

The only character so far known in which this differs from both the other subspecies is its almost glabrous rachis bracts. In leaf characters it matches subsp. *rigida* quite closely, notably in its overall blade length, depth of dissection, length of secondary lobes, and moderately glaucous upper surface of lamina, in all of which these two subspecies differ from subsp. *mariae*. Comparisons of flowers and mature fruits are not yet possible, due to lack of material. Recognition of this population as a separate subspecies on the basis of a single wild collection (and one from cultivation) is arguably rather premature, but represents a middle course between simply submerging it in subsp. *rigida* and treating it as a distinct species. (Fig. 3c, 5d)

**Distribution:** as so far known, this subspecies occurs in the gorges of the Durack and King Leopold Ranges, central Kimberley region, Western Australia. In the Durack Range it has been collected at Mt King and near El Questro Homestead, and seen from air in gorges between these points. In the King Leopold Ranges it has been collected at Mt Gladys, and apparently similar palms are reported by Dr Peter Wilson (NSW) in Brownrigg Gorge near the very head of the Lennard River in the King Leopold Range.

**Conservation status:** none assigned by Briggs and Leigh (1996); a coding of 3VCi is suggested.

**Specimens examined:** Western Australia: Bens Springs, 3 km E of El Questro Homestead, *Kenneally* 10965, 29 June 1989 (PERTH).

Cultivated: Queensland: Townsville Palmetum, *Dowe* 117, 9 Dec 1993 [ex seed from Broome Botanical Society: Mt Gladys, Leopold Range, *T. Willing s.n.*, May 1987] (NSW).

## 2. *L. lanuginosa* A.N. Rodd, *sp. nov.*

Palma magna affinis *L. mariae* habitu similique: folia valde undulata costa elongata valde deflexa; lamina profunde dissecta, griseo-viridia, infra velamine crasso cerae, petiolo supra squamas densas albo-lanuginosas ferenti. Inflorescentiae foliis breviores, axe principali recto crassoque, bracteis vaginatis squamas albo-lanuginosas dense ferentibus. Fructus magni, usque ad 3.5 cm diametro, atrocastanei ubi maturi, punctis minutis suberosis sparsis ferentes, mesocarpio crasso.

Type: Queensland: Glenroy Creek, 75 km SE of Ravenswood, 20°35'S, 147°10'E, A.K. *Irvine* 1912, 25 Aug 1978; holo NSW; iso QRS, BRI, BH, MEL.

[*Livistona* sp. 'Cape River' (Jones 1984, Dowe 1990)]

**Trunk** solitary, straight, to c. 15 (20?) m tall, c. 35 cm diameter at 1.5 m above ground, broadening gradually downward and flaring widely at very base to 50–60 cm diameter above a slight pedestal of exposed roots. Surface rather corky on lower trunk, usually with persistent appressed petiole stubs to 20 cm long on basal 1–2 m, as well as some step-like petiole scars; upper trunk surface very rough, with distinct annular sheath-scars; vertical fissures numerous, shallow on lower trunk, deep and zig-zagging on upper (some very long).

**Crown** ± globose or somewhat umbrella-shaped, rather open, consisting of c. 35–45 strongly ascending to horizontally spreading or slightly drooping greyish leaves with stiff petioles and downward-curving leaf-blades with arching to pendulous segment lobes. Ligules moderately prominent, pale straw-coloured ageing to dirty white, with inconspicuous but fairly dense whitish scales.

