

mature stems c. 8–17 cm, c. 3 mm diam.,  $\pm$  triangular in cross section, bearing scattered scales when fresh; blade dull brown or greenish brown when dry, narrow, entire, bifid, to 50 cm long, gradually widening from the base to 6 cm near the tip, usually shorter and narrower, split to 7.5 cm, the two halves with c. 6 shallow lobes to 7 mm deep; adaxial surface minutely punctate, abaxial surface bearing inconspicuous thin grey indumentum. Inflorescence unbranched, pendulous, 6 cm long; prophyll c.  $6 \times 1.4$  cm; peduncle very short, not exceeding c. 7 mm; rachilla surface hairy; triads strictly distichous, borne in a plane radial to the stem, each subtended by a low rachilla bract to 1 mm high. Staminate flowers  $\pm$  triangular ovate in outline, laterally flattened or curved by close packing; calyx irregularly 3-lobed, the lobes 1–2 mm high; petals cream-coloured, fleshy, irregular, two c.  $6.5 \times 3$  mm, the third c.  $6.5 \times 4.5$  mm; stamens 7–8, filaments c.  $1 \times 0.2$  mm, anthers c.  $2 \times 0.6$  mm, with broad connectives. Pollen grains monosulcate, ellipsoid in apertural view; long axis  $(31-33.3(-36)) \mu\text{m}$ , short axis  $(24-26.2(-30)) \mu\text{m}$ , wall thickness c.  $2 \mu\text{m}$ ; sulcus membrane not observed, sulcus somewhat longer than long axis; exine intectate, clavate, the larger clavae interspersed with smaller diameter, shorter clavae, clavae not modified at sulcus margin. Pistillate flower very low; calyx tubular,  $\pm$  striate, c. 0.8 mm high, very shallowly 3-lobed; petals imbricate, ovate, c. 0.8 mm long, the margins sparsely ciliate; staminodes lacking; ovary c. 0.8 mm diam., tipped with an irregularly lobed stigma. Fruit not known. (Fig. 2).

BORNEO. Sarawak: 1st Division, Bako National Park, *Dransfield et al.* JD5917 (holotype K; isotypes BH, L, SAR), *Dransfield* JD746 (K), *Ashton* S.17961 (K, SAR), *Jugah ak Kudi* S.36627 (BH, K, KEP, L, SAN, SAR).

This remarkable little 'pinang' is found only on the great sandstone cliffs and boulders of Bako National Park. It is by no means abundant, but is very distinctive. No fruits have been found although dead inflorescences can be seen on herbarium specimens and in the field. How the palm is dispersed to crevices in vertical cliffs is a mystery.

*P. rupestris*, although superficially very different, seems to me to be related to the rheophyte, *P. rivularis* Becc., from neighbouring Brunei and the 4th and 5th Divisions of Sarawak. Both species are diminutive, and have internodal branching and simple, hairy inflorescence axes bearing gamosepalous pistillate flowers; the leaves of *P. rivularis* are, however, very finely pinnate as befits a rheophyte.

***Pinanga pachyphylla*** *J. Dransf.* sp. nov. solitaria vel caespitosa *P. strictae* Becc., *P. ligulatae* Becc. et *P. patulae* Bl. verosimiliter affinis sed textura laminae folii crassa coriacea vel vix succulenta, foliolis distantibus inflorescentia compta rachillis divaricatis distincta. Typus: Borneo, Sarawak, *Dransfield et al.* JD5912 (holotypus K; isotypi BH, SAR).

Moderate, solitary or clustering undergrowth palm with stems to 3 m tall, c. 2 cm diam., conspicuously marked with nodal scars, internodes c. 5–10 cm, the surface covered with caducous brown scales. Crown of c. 5 pinnate leaves, the sheaths forming a well-defined green crownshaft c.  $30 \times 2$  cm; sheath  $15-25 \times 2$  cm, rather succulent in texture when fresh, drying dull brown, striate, with caducous scattered scales, apparently lacking any ligule-like appendages; petiole c.  $30 \times 1$  cm, bearing caducous scales as the sheath;

