidence of hybridization between the two species has been recorded, nor is suggested.

FIG. 44.—*Encephalartos eugene-maraisii*: female cones from a plant in the Botanical Research Institute Garden and originally from the Waterberg, Transvaal.

9. **Encephalartos princeps** *R. A. Dyer* in Journ. S.Afr. Bot. 31 : 111 (1965).

FIG. 45, 46, 47.

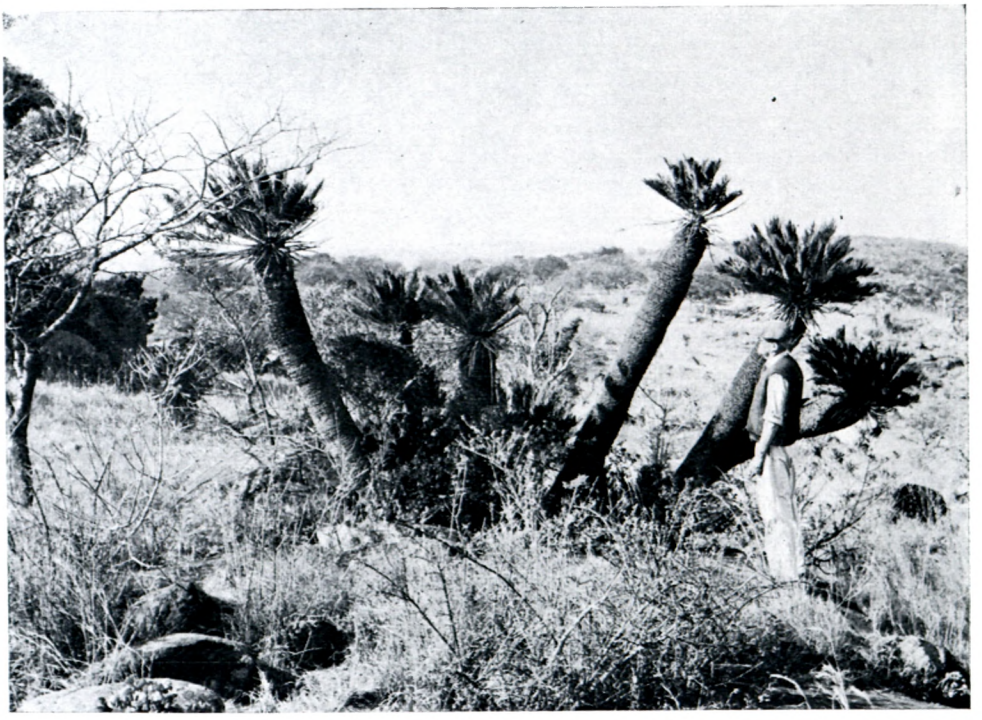

FIG. 45.—*Encephalartos princeps*: few miles north of Komgha in the eastern Cape overlooking Kabousie River Valley; main trunks nearly reaching their maximum upright height.

Plant unbranched or more often branched from the base with stem up to 3 m tall or occasionally up to 5 m long with age and reclining, up to about 30 cm diam. *Leaves* 1–1·3 m long, fairly straight or recurved in the top third with often bluish or silvery bloom for considerable period and pilose in early stage, leaflets reduced in size towards base, possibly to one prickle, mainly overlapping in the top third in V disposition; median leaflets about 15 cm long and 1·3 cm broad, pungent, entire or occasionally toothed on lower margin. *Cones* 2 or more together, dull green: *male cone* subcylindric, narrowing to both ends, 16–26 cm tall and 8–10 cm diam. with the face of median scales projected into a beak about 1·2–1·5 cm long: *female cone* more or less barrel-shaped, 30 cm long and 20 cm diam. with rounded apex; median scales with face protruding about 2 cm, indistinctly ridged but coarsely and irregularly pimpled and with sparse whitish or brownish hairs. *Seeds* red, about 4 cm long and 2 cm diam.

Encephalartos princeps is found on the doleritic cliffs and outcrops in the Kei River catchment area including parts of the districts of Queenstown, Cathcart, Komga, Tsomo and Butterworth. The exact range of the species up the main Kei River Valley and the

Kabousie River Valley has not been determined nor how far it extends towards the river mouth below the railway bridge, but it is quite frequent in parts. There is a record as far east as Mquanduli in the Transkei but it is based on a cultivated plant and confirmation of its presence there is necessary.

Specimens now classified as *E. princeps* were formerly regarded by most workers as belonging to *E. lehmannii*, but the case seems strong enough for specific separation. In addition to the usually greater size of the pulvinus and leaf scars of *E. lehmannii*, *E. princeps* becomes appreciably taller or longer when reclining, the leaves are often pilose when young, the leaflets are denser and the face of the female cone scales is more warty. There is an interesting difference in soil preference, *E. princeps* being found on doleritic formations as opposed to the sedimentary sandstone for *E. lehmannii* and the largely shale preference of *E. trispinosus* which is another closely related species. *E. princeps* may well have been earlier in the evolutionary series than any of its eastern Cape relatives but this is a speculative idea.

Encephalartos friderici-guilielmi is recorded by Galpin as an associate of *E. princeps* in the south-eastern part of the Queenstown district. Confusion between the two is unlikely in any circumstances and out of the question when cones are present, those of the former being very woolly and of the latter inconspicuously scurfy-hairy only on the face of the cone scale.

FIG. 46.—*Encephalartos princeps*: on the west bank of the Great Kei River below the railway line in the Komgha district, possibly all trunks originate from the same rootstock, whose ultimate roots have probably reached the water-table.

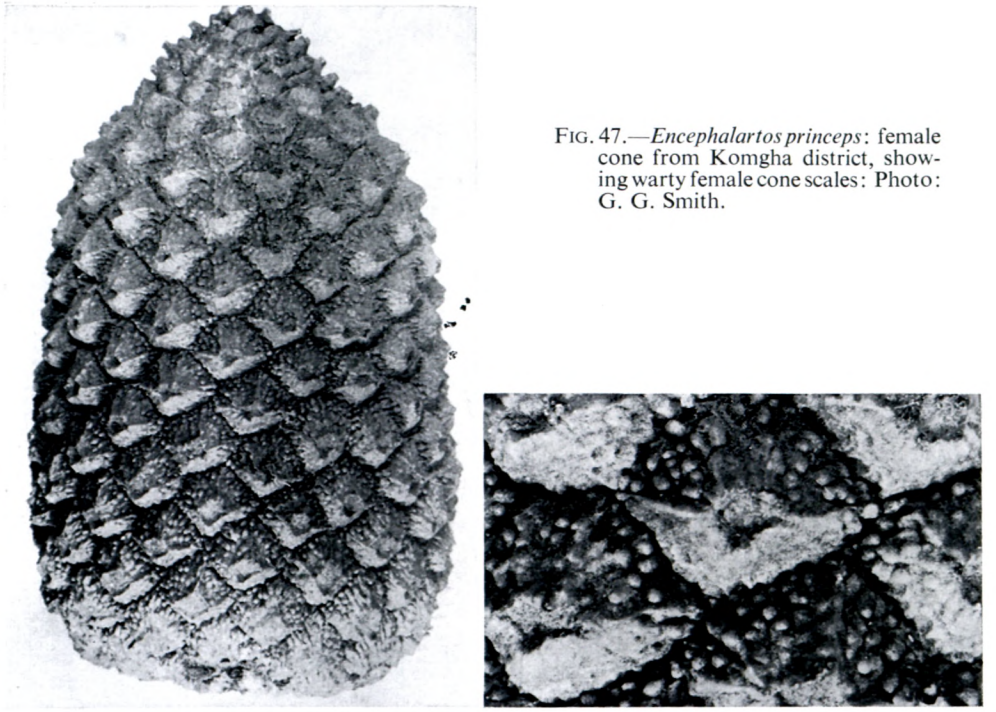

FIG. 47.—*Encephalartos princeps*: female cone from Komgha district, showing warty female cone scales: Photo: G. G. Smith.

10. **Encephalartos lehmannii** *Lehm.*, Pugill. 6 : 14 (1834).

FIG. 48, 49, 50, 54 on right.

Plant unbranched or more frequently branched from the base with stems 1–2 m tall, rarely more, 25–45 cm diam. *Leaves* 1–1·5 m long, stiff and nearly straight, occasionally somewhat recurved in the upper half, with bluish or silvery bloom persisting for considerable period, the base of the stalk swollen and with a red-brown collar; leaflets spaced and reduced in size towards the base but to only one prickle, close in the upper half but rarely much overlapping, in V disposition; median leaflets 12–18 cm long 1·7–1·9 cm broad, pungent, entire or occasionally with one or two small teeth on the lower margin. *Cones* solitary blackish-red over green because of short scurfy hairs on the face of the scales: *male cone* subcylindric, narrowed to apex and base, 25–35 cm long and 8–10 cm diam., the median scales with the face projected into a beak about 1·5 cm long: *female cone* somewhat egg-shaped, 45–50 cm long and about 24 cm diam., the median scales with the face protruding about 2 cm and with little surface irregularity except for central upper ridge and terminal facet. *Seeds* red, 4·7–5 cm long and about 2 cm diam.

Encephalartos lehmannii occurs mainly on sandstone hills and mountains in the Cape from near Willowmore and Steytlerville and extending eastwards to Uitenhage and Pearston.

FIG. 48.—*Encephalartos lehmannii*: Steytlerville district in the Cape north of Paardepoort: trunks rarely more than 4 ft tall, frequent.

FIG. 49.—*Encephalartos lehmannii*: Pearston district, in the Cape, infrequent on hills. Photo: L. E. Codd.

FIG. 50.—*Encephalartos lehmannii*: Pearston district, the female cone scales with angled relatively smooth face.

Most previous workers on the genus have taken a broad view of this species and various relationships have been suggested between it and *E. horridus* and the recently described species *E. princeps* and *E. trispinosus*. The differences in the face of the female cone scales was the guiding principle in distinguishing between these species: that of *E. lehmannii* being nearly smooth, of *E. horridus* ridged, of *E. trispinosus* wrinkled, of *E. princeps* warty. The spinous lobes on the lower margin of some, if not all, median leaflets of *E. horridus* and *E. trispinosus* also readily distinguish them from the other two, while *E. lehmannii* is distinguished from *E. princeps* by its larger pulvinus and leaf-scars, shorter trunks and more spaced leaflets. On occasions *E. lehmannii* and *E. princeps* show some toothing of the lower margin of median leaflets but comparable variation is found in all related species.

The distribution areas of the four species mentioned above do not appear to overlap. Both *E. horridus* and *E. lehmannii* are found in the Uitenhage district, but the former is mainly in the middle undulating part of the Zwartskops River Valley, whereas the latter

is in the mountainous area of the Klein Winterberg. For the rest the distribution range of *E. lehmannii* will be found in the drainage areas of the Groot and Sundays River Valleys. *E. trispinosus* is found further east in the Bushmans, Great Fish River and intervening river valleys, while *E. princeps* is even further east in the catchment area of the Great Kei River.

The inter-relationship of these species is further discussed under *E. trispinosus* where hybridization seems to have played a prominent part in the production of aberrant forms.

11. **Encephalartos trispinosus** (*Hook.*) *R. A. Dyer* in Journ. S. Afr. Bot. 31 : 112 (1965). *Encephalartos horridus* var. *trispinosus* Hook. in Bot. Mag. t. 5371 (1863).

FIG. 13, 51, 52, 53, 54.