**Petiolo** 150–200 cm long, 30–35 mm wide; triangular-flattened in t.s. with rounded keel, concave above near lamina but with slight median keel in mid-region. Margins mostly unarmed for upper  $\frac{2}{3}$  or more, toward base armed with mostly patent (some antrorse or retrorse), broad-based blackish prickles to 3 mm long; surfaces yellowish-green right to base, upper obscurely striate, hardly pitted, at first densely whitish-woolly over most of length, with deeply lacinate, antrorsely appressed scales

to 5 mm long, the laciniae straight or sharply bent, spirally twisted, becoming tangled with age, deciduous on older petioles leaving numerous minute, oval to elliptic, pustular, hardly raised pale grey-brown basal-masses; lower surface almost glabrous, hardly striate, with dark brown streaky markings and irregular, shallow, elongated pits, few inconspicuous appressed white scales sometimes present in long narrow rows either side of keel. *Hastula* base V-shaped, slightly cuspidate; rim at 40–50° to costa, to c. 12 mm wide, fairly straight and even, with narrow to broad necrotic margin. **Lamina** 130–190 cm long, 0.3 mm thick, strongly costapalmate, ± truncate at base, rigidly coriaceous, not readily splitting, strongly contorted with 3 adaxial undulations either side of a deep median crease along the strongly decurved costa, sharply involute either side at base with 3–4 lowermost segments resupinate. *Segments* 42–46 either side of costa; largest segments 36–42 mm wide, ± parallel-sided, free for 60–70% of their length, bifurcated for 50–75% of free length, the lobes moderately diverging and arching with pendulous tips, evenly tapering but drawn out into fine, flexible apices which on older leaves are shortly necrotic but remain entire. Intersegmental appendages ± persistent, threadlike but moderately tough, to 20 cm long, dark greyish, densely white-woolly at first, glabrescent. *Ribs*: abaxial ribs in t.s. oblong, narrowing slightly to lamina, square-edged, 0.9–1.3 mm thick, up to 3.0 mm deep; adaxial ribs similar, 0.8–1.2 mm thick, 2.0–3.0 mm deep. *Venation*: major longitudinal veins 7–9 either side of abaxial rib, moderately conspicuous above, evident but not prominent beneath; transverse veins barely discernible above, moderately prominent beneath, mostly near-orthogonal with respect to longitudinal veins, mostly arcuate or sinuous, mostly discontinuous. Surfaces both somewhat yellowish pale green but appearing pale bluish-grey, strongly pruinose, especially the lower which has a persistent thick coating of white wax readily rubbing off onto fingers; glabrous except for ribs on both sides toward base clothed in dense, moderately persistent, whitish matted scales as on adaxial petiole surface.

**Inflorescences** slightly longer than petioles, ± erect but with strongly deflexed branches, rachis stout and fairly straight. Partial inflorescences 9–12, subequal, the largest approaching ½ of rachis in length, branched to 4 further orders; rachillae 3–12 cm long, c. 0.8 mm thick, creamy-white, finely wrinkled-striate, glabrous; larger axes toward base of each partial inflorescence densely white-woolly, soon glabrescent post-anthesis, with sinuous, dendritically-branched hair-like scales c. 3 mm long, leaving minute, numerous granular-papillose remnants after shedding. Rachis bracts somewhat flattened, the largest 3.5–4 cm diameter, rigidly coriaceous, tightly sheathing, smooth or ± buckled with transverse wrinkles, pale green with short red-brown necrotic apical zone, conspicuously striate with prominent raised veins, densely and persistently lanuginose, most densely toward apices, with matted tomentum c. 2 mm thick, straw-coloured ageing greyish-white, consisting of scales c. 5 mm long, divided right to base into dense tufts of plumose, hair-like, straight or slightly sinuous laciniae which become curled and matted with age, the shed scales leaving inconspicuous but dense, hardly raised, elongated basal-masses concolorous with bract surface; bract-apices triangular-ovate, somewhat abruptly cuspidate or acuminate with fine, soft points which soon shrivel and break off. *Flower-clusters* 1–3 mm apart, 1-flowered; cluster axis vestigial, 0.2–0.3 mm long, conical, projecting from a larger chin-like protuberance from rachilla. Cluster-bract broad-based with narrow-triangular, acute central portion, marcescent post-anthesis. Bracteole 1, immediately above and laterally overlapping cluster-bract.

