A review of entire-leaved *Tacca* (Dioscoreaceae) in Sarawak, Borneo

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Abstract

A review of entire-leaved *Tacca* in Sarawak is presented; four species are recognized. *Tacca borneensis* Ridl. is resurrected and problems concerning the interpretation of *T. integrifolia sensu* Drenth are reviewed. The first complete description of *T. bibracteata* Drenth is published. One new species, *T. reducta* P.C.Boyce & S.Julia, is proposed. Significant floral and fruiting morphologies are highlighted and a key to all *Tacca* species (entire and palmate/dracontioid-leaved) in Sarawak is provided. All entire-leaved species in Sarawak are illustrated.

Introduction

The most recent complete revision of *Tacca* J.R. & G.Forst (including *Schizocapsa* Hance) was by Drenth (1972), with regional accounts for Flora Malesiana (Drenth, 1976) and Flora of China (Ling, 1985; Ding *et al*., 2000). All these accounts follow Drenth (1972) in treating *T. integrifolia* Ker Gawl as a widespread and highly polymorphic species.

Drenth (1972, 1976) recognizes two entire-leaved *Tacca* species for Sarawak, viz. *Tacca bibracteata* Drenth and *T. integrifolia*, in addition to two compound-leaved species: *T. leontopetaloides* (L.) Kuntze & *T. palmata* Blume. As is inevitably the situation with wholly herbarium-based monocot, family accounts, subsequent fieldwork has revealed considerable problems interpreting names and a far too broad circumscription of species. In particular there are considerable problems with the circumscription of *T. integrifolia*, which, far from being a highly variable species, in Sarawak, divides incontrovertibly into three morphologically and, in one instance, an ecologically – limestone –, a distinct species.

Characters of Taxonomic Significance

During our studies the following characters have proven to be of diagnostic value:

Involucral bracts

Outer and inner pair: heteromorphic or homeomorphic.
Outer pair position: lateral or dorso-ventral.
Outer pair position: lateral, lateral-ascending or dorso-ventral.

Perianth

Lobes of inner and outer perianth ± equal in size or dissimilar.
Perianth lobes soon marcescent or persistent into fruiting.

Tacca on Sandstone and Shale in Sarawak

Tacca integrifolia Ker Gawl & *T. borneensis* Ridl.

Sarawak has two non-limestone associated *Tacca* species with large involucral bracts. One has heteromorphic bracts and is discussed in detail later in this paper. The other, with homeomorphic bracts and a truncate, oblique leaf base equates to *T. borneensis* Ridl., and although treated as a synonym of *T. integrifolia* by Drenth (1972), is distinct and is here resurrected from *T. integrifolia sensu* Drenth.

***Tacca borneensis* Ridl.**, J. Straits Branch Roy. Asiat. Soc., 49(1): 45 (1907). Type: Malaysia, Sarawak, Kuching Division, Matang, Aug 1905, *Ridley* s.n. (holo, SING!). **Plate 1a.**

Moderate to robust terrestrial ***herb*** to 1.2 m. tall. ***Stem*** rhizomatous, hypogeal, creeping with the active apex ascending, up to 3.5 cm thick, clothed with persistent leaf bases and frequently rooting through these. ***Leaves*** 5 – 15 together; petioles ascending, up to 41 cm long, c. 12 mm diam, sub-terete- in overall cross-section, pronounced deeply canaliculate, sharply 2-keeled on the dorsal side, mid-green, stained deep purple-brown at the base; petiolar sheath c. 1/6 – 1/5 length of petiole, hyaline; lamina ascending to recurved, oblong-lanceolate to oblong, 23 – 65 x 10 – 24 cm, base oblique, broadly

Plate 1a. *Tacca borneensis*. Note the large homeomorphic involucral bracts. **1b.** *Tacca integrifolia*. W Sarawak form. **1b.** *Tacca integrifolia* NE Sarawak form. Note the rather fleshy inner involucral bracts.

