

6. ENCEPHALARTOS Lehm.

Lehmann, J. G. C., Nov. et minus cogn. stirp. pugillus 6: 1-14 (1834); Miquel, F. A. W., Monogr. Cycad. 39-60 (1842), Prodr. Syst. Cycad. 8-10, 18-22 (1861); De Candolle, A., Prodr. 16²:530-533 (1868); Prain, D., Flora Trop. Africa 6²:346-354 (1917); Schuster, J., Pflanzenreich 4¹:105-124 (1932); Hutchinson, J., and Rattray, G., Flora Capensis 5² (Suppl.):28-44 (1933); Henderson, M. R., Jour. S. Afr. Bot. 11:5-64 (1945).

Stem subterranean and tuberous or columnar and aerial, depending on the species; rarely branched; often 1-2 m. tall, rarely reaching a length of 15 m. (in E. laurentianus). Aerial stems and tops of subterranean stems covered with an armor of leaf bases (in E. latifrons and E. laurentianus on very old plants scaled off by repeated abscissions). Leaves usually many in a crown, generally more than 1 m. long (in E. laurentianus up to 6 m.); petiole usually unarmed but sometimes with two rows of spines representing reduced leaflets. Leaflets linear, linear-lanceolate, or ovate-lanceolate; rigid; entire or with spines, coarse teeth, or lobes; with "parallel" (dichotomous) venation. Vernation straight.

Male cones usually in groups of 2 or more, cylindrical or ellipsoid, mostly long stalked. Microsporophylls peltate, more or less cuneate, short stalked or sessile, the exposed portion thickened, rhomboid or rounded hexagonal, never ending in a spine but sometimes abruptly tapered into a truncate or depressed top (umbo), the lower surface densely covered with microsporangia. Female cones usually single but often in groups of 2 or more, ovoid or cylindrical, mostly short stalked. Megasporophylls peltate, long stalked, flattened or somewhat cuneate, the exposed portion rhomboid or rounded hexagonal, with an irregularly toothed ridge or abruptly narrowed

into a truncate or depressed top (umbo); never ending in a spine. Seeds usually some shade of red, sometimes yellow or brownish.

The genus, with about 20 species, is confined to Africa, most of the species occurring in the southeastern part of South Africa, especially near the coast. A few are found in tropical Africa, even north of the equator. Name from ἐν κεφαλῇ (in head) and ἄpros (bread). Encephalartos is often called Bread Palm or Kaffir Bread because the African natives use the large bud and the seeds to make a kind of bread. Type species: E. longifolius (Jacq.) Lehm.

Key to the Species

I. Stem subterranean or nearly so, rarely up to 1 m.

A. Leaves less than 70 cm. long; leaflets entire,

less than 10 cm. long, lowest not reduced to spines 1. E. brachyphyllus

B. Leaves more than 70 cm. long; leaflets toothed or

lobed, some entire, more than 10 cm. long

1. Leaflets with a sharp apex distinct from the marginal teeth, ~~spines~~ veins not more than 30

a) Leaflets linear-lanceolate

(1) Leaflets more than 12 mm. wide, green

(a) Leaflets thick, with 2 or 3 spines at apex, ^{up to 25 cm. long;} ~~spines~~ sporophylls not umbonate 2. E. villosus

(b) Leaflets thin, with pungent apex, ^{12-15 cm. long;} ~~spines~~ sporophylls umbonate 3. E. barteri

(2) Leaflets 8-12 mm. wide, glaucous 4. E. poggei

b) Leaflets ovate-lanceolate

(1) Leaflets with coarse spiny lobes, glaucous 5. E. horridus

(2) Leaflets spinose-toothed, not lobate, green

(a) Leaflets 18-25 cm. long, 30 mm. wide 6. E. gratus

(b) Leaflets 10-13 cm. long, 18-25 mm. wide 7. E. septentrionalis

2. Leaflets divided at apex into 3-5 triangular pungent lobes, oblong-elliptic, 6 cm. wide,

veins 40-50 8. E. kosiensis

II. Stem an aerial trunk 1-9 m. tall

A. Leaflets entire, toothed, or lobed; cones not woolly:
seeds red (orange in no. 16)

1. Leaflets glaucous, 13-16 mm. wide, entire or with
1 or 2 lobes on lower margin, lowest not reduced
to spines 9. E. lehmannii

2. Leaflets green, 2 cm. or more wide

a) Leaflets with 3 coarse lobes on lower margin,
ovate-lanceolate, lowest not reduced to spines,
veins prominent 10. E. latifrons

b) Leaflets mostly entire, lanceolate

(1) Mature leaflets pubescent below, lowest
reduced to spines, veins prominent;
sporophylls not umbonate 11. E. paucidentatus

(2) Mature leaflets glabrous, lowest not
reduced to spines, veins obscure;

sporophylls umbonate 12. E. longifolius

c) Leaflets spinose-toothed, entire on very old
broadly linear-lanceolate,
plants, ~~linear-lanceolate~~ lowest not reduced to spines,
veins obscure 13. E. altensteinii

d) Leaflets spinose-toothed, lower ones with 4
or 5 lobes on upper margin, ovate-lanceolate,
lowest reduced to spines, veins prominent 14. E. woodii

e) Leaflets spinose-toothed, lowest reduced to
spines

(1) Leaflets linear-lanceolate, 20-25 cm.
long, 2 cm. wide; sporophylls umbonate 15. E. hildebrandtii

(2) ~~linear-lanceolate~~ ^{leaflets} ovate-lanceolate, ~~20-25~~ ³⁵⁻⁵⁰ cm. long,
~~2-3~~ ⁴⁻⁷ cm. wide; sporophylls ^{not} umbonate 16. E. laurentianus

17

B. Leaflets entire; cones very woolly; seeds yellow

1. Leaflets glabrous, ^{6-8 mm.} ~~2-3 mm.~~ wide, veins prominent

a) Leaflets ^{up to} 17 cm. long, linear, veins 8-10 . 17. E. friderici-guilielmii

b) Leaflets ^{up to} 12 cm. long, lanceolate, veins ⁻¹⁴ 12 . 18. E. lanatus

2. Leaflets thinly pubescent, 1.5-2 mm. wide,

linear, veins 3-4, obscure 19. E. ghellinckii

1. Incephalartos brachyphyllus Lehm. XX

E. caffer (Thunb.) Miq.

~~Z. caffer~~
Thunberg, C. P., Nov. Act. Soc. Scient. Upsal. 2:285, as to
fig. 5 and part of description only (1775), Prod. Fl. Cap. 2:92
(1800); ~~Lehmann~~, J. G. C., Cat. Hort. Hamb., p. 97 (1836) ex
Lehmann and De Vriese, Tijdschr. Nat. Gesch. 4:414 (1838); Miquel,
F. A. W., Monogr. Cycad., pp. 49, 53 partly (1842), Prodr. Syst.
Cycad. 9, 20 (1861); De Candolle, A., Prodr. 16⁸:532 (1868);
Hutchinson, J., and Pattray, G., Flora Capensis 5⁸ (Suppl.):29
(1933); Henderson, M. R., Jour. S. Afr. Bot. 11:13 (1945).