Plant unbranched or more often branched from the base with stems up to about 1 m tall and 25–30 cm diam. *Leaves* 0·7–1·25 m long, spreading-recurved and often twisted towards apex with a bluish bloom when young and without hairs; leaflets reduced in size and simple towards base, occasionally overlapping in the upper half; median leaflets often slightly curved to one side, 10–18 cm long, 1·5–2·5 cm broad, pungent, with 1–2 pungent sometimes twisted lobes 1–3 cm long from the lower margin. *Cones* solitary, bluish- or yellowish-green: *male cone* subcylindric, narrowed to both ends, 25–35 cm long, 6·5–7·5 cm diam.; median scales with the face projected into a beak about 7 mm long: *female cone* 45–50 cm long and 16–18 cm diam.; median scales with the face protruding 2·5–3 cm, wrinkled and pimpled, rarely nearly smooth. *Seeds* red to yellowish-orange, about 5 cm long and 2 cm diam.

FIG. 51.—*Encephalartos trispinosus*: Kap River Valley, Bathurst district, eastern Cape.

FIG. 52.—*Encephalartos trispinosus*: near Plutos Vale, Albany district, eastern Cape.

Encephalartos trispinosus is located in the eastern Cape in the lower reaches of the Bushmans, Great Fish and intervening river valleys in karroid scrub. There is appreciable variation between specimens in the lobing and width of leaflets.

Specimens classified under this species were first regarded by Hooker at Kew as a variety of *E. horridus*. Later authors, for example Hutchinson, Rattray and Henderson included the concept under *E. lehmannii*. Of the two ideas it is felt that the relationship is decidedly stronger with *E. horridus* than *E. lehmannii*.

The decision to recognize *E. trispinosus* as a distinct species from these two others is discussed in the Journal of S. Afr. Botany, 1965, and the decision was taken only after a considerable amount of field work. Field work showed that in the lower reaches of the Great Fish and Bushmans River Valleys there are isolated populations which are sufficiently distinct and numerous to justify specific status.

Some of the specimens show a strong likeness to *E. horridus* in the lobing of the median leaflets, but the leaflets from plants of comparable age of the two species show that those of *E. trispinosus* are generally narrower and the twisting of the lobes on the lower margin is rarely as uniform. The face of the female cone scale of *E. trispinosus* is much wrinkled and pimpled, blue-green or yellowish-green in colour, whereas that of *E. horridus* has a relatively smooth surface with prominent ridges directed towards the terminal facet, and is usually dark reddish-brown in colour before maturity. M. J. Wells records that cones of *E. horridus*, in the Botanical Garden at Rhodes University,

Grahamstown, turned a dull orange-yellow beneath their greenish-grey exterior at maturity but that they did not get anywhere near as deep or definite an orange colour as an *E. trispinosus* from Kap River. In addition *E. trispinosus* has longer incurved side lobes to the female scales.

FIG. 53.—*Encephalartos trispinosus*: female cone with the face of the scales angled and conspicuously wrinkled.

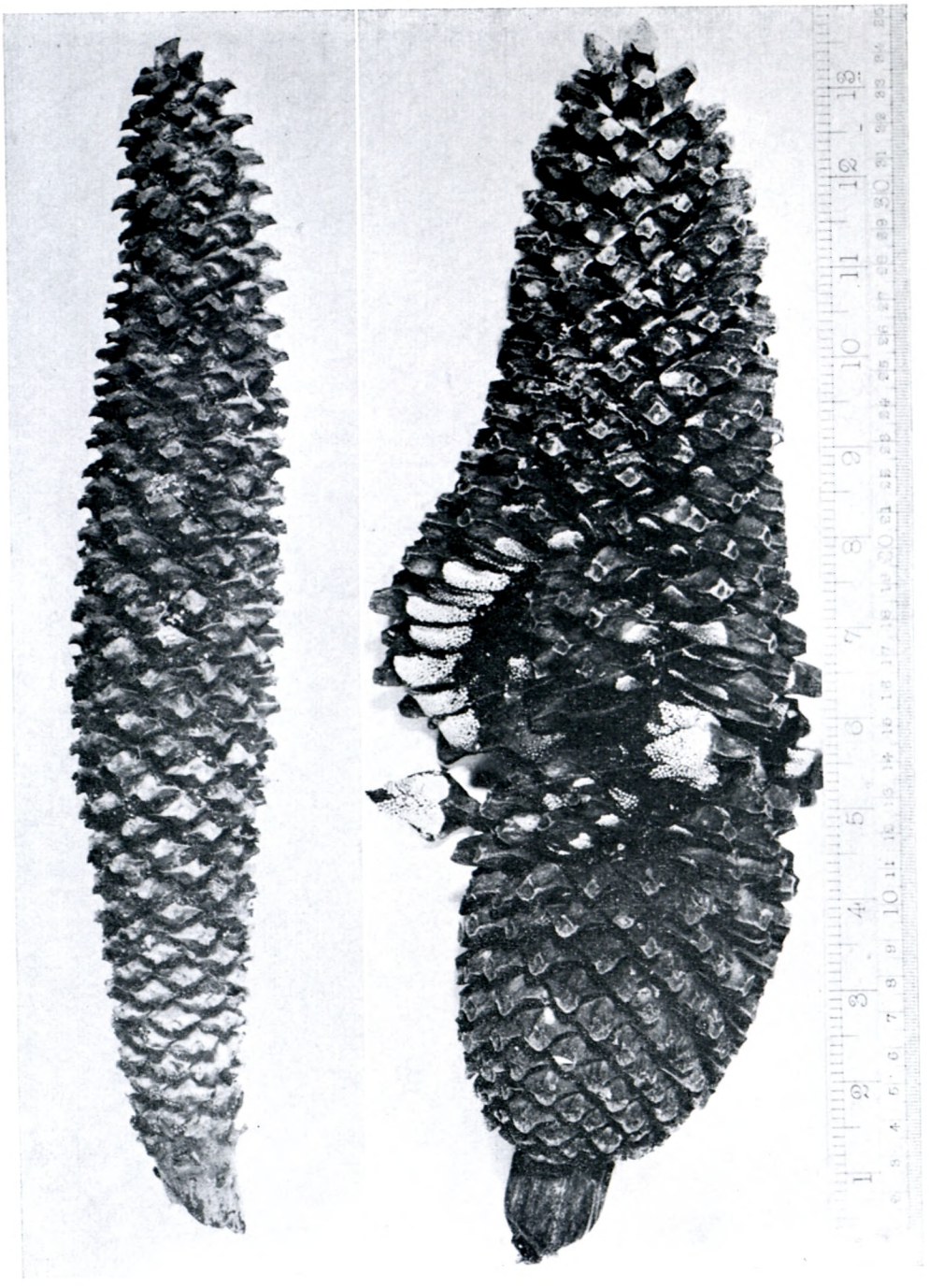

FIG. 54.—Male Cones: left, *Encephalartos trispinosus*; right *E. lehmannii*; former from Albany district, latter from Steytlerville district: Photo: G. G. Smith.

Encephalartos lehmannii, as seen here, is more robust than either *E. trispinosus* or *E. horridus*, has, for the most part, straight or nearly straight leaves with a large pulvinus or swollen base and the leaflets are only rarely toothed on the lower margin. The female cone scales are relatively smooth on the face by comparison with those of *E. trispinosus*.

The distribution range of neither *E. horridus* nor *E. lehmannii* overlaps that of *E. trispinosus*. However, in parts of its distribution range *E. trispinosus* comes into direct contact with *E. altensteinii* and in such localities there are plants which strongly suggest that natural hybridization has taken place. Some specimens are probably 1st generation hybrids, whereas others give the impression of 2nd generation segregates, because of their near approach in appearance to one or other of the parents.

Other species which come into direct or indirect contact, that is within a matter of one to several miles of *E. trispinosus* and *E. altensteinii* are *E. arenarius*, *E. latifrons* and *E. caffer*. Of these only the dwarf *E. caffer* seems uninvolved in hybridization. Some specimens, including several seen in the Bathurst district, seem to have an involved parentage which eludes a reasoned interpretation.

12. **Encephalartos horridus** (*Jacq.*) *Lehm.*, Pugill. 6 : 14 (1834). *Zamia horrida* Jacq., Fragm. 27 : tt. 27 & 28 (1801).

FIG. 11, 55, 56, 57.

FIG. 55.—*Encephalartos horridus*: dwarf female plant few miles west of Port Elizabeth, eastern Cape, on quartzite ridge.

Plant unbranched or more usually branched from the base with stems subterranean or exposed about 30 cm, exceptionally up to 1 m tall, with the crown sparsely woolly. *Leaves* rigid 0·5–1 m long, recurved in the upper third, with an intense bluish or silvery

bloom; leaflets reduced in size and simple towards base but not reduced to more than one prickle at base; median leaflets up to about 10 cm long and 2·5 cm broad with pungent apex and 1–3 pungent lobes up to 4 cm prominent on the lower margin and twisted out of the plane of the leaflet. *Cones* solitary with sparce blackish- or reddish-brown scurfy hairs over dark green surface: *male cone* subcylindric narrowed to both ends, 20–40 cm tall, 6–12 cm diam.; face of median scales projected into a beak up to 1 cm long: *female cone* more or less egg-shaped, 20–40 cm long, 15–20 cm diam., median scales with the face protruding 1·5–2 cm, ridged towards the tip but not much wrinkled or pimpled. *Seeds* pale red or carmine, 3–3·5 cm long and about 2·5 cm diam.

Encephalartos horridus occurs in the Port Elizabeth and Uitenhage districts of the eastern Cape.

It has been generally accepted that the typical form of this species originated from the Uitenhage district where it grows in association with karroid scrub in which succulent plants abound. The specimens must have been fairly abundant locally at one time judging by the number now in cultivation and plants may still be seen scattered in parts along the roadside when travelling from Uitenhage to Steytlerville. In the majority of specimens the major part of the stem is below ground level, but one exceptional record was made by R. Story of a plant with a stem over one meter (4 ft) tall. This indicates a close relationship with the concept classified under the name *E. trispinosus*, under which a fuller discussion of the problem of interrelationship will be found.

FIG. 56.—*Encephalartos horridus*: unusual form with trunk above ground few miles from Uitenhage, eastern Cape, on shale formation.

FIG. 57.—*Encephalartos horridus*: female and male cones and leaf from dwarf form in Port Elizabeth district as shown in FIG. 55.

In the Port Elizabeth district a few miles west of the city, the record of *Encephalartos horridus* is on a quartzite hill with a sparse sour vegetation (Fig. 55 and 57). The specimens are much-branched and dwarf by comparison with those in the Uitenhage district, to such an extent that they seem to merit varietal rank. There appears to be no important difference in the cone formation, except a smaller size. It has not been possible to compare growth reactions under cultivation of the two forms, for which reason the *status quo* is maintained.

Except for some specimens of *E. trispinosus*, *E. horridus* is readily distinguished from other related species, by its spreading recurved leaves with an intense bluish bloom on the inner whorls, by the deeply lobed lower margin of the median leaflets and the

twisting of the lobes. It is best distinguished from *E. trispinosus* by the cone characters, which unfortunately are not always available and one may have to rely on general characteristics and distribution records. If one knows that the specimen was collected near Uitenhage or Port Elizabeth, it is a rule of thumb identification because no allied species grows within its distribution area. It is difficult to appreciate why some authors have confused *E. horridus* with *E. latifrons*, which has a stout trunk developing over 3 m tall, broad dark green leaves, hairy at first and very different cones. The only excuse for confusion is the similarity in the lobing of the lower margin of median leaflets.

13. **Encephalartos arenarius** *R. A. Dyer* in Journ. S. Afr. Bot. 22 : 1 (1956).

FIG. 58, 59.

Plants unbranched or more often branched from the base with stems up to about 1 m tall and at this stage often somewhat reclinate, 20–30 cm diam. *Leaves* 1–1·5 m long, recurved in the upper half, without hair: leaflets light green when young with a faint bloom, becoming darker with age and losing the bloom, overlapping in the upper half and in V disposition, reduced in size towards base occasionally to one prickle; median leaflets 12–16 cm long, 2·5–4 cm broad with the attachment 1–1·5 cm broad, pungent with upper margin entire or occasionally with a single tooth, and lower margin usually with 3, rarely 4 flat or slightly twisted pungent lobes. *Cones* single: *male cones* with median scales projected into a beak about 1 cm long: *female cone* mainly barrel-shaped with rounded base and apex, 35–45 cm long and 20 cm diam. green with a slight bloom; median scales with the face projected about 2 cm, wrinkled or pimply. *Seeds* coral-red, up to about 5 cm long, 2–2·5 cm broad.