ovate to unequally weakly cordate, apex acuminate, margins smooth, lamina glossy mid-to deep green, paler and less glossy abaxially; mid-rib strongly raised abaxially, sunken adaxially, primary lateral veins 7 - 9 per side, prominent abaxially, sunken adaxially, interprimary lateral veins less prominent than primaries, secondary veins forming a tessellate network with a variably pronounced interprimary collecting vein running through the middle of each trans-interprimary area. ***Inflorescence*** solitary to up to 5 at different developmental stages per plant; peduncle sub-erect to decumbent and apically ascending at anthesis, 3 – 5 angled or weakly 3 – 5 winged, up to 45 cm long, mid-green to more-or-less wholly stained purple-brown; involucral bracts homeomorphic; outer pair dorso-ventrally positioned, ovate-triangular, basally briefly clawed, 5.5 – 7.5 x 6 – 9 cm, velvety very deep purple-black, rarely pale purple with deep purple veining, claw paler, occasionally almost white; inner pair laterally positioned, ovate to broadly ovate, clawed basally, 5 – 10 x 5.5 – 12 cm, deep lustrous purple-black, claw paler to almost white; filiform bracts 10 – 25 or more per inflorescence, 12 – 15 cm long, deep purple. ***Flowers*** 5 – 25 (– 30) per inflorescence; pedicel triangular in cross-section, 2.5 – 4 cm long, dark purple, initially erect, later in anthesis pendent; gynoecium obpyramidal, c. 1.5 cm long x c. 1.3 cm wide at apex, 6-ribbed, purple with the ribs darker, perianth inserted annularly onto top of gynoecium; outer perianth lobes rounded, c. 10 x 9 mm, reflexing at anthesis, velvety deep purple; inner perianth lobes ovate, c. 10 x 10 mm, deep velvety purple. ***Infructescence*** prostrate by twisting of the peduncle base, many-fruited, involucral bracts marcescent well prior to fruit maturation; fruits obpyramidal, c. 3.5 x 1.5 cm, semi-glossy deep purple. *Seeds* weakly laterally compressed-reniform, c. 3.5 x 1.5 – 2 mm, pale brown.

Distribution: Sarawak. Endemic, based on known herbarium collections, but most likely occurring also in Kalimantan Barat.

Habitat: Old or disturbed secondary lowland forest on sandstones, very rarely on limestone, but then never on exposed rocks. 40 – 450 m altitude.

Other specimens examined: SARAWAK. Kuching Division: Padawan, Kampung Belimbing, 28 Nov 2003, *P.C.Boyce & Jeland ak Kisai* TA-5 (SAR); Bau, Kampung Jugan, 26 Mar 2004, *P.C.Boyce & Jeland ak Kisai*, TA-7 (SAR); Padawan, Kampung Sadir, 2 Feb 2006, *P.C.Boyce & Simon Kutuh ak Paru* TA-34 (SAR); Bau, Plaman Kaman, 26 Sep 2000, *K.G.Pearce et al.* SBC 21 (SBC); Bau, Bukit Kho Z San, Km 1 ½ Bau – Kuching road, 20 Dec 1994, *Rantai Jawa et al.* S70124 (SAR); Padawan, Gunung Merubong, Ulu Sungai Sluba, 18 Sep 1987, *Yii Puan Ching* S.51396 (K, L, SAR). Samarahan

Division: Serian, Gunung Ampungan, 21 Nov 2003, *P.C.Boyce & Jeland ak Kisai* TA-4 (SAR); Serian, Tebedu, Kampung Saan, 4 Oct 2004, *P.C.Boyce & Simon Kutuh ak Paru* TA-13 (SAR); Serian, Pichin, Bung Biringan, 28 Oct 2004, *P.C.Boyce & Simon Kutuh ak Paru* TA-15 (SAR); Serian, Pichin, Utak Ogong (Ogong Amang Ramping), 5 Jan 2005, *P.C.Boyce & Simon Kutuh ak Paru* TA-18 (SAR). Sri Aman Division: near Sungai Kuap, Ulu Sungai Engkari, 21 Mar 1974, *P.Chai* S34090 (L, K, MO, SAR, USA). Kapit Division: Rejang, *G.D.Haviland* 936 (SAR). Miri Division: Baram, *J.Hewitt* 593 (SAR). Bintulu Division: tau Range, Sungai Mayeng, 2 Jun 1956, *J.W.Purseglove P.5300* (SAR).

*Note*s: The oblique, broadly ovate to unequally weakly cordate leaf bases immediately distinguish *T. borneensis* from all other entire-leaved Sarawakian *Tacca* in which the leaf bases are acute and decurrent. The large ovate homeomorphic involucral bracts of *T. borneensis* are diagnostic.

Resurrection of *T. borneensis* in Sarawak delimits a non-limestone associated *Tacca* with large heteromorphic involucral bracts. For the present, with the caveat that there appears to be at least two taxa involved (one in W Sarawak and the other in NE Sarawak), and that these require further field study to ascertain their appropriate status, we are maintaining this heteromorphic bracted plant as a single taxon for which the earliest name applicable name is *T. integrifolia*.