**Flowers** c. 3.0 mm long, funnel-shaped. Anthopodium 0.5 mm or less long, c. 0.9 mm wide, tapering, deeply recessed at base with a sharp rim and 3 obscure downward bulges, completely concealing cluster axis. Sepals closely appressed to petals, very concave basally, thick and pigmented except for narrow, thin, translucent margin, c. 1.5 mm long, connate for almost half their length with broad, shallow sinuses, narrowly triangular, sharply acute to finely acuminate or even aristate at apex.

Petals very thick, tough, moderately concave, 2.8–3.0 mm long, connate for c.  $\frac{1}{4}$  their length, rather narrowly ovate-triangular; mostly sharply acute at the strongly thickened, barely inflexed apex auriculate at base, the auricles quite large, sometimes broadly overlapping; inner faces with 3 long, deep cavities. Stamens  $\frac{3}{5}$  to  $\frac{2}{3}$  as long as petals, filaments broadly oblong with rounded apex to almost semicircular in outline, not or barely shouldered, narrowed very abruptly into short, very slender apex; anthers c. 0.4 mm long. Carpels slightly shorter than stamens; ovaries obovate to obconical, strongly gibbous abaxially, narrowed very abruptly into slender, frequently curved styles c. 0.5 mm long.

**Fruit**  $\pm$  spherical, shallowly conical at base, 33–36 mm diameter. Epicarp moderately tough, dark purplish-brown when ripe, smooth and moderately shiny, slightly pruinose, with sparsely but evenly scattered pale brown pustules 0.3–1.0 mm diameter, each with small circular pore or 3-cornered slit in summit. Mesocarp to c. 4 mm thick, granular-fleshy, moderately juicy when fresh, containing numerous thick fibres much denser toward inner face, tending to be parallel in basal half and anastomosing in apical half, prominent on inner wall at least in fallen fruits. Endocarp 0.3–0.5 mm thick, quite hard, tough and springy, pale straw-coloured, minutely rugulose on both faces but appearing smooth and matt-surfaced except for prickly-like projection at stalk position. *Seed* subspherical, very slightly flattened on ventral face, c. 22 mm long, 21 mm wide, 19–20 mm thick, with distinct, large raphal scar at base; surface smooth, mottled pale and dark red-brown; seed-coat mostly c. 1.0 mm thick. Intrusion very large, occupying most of seed volume, penetrating  $\frac{1}{3}$  or more of seed width from a lateral position, in l.s. very broad-based but broadening into irregular, vaguely circular outline, divided somewhat into 2 lobes, occupying  $\frac{2}{3}$  of seed length; in t.s. similar in outline but slightly narrower, occupying slightly over  $\frac{1}{2}$  seed width. Embryo large, sub-basal (4.30–5.00 o'clock relative to stalk). (Fig. 3d, 7, 9a)

**Distribution:** restricted to a small area of the Burdekin River basin, tropical east Queensland, 100–200 km from the coast, between latitudes 20°30' and 21°, and altitudes 150–300 m.

**Ecology:** known only along sandy river and creek channels that flow only for part of the year but with permanent pools or soaks; associated trees are *Eucalyptus camaldulensis*, *Melaleuca leucadendra*, and *Pandanus ?cookii*.

**Conservation status:** 2V (Briggs & Leigh 1996).

**Specimens examined:** Queensland: North Kennedy: Glenroy Creek 75 km SE of Ravenswood, *Irvine* 1913, 25 Aug 1978 (QRS, NSW); Glenroy Creek, c. 11 km N of Burdekin Falls, *Rodd* 3759 & *Jacks*, 25 Nov 1981 (NSW); Glenroy Creek c. 3km from Glenroy Station homestead, *McLain* 2, Feb 1978 (QRS); Middle Burdekin Valley somewhere near Burdekin Falls, *McLain s.n.*, 1978 (or possibly 1977) (NSW).

Cultivated: Queensland: Townsville Palmetum, *Dove* 111, 18 June 1993 [ex seedlings: upper reaches of Burdekin River in vicinity of Burdekin Dam wall, *R. Tucker s.n.*, 1986] (NSW).

