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New Species of Vanuatu Palms

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ABSTRACT

Three new species, *Licuala cabalionii*, *Calamus vanuatuensis* and *Cyphosperma voutmelense*, are described from Vanuatu as a precursor to a revision of the palm flora.

Vanuatu (formerly the New Hebrides) is an archipelago of about 80 small to moderate-sized volcanic and coral-based islands orientated linearly north-west to south-east between 13°S and 22°S and 165°E and 170°E in the southwest Pacific Ocean. The closest neighboring land mass (16,192 sq km) is la Grande Terre of New Caledonia, which is about 500 km to the southwest. The scattered southern islands of the Solomon Islands, of which San Cristobal is the largest at 4,200 sq km, are about 600 km to the north while the Fiji Islands lie some 1,200 km to the east. Espiritu Santo, at 4,100 sq km, is the largest island in Vanuatu.

Geologically much of Vanuatu is of recent (Eocene and younger) age when compared with nearby terrains; both New Caledonia and Fiji retain evidence of continental (Cretaceous) formation dating from the break-up of the continent of Gondwana. There are six active volcanoes and many semi-active areas within the Vanuatu archipelago. Island-building is presently taking place because of uplift wrought by the convergence of tectonic plates.

The flora of Vanuatu, in essence an extension of the floras of Malesia and New Guinea, is not as well known as those of some nearby island groups (e.g., Fiji and New Caledonia), as many of the remote and outlying islands (most of which harbor complex forests) have yet to be thoroughly botanized. P. S. Green (1979), while writing on the findings of the 1971 Royal Society Expedition to Vanuatu, noted an unexpectedly large number of plant species which were recorded for the first time in Vanuatu, particularly species from the Solomon Islands, New Caledonia, and Fiji. Of those regional affinities which have been ascertained, that with the Fiji Islands (even though they are considerably farther away than either New Caledonia or the southern Solomon Islands) is the most obvious (Schmid 1966).

The affinity of the palm flora displays the same trends as does the flora in general (i.e., in a broad sense an extension of the Malesian and New Guinea floras and in a regional perspective having a close relationship with that of the Fiji Islands) (Schmid 1966, Chew Wee-Lek 1984, Dowe 1991), although in the northern islands, such as the Torres and Banks Groups, a shared distribution and/or close relationship with palm species from the southern Solomon Islands exists (the Santa Cruz Group of the Solomon Islands is geologically similar to the northern islands of Vanuatu). An appraisal of the relationship between the Vanuatu and Fijian palm floras (Dowe 1991) recognizes that, despite there being only one shared species (i.e., *Cocos nucifera*), the number of shared genera is relatively high, being in the order of seven of a total of fifteen. This is significant when it is considered that many palm genera which occur in the southwest Pacific are monotypic or have only a few species and that Fiji is a considerable distance away. Compare this to the number of palm genera shared with Vanuatu's clos-

1. Juvenile plant of *Licuala cabalionii* with the obvious symmetrical segmentation of the leaf.

est neighbor, New Caledonia; only two genera (*Cocos* and *Cyphosperma*) of a combined total of 25 genera occur in both areas. Whether Vanuatu was or is in a favored position to receive propagules from Fiji (i.e., abutting prevailing ocean currents, in the paths of migrational birds, etc.) has yet to be investigated, although the uniformity of the strand vegetation of the region is evidence of ocean currents being a major influence on the distribution of plants in the southwestern Pacific (Gunn and Dennis 1976, Merrill 1981). Of the eight genera which are not shared, four are monotypic, three of which are endemic to Fiji.

A list of the recognized Vanuatu palm species, including the three new species described here, is as follows: ** denotes suspected or known to be introduced/naturalized taxa: † denotes endemic taxa: ‡ denotes indigenous taxa which also occur elsewhere.