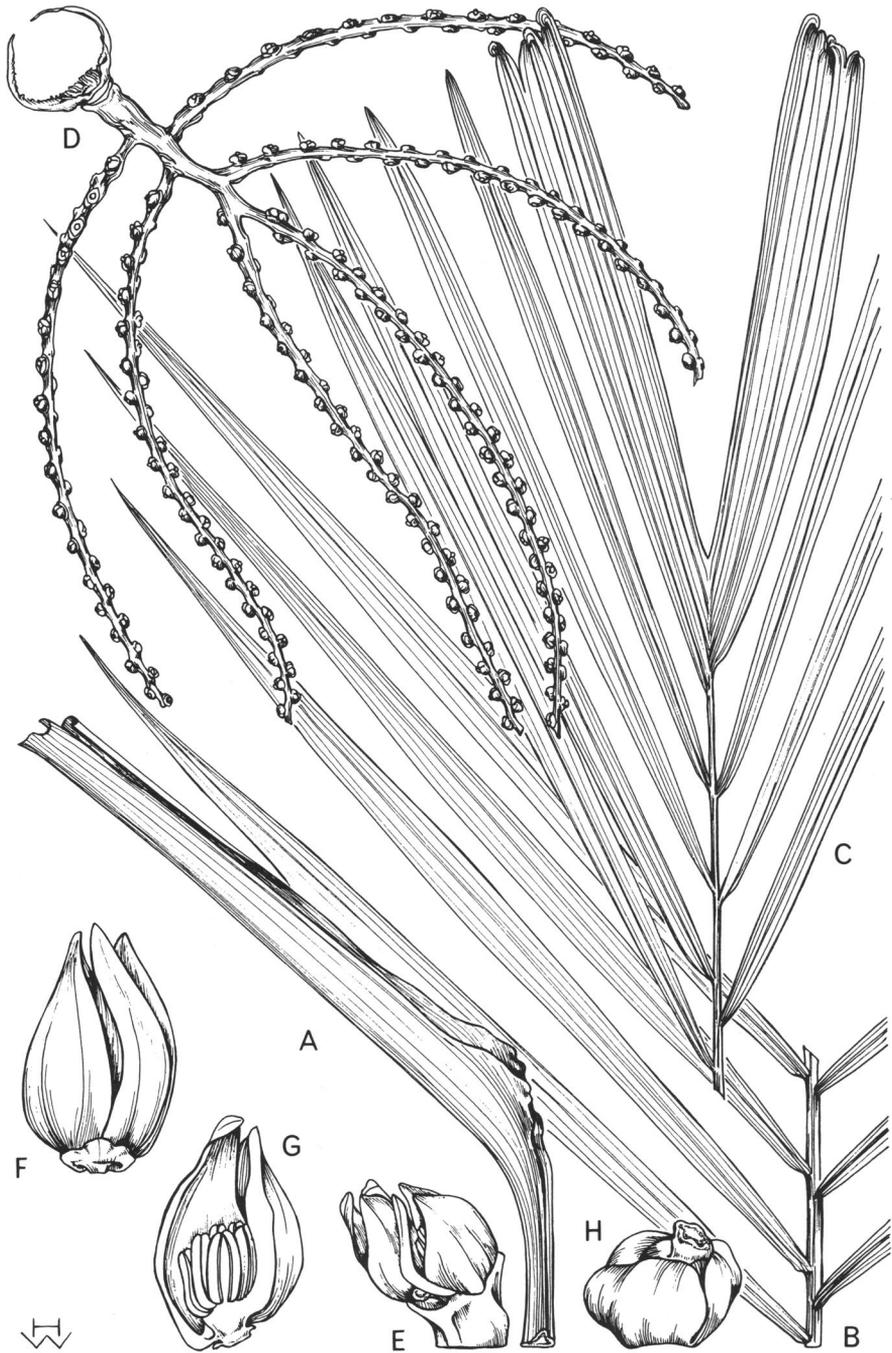


FIG. 3. *Pinanga pachyphylla*. **A** leaf sheath  $\times \frac{1}{2}$ ; **B** mid portion of leaf  $\times \frac{1}{3}$ ; **C** leaf tip  $\times \frac{1}{3}$ ; **D** inflorescence  $\times \frac{2}{3}$ ; **E** portion of rachilla showing triad  $\times 2$ ; **F** staminate flower  $\times 3\frac{1}{2}$ ; **G** staminate flower, one petal removed  $\times 3\frac{1}{2}$ ; **H** pistillate flower  $\times 7\frac{1}{2}$ . **A-C**, **E-H** from Dransfield JD5912, **D** from Dransfield JD740. Drawn by Heather Wood.