FIG. 58.—*Encephalartos arenarius*: plant of medium size, few with trunks up to 4 ft tall, from Alexandria district, eastern Cape.

FIG. 59.—*Encephalartos arenarius*: female plant with single cone, produced contemporary with whor of leaves, probably unusual, Alexandria district.

Encephalartos arenarius is local in the Alexandria district of the eastern Cape, associated with coastal sand-dune scrub bush; at one time it was locally plentiful, but its numbers have been reduced to make way for farming activities.

This species could well be confused with *Encephalartos latifrons*, yet it may readily be distinguished by its smaller stature its less rigid, lighter green foliage with a thin bloom, and, in the wild state, by its distribution pattern in sand-dune bush, as opposed to bush groups on rocky outcrops.

It is reasonably certain that natural hybridization has taken place on the banks of the Bushmans River between *Encephalartos altensteinii* and *E. trispinosus*. There are also grounds for a suspicion that *E. arenarius* may also be involved in certain cases of doubtful parentage. The elucidation of the taxonomic problems which present themselves in the identification of some specimens of *Encephalartos* in the lower reaches of the Bushmans and adjacent river valleys of the Alexandria and Bathurst districts, would be a long-term undertaking. At this stage it is not possible to be anything but vague on many issues.

14. **Encephalartos latifrons** *Lehm.* in Tydschr. Nat. Gesch. 4 : 424, t. 9 A & B (1837–38).

FIG. 15, 16, 60, 61.

FIG. 60.—*Encephalartos latifrons*: a large male plant about 9 ft in a bush group at Trappes Valley in the Bathurst district, eastern Cape.

FIG. 61.—*Encephalartos latifrons*: female cone on right hand plant in garden of the Old Mill, Trappes Valley, see FIG. 15 and 16.

Plants unbranched or more often branched from the base with stems 2·5–3 m tall. *Leaves* 1–1·5 m long, recurved or curled in the upper half, hard and rigid, finely hairy when young and gradually losing the hairs with age; leaflets overlapping in the upper half of the leaf and in V disposition, reduced in size near base but only the lowest sometimes prickle-like; median leaflets 10–15 cm long, 4–6 cm broad with the attachment

1·5–2 cm broad, pungent with upper margin entire or sometimes toothed and with 2–4 deep triangular pungent, sometimes slightly twisted, lobes on the lower margin. *Cones* 1–3, dark green or dark blue-green: *male cones* subcylindric, narrowed to both ends, 30–50 cm long, 8–17 cm diam.; median scales with the face projecting into a slightly decurved beak about 2 cm long. *Female cones* barrel-shaped up to about 60 cm long and 25 cm diam.; median scales with the face wrinkled and pimply and protruding 2–2·5 cm. *Seeds* red, about 5 cm long and 2–2·5 cm diam.

Encephalartos latifrons is found in association with scrub-bush on rocky outcrops in the Bathurst and Albany districts of the eastern Cape; it is now rare and shows little sign of active regeneration from seed. Distribution records from outside this area are suspect and require verification.

As mentioned earlier this is one of, if not the slowest growing arborescent species in South Africa. It seems that two or more years elapse between the emergence of new whorls of leaves, and cone production is irregular.

Some earlier workers seem to have experienced difficulty in distinguishing the robust *E. latifrons* from the dwarf *E. horridus*, and as pointed out in the notes under the latter, there is little justification for this. If, however, one introduces *E. arenarius* into the discussion, one could visualize it as an intermediate species, which bridges the gap in certain characters. It is certainly far more understandable that *E. latifrons* should have been thought to include *E. arenarius* than that it should be confused with *E. horridus*. Up to now, no direct overlap has been discovered in the distribution records of *E. latifrons*, in the slightly inland broken scrub of the Albany and Bathurst districts, and of *E. arenarius* in the coastal dune bush of the adjacent Alexandria district.

Encephalartos latifrons has not been found in close association with *E. altensteinii* in the Bathurst district, yet they are certainly not many miles apart in some places. A specimen in a local farm garden strongly suggested that it had its origin in hybridization between these two species. Another, rather different plant, cultivated in the Albany Museum grounds in Grahamstown, suggests the same possiblility.

15. **Encephalartos longifolius** (*Jacq.*) *Lehm.*, Pugill. 6 : 14 (1834). *Zamia longifolia* Jacq., Fragm. Bot. 1 : 28, t. 29 (1801).

FIG. 6, 62, 63, 64, 97.

Plants unbranched or branched from the base with stems up to about 3 m tall, rarely 4·5 m, 30–45 cm diam. *Leaves* 1–1·75 m long sometimes nearly straight but usually spreading and recurved towards the apex or occasionally arcuate, finely hairy for some time but most hairs eventually falling; leaflets usually dark green, sometimes with a bluish lustre or bloom, overlapping in the upper half and reduced in size towards base but not to a series of prickles, at most 2 prickles; median leaflets up to about 20 cm long and 4 cm broad, pungent or blunt, entire for the most part or with the lower margin with 1–3 short teeth. *Cones* 1 or 2 together, greenish-brown with reddish adpressed hairs: *male cones* 40–60 cm long and 14–20 cm broad, narrowed to the ends; median scales with the beak projecting about 2 cm: *female cones* more or less egg-shaped, up to about 60 cm long and 40 cm diam.; median scales with the face projecting 2–2·5 cm, coarsely wrinkled on the surface. *Seeds* red, about 5 cm long and 2·5 cm diam.

Encephalartos longifolius makes an imposing sight on the sourveld mountains from the Uniondale to Albany district, and is sometimes locally frequent.

FIG. 62.—*Encephalartos longifolius*: in Van Stadens River Valley, eastern Cape; a robust specimen, with Frank Stayner.

FIG. 63. *Encephalartos longifolius*: female plant with single cone in Paardepoort, between Steytlerville and Uitenhage, Cape.

FIG. 64.—*Encephalartos longifolius*: a specimen repeatedly burned in fynbos fires in the Langkloof, Uniondale district, Cape, showing unusual branching, with M. Wells.

This would be the first species of *Encephalartos* to be seen by early travellers approaching the eastern Cape via the Langkloof Valley. It appears first on the mountains some miles west of Joubertina and from there it is seen at irregular intervals on the hills of the Zuurberg approaching Grahamstown. It was the Swedish traveller Thunberg who first collected this arborescent species and also a dwarf species on his way to the eastern Cape with Masson, of Kew, in 1772. He mistook them for forms of one species and gave them the name *E. caffer*. The error was not discovered until much later, when it was found necessary to use the name *E. longifolius* for the arborescent species, while the dwarf retained the name *E. caffer*.

The stems of *E. longifolius* are often unbranched from the base and develop a massive trunk. Occasionally specimens are seen to branch above ground, but this must be regarded as abnormal and possibly caused by some injury (Fig. 64). The trunks withstand fierce fynbos fires over a considerable period of time but there must be a limit to their endurance of this hazard. One wonders whether the present western limit of distribution was set by the influence of fire. Fynbos or macchia fires are very much more intense than those in open grassveld. Grassveld becomes ecologically more important as one goes eastwards from Port Elizabeth.

The stature of the plant, the metalic green colour and the scurfy hairs of the leaflets are generally good guides to the identification of *E. longifolius*, but the degree of bloom on the surface of the leaflets varies, sometimes to the extent of a silvery shine, and one must be prepared for this. Normally there should be little difficulty in distinguishing *E. longifolius* from its near ally *E. altensteinii*, but specimens of the latter grown in full sunlight could cause some uncertainty to arise. There can be no doubt about specimens in the field, because the distribution ranges of the two do not overlap; the former keeps to inland hills of Table Mountain Sandstone and the latter mainly to coastal bush and on kranses, and for the most part is further east.

Although the relationsip to *E. woodii* in Natal must be remote, the leaf-canopy of *E. longifolius* sometimes takes on the characteristic ' umbrella ' shape of the former. In such cases one must confirm the identification by noting the absence of prickles towards the base of the leaves.

E. longifolius is associated on occasions, for example in Paardepoort on the Klein Winterberg, with *E. lehmannii*, but there is no close relationship between them, and no question of interspecific hybridization has been raised so far.

16. **Encephalartos altensteinii** *Lehm.*, Pugill. 6 : 11, t. 4 & 5 (1934).

FIG. 14, 65, 66, 67, 68.

Plants unbranched or branched from the base with trunks up to about 4 m tall, rarely up to 7 m and then generally reclining, 25–35 cm diam. with a small amount of wool on the crown. *Leaves* 1·5–3 m long, rarely 4 m long, nearly straight in exposed situations and recurved in shade, hairy at first except the surface of the leaflets, hairs soon falling; leaflets reduced in size at base but not to a series of prickles; median leaflets up to about 15 cm long and 2·5 cm broad, fairly rigid in open situation, not usually markedly tapering, with 1 or 2 or, less frequently, 3–5 teeth on upper and lower mergin, sometimes on one margin and not on the other, mucronate. *Cones* 2–5 together, rarely only one, yellowish-green: *male cones* subcylindric, rounded or narrowed to apex, up to about 50 cm long and 12 cm in diam., the median scales with the face extended into a decurved beak about 1·5 cm prominent: *female cones* more or less egg-shaped, 40–55 cm long, 20–28 cm diam., with the median scales with the face wrinkled and lumpy and with some hairs, projecting 2·5–3 cm. *Seeds* scarlet, 3·5–4 cm long, 2–2·5 cm diam.

FIG. 65.—*Encephalartos altensteinii*: in forest near East London, eastern Cape, trunk about 12 ft tall, with Miss Courtenay-Latimer.

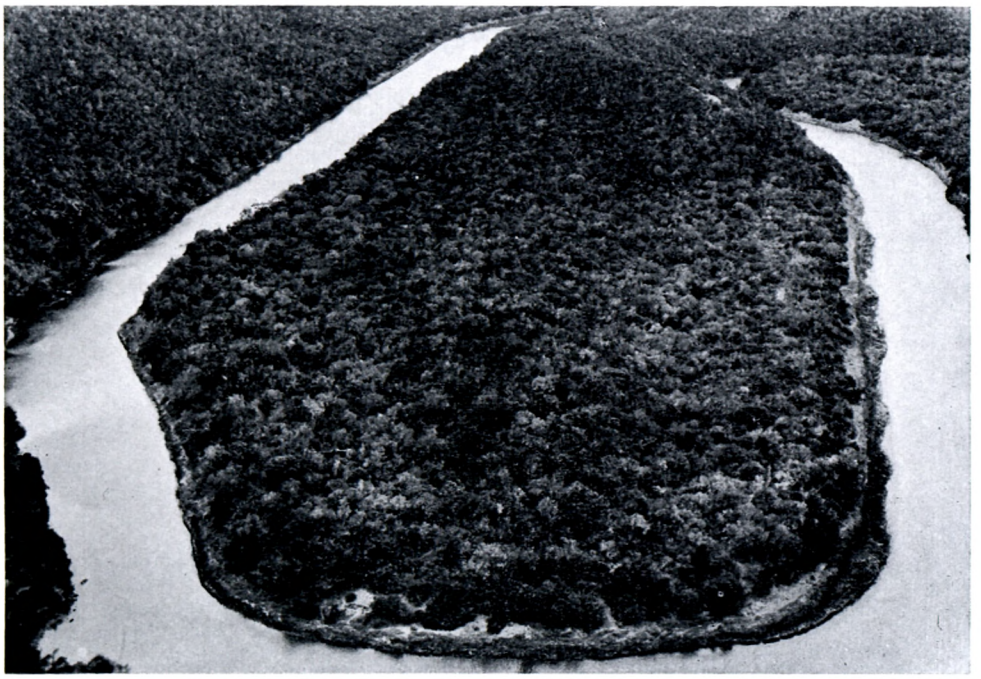

FIG. 66.—Horse-shoe Bend in Kowie River, Bathurst district, Cape, where *Encephalartos altensteinii* occurs frequently in coastal forest, photo taken from overlooking krans.