Licuala cabalionii Dowe†
L. grandis H. Wendl. ex Linden‡
Pritchardia pacifica Seem. & H. Wendl.**
Metroxylon warburgii (Heim) Becc.‡
M. salomonense (Warb.) Becc.**
Calamus vanuatuensis Dowe†
Caryota albertii F. Muell. ex H. Wendl. & Drude**
Veitchia arecina Becc.†
V. macdanielsii H. E. Moore†
V. metiti Becc.†
V. montgomeryana H. E. Moore†
V. spiralis H. Wendl.†
V. winin H. E. Moore†
Gulubia cylindrocarpa Becc.‡
Pelagodoxa henryana Becc.**
Clinostigma harlandii Becc.†
Carpoxylon macrospermum H. Wendl. & Drude†
Physokentia tete (Becc.) Becc.†
Cyphosperma voutmelense Dowe†
Cocos nucifera L.‡

New Species

Licuala cabalionii Dowe, sp. nov. *L. grandi* H. Wendl. ex Linden proxissima a qua lamina foliorum segmentata, caulibus tenuioribus altioribusque, fructibus maturis aurantiacis non carmesinis, et endocarpio parce costato differt. TYPUS: Vanuatu. Malekula: *Dowe 048*, 5 Sept. 1991 (holotypus BRI). Figures 1–3.

Stem solitary, erect to slightly reclining, to 5 m tall, to 8 cm diam., portion below leaves retaining decaying leaf-bases, proximal portion smooth, light brown/gray. Leaves to 12 in a loose crown; petiole very long and thin, to 3 m long to 1 cm wide in distal portion, irregular marginal spines only at the base; leaf-blade segmented; segments to 12, symmetrically arranged, central segment twice or more times broader than lateral segments which become progressively narrower toward the leaf margins, all segments slightly pendulous. Inflorescence interfoliar, pendulous, to 1.8 m long, five once-branched branches; bracts subtending primary and secondary branches tubular, remaining green during fruit development and maturity. Flowers pedicellate, single, spirally arranged, sepals fused to one-third their length, apex rounded, to 12 mm long, petals fused basally, apex valvate, pointed to 4 mm long. Fruit yellow/orange when ripe, globose, to 10 mm diam.; endocarp brittle with few longitudinal ridges. Seed to 6 mm diam., testa intruding into endosperm below the raphe. Eophyll plicate, leaf dividing early.

Distribution. Vanuatu, on the islands of Vanua Lava (in littoral forest at sea-level on volcanic soils) and Malekula (in rainforest to 250 m above sea level on volcanic soils). Endemic.

Specimens Examined. VANUATU. SOUTH MALEKULA: "Amethyst Camp," 250 m in rainforest on volcanic soil, 5 Sept. 1991, *Dowe 048* (holotype BRI).

Typification. Although this taxon had been recognized by the author to be distinct in 1988, no suitable sample for typification was available until that collected on 5 September 1991 (*Dowe 048*, BRI). This collection consists of two leaves (one with petiole) and a complete infructescence with immature fruit. Mature fruit has been seen by the author in the field but no sample of it has been preserved.

2. *Licuala cabalionii* in rainforest at altitude of about 200 m at Amethyst Camp, southern Malekula.

Derivation of Name. Licuala cabalionii is named for Pierre Cabalion (born 1947), French ethnopharmacologist whose work in Vanuatu has been an important contribution to the Flora of Vanuatu Project.

Licuala comprises about 110 species distributed from northeast India, through southern China, Philippines and southeast

3. Prolific production of seedlings below the "parent" plants is characteristic of *Licuala cabalionii*.

Asia to New Guinea, northern Australia, Solomon Islands and Vanuatu. The genus has developed its greatest diversity in Malay Peninsula and Borneo (about 50 species) and New Guinea (about 36 species). *Licuala* was not recognized as occurring in Vanuatu until 1970, when *L. grandis* was collected from southern Espiritu Santo (Whitmore 1973). Erroneously this species had been documented in numerous publications as originating from New Britain, an island to the east of New Guinea, an error most probably originating from its initial description from a horticultural source.