Stem subterranean, up to 45 cm. in length, covered with woolly
leaf bases. Leaves about 14 in a crown, seldom more than 60 cm.
long (suggesting the specific name), pubescent when young, becoming
glabrous. Petiole 15-24 cm. long; petiole and rachis smooth but
pubescent beneath. Leaflets about 60 on each side, crowded, approx-
imately opposite in upper half of leaf, opposite or alternate below,
narrowly linear-lanceolate, pungent, narrowed and decurrent at the
base, entire in mature plants but with a few spines at the tip in
seedlings and young plants; largest leaflets 9 cm. long and 10 mm.
wide, the upper and lower ones shorter but none reduced to spines;
veins 10-13, very prominent on the lower side.

Male cones usually single but sometimes 2 or 3, ovoid-
cylindric, green, 20-30 cm. long, 5-7 cm. in diameter; peduncle
about 12 cm. long. Microsporophylls cuneate, 3 cm. long, 3 cm.
wide, 2.5 cm. high, rhomboid and concave at the top, rugose.
Microsporangia 300-400, mostly in sori of 3, covering the entire
under side except the exposed tip. Female cones usually single,
ovoid, greenish yellow, nearly glabrous, up to 28 cm. long and
12 cm. in diameter; peduncle 6 cm. long. Megasporophylls up to

4.5 cm. wide and 2 cm. high, thin at sides and lower border, which is conspicuously toothed, the top rounded rhomboid and concave. Seeds broadly oblong, red, 2.3 cm. long, 1.8 cm. in diameter; stony coat with about 10 prominent ribs or grooves.

Geographic distribution: Abundant in the Ngoye region of Zululand, where it is associated with Stangeria paradoxa, extending south in the coastal country as far as East London and Bathurst.

This is the E. caffer Lehm. of Hutchinson and Rattray's account, the E. caffer Miq. of Schuster's monograph, and the E. caffer var. brachyphyllus of De Candolle. It is not the E. caffer of Sir Joseph Hooker, the large plant at van Staadens, which is correctly designated as E. longifolius Lehm. In his original description of Cycas caffra, Thunberg confused these two species. The name, E. caffer, has been applied by various authors to both species, while Lehmann, according to Schuster, applied it to E. horridus. The small plant of Zululand could not have suggested the names Encephalartos, Bread Palm, or Kaffir Bread.

2. Encephalartos villosus (Gaertn.) Lem.

Gaertner, J., De Fruct. et Semin. Plant. 1 (1788); Lemaire, C., Illus. Hort. 14:79 (1867); Dyer, W. T. T., Bot. Mag. 108: t. 6654 (1882); Smith, F. G., Bot. Gaz. 43:187-204 (1907); Sedgwick, P. J., Bot. Gaz. 77:300-310 (1924); Hutchinson, J., and Rattray, G., Flora Capensis 5² (Suppl.):30 (1933); Henderson, M. R., Jour. S. Afr. Bot. 11:17 (1945).

Stem stout, subterranean, very woolly, with armor of leaf bases distinct down to the root. Leaves usually not more than 3 or 4 in a crown, generally 2-3 m. long but occasionally up to 5m., gracefully curving, bright green, very woolly when young, becoming nearly glabrous when mature except at the base, where the woolly condition is permanent. Petiole terete; rachis flattened above and with two grooves, rounded below. Leaflets 50-100 on each side, approximately opposite, linear-lanceolate, pungent and with 1 or 2 strong spines close below the apex; upper margin with 3-6 strong spines and lower margin with 1-3, some plants with nearly entire leaflets but even these with the characteristic spines at the apex; largest leaflets up to 25 cm. long and 19 mm. wide, the lower ones gradually smaller and the lowest 5-15 reduced to spines; veins 15-25. Leaflets of seedlings oblanceolate, with more spines; the lowest smaller but not reduced to spines.

Male cones usually 2-7, cylindric, slightly tapering toward the apex, yellowish green and glabrous, 20-50 cm. long, 6-12 cm. in diameter; peduncle up to 25 cm. long. Microsporophylls 3.5-5 cm. long, 3.5-4 cm. wide, 2-2.5 cm. high; top rounded, rhomboid, its lower border crenate-denticulate. Microsporangia averaging 720 on larger sporophylls, mostly in sori of 3 or 4, covering the under surface. Female cones usually solitary but occasionally

up to 5, cylindric or subovoid, orange-yellow when ripe, glabrous, usually about 35 cm. long but varying from 20 to 50 cm., 8-16 cm. in diameter; peduncle up to 20 cm. long. Megasporophylls 3-4 cm. long, 2.5-3.5 cm. wide, 2.5-3.5 cm. high, overlapping downward, almost smooth, the top somewhat rounded rhomboid with a projection at each side, the lower border conspicuously and irregularly dentate. Umbo absent, the megasporophylls thus differing from the conspicuously umbonate ones of E. hildebrandtii. Seeds ellipsoid, scarlet, 4 cm. long, 2 cm. wide; stony layer 2.7 cm. long, 1.6 cm. wide, with 11-13 strong ridges.

Geographic distribution: South Africa--shaded localities from the Keiskama River northward into Natal and extending as far as Delagoa Bay; abundant near East London and Kentani; occurring from sea level to 500 m. elevation and from the coast to about 65 kilometers inland. According to Henderson, this species also occurs in Swaziland, where the plants have leaflets up to 2.5 cm. wide.