Encephalartos altensteinii has its western limit of distribution in the coastal bush on the west bank of the Bushmans River in the Alexandria district of the eastern Cape: it is furthest from the sea in the King William's Town district and extends eastward to the southern border of Natal.

Specimens from the midlands of Natal previously classified as *E. altensteinii* will be found classified under the name *E. natalensis* in this account. The absence of a series of prickles at the base of the leaf stalk in the former and their presence in the latter, is a fairly constant distinguishing feature between the two.

As in most species with prickles on the margins of the leaflets, those of *E. altensteinii* vary considerably in number, size and position. The type figure of the species shows the prickels to be conspicuous and fairly regular on both upper and lower margins. This indicates that the type specimen was probably collected on the west bank of the Bushmans River towards the coast, where very similar forms have been seen in recent times, Geographically too, this would be the most likely locality to be reached first by early botanical collectors. Specimens of *E. altensteinii* on the east bank of the river have fewer prickles, and, travelling eastwards, it is not long before some specimens are found which are almost devoid of marginal prickles. One wonders how long the Cycads on the Bushmans River banks, many reclining up to 25 ft long on the east bank, will survive the encroachment of the beach cottage.

In the Bushmans, Great Fish, Buffalo and intervening river valleys, *Encephalartos altensteinii* is found in association with several other species. In the case of *E. trispinosus* and *E. villosus*, they are found side by side with *E. altensteinii*, while *E. arenarius* and *E. latifrons* are not far distant from it in certain other areas. In such circumstances one

finds occasionally specimens which appear to combine the characteristics of the associated species and these strongly suggest that natural hybridization has taken place. No other species seems so much involved in natural hybridization as *E. altensteinii* and the supposed hybrid forms have added greatly to the problem of classification.

FIG. 67.—*Encephalartos altensteinii*: female cone from Bathurst district, near the area from which the type specimen was probably collected, specimen from Dr. E. E. A. Gledhill.

FIG. 68.—*Encephalartos altensteinii*: exposed in low scrub bush in the King William's Town district; main trunk about 15 ft tall, with G. G. Smith.

17. **Encephalartos woodii** *Sander* in Gard. Chron. 1908, 257 (1908).

FIG. 69, 70, 71.

Plants (only male known) unbranched or branched from the base, sometimes branched near the crown in cultivation, up to about 6 m tall, 40–60 cm diam., sometimes expanding to 90 cm at base, narrowing to 30–40 cm above, with densely leafy umbrella-like canopy and somewhat woolly crown. *Leaves* 1·75–2·5 m long, gracefully curved and spreading or broadly arched and bow-like, densely pale brown-woolly at first but hair falling with age; leaflets dark green and leathery, gradually reduced to prickles at the base, those from juvenile suckers variably 2–5-toothed in the lower half on one or both margins, those on old stems often entire; median leaflets up to about 20 cm long and 5 cm broad; the apex pungent or sometimes slightly hooked and blunt. *Cones*: *male* 1–several, bright orange-yellow, subcylindric, 40–90 cm long, rarely up to 120 cm, 15–20 cm diam., median scales up to about 2·5–3·5 cm prominent.

There is only one locality record for this species near Ngoye in Zululand. It is now probably extinct in the wild state.

Because of its unique character the story of its discovery and subsequent disappearance from nature is summarized below.

The first record was made by Medley Wood in 1895 near Ngoye forest on a botanical expedition by oxwagon. He noted a single male plant consisting of four large stems up to 18 ft tall, with several off-shoots from the base. Some years later, probably in 1903, Medley Wood sent John Wylie to collect living specimens for cultivation. He brought back some of the smaller off-shoots, three of which were planted in the Durban Botanic Garden and according to an unpublished report by Medley Wood other specimens were sent to Kew and Messrs. Sander & Co. of St. Albans.

In Medley Woods' Annual Report of 1906–7, which included a photograph of one of the plants, he referred to it under the name *E. altensteinii* var. *bispinosa*. On 25th April, 1908, however, Sander gave a short account of his specimen in the Gardeners' Chronicle under the name *E. woodii*. This prompted Medley Wood to give further information in the same journal of 2nd May, 1908. " Having reached a spot where the country was very rough, I stayed for several days botanising in the vicinity, and in so doing found a solitary clump of *Encephalartos* . . . not another plant in the vicinity . . . but a number of *E. brachyphyllus* (i.e. *E. ngoyanus* Verdoorn) . . . we have in the garden seven species . . . numerous specimens, but these three (*E. woodii*) as far as the foliage is concerned, are in my opinion, not only the handsomest of all, but are strikingly different from any of the others ".

Wylie returned in 1907 to collect two of the larger trunks and found that one of the original four had been mutilated by Bantu in the interim. A photograph of the parent plant was taken *in situ* on that occasion and is preserved in the Natal Herbarium, Durban (Fig. 69). The two trunks are still in good health on the lawn near the Old Conservatory in the Durban Botanic Garden. These specimens prompted Medley Wood to say in 1912 that " the leaves are not at all like those of the other species known to me, but are beautifully curved, and make the plant a very decorative one ".

The next record of importance is the visit to the site by C. J. Chamberlain from Chicago, about 1912, and reported in his booklet of 1919 under the title of The Living Cycad. He refers to a single specimen more than 10 ft high about 20 miles from

Mtunzini in the midst of *Stangeria* and *Encephalartos brachyphyllus* (i.e. = *E. ngoyanus* Verdoorn) " My Zulu guide, the son of the Zulu Chief, . . . had been well coached by Mr. Wylie, otherwise there would have been little likelihood of finding such an isolated specimen in a hilly country, with numerous stretches of forest and bush " . . . " They say that it is the only Cycad, with a trunk, within a distance of fifty miles ".

FIG. 69.—*Encephalartos woodii*: the original male plant found near Ngoye, Zululand; from a photograph in the Natal Herbarium, Durban, taken on the expedition by Wylie in 1907.

FIG. 70.—*Encephalartos woodii*: plant established in Durban Botanic Garden, with Medley Wood, from photo in Kew Bulletin 1914.

FIG. 71.—*Encephalartos woodii*: same plant as in previous figure with Miss H. Forbes, 1945, trunk abnormally branched above, other trunks in the garden have not branched, base enlarged probably due to compression through weight of canopy.

A further interesting record was revealed in 1964 by Mr. B. J. Huntley, who traced a copy of a letter from Forester Prior, dated 22nd May, 1916. It reads:

" Only two plants (presumably trunks from the old rootstock) of this species (*E. woodii*) are known ". " I intend cutting both, one for him (Wylie) and one for Pretoria ". " The vegetation has been burned in the vicinity during the last year or two and the stems are clipped by natives, so if they are removed now they will

serve a better purpose to the botanical world than if they remained there ". A letter dated 29th May, 1916 from the Acting District Forester states: " Forester Prior has now consigned the only known plant of this species in the Ngoye to the Chief: Division of Botany, Pretoria " . . . " the weight of this plant is between 13 and 15 hundred pounds and is about 12 feet long and 18 inches in diameter ".

What may be the plant referred to above was traced in the Union Buildings rockery and by kind permission of the Superintendent was replanted in the National Botanic Garden of the Botanical Research Institute in 1964.

Huntley went on to say that in a three week's stay he had not discovered a specimen of *E. woodii* at Ngoye. He had, however, located the spot where the plants had been removed, a steep, south facing slope on the margin of a forest outlier. This he had done with the assistance of an old wizened Zulu of about 85 years, the only one who really knew *E. woodii*. On some of the adjacent slopes specimens of *E. ngoyanus* were frequent and were regarded by the old man as seelings of *E. woodii*. The other old Zulus, whom Huntly consulted, confused it with *Cyathia dregei*, *Stangeria eriopus* and *Encephalartos ngoyanus*. He concluded by saying that he doubted very much if the species was still to be found there, an opinion with which I reluctantly agree.

18. **Encephalartos natalensis** *Dyer & Verdoorn* in Bothalia 6 : 205 (1951).

FIG. 72, 73, 74, 75.

Plants unbranched or more often branched from the base with stems 3–4 m tall and occasionally up to 6·5 m, 30–40 cm diam., sometimes with wool on crown. *Leaves* 1·3–3·2 m long, nearly straight or somewhat recurved and slightly twisted towards apex; leaflets reduced in size towards the base to several prickles on either side of the stalk, dark green; median leaflets 16–23 cm long and 2·5–4·5 cm broad, pungent, entire or with 1–5 sharp prickles on one or both margins, more often on the lower leaflets and sometimes almost lobate on young trunks. *Cones* 2–3 together, dark yellowish-green with thin covering of foxy wool: *male cones* up to about 45 cm long and 9–10 cm diam.; median scales extended into a beak about 1·5 cm long: *female cones* somewhat egg-shaped, up to 50 cm long and 25 cm diam.; median scales with the face wrinkled into blunt papillae and projecting about 2 cm. *Seeds* scarlet, about 5 cm long and 2 cm diam.

Encephalartos natalensis is to be seen on inland kranses and in kloofs from the eastern Cape–southern Natal border to northern Natal in the upper catchment area of the Umfolozi River.

This species was segregated from the broad concept held by some earlier workers of *Encephalartos altensteinii* Lehm. In typical *E. altensteinii* the basal leaflets are not reduced to a series of prickles as they are in *E. natalensis*. When *E. natalensis* was first described it was suggested that there was a wide break between its distribution areas and that of *E. altensteinii*. Since then the gap has been very much bridged by records of *E. altensteinii* from the eastern Cape border and *E. natalensis* is at no great distance from it. There is still a difference though, in that *E. altensteinii* is frequent in coastal bush and is at its furthest from the coast in the district of King Williams Town, whereas *E. natalensis* is restricted to inland areas well out of the coastal vegetation association.

FIG. 72.—*Encephalartos natalensis*: type female plant in Monteseel Reserve near Inchanga, Natal, with Dr. Herd.

E. natalensis used to be called the giant Natal Cycad even as early as 1867 when a particularly large specimen from Kranskloof was painted by J. Sanderson. Charles Millar, writing at the time to Hooker at Kew said that the huge *Encephalartos* was found in a secluded kloof about 30 miles from the sea. It had a girth of 9 ft, was 16 ft tall before branching and was 25 ft to the crown formed of 5 branches. Millar added that one trunk filling a large wagon, was transferred to the Durban Botanic Garden. It is not known whether or not this is the same specimen which Medley Wood commented on in a note he sent to the Gardeners' Chronile in 1908, about a plant in the Durban Botanic Garden: " This plant is a male and this year has no less than 18 cones, arranged in more or fewer complete concentric circles. I think that this is a record number; the tree has been partly buried in the side of an embankment, and it is intended to remove it to a position where its full length can be seen to better advantage ". There is a large male specimen near the steps leading to the old Conservatory today, which seems to answer this description.

Further information about *E. natalensis* is included in the notes on the rate of growth of trunks. The appearance of the old female type-plant in question has altered considerably in recent times. The tallest trunk was snapped in two places by a tornado which devastated the area in 1961. Several of the younger trunks have since made appreciable growth but the tallest one in 1963 was then only 11 ft 7 ins in height.