Licuala cabalionii is distinguished from the closest occurring species, *L. grandis* H. Wendl. ex Linden (distributed throughout much of Vanuatu as well as the Santa Cruz Group and San Cristobal Island of the Solomon Islands) by its divided leaf-blade, less spiny petiole, shorter floral pedicel and sparingly as opposed to multi-ribbed endocarp. *L. lauterbachii* Dammer & K. Schum. (Solomon Islands and New Guinea) differs in having a short and erect inflorescence, red fruit, and irregularly divided leaf-blade.

The known populations of *L. cabalionii* do not occur close to populations of *L. grandis* although they occupy similar habitats. The former occurs in very dense colonies (almost monospecific) in primary rainforest; the forest floor in the vicinity is thickly cover with seedlings and small plants. *L. grandis* is much less gregarious, with very few seedlings being observed and individuals being relatively widely spaced. *L. grandis* is more commonly found in disturbed or secondary forest. No traditional uses or vernacular names have been recorded for *L. cabalionii*.

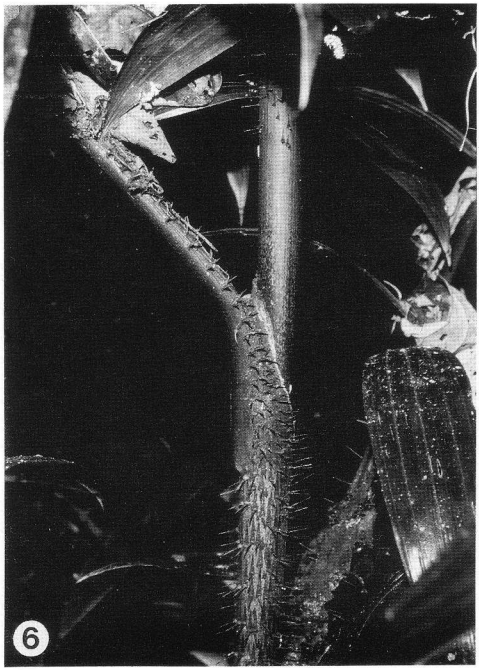
Licuala cabalionii has appeared as the manuscript names "*Licuala* sp. Vanua Lava" (Dowe 1989a) and "*Licuala* sp." (Dowe 1989b).

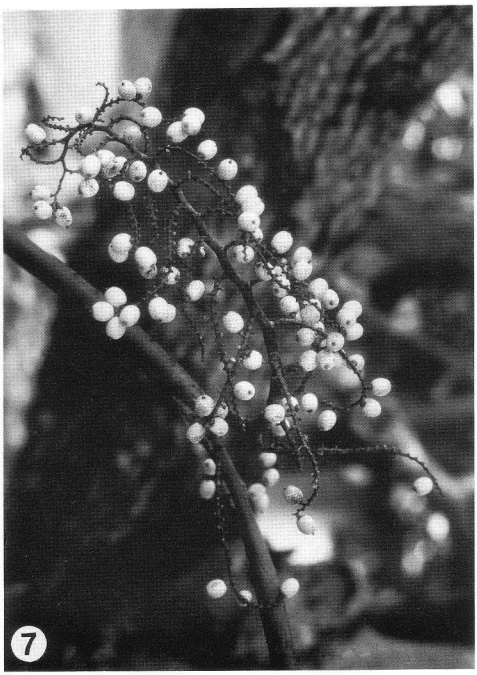
Calamus vanuatuensis Dowe, sp. nov. *C. vitiensi* Warb. ex Becc. et *C.*

4. *Calamus vanuatuensis* is a cirrate climber, seen here in the low altitude forest of central Espiritu Santo. 5. Leaflets of *Calamus vanuatuensis* are characteristically broad and chartaceous in appearance.

hollrungii Becc. affinis; a *C. vitiense* spinis in pectine non nisi in juvenalibus, ligula in pagina abaxiali petioli fructibus maturis cremeis majoribusque distinguitur; a *C. hollrungii* foliolisque non spinescentibus, et fructibus multo majoribus distinguitur. TYPUS: Vanuatu. Erromango: *Chew Wee-Lek* (*RSNH*) *118* (*1 & 2*), 3 August 1971 (holotypus PVV; isotypus K). Figures 4–7.