3. Encephalartos barteri Carruth. ex Miq.

Carruthers, W., ex Miquel, F. A. W., Arch. Néerl. 3:243, as to Barter's plant only (1868); Prain, D., Bot. Mag. 135: t. 3232 (1909), Flora Trop. Africa 6²:348 (1917).

Stem very short and subterranean, rarely rising above the ground and reaching a height of 30 cm., 20-25 cm. in diameter, ellipsoid, covered with woolly leaf bases. Leaves 1-1.7 m. long, erect or suberect, bright green. Petiole 10-12 cm. long; petiole and rachis subterete, tomentose at first, becoming glabrous. Leaflets about 80 on each side, opposite or subopposite, thinly coriaceous, linear-lanceolate, slightly falcate, acuminate, pungent, somewhat narrowed at the base, with about 4 small teeth along each margin, 12-15 cm. long, 12-18 mm. wide, lower leaflets smaller and passing into weak spines.

Male cones narrow cylindric, pale green, 12-20 cm. long, 4-5 cm. in diameter; peduncle 4-6 cm. long, sparingly tomentose at first, becoming glabrous. Microsporophylls deltoid, fertile portion 1.2 cm. long and 18 mm. wide; apex triangular, 2 cm. wide, the lateral angles acute, the lower very obtuse, umbonate. Female cones oblong-ellipsoid, dark olive-green, 20-25 cm. long, 12 cm. in diameter, subsessile. Top of megasporophylls wide rhomboid, 6 cm. wide, 3 cm. high, lateral angles explanate, upper very obtuse, lower obtuse, umbonate. Seeds ovoid-oblong, faintly angled, crimson, 3.5 cm. long, 2.5 cm. wide.

Geographic distribution: Tropical Africa—Gold Coast, Dahomey, northern Nigeria.

4. Encephalartos poggei Aschers.

E. lemarinellianus De Wild. and Durand

Ascherson, P. F. A., Verh. Bot. Ver. Prov. Brandenburg 20:25 (1878); De Wildeman, E., and Durand, T., Compt.-rend. Soc. Roy. Bot. Belg. 39:80 (1900); De Wildeman, E., Études Fl. Bas.- et Moyen-Congo 1:9 (1903); Prain, D., Flora Trop. Africa 6²:349 (1917).

Encephalartos poggei
Aschers.
1878

Stem short, 30-60 cm. high, occasionally up to 1-2 m., 20 cm. in diameter, ellipsoid or subcylindric, occasionally forked, closely covered with woolly leaf bases. Leaves 0.7-1.3 m. long, glaucous. Petiole and rachis subterete, tomentose at first and remaining so near the base. Leaflets 20-60 on each side, rigid, linear-lanceolate, slightly falcate, acute, pungent, abruptly and rather unequally narrowed at the base, the lower margin usually entire or occasionally with 2 or 3 teeth, the upper margin with 1-4 teeth mainly near the base or sometimes entire; 8-15 cm. long, 8-12 mm. wide.

Male cones narrowly cylindric, greenish or orange-yellow, 15-20 cm. long, 5-6 cm. in diameter; peduncle 10 cm. long, nearly glabrous. Microsporophylls deltoid, the fertile portion 1.9 cm. long, nearly as wide, the top rhomboid, 2.5 cm. wide, the lateral angles acute, the others very obtuse, ridged, not umbonate. Female cone oblong-ellipsoid, becoming pale salmon-colored, 20-23 cm. long, 11-12 cm. in diameter, subsessile. Apex of megasporophylls wide rhomboid, 4.5-5 cm. wide, 1.6-1.9 cm. high, lateral angles explanate, upper and lower very obtuse, surface divided into 3 or 4 facets, the center raised but not umbonate. Seeds ovoid, faintly angled, brownish red, about 2.5 cm. long.

Geographic distribution: Belgian Congo, in dry savannas.

5. Encephalartos horridus (Jacq.) Lehm.

Jacquin, N. J., *Fragm. Bot.* 1:27 (1809); Lehmann, J. G. C., *Pugill.* 6:14 (1834); Hutchinson, J., and Rattray, G., *Flora Capensis* 5² (Suppl.):32 (1933); Henderson, M. R., *Jour. S. Afr. Bot.* 11:20 (1945).

Stem subterranean or slightly raised above the ground, sub-spherical, about 15 cm. in diameter, longer in older plants; very woolly at the top. Leaves usually not more than 5-10 in a crown but in cultivation as many as 16, about 70 or occasionally up to 90 cm. long, often so recurved in upper portion that a circinate condition is permanent, glaucous until full grown. Petiole terete, 10-15 cm. long, smooth; rachis somewhat flattened above, rounded below, smooth. Leaflets 20-30 on each side, arising at a considerable angle from the rachis, approximately opposite, very thick and rigid, obliquely ovate-lanceolate, horribly sharp-pointed, contracted and slightly decurrent at the base, with 2 or 3 sharp-pointed lobes in different planes mainly on the lower margin, rarely with a lobe on the upper margin, the lower 3-5 leaflets on each side entire; leaflets 10-16 cm. long, 2-3 cm. wide (5 cm. including the lobes), the lowest only 2-3 cm. long but not reduced to spines; veins 15-30, obscure.

Male cones solitary, cylindric, tapering at the ends, yellow, about 30 cm. long and 6.5 cm. in diameter; peduncle about 8 cm. long. Microsporophylls broadly obovate, somewhat rounded in outline, short stalked, 2.4-4 cm. long, 1.8-3.5 cm. wide, the top rugose, low rhomboid-pyramidal with truncate rhomboid tip. Microsporangia covering the entire under surface except about 2 mm. at the sides. Female cones solitary, cylindric, 25-35 cm. long, 15-20 cm. in diameter, short stalked. Megasporophylls 5.5-6 cm. long, 4.3-4.5

cm. wide, 3 cm. high, the peltate top very rugose, low rhomboid-pyramidal with truncate apex about 1.5 cm. wide, with pointed projections extending down the sides and partly covering the seeds. Seeds oblong, slightly angular, red, 4.3-4.5 cm. long, the end next to the rachis flat. Stony coat 3 cm. long, 2 cm. wide, with 8-10 ridges conspicuous at base, distinguishable at the top, and with the intermediate three-quarters smooth.