***Tacca integrifolia* Ker Gawl**, Bot. Mag., 35, t.1488 (1812). Type: 'East Indies', (holo, K!; iso, L!). **Plate 1b, c.**

Slender to moderately robust terrestrial ***herb*** to 75 cm tall. ***Stem*** rhizomatous, hypogeal, creeping with the active apex ascending (W Sarawak) or epigeal (NE Sarawak), up to 2 cm thick, clothed with persistent leaf bases and frequently rooting through these. ***Leaves*** 5 – 15 together, petioles ascending, up to 41 cm long, c. 12 mm diam, D-shaped in overall cross-section, canaliculate, 2-keeled on the dorsal side, pale to mid-green sometimes stained purple at the base; petiolar sheath c. $^{1}/_{5}$ length of petiole, hyaline; lamina thinly to rather thickly coriaceous, ascending, lanceolate, 11 – 45 x 5 – 12 cm, base acute, decurrent, c. 5 cm along petiole, apex acute to acuminate, margins smooth, lamina pale to mid-green, weakly glossy adaxially, paler and less glossy abaxially; mid-rib prominently raised abaxially, sunken adaxially, primary lateral veins 3 – 5 per side, slightly sunken adaxially, interprimary lateral veins slightly less prominent than primaries, secondary veins forming a very obscure network with an obscure interprimary collecting vein running through the middle of each trans-interprimary tessellate area. ***Inflorescence***

solitary; peduncle erect, weakly 3 angled, up to 75 cm tall but usually less, especially in plants from NE Sarawak, pale green stained deep purple especially near the base; involucral bracts heteromorphic: outer pair dorso-ventrally positioned, narrowly ovate, 2.5–3.5 cm x 10–22 mm, deep purple-black to pale lavender purple, rarely white with lilac veining; inner pair laterally positioned but ascending and ultimately sub-erect at anthesis, spathulate, 3.5 –9 x 2–6 cm, deep purple-black to pale lavender purple, rarely white with lilac veining; filiform bracts 8–15 per inflorescence, 12–19cm long, pale to mid- or deep purple basally, fading to at the tip. ***Flowers*** 7–14 per inflorescence; pedicel triangular in cross-section, 2–4cm long, pale to mid-purple, initially erect, later in anthesis reflexing, thence pendent; gynoecium widely obpyramidal, c. 1 cm long x c. 1 cm wide at apex, 6-ribbed, greenish-purple to dark purple, the ribs darker purple, perianth inserted annularly onto top of gynoecium. Outer perianth lobes oblong, rounded 10–17 x 5–7 mm, reflexing at anthesis, dark purple; inner perianth lobes oblong, 12–17 x 6–9 mm, deep velvety purple on both surfaces. ***Infructescence*** declinate by twisting of the peduncle base, few to many-fruited, involucral bracts marcescent well-prior to fruit maturation; fruit obpyramidal, deep glossy brown-purple c. 3 x 1.5 cm, dull purple. ***Seeds*** weakly laterally compressed-reniform, c. 3.5 x 1.5 –2 mm, pale brown.

Distribution: Following the taxonomic interpretation used here, the distribution is southern Peninsular Thailand, Peninsular Malaysia, Singapore and N Borneo.

Habitat: Old or disturbed secondary lowland forest on sandstones. Very occasionally associated with limestone formation but never on exposed limestone rock, 40–420 m altitude.

Other specimens examined: SARAWAK. Kuching Division: Bau, Tanjung Durian, 14 Nov 2003, *P.C.Boyce* TA-3 (SAR); Bau, Serikin, *P.C.Boyce* TA-37 (SAR); Kuching, Dec 1906, *J.Hewitt* 592 (SAR); Matang, Sungai Rayu, 27 Mar 1987, *Bernard Lee Meng Hock* S.53351 (K, SAR); 10th Mile Landeh Road, Engkabang Plantation, 26 Feb 1974 *S. Laijanai* S.33648 (SAR, USA). Samarahan Division: Serian, Pichin, Kampung Kakang, Sungai Sisang, 14 Jan 2005, *P.C.Boyce & Simon Kutuh ak Paru* TA-19 (SAR); Serian, Pichin, Ampan Pichin, 25 May 2005, *P.C.Boyce & Simon Kutuh ak Paru* TA-36 (SAR). Sarikei Division: Sungai Lepong, 01° 57’ 12.9”; 111° 30’ 34.9”, 8 Dec 2005, *P.C.Boyce, Jeland ak Kisai, Jepom ak Tisai, Mael ak Late & Wong Sin Yeng* TA-33 (SAR).