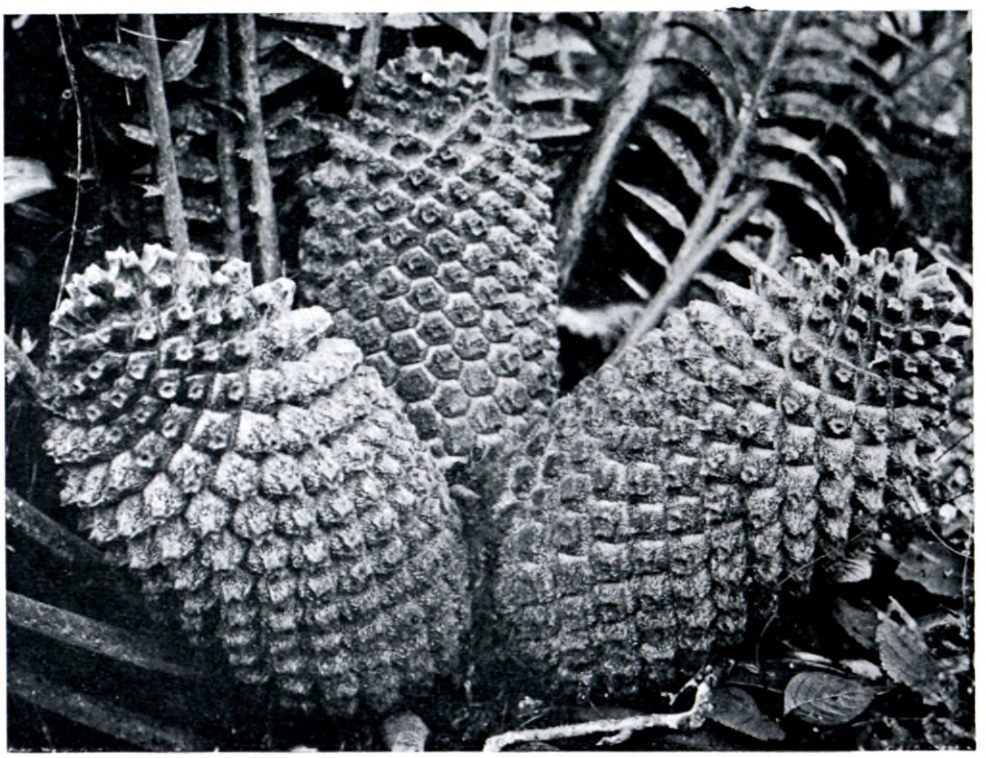

FIG. 73.—*Encephalartos natalensis*: cones on a branch of the type specimen shown in previous figure.

FIG. 74.—*Encephalartos natalensis*: habitat view at Howick Falls, near Pietermaritzburg, Natal.

FIG. 75.—*Encephalartos natalensis*: habitat view on Inhlazatje Mt. south of Vryheid, Natal.

19. **Encephalartos lebomboensis** *Verdoorn* in Flow. Pl. Afr. 27 : Pl. 1078, 1079 (1949).

FIG. 5, 10, 76, 77, 78.

FIG. 76.—*Encephalartos lebomboensis*: on the mountains in the vicinity of Stegi, Swaziland, with J. Erens.

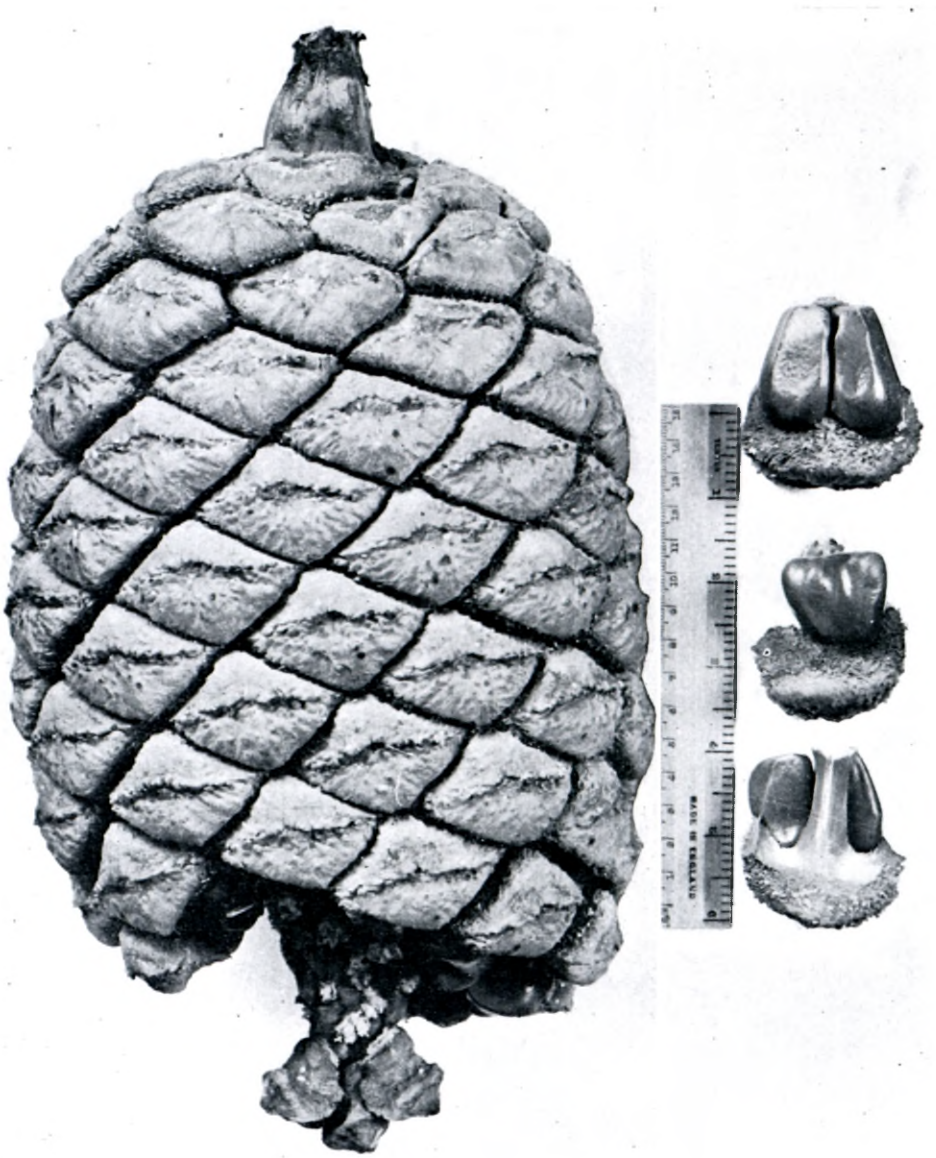

FIG. 77.—*Encephalartos lebomboensis*: female cone from Paulpietersburg district, Natal, showing relatively flat unwrinkled face of the scales.

Plant unbranched or sometimes branched from the base with stems occasionally up to about 4 m tall and 30 cm diam., somewhat woolly on crown. *Leaves* in a dense crown, 1–2 m long, fairly straight or somewhat recurved towards apex, hairy at first but hairs soon falling; leaflets reduced in size towards base and ending in several prickles on either side of the leaf stalk; median leaflets 12–17 cm long and 1·2–2·2 cm broad, with

1–4 prickles on both margins but more regularly on the lower margin and rarely without prickles. *Cones* 1–3 together, apricot-yellow, or dull salmon-pink; *male cones* subcylindric, up to about 45 cm long and 13 cm diam., narrowed gradually to both ends, median scales projected into a beak 1–1·5 cm long: *female cones* more or less egg-shaped, up to about 45 cm long and 22 cm diam., median scales fairly smooth and the face protruding only about 1 cm, somewhat hairy at first. *Seeds* scarlet, 4 cm long and 1·8–2·2 cm diam.

Encephalartos lebomboensis features prominently on cliffs and in kloofs of the Lebombo Mountain range in Swaziland, southern Transvaal and northern Natal and also extends into Portuguese East Africa.

There is a fairly close relationship between this and *E. natalensis* which occurs further south. There does not seem to be an overlap in distribution, *E. lebomboensis* not occurring south of the Pongola River catchment and *E. natalensis* not further north than the Umfolozi River catchment. The face of the female cone scales of *E. lebomboensis* is relatively smooth and flattish compared with the more prominent wrinkled one of *E. natalensis*. In addition the leaves of *E. lebomboensis* are straighter, the base of the leaf stalk more densely prickled and the leaflets narrower.

FIG. 78.—*Encephalartos lebomboensis*: rescue by ' Operation Wild Flower ' at the site of the Jozini Dam across Pongola Poort. Photo: J. Hall.

The distribution of *E. lebomboensis* overlaps in places, such as near Pongola Poort in southern Transvaal, that of *E. villosus*, and the appearance of certain young plants in the area suggests that natural hybridization between the two species has taken place. *E. ngoyanus* also occurs at the Jozini Dam site.

Several thousands specimens of *E. lebomboensis* doomed to be swamped by the waters of the Jozini Dam across the Pongola Poort were removed beforehand, largely by " Operation Wild Flower " for distribution to public gardens and interested growers. (Fig. 78). In order to remove specimens there was no option but to float or take them by raft from the north to the south bank and this photograph shows how some of the larger trunks were handled. The aims of Operation Wild Flower are most praiseworthy and the organization has met a real need.

It is unusual for plants of *Encephalartos* in cultivation to set fertile seed but a striking example was observed in the garden of Capt. D. R. Keith near Stegi, Swaziland in 1947 (Fig. 10). He had a short avenue of *Encephalartos* including both male and female specimens of *E. lebomboensis*, which occurs naturally in the neighbourhood. Female cones had developed and fallen to pieces the previous year and at the time of our visit one parent plant was surrounded in the short grass cover by a dense stand of seedlings. A quantity of them was collected and a group of young plants is now established in the Pretoria National Botanic Garden of the Botanical Research Institute. In nearly 20 years the stems under dry conditions have not developed above ground.

20. **Encephalartos transvenosus** *Stapf & Burtt Davy* in Burtt Davy Fl. Transvaal & Sw. 1 : 40 & 99 Fig. 4B (1926).

FIG. Frontispiece, 79, 80, 81, 82.

Plants unbranched or occasionally branched, reaching a height of about 13 m (40 ft) in exceptional cases but many are between 5 and 8 m and 40–65 cm diam., with brown woolly hairs on the crown. *Leaves* 1–2·5 m long, fairly straight or slightly recurving towards the tip, hairy at first but the hairs soon falling: leaflets reduced to several prickles on either side at base; median leaflets spreading more or less at right angles from the stalk and then recurving gradually and sometimes slightly sickle-curved, 10–20 cm long, 2–3·5 cm broad, generally toothed on both upper and lower margin towards base. *Cones* 2–4 together: *male cones* subcylindric, 30–40 cm, 13–15 cm diam., rounded at apex; median scales with the face projecting into a beak 1–1·5 cm long: *female cone* more or less egg-shaped, 50–80 cm long and 20–30 cm diam., the median scales with the face somewhat wrinkled or nearly smooth and projecting about 2·5 cm. *Seeds* red, 4·5–5 cm long and about 2·5 cm diam.

Encephalartos transvenosus, the giant Modjadji Cycad, is prominent in the mist belt on the mountains of the Soutpansberg and Letaba districts of the Transvaal.

The Modjadji Cycad, sometimes referred to as Modjadji Palm, which enjoys royal protection in the territory of the Rain Queen near Duiwelskloof, is certainly the most majestic of all species in southern Africa and at its full height of about 40 ft has few rivals in any other part of the world. In addition to its size, a distinguishing feature of the species is the recurving of the leaflets from the leaf-stalk. The leaflets are somewhat broader in proportion to their length than those of its relative *E. paucidentatus* with which it might be confused in its middle height. The leaflets do not have the same prominent venation on their under surface as do those of *E. paucidentatus*. The female cones weigh up to about 75 lb.