Geographic distribution: South Africa—fairly well distributed in the Addo Bush, Uitenhage Division; Geylor Manor between Port Elizabeth and Uitenhage, Bethelsdorp, in the Kanoia Scrub southwest of Grahamstown. I studied this species only at Despatch, near Port Elizabeth, where it is associated with Aloe, Cotyledon, shrubby Euphorbia, and other xerophytes that are so spiny that the region is almost impenetrable.

6. Encephalartos gratus Prain

Prain, D., Kew Bull., p. 181 (1916), Flora Trop. Africa 6²: 352 (1917).

Stem usually very short, often entirely subterranean, globose or ellipsoid, 30-40 cm. high, 30 cm. in diameter; occasionally subcylindric, 1.25 m. high and 70 cm. in diameter; covered with woolly leaf bases. Leaves usually 1.2-1.5 m. or occasionally up to 2 m. long, dark green. Petiole and rachis subterete, permanently tomentose. Leaflets 30-70 on each side, firm, ovate-lanceolate, falcate, acuminate, pungent, oblique at the base and widely cuneate ^{narrowly cuneate on the lower edge,} or rounded on the upper edge, with 1-4 teeth on the lower margin and 2-4 strong teeth on the upper margin mainly in the lower half; the tip occasionally 2-spinescent, in young plants often 4-5-spinescent; 18-25 cm. long, 3 cm. wide.

Male cones up to 5 or more, ovoid to fusiform, yellow-green dotted with red, 30-40 cm. long, 8-10 cm. in diameter; peduncle 15-17 cm. long, tomentose. Microsporophylls wide obovate-deltoid, the fertile portion 2 cm. long and equally as wide; the top rhomboid and 2 cm. wide, lateral angles acute, upper very obtuse, ridged, faintly umbonate. Female cones sometimes up to 10, subcylindric to narrow conical, yellow-green, up to 60 cm. long, 15-20 cm. in diameter; peduncle 12-14 cm. long. Top of megasporophylls wide rhomboid, 5.5 cm. wide, 3 cm. high, lateral angles explanate, upper and lower very obtuse, umbonate near the lower angle. Seeds ellipsoid or ovoid, distinctly angled, dull vermilion, 3.3-3.8 cm. long.

Geographic distribution: Nyasaland, 700-900 m. elevation, usually in rocky places.

7. Encephalartos septentrionalis Schweinf.

Schweinfurth, G., Bot. Zeit. 29:334 (1871); Braun, A., Ind. Sem. Hort. Berol. p. 18 (1874); Prain, D., Flora Trop. Africa 6²/₃: 350 (1917).

Stem usually very short, globose, 30 cm. in diameter, scarcely rising above the ground but sometimes cylindric and up to 60 cm. high, covered with woolly leaf bases. Leaves about 1.5 m. long, dark green, densely tomentose at first, becoming nearly glabrous. Petiole and rachis subterete, more or less tomentose. Leaflets about 50 on each side, firm, ovate-lanceolate, distinctly falcate, acute, pungent, abruptly and rather unequally rounded or wide-cuneate at the base, insertion broad, with 3-8 teeth along each margin mainly in the basal half; 10-13 cm. long, 18-25 mm. wide.

Male and female cones not available. Seeds ovoid, not angled, about 2.5 cm. long.

Geographic distribution: Central Africa—Ubangi-Shari Territory, Dar Banda, Boro Valley; Upper Nile Land—Golo, Bongo; Uganda; confined to savannas.

8. Encephalartos kosiensis Hutch.

Aitken, R. D., and Gale, G. W., Bot. Surv. S. Afr. Mem. 2:18 (1921); Hutchinson, J., Kew Bull., p. 512 (1932); Hutchinson, J., and Rattray, G., Flora Capensis 3² (Suppl.):34 (1933); Ogilvie, B. M. L., Kew Bull., pp. 655-657 (1939); Henderson, M. R., Jour. S. Afr. Bot. 11:27 (1945).

Stem up to 45 cm. high. Leaves up to 1 m. long, dark olive-green above, lighter below, glabrous. Petiole 8-11 cm. long; both petiole and rachis smooth and not grooved on the upper side. Leaflets about 25 on each side, crowded, slightly overlapping, not quite in one plane, mostly opposite, oblong-elliptic, without a definite apex but divided into 3-5 broadly triangular pungent lobes; base broad, unequal, the upper margin subcordate and the lower margin almost at a right angle to the rachis; margin firm and revolute, with 3 or 4 smaller lateral teeth on the upper margin and 0-3 on the lower, the number on the lower margin reduced toward the base of the leaf; largest leaflets at the middle of the leaf 16 cm. long and 6 cm. wide, decreasing toward the base until the lowest 1-3 pairs are little more than spines; veins in largest leaflets 40-50, rather obscure. Even in a 2-year-old seedling, leaflets so characteristic that species can be identified.

Male cones 1-3, cylindric, orange-brown, glabrous, tapering slightly at both ends, 39 cm. long, 9-10 cm. in diameter; peduncle 12 cm. long, pubescent at the base. Microsporophylls obovate, 2.5-3 cm. wide, 1-1.5 cm. high, the top rhomboid and slightly rugose, with an irregularly rhomboid, flat, smooth area at the tip about 1.5 cm. wide and nearly 1 cm. high. Female cones mostly solitary, ovoid, orange but turning yellow at maturity, glabrous, about 27 cm. long, 19-20 cm. in diameter; peduncle 8-10 cm. long, cream-colored,

725
glabrous. Megaporophylls very rugose, almost echinate on the un-
exposed surfaces, the top rhomboid, 3.5-5.5 cm. wide, 2.5-3.5 cm.
high, with a smooth, slightly ⁿconvex, irregularly rhomboid tip.
Seeds orange, 4.5 cm. long and 1.5 cm. in diameter; stony coat
2.5-2.8 cm. long, 1.5 cm. in diameter, with 11-14 bundles.

Geographic distribution: Z^luzuland—east of Ingwavuma, near
Kosi Lake; Kosi Bay.

9. Encephalartos lehmannii Lehm.

Lehmann, J. G. C., Pugill. 6:14 (1834); Hooker, W. J., Bot. Mag. 89: t. 5371 (1863); Hutchinson, J., and Rattray, G., Flora Capensis 5² (Suppl.):34 (1933); Henderson, M. R., Jour. S. Afr. Bot. 11:27 (1945).