rachis c. 90 cm, scaly as the petiole, bearing 9–20 very thick, stiff, almost succulent narrow rather divergent leaflets, bright green when fresh, drying silky dull green to brown, acuminate, mostly composed of single folds except for the compound terminal leaflet pair, the longest in mid-leaf to  $50 \times 2.2$  cm, the apical pair c.  $25 \times 3$  cm, both surfaces glabrous. Inflorescence spreading or pendulous, 14–20 cm long with 4–6 divergent rachillae held stiffly  $\pm$  in one plane; prophyll not preserved; peduncle  $10\text{--}20 \times 6$  mm just above the base; rachillae green at anthesis, glabrous, c.  $11\text{--}17 \times 0.4$  cm, bearing strictly distichous triads subtended by minute scarcely visible bracts, rachilla becoming orange after fertilisation. Staminate flower irregularly flattened and curved by close-packing; calyx irregularly explanate and 3-lobed, ca. 1–2 mm high; petals irregular, very fleshy, two  $\pm$  triangular-ovate, c.  $8.5 \times 4.5$  mm, the third c.  $8 \times 2.5$  mm; stamens about 10, filaments very short, 0.2–0.5 mm, anthers elongate  $2.5 \times 0.8$  mm with broad connective. Pollen grains monosulcate, ellipsoid in apertural view; long axis (27–)30.3 (–34)  $\mu\text{m}$ , short axis (21–)23.0(–25)  $\mu\text{m}$ , wall thickness, c.  $1\text{--}1.5 \mu\text{m}$ , sulcus membrane thin, underlying small finely reticulate insulae, sulcus shorter than long axis, exine semitectate, finely reticulate, lumina slightly reduced in diameter at sulcus margin. Pistillate flower globular depressed, c.  $2 \times 3$  mm; calyx of 3 separate imbricate, rounded striate sepals, c.  $2 \times 2.5$  mm, with imbricate, rounded, striate sepals, c.  $2 \times 2.5$  mm, with minutely toothed margins; petals 3, imbricate, similar to the sepals; staminodes lacking; ovary rounded c. 1.5 mm diam., tipped with conspicuous curved, irregularly lobed stigma. Immature fruit green, broad-ellipsoidal, pointed at both ends,  $9 \times 5$  mm; seed spherical, 4 mm diam., deeply ruminant. Seedling not known. (Fig. 3).

BORNEO. Sarawak: 1st Division, Bako National Park, *Dransfield et al.* JD5912 (holotype K; isotypes BH, SAR), *Dransfield et al.* JD740 (K); Serian District, Sabal Tapang Forest Reserve, G. Gaharu, *Dransfield et al.* JD6097 (BH, K, L, SAR).

A rare palm found in lowland and submontane kerangas forest on sandstone, *P. pachyphylla* is peculiar in its strange succulent texture. It is probably related to *P. stricta* Becc., *P. ligulata* Becc. and *P. patula* Bl., but is distinctive in the texture of the leaves, the distant leaflets and its neat inflorescence with stiff divergent glabrous rachillae.

***Pinanga mirabilis* Becc.** in *Malesia* 3: 126 (1886). Type: Borneo, Sarawak, Kuching, *Beccari* PB 389 (holotype FI).

*Pinanga malaiana* (Griff.) Scheff. var. *barramensis* Becc. ex Martelli in *Atti Soc. Tosc. Sci. Nat. Res. Pisa, Mem.* 44: 122 (1934). Type: Borneo, Sarawak, Baram, *J. Hewitt* s.n. in 1908 (holotype K).

*P. malaiana* var. *barramensis* differs from *P. mirabilis* only in the dissection of the leaf blade; in the former it is irregularly pinnatisect, in the latter entire. In the field, as in the Lambir Hills National Park, populations occur with both entire- and pinnate-leaved individuals. *P. malaiana* var. *barramensis* is thus reduced to *P. mirabilis* which although closely related to *P. malaiana* var. *malaiana* I still consider to be distinct in its habit, leaf-costa orientation, rachillae, flowers and fruit.