High climbing solitary-stemmed rattan. Stem without sheath bright green, glossy, 10–50 mm diam., narrowing above the nodes. Sheaths dull green to coppery/brown, densely spiny particularly toward the knee and petiole; spines green to yellowish green, light brown to almost black, to 4 cm long, irregularly spaced, robust and infrequently in combs in juvenile plants; knee prominent, spineless, but spines densely aggregated near its margins. Leaf cirrate, to 4 m long; cirrus thick, to 2 m long, bi- to five-clawed on all surfaces; petiole 7–30 cm long, with spines on margins and adaxial surface; ligule prominent on adaxial surface of petiole base; rachis spineless in median portion, but with clawed spines developing on abaxial surface of distal portion; leaflets regularly arranged, well spaced, coriaceous, dark green on both surfaces, 45 × 12 cm, four- to seven-veined, apex acute, spineless, terminal pair in non-cirrate juvenile leaf united basally. Inflorescence to 2 m long, non-flagellate, pendulous, with about six branches; staminate inflorescence smaller than pistillate inflorescence; bracts persistent, green, basal portion narrow, apical portion funnel-shaped, truncate, with marginal spines, rachillae to 12 cm long, curved, alternate and distichous, about 24 per branch. Flow-





6. The petiole and upper leaf-sheath of *Calamus vanuatuensis*. Note the spineless knee which is characteristic of the species. 7. Infructescence of *Calamus vanuatuensis*.

ers pedicellate; staminate flowers closely spaced, subtended by prominent funnel-shaped, truncate bracts; pistillate flowers 8–12 per each side of rachillae, to 15 mm long, staminodes prominent. Fruit sub-globose to 20 mm long, stigmatic remains prominent, white or cream suffused at maturity, scales arranged in seven rows. Seed pebbled, basally depressed, raphe prominent. Eophyll bifid.

Distribution. Vanuatu, occurring on most islands between Erromango and Vanua Lava in moist forests from sea-level to an altitude of over 1,000 m on a variety of soil types but most commonly in forest on basalt at 200–300 m. Endemic.

Specimens Examined. VANUATU. ERROMANGO: Nouankao River, agathis forest at 150 m, *Chew Week-Lek* (*RSNH*) *118* (*1 & 2*), 3 August 1971 (holotype PVV; isotype K); Southeast, in kauri forest 200–300 m, *Schmid 3272*, 12 May 1970 (NOU); River 5 km southwest of Ipota, *Cabalion 3028*, 16 November 1985 (PVV). EFATE: Loukpat, near Tagabe, dense forest about 200 m, *Green* (*RSNH*) *1076* (*1–4*), 11 July 1971 (PVV); South, Rentabao River in secondary forest on red-brown soils at sea-level, *Schmid 3271* (*2 sheets*) 29 April 1970 (NOU); Mt. Bernier at 470 m, *Seoule 38*, 12 August 1981 (PVV). PENTECOST: valley to the south of Melsisi, *Cabalion 1153*, 3 October 1980 (NOU). BANKS GROUP: *Vienne s.n.*, 1972 (NOU). MOTA LAVA: 300 m, *Bourret 216*, May 1978 (NOU).