Stem often 1 m. in height and occasionally up to 3 m., not woolly. Leaves about 1 m. long, the tip recurved but less so than in E. horridus, both young and old so glaucous that the plant has a characteristic grayish green color. Petiole about 20 cm. long, subterete, smooth; rachis somewhat grooved above, rounded below. Leaflets 30-50 on each side, opposite or alternate, not overlapping, linear-lanceolate, pungent, entire or with 1 or 2 strong-pointed lobes on the lower margin resembling those of E. horridus; 12-18 cm. long, 13-16 mm. wide, the lowest about 1.5 cm. long; veins 15-18, obscure on the lower side and hardly distinguishable above.

Male cones ellipsoid, reddish, about 18 cm. long and 8 cm. in diameter, short stalked. Microsporophylls 3.5 cm. long, 1.5 cm. wide, sterile top tapering rhomboid, almost as long as the fertile part, curved and flat at the top; microsporangia about 200. Female cones ellipsoid, reddish brown, about 45 cm. long and 30 cm. in diameter, sessile. Megasporophylls 6 cm. long, 4 cm. wide, the peltate top irregularly rhomboid, very rugose, 3 cm. long, with rounded truncate tip and long-pointed lateral and median projections extending downward half the length of the seeds. Seeds red, 4 cm. long and 2.2 cm. wide, the tip truncate hexagonal; stony coat 3 cm. long, 1.8 cm. wide, with 12 bundles.

Geographic distribution: South Africa—in dry places from Willowmore Division to Grahamstown, in Bedford, Queenstown, Komgha, and on the Tsoma River in the Nqumqwe District. I studied this

19

species only in the Junction Farm region. Fine specimens have been set out on lawns throughout its entire range. Henderson regards E. lehmannii as a composite species and describes a number of segregates which he designates as forms, all of which are unnamed. I. C. Verdoorn, in Jour. S. Afr. Bot. 11:1-3 (1945) describes a new species, E. eugene-marasii, from the Waterberg District, Transvaal. It differs from E. lehmannii in several minor respects and is doubtfully distinct.

111

10. Encephalartos latifrons Lehm.

Lehmann, J. G. C., Tijdsch. Nat. Gesch. 4:424 (1837);
Hutchinson, J., and Rattray, G., Flora Capensis 5² (Suppl.):
36 (1933); Henderson, M. R., Jour. S. Afr. Bot. 11:22 (1945).

Stem stout, up to 3 m. in height and 40 cm. in diameter, seldom branched, with an armor of leaf bases which becomes obscured by repeated abscissions. Leaves 8-12 in a crown, about 1 m. long, strongly recurved at the tip, dark green above and lighter below, pubescent when young, becoming nearly glabrous. Petiole about 12 cm. long, terete, with a white ring at the base; rachis with two grooves above, rounded below, both the petiole and rachis smooth. Leaflets 20-30 on each side, opposite or alternate, overlapping, ovate-lanceolate, pungent, with usually 3 triangular spinescent lobes on the lower margin and rarely a small lobe on the upper margin; insertion very broad, up to 1.5 cm.; largest leaflets 15 cm. long, 3-5 cm. wide exclusive of the lobes; veins 30-50, very prominent below, obscure above. Young leaflets flat, becoming revolute as they mature and very revolute when dead and dry.

Male cones cylindrical, rounded below and tapering above, brownish yellow, smooth, up to 70 cm. long, 15 cm. in diameter; peduncle 5 cm. long. Microsporophylls almost sessile, 6 cm. long, the fertile part 3 cm. wide at the top and 1.5-2 cm. wide at the bottom, the sterile top prolonged rhomboid, rugose, 1 cm. wide at the tip. Microsporangia 900-1,100, mostly in sori of 3 and 4, covering the under surface except notches at the top and bottom and 2 mm. at the thin sides. Female cones solitary, ovoid-ellipsoid, green, 60 cm. long, 20-30 cm. in diameter, 25-30 kilos in weight, subsessile. Megasporophylls long stalked, 8 cm. long, 7 cm. wide,

the sterile top irregularly rhomboid, umbonate, rugose, tapering to a small flattened tip. Seeds bright red, 4.1-5.5 cm. long, 2.3-3 cm. wide, the fleshy layer prolonged above and equalling half the length of the stony layer, irregularly hexagonal at the flat top. Stony coat 2.5-3 cm. long, 2 cm. wide, with 10-13 easily recognizable bundles.

Geographical distribution: South Africa—Uitenhage and Bathurst Divisions. According to Rattray, this species does not occur as far south as Bathurst or as far north as Grahamstown, and is most abundant at Trapps Valley, where I studied it.

As seen in the field, this species is one of the most characteristic of all cycads. Since descriptions written from herbarium sheets have made it a variety of E. horridus, it is worth while to note that E. latifrons has a tall, massive, aerial trunk, larger leaves with ^{broader} ~~longer~~, nearly glabrous leaflets, microsporophylls with about 1,000 sporangia, and immense female cones weighing up to 30 kilos. E. horridus, on the other hand, has a subterranean stem, smaller leaves with narrower glaucous leaflets, microsporophylls with probably not more than 500 sporangia, and comparatively ~~very~~ small female cones seldom weighing more than 4 kilos.

11. Encephalartos paucidentatus Stapf and Burt Davy

Stapf, O., and Burt Davy, J., in Burt Davy's Flora Transvaal 1:40, 99 (1926); Hutchinson, J., and Rattray, G., Flora Capensis 5^v (Suppl.):40 (1933); Henderson, M. R., Jour. S. Afr. Bot. 11:48 (1945).

Stem about 2 m. high and 30 cm. in diameter. Leaves about 2.4 m. long, somewhat twisted, green, more or less pubescent when young, becoming glabrous or nearly so above, the petiole about one-quarter as long as the rachis. Leaflets about 70 on each side, somewhat separated below, overlapping above, opposite or alternate, very rigid, narrowly lanceolate, subfalcate, pungent, mostly entire but the lower ones with a spine on the lower margin; middle leaflets about 25 cm. long and 2.5-3 cm. wide, the lower ones rather abruptly reduced to spines; veins 20-30, prominent.

Male cones glabrous, 45-60 cm. long, 15 cm. in diameter. Microsporophylls broadly oblong-lanceolate, 6.5 cm. long, the lower ones with a subrhomboid top and an irregularly toothed margin, the upper ones broadly acuminate and very rugose. Microsporangia nearly covering the under surface. Female cones not available.