FIG. 79.—*Encephalartos transvenosus*: the Modjadji Cycad, about 30 ft tall, with younger ones below, in Modjadji Location, Letaba, Transvaal, and under the protection of the Rain Queen, with Prof. R. H. Compton.

Another feature of *E. transvenosus* at Modjadji, and unrivalled in southern Africa, is its presence in forest formation. It is to be numbered in its thousands, on the hills near the royal kraal. For how long protection has been enforced by the Bantu Queens it is not possible to say, but the decree must have had some bearing on the present density of the local Cycad population. Damaged trunks are the exception. In other areas and in the case of most other species, the trunks frequently show signs of mutilation, often the work of the Bantu medicine men. *E. woodii*, now probably extinct in nature, certainly suffered at their hands.

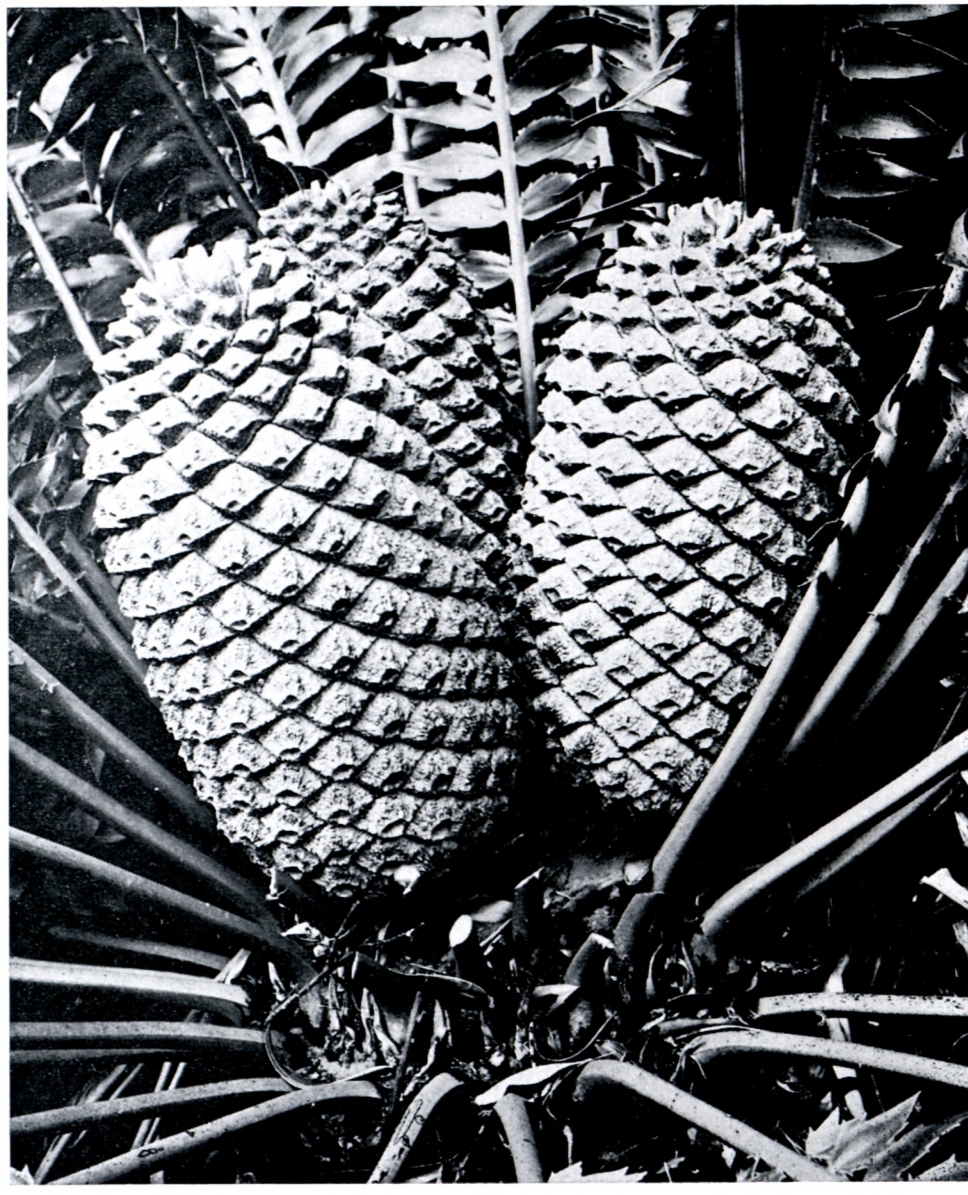

FIG. 80.—*Encephalartos transvenosus*: female cones weighing up to 75 lb on maturity.

FIG. 81.—*Encephalartos transvenosus*: general view of remarkable forest of Cycads in protected area at Modjadji Location.

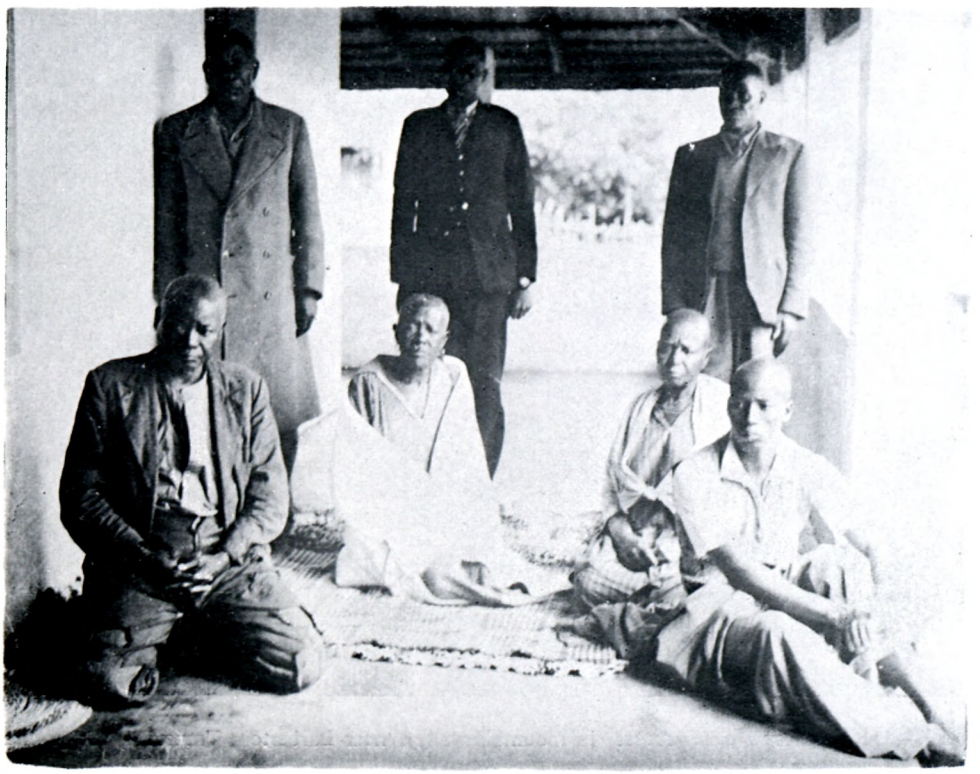

FIG 82.—The Modjadji Rain Queen in 1947, with her lady in waiting, advisors and son seated on the right.

21. **Encephalartos paucidentatus** *Stapf & Burtt Davy* in Burtt Davy Fl. Transvaal & Sw. 1 : 40 & 99 Fig. 4A (1926).

FIG. 83, 84.

Plants unbranched or occasionally branched from the base with stems up to about 6 m tall and 40–70 cm diam. and brown woolly on crown. *Leaves* 1–2 m long, fairly straight or slightly recurved, hairy at first and gradually losing the hairs; leaflets gradually reduced in size towards the base, becoming lobate and the lowest prickle-like; median ones straight or somewhat curved, 15–25 cm long and 2–3·2 cm broad towards the base, with up to 30 conspicuous raised veins on the lower surface where hairs persist longer than elsewhere. *Cones* probably 2–3 together: *male cones* up to about 60 cm long and 15 cm broad with the scales projecting into a decurved beak 1·5–2 cm long with toothed or crenate margin: *female cones* large but exact measurements of a complete one are not recorded; the individual scales are 5–6 cm broad and about 3·5 cm thick vertically; the face is wrinkled and the beak protrudes about 3 cm. *Seeds* red, up to about 4 cm long and 2·5 cm diam.

Encephalartos paucidentatus is found rather sparsely in low forest and mountain bush in the eastern Transvaal near Barberton and over the border of Swaziland.

One may claim with good reason that this is one of the most handsome species for cultivation, because of its graceful widely spreading leaves with long slender, often slightly recurved, leaflets. The numerous (up to about 30) conspicuous longitudinal raised veins on the lower surface of the leaflets are distinctive among related species, such as the giant Modjadji Cycad, *E. transvenosus*, from near Duiwelskloof and the

FIG. 83.—*Encephalartos paucidentatus*: in mountain valleys near Barberton, Transvaal, with typical whorl of leaves.

FIG. 84.—*Encephalartos paucidentatus*: on mountain near Barberton; male plant with trunk up to about 12 ft tall and three or more specimens in the background.

Soutpansberg. It is comparatively rare, unfortunately, but in co-operation with the Department of Nature Conservation of the Transvaal wise inhabitants of Barberton have established the Ida Doyer Nature Reserve where fine specimens are included.

There has been some confusion about the distribution of *E. paucidentatus* in nature because it was first recorded as having originated from the farm Breslau, north-west of the Soutpansberg. All efforts to substantiate the record failed and there is little doubt that the species is, in fact, restricted to the area mentioned above.

22. **Encephalartos ferox** *Bertol.* f. in Mem. Accad. Sci. Bologn. 3 : 264 (1851) *E. kosiensis* Hutch. in Kew Bull. 1932 : 512.

FIG. 85, 86, 87.

Plants unbranched or occasionally branched from the base, usually less than 1 m tall but occasionally up to about 2 m and 30–35 cm diam. *Leaves* 1–2 m long, nearly straight and gradually spreading, hairy at first but soon without hairs; leaflets gradually reduced to a few prickles near the base; median ones broadest above the middle, up to about 15 cm long and 3·5 cm broad, rarely up to 5 cm broad, with 2–4 small teeth on the upper and lower margins and terminating in 3–5 pungent lobes. *Cones* 1–3 together, salmon- or shrimp-pink to scarlet: *male cones* subcylindric, narrowed to both ends, up to about 40 cm long and 7–10 cm diam.; the median scales with a decurved beak about

1 cm long: *female cones* egg-shaped, 25–50 cm long 20–40 cm diam; the median scales with the face somewhat wrinkled and 2–2·5 cm prominent. *Seeds* red, 4·5–5 cm long, 1·5–2 cm diam.

FIG. 85.—*Encephalartos ferox*: young male and female plants in Durban Botanic Garden, Natal.

FIG. 86.—*Encephalartos ferox*: vigorous young specimen in garden of Mr. Harry Butcher in Durban, Natal; *E. humilis* in left foreground, 1947.