#### Notes

1. Bailey (1902) included '*L. mariae*' in his Flora, with description probably drawn largely from those of Mueller and Benthams. Instead of citing a region or locality for its occurrence, however, he only notes: 'I have received a portion of a leaf from F.L. Berney of Hellenslie, Campaspe River, which in all probability belongs to this inland palm.'

2. The above record aroused my interest in the early stages of this project, in that there had not been any other report of palms from this region of Queensland except those much closer to the coast (*L. decipiens*, *L. drudei*, *L. australis*). In 1976 a visit was made to 'Helenslee' (as it is now spelt on the map), which is near the head of the Campaspe about 30 km east of Pentland. The manager of the property knew of no palms in the vicinity at all, and the river bed there appeared an unlikely habitat for palms.

It was concluded that the specimen sent to Bailey (which has apparently not been preserved) must have been collected from some more distant locality.

3. Quite coincidentally, in 1977, word reached palm collectors in Sydney that an apparently quite new *Livistona* had been discovered in the middle-lower area of the Burdekin, by Peter McLain, an enthusiastic young horticulturist and plant collector from Ayr near Townsville. Seeds of the palm distributed by him were seen to be much larger than those of any Australian *Livistona* except *L. alfredii*.

4. Tony Irvine, CSIRO botanist from Atherton with a specialist interest in palms, followed up Peter McLain's discovery with an investigation of his own, making collections and field observations which he very generously communicated promptly to me. He revisited the stand known to McLain on Glenroy Creek, south of Ravenswood not far from Burdekin Falls.

5. Tony Irvine also, following a chance remark made to him, called on Mr Jim Rollinson of 'Nosnillor', a large property situated at the junction of the Cape and Campaspe Rivers. Around the homestead he found a number of mature plants of this same species, and was informed that these had been transplanted as seedlings by Mr Rollinson from a distant part of his property on the Cape River over thirty years previously. In September 1978 I visited 'Nosnillor' and photographed these same plants, but was told that the area of river where they occur wild was not accessible by vehicle. Tony Irvine was also informed by Mr Rollinson that there is another occurrence of these palms on the property 'Harvest Home', lower down the Cape River.

6. The species clearly occupies only a very limited area of the Burdekin Basin. At least some of the known stands exhibit vigorous regeneration with most age-classes represented, but it is possible that, in a climate marginal for palm survival, there are periodic droughts resulting in death of all stands other than those on the most permanent soaks in stream beds; otherwise it is difficult to understand why an apparently so vigorous and hardy species should not be more widespread, as its seeds are well adapted to dispersal by floods. This reasoning applies equally to the similarly restricted *L. mariae* and *L. alfredii*.

7. Dowe (1990) says of *Livistona* sp. 'Cape River': 'Distribution of this species is relatively widespread, being found as far north as the tributaries [of the Burdekin] which have their source west of Ingham; near to Greenvale in the west; to the Cape River in the south and to Ravenswood in the south-east. The distance from north to south is about 200 km, but this may be misleading as groups are usually very small (this species does not form colonies as do other *Livistona* spp.) and are widely located.' Dowe does not state whether this account is based on his own observation. He concludes that its endangered status falls into the category of 'Restricted distribution and uncommon: presently threatened', one of only two Australian palms placed by him in this category.

8. *L. lanuginosa* is a very distinct species, instantly recognisable by the abundant woolly scales on petioles and rachis bracts and by the very large, brownish fruits. Its closest affinity is clearly with *L. mariae*, there being in particular a striking similarity in dimensions and other characteristics of the trunk, most strikingly at the base. Also, the thickly waxy undersides of the leaves, their broad, thick-textured segments, and the large white scales on the rachis bracts, together with overall size and architecture of the inflorescences, are all features shared by both species.

### 3. *L. benthamii* F.M. Bailey

Bailey (1902: 1683); Beccari (1921: 14,18; 1931: 84, t.6iv); Burret (1941: 325); Blake (1954: 127, t.6, f.3-4); Specht (1958: 208, t.2C-D); Covacevich & Covacevich (1978: 92); Johnson (1979: 13); Tucker (1980: 101); Jones (1984: 130).