Geographic distribution: Northeastern Transvaal, in partial shade at 1,000-1,300 m. elevation.

12. Encephalartos longifolius (Jacq.) Lehm.

E. lanuginosus Lehm.

E. caffer Hook. f.

Jacquin, N. J., *Fragm. Bot.* 1:28 (1809); Lehmann, J. G. C., *Pugill.* 6:14 (1834); Hooker, J. D., *Bot. Mag.* 82: t. 4903 (1856); Hutchinson, J., and Rattray, G., *Flora Capensis* 5^v (Suppl.):38 (1933); Henderson, M. R., *Jour. S. Afr. Bot.* 11:40 (1945).

Stem often more stocky than in E. altensteinii, the largest 2-3 m. or rarely 4 m. high, 30-40 cm. in diameter, rarely branched, not woolly. In plants 1.5 m. tall, leaves about 15 in a crown or occasionally up to 30, the largest 1.2-1.6 m. long, usually with a characteristic curve like that of E. horridus but less pronounced, bluish green, finely pubescent at first, becoming glabrous. Petiole about 25 cm. long, flattened above, smooth, hairy when young, with a white ring at the base; rachis with a thick rib above, rounded below. Leaflets 30-40 on each side, crowded, semi-erect, very rigid, obliquely linear-lanceolate, obtuse or sharply acute and pungent, contracted and rather broad at the base, in young plants as spiny as in E. altensteinii and resembling that species, in plants more than 1 m. tall most leaflets entire but sometimes with an occasional spine on lower ones; largest leaflets 12-20 cm. long, 2.5-3.5 cm. wide, lower leaflets smaller; rather obscurely veined.

Male cones 1-12, cylindric, rounded above and tapering below, greenish brown, the larger ones 45-60 cm. long, 10-20 cm. in diameter; peduncle up to 5 cm. long. Microsporophylls 4-6 cm. long, 2-2.5 cm. wide, the fertile part subcuneate; the exposed top narrowed, quadrangular, recurved and flat at the tip, in the upper part of the cone as long as the fertile area but elsewhere less than one-third as long. Microsporangia averaging 650 on the

145

larger sporophylls, mostly separate but a few in sori of 3 and 4, covering the under surface except 1-2 mm. at the sides and, in the upper part of the cone, with a pointed sterile region above and below. Female cones usually solitary, cylindrical, brown, 35-60 cm. long, 30-35 cm. in diameter, sessile; when solitary up to 45 kilos in weight. Megasporophylls rhomboid in surface view, rugose, the top truncate and umbonate. Seeds broadly oblong, red, 4-5 cm. long, about 2.5 cm. in diameter; stony coat 3.2-3.5 cm. long, 2.2-2.5 cm. wide, smooth but with 11-14 bundles visible around the micropyle.

Geographic distribution: On rocks and slopes at van Staadens, about 30 kilometers west of Port Elizabeth, Union of South Africa. This is the type locality. Also recorded from Lower Albany, Komgha, Kattraria, and Natal. I studied the species at van Staadens, where it is associated with Schizaea pectinata, Todea barbara, Erica watsonia, Gladiolus, etc. It is also common in gardens and on lawns. This cycad, more than any other, is called the Kaffir Bread or Bread Palm. Many plants from which the tops were cut off for Kaffir bread a hundred years ago have new trunks growing from the wounded surface.

13. Encephalartos altensteinii Lehm.

Lehmann, J. G. C., Pugill, 6:11 (1834); Hooker, J. D., Bot. Mag. 117: t. 7162, 7163 (1891); Hutchinson, J., and Rattray, G., Flora Capensis 5² (Suppl.):39 (1933); Henderson, M. R., Journ. S. Afr. Bot. 11:41 (1945).

Stem usually not more than 2 m. high but occasionally up to 5 m., 20-30 cm. in diameter, the longest trunks prostrate with the growing apex turned up and bearing the crown of leaves and with young stems growing from the base. Leaves 25-40 in a crown, up to 1.5 m. long, slightly curved, dark yellow-green, paler beneath, glabrous when mature. Petiole 20-30 cm. long, subterete, widely spreading at the base, becoming glabrous; rachis rounded, with two grooves above. Leaflets 40-70 on each side, mostly opposite, broadly linear-lanceolate, pungent, revolute; in plants less than 2 m. high with 1-6 sharp spines on the upper margin and 1 or 2 less below; in old plants more than 2 m. high with all or nearly all the leaflets entire (the leaf then resembling that of E. longifolius); leaflets up to 18 cm. long and 2.5-3 cm. wide, the lower leaflets smaller but not reduced to spines; veins about 30, usually inconspicuous.

Male cones usually more than 1, cylindric, tapering gradually to apex and base, yellowish, 30-40 cm. long, 8-10 cm. in diameter; peduncle about 5 cm. long. Microsporophylls cuneate, sessile, 3.5-4 cm. long, 2-2.5 cm. wide; the top rugose, pointed, reflexed, with the tip rounded concave. Microsporangia about 560, mostly in sori of 3, separated at the top into two groups by a pointed sterile portion extending 2-5 mm. downward. Female cones one or several, long ovoid, yellowish brown, 40-50 cm. long, 20-25 cm. in diameter, about 2 kilos in weight when borne singly,

subsessile. Megasporophylls 8 cm. long, 6.5 cm. wide; the peltate top truncate, rhomboid-umbonate, very rugose, the tip rounded, 1.5 cm. in diameter, concave with a shallow groove extending backward and with two lateral pointed projections extending downward and partly covering the seeds. Seeds oblong, red, 4.5-5.5 cm. long, 2.5 cm. in diameter; stony coat 3 cm. long, 2.5 cm. in diameter, smooth above but with 10 conspicuous bundles, strong and forked below.

Geographic distribution: South Africa—from Kowie River in Bathurst Division northeast to Natal and eastern Transvaal; in the south extending from the coast to the Amatola Mountains; usually in shaded localities. I studied this species in the field at East London and Trapps Valley. It is planted in many botanical gardens and on many private lawns, where specimens are usually 1-2 m. in height. The form growing in Transvaal has been named E. transvenosus by Stapf and Burt Davy in Burt Davy's Flora Transvaal 1:40, 99 (1926), a species also recognized by Henderson.