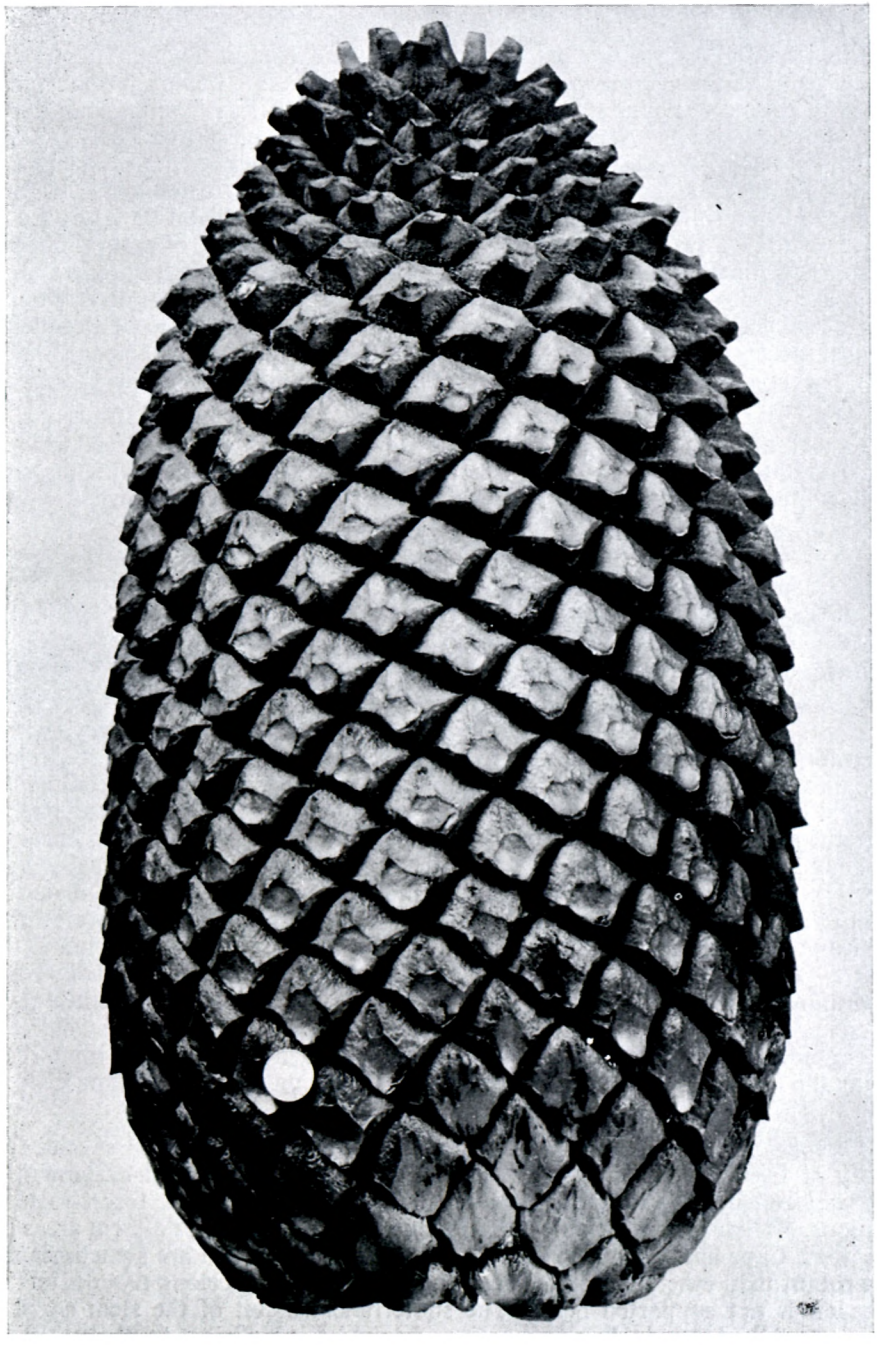

FIG. 87.—*Encephalartos ferox*: female cone from Xai Xai (Chai Chai) in Portuguese East Africa.

Encephalartos ferox occurs in coastal scrub bush and grassveld from about 400 miles north of Lourenço Marques to Sordwana Bay in Zululand.

After this species was first discovered in Zululand at Kosi Bay by Aitken and Gale, the new name *Encephalartos kosiensis* was given to it and it was only some years later that it was proved to be the same as the plant named earlier as *E. ferox* from the coastal belt of Portuguese East Africa. This habitat along the eastern coast is far removed from that of any other species in southern Africa. Its furthest inland record in southern Africa is about 25 miles from Sordwana Bay on the road to Pongola. Here on the Makatini Flats a single specimen was reported in 1964 by a Natal Parks Board ranger, Mr. I. Steytler. But this does not appear to be within the range of natural distribution. *E. ferox* is distinctive in the shape of the broad leaflets which are broadest above the middle and terminate in 3–5 spinescent lobes. The salmon-pink or red colour of the cones is also peculiar to it in southern Africa. It does not appear to be closely allied to any local species. Its numbers have been diminished by the encroachment of habitation on the Moçambique coast and by afforestation in Zululand.

As mentioned in the chapter on propagation, a record was kept of seed which germinated in Durban in 1937 and it was noted that one of the plants, with the stem still mostly subterranean, produced its first cone after twelve years' growth.

23. **Encephalartos villosus** *Lem.*, Ill. Hort. 14, Misc. 79 (1867); 15 : t. 557 (1868).

FIG. 88, 89.

Plants unbranched or occasionally branched possibly due to injury, with stems subterranean or sometimes with the crown slightly exposed, up to about 30 cm long and 20 cm diam. *Leaves* 1·25–2·5 m long, suberect to gracefully curved-spreading, with the stalk white-woolly at first; leaflets glossy green, widely spreading to recurved, reduced in size towards the base into a series of prickles; median leaflets linear to linear-lanceolate, acuminate, 15–25 cm long, rarely up to 30, 1·5–2·5 cm broad, usually with both upper and lower margins with 1–3 forward-directed sharp prickles and the apex with a single point, or occasionally with 2 subequal prickles. *Cones* 1–several together, greenish-yellow to orange-yellow: *male cone* up to about 65 cm tall, tapered to the apex and 6·5–12 cm diam. above the base (varying considerably in size and partly dependent on the number of cones from the head); median scales with face very little projecting and irregularly toothed or rough on lower margin: *female cone* subcylindric, 30–40 cm long and 12–13 cm diam.; median scales with face flattened and somewhat overlapping the scale below. *Seeds* scarlet, 2·5–3·3 cm long, 1·8–2 cm diam.

Encephalartos villosus is a relatively common and widely spread species from the vicinity of East London into the coastal parts of Natal, the south-eastern tip of the Transvaal and into Swaziland: it is usually associated with low forest in temperate situations. There is considerable variation in size of plants from different areas between the eastern Cape and Swaziland and those from the latter area are sometimes so much more robust than others that it has been suggested that they belong to a distinct variety. This view is not supported here. The subterranean habit of the stem added to the reduction of the lower leaflets to a series of prickles is sufficient to distinguish it from most related species in southern Africa. It has its nearest relative in *E. umbeluziensis*, which also has a subterranean stem but lacks the series of prickles on the base of the leaf stalk.

FIG. 88.—*Encephalartos villosus*: near Shongweni Waterfall north-west of Durban, Natal; this may be regarded as the typical form of the species; the prickles can be seen extending almost to the base of the leaf rhachis.

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It was mentioned in an earlier chapter that *E. villosus* was collected and exported in large numbers from Natal in the last century and in recent times many plants have been removed from the wild state near East London in the preparation of land for pine-apple research. Yet, because the species regenerates well naturally, no fear need be felt that its survival in nature is in any danger.

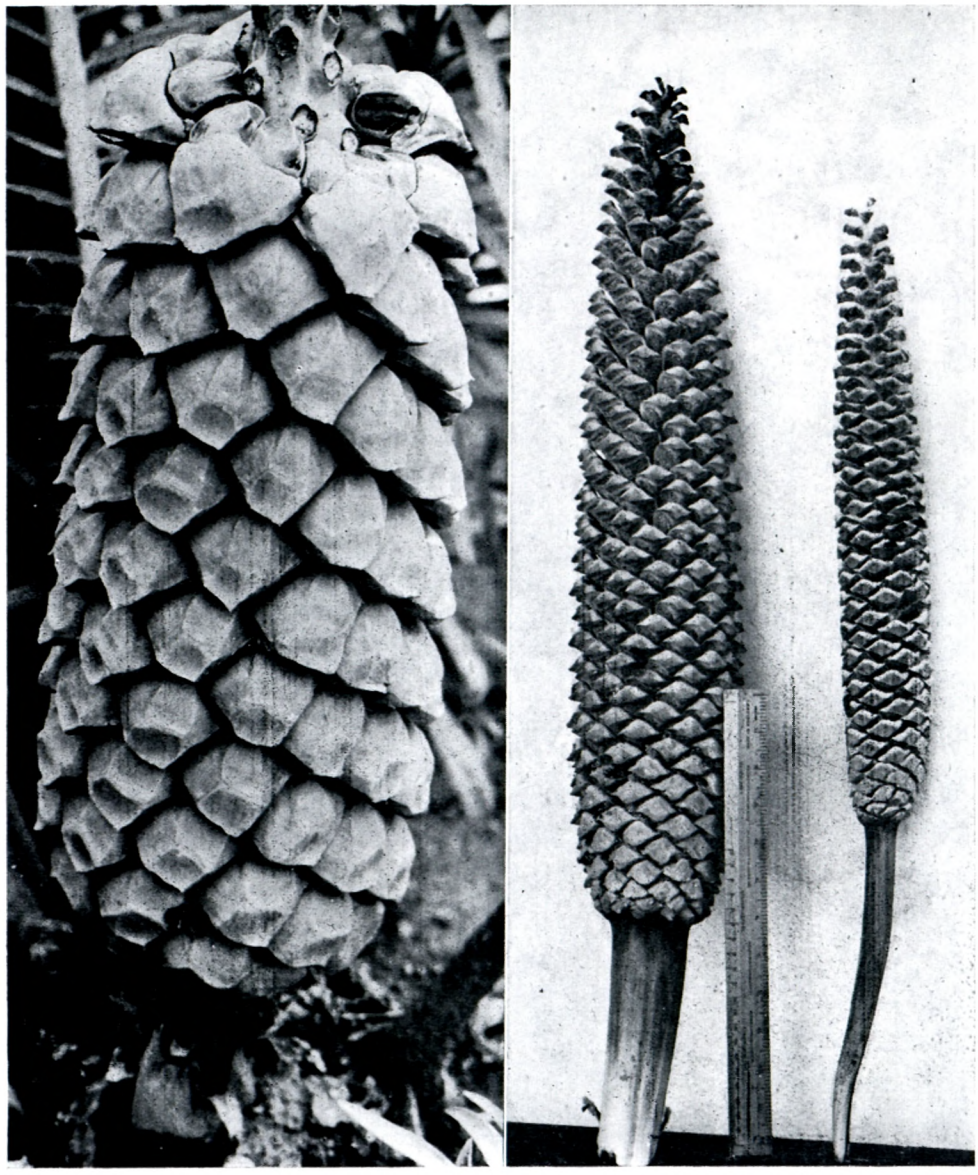

FIG. 89.—*Encephalartos villosus*: left, female cone from near Shongweni, north-west of Durban; right, extreme forms of the male cone on plants in cultivation at the Botanical Research Institute, Pretoria.

Near East London *E. villosus* sometimes grows in close proximity to *E. altensteinii*. In the south-eastern tip of the Transvaal near Pongola Poort it is found in association with *E. lebomboensis*. In both areas specimens with intermediate characters between *E. villosus* and the second species have been found, strongly suggesting that natural hybridization has taken place. Further examples of suspected natural hybridization within the genus are mentioned under *E. altensteinii*, *E. trispinosus* and elsewhere.

24. **Encephalartos umbeluziensis** *R. A. Dyer* in Flow. Pl. Afr. 28 : Pl. 1100 (1951).

FIG. 90, 91.

Plants unbranched or occasionally branched possibly due to injury; stem subterranean or sometimes with crown slightly exposed, up to about 30 cm long and 20–25 cm diam. *Leaves* 1–2 m long, suberect in open situations and only recurving in shade, woolly at first except on upper surface of leaflets, hairs falling with age; leaflets, reduced in size towards base but not to more than 1 or 2 prickles; median leaflets 10–20 cm long, rarely up to 30 cm, 8–15 mm broad tapering gradually to the pungent apex, and margins usually with 1–3 prickles. *Cones* 1–3 together, sulphur-yellow on maturity: *male cones* subcylindric up to about 30 cm long, 6–8 cm diam. tapering slightly to apex, median scales flattened and only slightly projecting: *female cones* more or less cylindrical, up to about 30 cm long and 12 cm diam.; median scales with face flattened slightly, ridged and not much projecting. *Seeds* scarlet, about 3·5 cm long and 2 cm thick.