Typification. The earliest known collection of this taxon is that by D. Levat, 1883, conserved at Montpellier University (MPU), France. The next recorded collections were those made in the 1970's by botanists from ORSTOM, based in Noumea, New Caledonia and collectors involved in the 1971 Royal Society and Percy

Sladen Expedition, New Hebrides. It is from this expedition that the type specimen has been chosen: *Chew Wee-Lek 118*, 3 August 1971, consisting of two parts; (1) a basal leaf section (including petiole), a packet of pistillate flowers and a section of infructescence with fruit and (2) a mid leaf section and a section of infructescence with fruit; this is the most complete and representative collection seen by the author; it is preserved at PVV with a duplicate at K. The only collection to contain staminate flowers is *Schmid 3271*, 29 April 1970, preserved at NOU.

Derivation of Name. Calamus vanuatuensis is named for Vanuatu, the type locality.

Discussion. This species has a relatively widespread occurrence and is variable. Samples collected from higher altitudes and from the northern parts of its range display a smaller overall size. It appears most closely related to *C. vitiensis* Warb. ex Becc., an endemic Fijian species and *C. hollrungii* Becc. from northeast Queensland, New Guinea and the Solomons. *C. vitiensis* has basally aggregated and obliquely arranged spines, a shorter and more robust pistillate inflorescence, smaller fruits which are whitish at maturity, and lacks the often prominent ligule on the adaxial surface at the base of the petiole. *C. hollrungii* has leaflets aggregated into groups (2–5) and which have marginal and rib spines and a leafsheath with a spinous knee.

Distinguishing Features of Three Calamus Species

C. vanuatuensis	*C. vitiensis*	*C. hollrungii*
leaflets evenly arranged	leaflets evenly arranged	leaflets unevenly arranged
leaflets unarmed	leaflets unarmed	leaflets armed
sheath spines not in combs	sheath spines in combs	sheath spines not in combs
knee unarmed	knee unarmed	knee armed
inflorescence long	inflorescence short	inflorescence long
fruit 2 cm long	fruit 1.5 cm long	fruit 1 cm long
fruit cream	fruit white	fruit white

Calamus L. is the largest genus in the Palmae with about 380 species distributed in tropical Africa (one species), eastern and southern India through Burma, southern China, Philippines, south-east Asia, Malesia, New Guinea, Solomons, northern and eastern Australia, Fiji and Vanuatu. The greatest concentration of species occurs in Malesia. The few species occurring in the Solomons, Fiji, Vanuatu and eastern Australia represent outliers; apart from the three species noted above, other outlying species in Australasia/western Pacific appear not to be closely related.

Calamus vanuatuensis has appeared as manuscript names as follows:

Calamus sp. 'Efate' (Guillaumin 1948)
Calamus (Schmid 1965)
Calamus (Moore 1966)
Calamus (Schmid 1973a)
Calamus sp. 'Erromango Sud-Est' (Schmid 1973b)
Calamus sp. 'Vaté-Sud' (Schmid 1973b)
Calamus sp. (Schmid 1974a)
Calamus sp. (Schmid 1974b)
Calamus sp. (Hodel 1982)
C. sp. aff. *vitiensis* (Dowe 1989a)
Calamus sp. (Cabalion 1989)
Calamus sp. (Dowe 1991)

Cyphosperma voutmelense Dowe, sp. nov. *C. balansae* (Brongn.) H. Wendl. ex Salomon proximissa a qua statura aliquantum minore, inflorescentia dimidio breviore squamis persistentibus obtecta, bracteis subtendentibus ramos inflorescentiae humilibus rotundatisque, et fructibus multo minoribus distinguitur. TYPUS: Vanuatu. Espiritu Santo: *Morat 6488*, August 1979 (holotypus NOU; isotypus BH).