14. Encephalartos woodii Sander,

E. altensteinii var. bispinna J. M. Wood

Wood, J. M., Ann. Rep. Bot. Gard. Natal, p. 8 (1907);
Sander, F., Gard. Chron. 43:257 (1908); Prain, D., Kew Bull.,
p. 250 (1914); Hutchinson, J., and Rattray, G., Flora Capensis
5⁸ (Suppl.):40 (1933); Henderson, M. R., Jour. S. Afr. Bot. 11:
47 (1945).

Stem of larger plants 3-6 m. high and 20 cm. in diameter;
occasionally branched. Leaves 25-30 in a crown, 1.3-2 m. long,
slightly recurved, bright green and glabrous. Leaflets 60 or
more on each side, mostly alternate, ovate-lanceolate, ovate in
the lower part of the leaf, pungent, abruptly narrowed at base,
the broader leaflets in the lower half of the leaf with 4 or 5
crowded spiny lobes on the proximal upper margin and 3 or 4 shorter
lobes or spines on the distal upper margin, the spiny condition
much less pronounced on the lower margin; middle leaflets up to
20 cm. long, 4 cm. wide; somewhat lower leaflets 17 cm. long, 5
cm. wide exclusive of the lobes; lowest leaflets gradually reduced
to spines; veins about 40, prominent on the under side of broader
leaflets.

Male cones usually more than 1, up to 18, cylindric, orange-
yellow, up to 90 cm. long. Microsporophylls 6 cm. long, 3 cm.
wide, the exposed part triangular with truncate top. Microsporangia
600-700, mostly in sori of 3, somewhat separated into two groups
by sterile notches at top and bottom. No female cones have ever
been described or even reported.

Geographic distribution: Ngoye, Zululand.

15. Encephalartos hildebrandtii A. Br. and Bouché

Braun, A., and Bouché, C., Ind. Sem. Hort. Berol., p. 8 (1874); Braun, A., Monatsb. Akad. Wiss. Berlin, p. 859 (1876), Sitzungsab. Gesell. Naturf. Freunde, 117-123 (1876); Stapf, O., Kew Bull., p. 386 (1914), Bot. Mag. 141: t. 8592 and 8593 (1915); Prain, D., Flora Trop. Africa 6²:351 (1917).

Stem cylindrical, 1 m. or more high, occasionally up to 6 m., 30 cm. in diameter, seldom branched. Leaves 2-2.5 m. long, dark green above, paler beneath, very woolly when young, becoming glabrous. Petiole and lower third of rachis subterete, slightly 2-grooved above. Leaflets 50-90 on each side, ^{rigid,} ~~firm,~~ linear-lanceolate, slightly falcate, acute, pungent, long cuneate at the base, with 3 or 4 sharp spines on the upper border and 1 or 2 less on the lower border, frequently with the characteristic 3-spinescent tip of E. villosus; the middle leaflets 20-25 cm. long and about 20 mm. wide, the upper ones 10 cm. long and 5 mm. wide, the lower ones gradually reduced to spines. Leaflets of seedlings oblanceolate with numerous spines at the rounded apex.

Male cones often more than 1, sometimes up to 7, ovate to cylindrical, greenish or reddish, 20-45 cm. long, 6-10 cm. in diameter; peduncle 9 cm. long, tomentose. Microsporophylls obovate-deltoid, 3-3.5 cm. long, 1.5-1.7 cm. wide, the top rhomboid or hexagonal, with sharp radial lines extending horizontally and vertically from the apex, not umbonate. Female cones cylindrical, yellowish green, 25-60 cm. long, 10-20 cm. in diameter, subsessile. Exposed top of megasporophylls rounded rhomboid, up to 5 cm. wide and 2.5 cm. high, distinctly umbonate, a shallow groove extending above and backward from the truncate apex. Seeds ellipsoid or ovoid, red, 3.5 cm. long, 2 cm. wide, the apex broadly truncate;

stony coat 3 cm. long, 1.5 cm. wide, with 10 strong bundles very prominent at the oblique base.

Geographic distribution: Kenya and Tanganyika Territory, confined to a narrow coastal belt extending from Mombasa to Dar-Es-Salaam; also on Zanzibar Island. Related to E. villosus (Gaertn.) Lem.

16. Encephalartos laurentianus De Wild.

De Wildeman, E., Études Fl. Bas- et Moyen-Congo 1:10 (1903);
Prain, D., Flora Trop. Africa 6²:353 (1917); Lebrun, J., Rev.
Zool. et Bot. Afr. 19:387 (1930).

Stem 4-9 m., rarely up to 15 m. in length, 50-75 cm., rarely
1.25 m. in diameter, cylindric, generally becoming prostrate with
age, gray at first, becoming ivory white, leaf bases persistent for
awhile, finally falling away. Leaves 3-6 m. long, dark green,
glabrous. Petiole and rachis slightly angular, woolly at first,
becoming glabrous. Leaflets up to 120 on each side, opposite,
firm, ovate-lanceolate, falcate, acuminate, pungent, very oblique
at the base and rounded on the upper edge, straight or concave on
the lower edge, with 6-10 strong teeth along both margins except
in the lower third, the tip in young plants occasionally 3-4-spines-
cent; 35-50 cm. long, 4-7 cm. wide; veins about 35. lowest leaflets
reduced to spines;

Male cones 2-6, rarely 8, ovoid to narrow cylindric, pale green
to bright red, tomentose, 20-35 cm. long, 6-10 cm. wide; peduncle
15-30 cm. long, tomentose. Microsporophylls obovate-deltoid, the
fertile portion 2 cm. long, almost as wide, the apex rhomboid, 1.6-
1.9 cm. wide, the lateral angles acute, the upper very obtuse, ~~is~~
ridged, not umbonate. Microsporangia in two groups separated by
a sterile line, in sori of 2-5. Female cones usually in 2's or
3's, oblong-ellipsoid, grayish green, about 45 cm. long and 20 cm.
in diameter, subsessile. Megasporophylls 7 cm. long, the apex
wide rhomboid, 6.5 cm. wide, 2 cm. high, lateral angles explanate,
upper and lower very obtuse, vertically 2-ridged, not umbonate.
Seeds ovoid-oblong, faintly angled, ^{red or} orange, 4 cm. long, 2 cm. wide.

Geographic distribution: Uganda, Belgian Congo, Angola.