Encephalartos umbeluziensis appears to be restricted in distribution to dry forest without much undergrowth in southern Portuguese East Africa, and extends into Swaziland up the Umbeluzi River Valley: it may be common locally.

This species is distinguished from *Encephalartos villosus*, its nearest relative, by the absence of a series of prickles on the base of the leaf-stalk. Sometimes there may be one or two prickles but not more. The leaf-stalk or rhachis is usually fairly straight, round and smooth and the dark green upper leaflets are set like a half open Venetian blind. The cones are generally smaller than those of *Encephalartos villosus* and the face of the scales also differs somewhat. Anatomical differences also have been observed by Prof. Dr. P. Greguss of the Botanical Institute, Szeged, Hungary. Both species occur in Swaziland but under different habitat conditions. *E. villosus* favours relatively high, cool and moist areas as opposed to the hot drier habitat of *E. umbeluziensis* in the Umbeluzi River Valley. And in spite of this relatively near approach of the two species, no actual overlapping of the distribution areas has been recorded. In addition no specimen with intermediate characters between the two species has been reported from either distribution area.

The evidence taken as a whole, is sufficiently strong to refute the suggestion that *E. umbeluziensis* should be regarded as a variety of *E. villosus*.

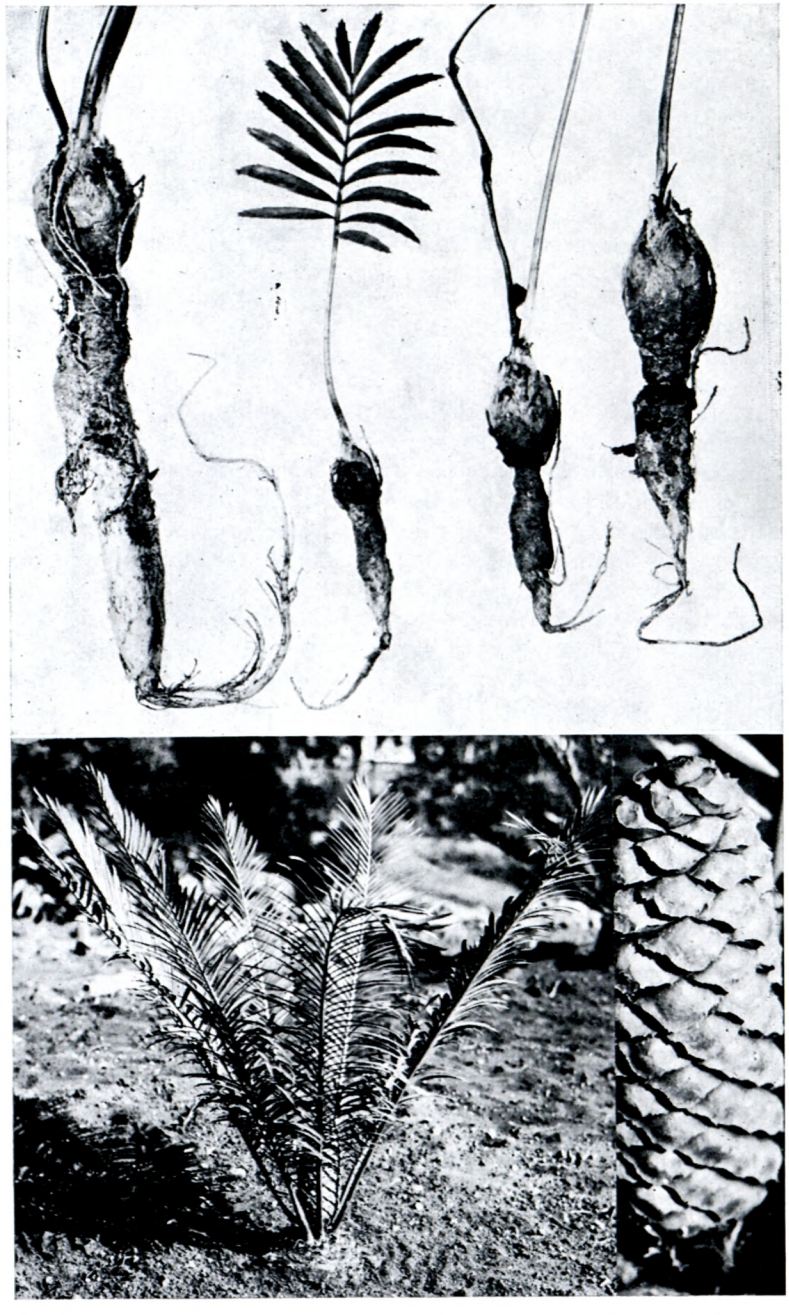

FIG. 90.—*Encephalartos umbeluziensis*: top, seedling and young plants from Swaziland; bottom left, female plant in garden of Botanical Research Institute, Pretoria; right, closer view of female cone.

FIG. 91.—*Encephalartos umbeluziensis*: male plant in cone; leaf rhachis smooth and round; leaflets not reduced to a series of prickles towards base as in *E. villosus*.

25. **Encephalartos ngoyanus** *Verdoorn* in Flow. Pl. Afr. 27: Plates 1053, 1054 (1949).

FIG. 4, 92.

FIG. 92.—*Encephalartos ngoyanus*: left, type female plant of the species near Ngoye Forest in the Umtunzini district of Zululand; right, male cone from plant collected in the type locality.

Plant dwarf, unbranched or possibly branched occasionally due to injury, stem subterranean or with crown slightly exposed, up to 30 cm long and 20 cm diam. *Leaves* 0·5–1·25 m long, erect-spreading or slightly recurved in the upper half, with silky and woolly hairs which fall with age; leaflets reduced in size towards the base but rarely to a prickle; median leaflets 7–8 cm long rarely up to 12 cm, 9–11 mm broad, rarely 1·5 cm, tapering gradually from near the base to the pungent apex, usually with 1–3 teeth on lower margin, rarely entire. *Cones* solitary, yellow at maturity: *male cones* subcylindric, 20–25 cm long, 4·5–6 cm broad, narrowed to apex; the median scales with the face projected into a beak about 7–8 mm long; *female cone* more or less egg-shaped, about 23 cm long, 10 cm diam.; median scales with the face flattened and the lower margin sometimes slightly overlapping the scale below. *Seeds* scarlet, 2·7–3 cm long, 2 cm diam.

Encephalartos ngoyanus is sometimes common in grassveld and on forest margins, often near boulders, in Zululand and possibly extends over the southern border of Swaziland and Transvaal at Pongola Poort.

This species seems distinguishable from *Encephalartos caffer* in a number of inconspicuous ways. The root-system seems less tuberous, the stems less consistently subterranean, the leaflets less crowded, not twisted and with the lower margin often toothed and the female cone scales with a less pronounced terminal facet. While each of these characters shows variability the combination is considered to justify specific separation.

The break in distribution between *Encephalartos caffer* in the eastern Cape and *Encephalartos ngoyanus* in Zululand is also noteworthy but not necessarily significant on a species level.

26. **Encephalartos caffer** (*Thunb.*) *Lehm.*, Pugill. 6 : 14 (1834). *Zamia caffra* Thunb. in Nov. Act. Soc. Sc. Uppsal. 2 : 285 (1775).

FIG. 4, 93, 94, 95, 96.

FIG. 93.—*Encephalartos caffer*: plant at Trappes Valley in the Bathurst district, Cape.

Plant dwarf, unbranched or occasionally branched possibly due to injury, with tuberous roots and subterranean stem up to 30 cm long and 15–25 cm diam., woolly at crown. *Leaves* 40–90 cm long, erect-spreading or curved or twisted, brown-woolly at first, hair soon falling; leaflets crowded, sometimes irregularly twisted from the axis, reduced in size towards base, sometimes to 1 or 2 prickles; median leaflets up to about 10 cm long and 8–10 mm broad, gradually narrowed from near base, mostly entire on mature plants. *Cones* solitary, greenish-yellow: *male cone* subcylindric, narrowed to apex, 20–30 cm long, 6–11 cm diam.; median scales with the face slightly projected into a beak 5–6 mm long, with the lower margin sometimes toothed: *female cone* subcylindric, up to about 30 cm long and 15 cm broad, slightly narrowed to the rounded apex; median scales flattened on face and not much projecting. Seeds scarlet, up to 3·8 cm long and 2·3 cm diam.

Encephalartos caffer is found only infrequently in sour grassveld of the eastern Cape coastal belt from Uitenhage district to the neighbourhood of Willowvale in the Transkei. At Kirstenbosch there is a record from the Steytlerville district but the environmental conditions in that area are such as to cast a doubt as to its accuracy.

The species has not been rediscovered in the Uitenhage district for many years and the record of its presence in the Steytlerville district could have been caused by plants being received at Kirstenbosch from that postal address. One would need the co-operation of all farmers and their herdsmen in the eastern Cape coastal districts in order to establish the true position as regards the distribution of this dwarf species. It is very readily overlooked in grassveld.

FIG. 94.—*Encephalartos caffer* (form): near Slippery Drift in the East London district, Cape.

FIG. 95.—*Encephalartos caffer*: left, female cone; right, male cone, from plants in cultivation by Miss G. Blackbeard, Grahamstown, Cape.

Notable features of the typical form of E. *caffer* are the density and twisting of some of the median leaflets and the relatively large tuberous roots. A feature likely to cause confusion is that the leaflets of young plants are freely toothed on the margin whereas those on mature plants are generally entire and needle-pointed.

FIG. 96.—*Encephalartos caffer*: typical old male plant in Miss G. Blackbeard's garden Grahamstown, Cape, showing large tuberous rootsystem; since transferred to garden of Botanical Research Institute, Pretoria.

FIG. 97.—*Encephalartos longifolius*: typical old male plant, thought originally by Thunberg to be the adult form of the dwarf species *E. caffer* shown in Fig. 93–96.

G. G. Smith notes that specimens from the neighbourhood of East London have less rigid leaves than those from Bathurst and the leaflets are rolled inwards in the young stage, unlike the usually spreading ones in the Bathurst district. But M. J. Wells has recently detected inrolling in a Bathurst plant. Lack of adequate study material has so far prevented a full picture being obtained and for the time being no further segregation from *Encephalartos caffer* is contemplated other than *E. ngoyanus* from Zululand.

E. caffer was one of the first two species of *Encephalartos* to be discovered in southern Africa. The Swedish botanist Thunberg and the English botanical collector Masson travelled down the Langkloof valley in 1772 on their way to the neighbourhood of Coega, north-east of Port Elizabeth. On the journey Thunberg collected material of an arborescent and a dwarf species, but considered them to be forms of one species which he named *Zamia caffra.* It was not until long after that the confusion was unravelled and the name *Encephalartos caffer* restricted to the dwarf species while the name *E. longifolius* was restored to the arborescent species (Fig. 97).

Conclusion

Whatever is recorded here on the subject of the Cycads of Southern Africa must be viewed in the light of the old adage that the exception proves the rule. Very little about Cycads can be said to be constant except their inconstancy. To detail all the variations, and deviations from the presumed normal for growth form and growth rhythm of stems leaves and cones, would be a major undertaking. This applies to plants both in the wild and in cultivation but more particularly to the latter.

It is as well to remind students that the Cycads present many problems of interest, fascinating to some, which call for further investigation. The field of research is still wide open.

A measure of support exists for the views of Johnson in Proc. Linn. Soc. N.S. Wales 84 : 64 (1960) that the genera should be segregated under several smaller famillies. The problems involved are still under consideration.