Stems solitary, to 6 m tall, markedly cylindrical, leaf-scars closely spaced. Leaf

to 1.5 m long; leaf-base smooth, not forming a crownshaft; petiole narrowing abruptly, deeply channelled adaxially, rounded abaxially; leaflets widely spaced on rachis, to 5 cm apart, falcate, acuminate, to 45 × 3 cm, mid-rib prominent; two pronounced lateral ribs, equidistant from mid-rib and leaf margin; mid-rib with brown scales below, only at the base. Inflorescences interfoliar, arching to pendulous, to 92 cm long; prophyll to 30 cm long, open abaxially and not fully encircling peduncle at attachment; peduncular bract, attached 2–2.5 cm above prophyllar attachment, to 55 cm long, becoming fibrous with age; rameal bract to 4 cm long, pointed, attached 12 cm above peduncular attachment; all bracts persistent; peduncle to 35 cm long, to 10 mm wide, adaxially flat, abaxially rounded, covered with persistent brown scales; rachillae, about 13 per inflorescence, to 25 cm long, angled, covered with persistent brown scales, rachillae becoming closer spaced toward inflorescence apex; inflorescence branches subtended by low rounded bracts. Flowers spirally arranged, triads in the basal one-quarter to one-third, paired or solitary staminate flowers distally; staminate flowers symmetrical, larger than pistillate flowers, sepals imbricate to 1 mm long, petals valvate to 3 mm long, stamens 6; pistillate flowers to 2 mm high and wide, sepals imbricate with smooth margins; bracteoles large. Fruit sub-globose 10 × 8 mm, red at maturity, stigmatic remains subapical; endocarp ridged and furrowed. Seed 6 × 4 cm, in shape similar to endocarp.

Distribution. Vanuatu, on Espiritu Santo where it is known from a small population on the Cumberland Peninsula on a ridge below Voutmélé Peak (1,535 m) in moist forest on volcanic soils at 900–1,100 m. Endemic.

Specimens Examined. VANUATU. ESPIRITU SANTO: Cumberland Peninsula, ridge below Voutmélé Peak in forest on volcanic soils at 1,000 m, *Morat 6488* (5 sheets), 3 August 1979 (holotype NOU; isotype BH).

Typification. The only collection of this taxon is *Morat 6488*, 3 August 1979, preserved at NOU and BH. The sample at NOU consists of five sheets of which three comprise a complete leaf, the remaining two are complete inflorescences both with staminate and pistillate flowers. Fruit and a section of inflorescence are preserved at BH.

Derivation of Name. Cyphosperma voutmelense is named for Voutmélé (also spelt Vutmélé and Vutimélé), a peak above the ridge from where the type specimen was collected.

Discussion. Cyphosperma voutmelense is most closely related to *C. balansae* from New Caledonia, from which it differs by its much smaller inflorescence, brown, scaly inflorescence branches, rounded and not prominent inflorescence branch bracts and smaller fruit. The two Fijian species are more distinct: *C. tanga* H. E. Moore has undivided or only apically divided leaves and a sparsely branched inflorescence while *C. trichospadix* (Burret) H. E. Moore has a distinct crownshaft, an infrafoliar inflorescence, and large fruit to 2 cm long.

Cyphosperma voutmelense has appeared in manuscripts under the following titles:

Cyphosperma sp. 'New Hebrides' (Moore & Uhl 1984)
Cyphosperma sp. 'Vanuatu' (Dowe 1989b)
Cyphosperma cf. *balansae* (Cabalion 1989)
Cyphosperma sp. (Dowe 1991)

Key to Species of Cyphosperma

1. Crownshaft developed; inflorescence infrafoliar
   Vanua Lava, Taveuni, Fiji . . . *C. trichospadix*
1. Crownshaft undeveloped; inflorescence interfoliar
   2. Peduncle greater than 1 m long
      3. Leaf undivided except irregularly toward the apex fruit oblong/ellipsoidal to 1.3 cm long ..... Vitu Levu, Fiji . . . *C. tanga*
      3. Leaf divided regularly throughout fruit globose to 1.2 cm diameter ..... New Caledonia . . . *C. balansae*
   2. Peduncle less than 1 m long ..... Espiritu Santo, Vanuatu . . . *C. voutmelense*

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