17. Encephalartos friderici-guilielmi Lehm.

E. cycadifolius (Jacq.) Lehm. (?)

Jacquin, N. J., *Fragm. Bot.* 1:27, partly, as to t. 26 only (1809); Lehmann, J. G. C., *Pugill.* 6:8, 13 (1834); Hutchinson, J., and Rattray, G., *Flora Capensis* 5² (Suppl.):42 (1933); Henderson, M. R., *Jour. S. Afr. Bot.* 11:50 (1945).

Stem usually 1-2 m. high, occasionally up to 4 m., diameter of larger trunks 40-45 cm.; terminal bud the most woolly of all cycads, the woolly condition extending down four crowns, then diminishing until the trunk becomes smooth; petioles weathering off slowly for many years before abscission layer cuts them off smoothly, making the diameter of the trunk much greater at the top. Leaves 40-60 in a crown, a new crown appearing every year and remaining green for two years; 1-1.5 m. long, straight or nearly so; blue-green and woolly when young, becoming yellowish green and glabrous. Petiole up to 25 cm. long; petiole and rachis woolly, rounded below, broadly flattened and with two grooves above. Leaflets 50-125 on each side, separated below, overlapping above, mostly opposite, rigid, linear, straight or nearly so, pungent, revolute, entire but with an occasional spine in young plants; larger leaflets 17 cm. long and 6 mm. wide, upper and lower leaflets somewhat smaller but the latter not reduced to spines; veins 8-10, very prominent on the under side.

Male cones usually more than 1, long ellipsoid, densely covered with felt-like brownish wool, 20-25 cm. long, 6-8 cm. in diameter; peduncle about 4 cm. long. Microsporophylls thin and flat, 2.5-3 cm. long, 2.5-2.8 cm. wide, average number of microsporangia 800, in sori of 4 or 5, occasionally 6, mostly

in two groups separated by a sterile line and with a sterile margin about 2 mm. wide. Female cones usually 3-7 in a circle, from the axils of leaves, ellipsoid, very densely woolly, 15-25 cm. long, 12-15 cm. in diameter. Megasporophylls 5-6 cm. long, 4-5 cm. wide; peltate top extremely woolly, rugose, with two pointed lateral lobes and a median lobe extending downward and partly covering the seeds. Seeds yellow, 3.8-5 cm. long, 3-3.8 cm. in diameter; stony coat 2.3 cm. long, 1.5 cm. wide, nearly smooth, with 10 bundles.

Geographic distribution: South Africa—abundant at Queenstown, disappearing a little farther north, and extending south to the Amatola Mountains; common around the Thomas River but not reaching to the Toise River to the south; east to the village of Toslo. I studied this species on dolomite rocks at Queenstown and on the Windvogelberg at Cathcart.

18. Encephalartos lanatus Stapf and Burt Davy

Stapf, O., and Burt Davy, J., in Burt Davy's Flora Transvaal 1:40, 99 (1926); Hutchinson, J., and Rattray, G., Flora Capensis 5² (Suppl.):43 (1935); Henderson, M. R., Jour. S. Afr. Bot. 11:52 (1945).

Stem up to 3 m. high. Leaves numerous, about 85 cm. long, glaucous when young, becomes glabrous. Petiole 12 cm. long; rachis subterete, woolly when young. Leaflets about 90 on each side, crowded, overlapping in upper part of leaf, opposite, lanceolate, pungent, entire, the largest 12 cm. long, 6-8 mm. wide, lower leaflets smaller but not reduced to spines; veins 12-14, prominent on the under side.

Male cones cylindric, densely woolly, 15 cm. long, 5 cm. in diameter, short stalked. Microsporophylls about 2 cm. wide, narrowly rhomboid at the top. Female cones solitary or several together, abruptly narrowed at each end, densely woolly, about 18 cm. long and 8 cm. in diameter, short stalked. Megasporophylls broadly rhomboid, about 5 cm. wide, 2.5 cm. high, densely but shortly tomentose except toward the margin, which forms a thick glabrous callus. Seeds broadly ellipsoid, probably yellow, about 2.5 cm. long.

Geographic distribution: Eastern Transvaal, from Middleburg through the Godwan River area to Barberton, north to Lydenburg; generally at elevations of 1,000-1,700 m. This species is related to E. friderici-guilielmi Lehm.

19. Encephalartos ghellinckii Lem.

Lemaire, C., *Illus. Hort.* 14:80 (1867); Seward, A. C., *Proc. Cambr. Phil. Soc.* 9:340 (1897); Hutchinson, J., and Rattray, G., *Flora Capensis* 5² (Suppl.):43 (1933); Henderson, M. R., *Jour. S. Afr. Bot.* 11:57 (1945).

Stem stout, up to 2 m. or rarely 3 m. high and 60 cm. in diameter, usually leaning or prostrate in plants more than 1 m. high, woolly. Leaves 20-30 in a crown, up to 1 m. long, densely grayish tomentose at first, becoming thinly pubescent or glabrous, dark green. Petiole 20-30 cm. long, woolly until quite mature, the base permanently woolly; rachis flattened above, triangular below, sometimes twisted, woolly. Leaflets 20-50 on each side, mostly opposite, narrowly linear, pungent, entire, the larger ones 15 cm. long, 1.5-2 mm. wide, strongly revolute, the lower leaflets somewhat smaller but not reduced to spines; veins 3 or 4, obscure.

Male cones ellipsoid, narrowed below and rounded above, very woolly, up to 23 cm. long and 9 cm. in diameter, subsessile.

Microsporophylls elliptic at the top, with thin wide margins, the under side covered with microsporangia except at the margins.

Female cones ellipsoid, woolly, 20-38 cm. long, 15-23 cm. in diameter, subsessile. Megasporophylls few and large in relation to the size of the cone, up to 7 cm. wide and 3 cm. high; the apex rounded truncate or somewhat concave, about 7 mm. in diameter, the sides tapering to a thin edge. Seeds broadly ellipsoid, brown or yellow with a tinge of red below, about 3 cm. long.

Geographic distribution: Natal--from sea level at Umkomaas, near Durban, to 2,700 m. on the eastern slopes of the Drakensberg.

Don't find encephalartos ferox mentioned.

Original publication checked Dec. 7, 1907 at Oran.

encephalartos ferox G. Bertoloni, Mem. dell'Accad. delle Sci. dell'Istit. di
Bologna 3: 264. 1851.

Author's name needs checking. I believe it is listed in dew as Bertoloni f.

John W. P. Smith