Bintulu Division: Bukit Satiam, 02° 59' 26.1"; 112° 55' 54.4", 11 Aug 2004, *P.C.Boyce & Jeland ak Kisai* TA-10 (SAR). Miri Division: Baram, Sept. 1891, *C.Hose 1357* (*G.D.Haviland* 949) (SAR); Marudi, Sungai Slat basin, Sungai Palutan, 2° 50' 32"; 114° 59' 12", *S.P.Lim & Banyeng L.* S.90414 (SAR, KEP).

*Note*s: Drenth (1972) took a very broad view of the circumscription of *T. integrifolia*, synonymizing 10 taxa described from as far apart as NE India to NE Borneo. The present paper is not intended as a critical revision of all the names so treated, but observation of *Tacca* in Sarawak coupled with knowledge of the level of endemism in ever-wet Sunda of other herbaceous monocots (notably Araceae and Zingiberaceae) are pertinent in suggesting that *T. integrifolia sensu* Drenth is a grossly heteromorphic assemblage.

A brief discussion of the taxa treated as synonymous with *T. integrifolia* by Drenth (1972) is insightful. Six names attributed to the synonymy of *T. integrifolia* (*Tacca aspera* Roxb., *T. choudhuriana* Deb., *T. integrifolia* var. *pseudolevis* Limpr, and *T. laevis* Roxb. [including var. *angustibracteata* Limpr. and var. *latibracteata* Limpr.]) are based on types originating from NE India and Bangladesh, and one (*T. integrifolia* var. *pseudolevis* Limpr.) on a type from NW Myanmar. Given the fact that in families, e.g., Araceae and Zingiberaceae – with pronounced bipolar diversity, and endemism in ever-wet Sunda and Indo-China, and tropical and subtropical trans-Himalaya – there are no shared indigenous species between Borneo and the Indo-Himalaya, it is unlikely that *Tacca* from these areas are synonymous with species present in Borneo.

There are three distinct entire-leaved *Tacca* species in Peninsular Malaysia and Singapore, one with heteromorphic and two with homeomorphic involucral bracts. The earliest available name for the heteromorphic bracted species is *T. integrifolia*, and for the homeomorphic bracted, *T. cristata* Jack and *T. chantrieri* André. More fieldwork is required to ascertain whether additional taxa require recognition, to clarify the presence, or otherwise, of *T. chantrieri,* and to further its status *vis à vis* other published names for Thailand and Indo-China. In particular *T. minor* Ridl. (treated as one of nine synonyms of *T. chantrieri* by Drenth in 1972) requires field investigation to clarify its status.

Four names (*T. sumatrana* [incl. var. *ovalifolia* Limpr.]) and (*T. lancifolia* [including var. *laeviformis* Limpr.]) originate from Sumatera and Java respectively. None of the types of these names is in a sufficient state of preservation to place them without question in any one of the known taxa

for these islands. More fieldwork is required.

The spathulate and ascending inner involucral bracts are diagnostic for *T. integrifolia* as interpreted here. Inflorescence colour is variable with the involucral bracts and perianth ranging from deep glossy purple through to pale lavender to lilac-flushed white. The 'white' form is in cultivation under the illegitimate name '*T. nivea*'.

Plants from NE Sarawak differ from those in NW Sarawak by an epigeal stem, distinctly more leathery leaf, shorter peduncle, and somewhat fleshy, glossy, deep purple inner involucral bracts (Plate 1c). More fieldwork is required to investigate the taxonomic significance of these characters.

Tacca bibracteata Drenth

The type description of *T. bibracteata* (Drenth, 1972) was based on only three herbarium specimens and lacking details of the stem and ripe fruits. The first author has had the opportunity to collect and bring *T. bibracteata* into cultivation and we are now able to furnish a more detailed description.

Tacca bibracteata **Drenth**, Blumea, 20(2): 395 (1972 publ. 1973) & in Fl. Mal. Series 1, 7(4): 814, Fig.7 a – c (1976). Type: Malaysia, Sarawak, Kapit Division, Belaga, Long Kapa, Bukit Dulit, *Synge* 1335 (holo, K!; iso, L!). **Plate 2 a, b.**

Moderate terrestrial ***herb*** to 40 cm tall. ***Stem*** rhizomatous, ascending and ultimately epigeal, c. 2 cm thick, clothed with persistent leaf bases. ***Leaves*** c. 6–8 together, petioles ascending, 5–19 cm long, c. 2–5 mm diam, D-shaped in overall cross-section, sharply sulcate-canaliculate, bluntly keeled on the dorsal side, pale to mid-green; petiolar sheath c. ¼ – ½ length of petiole (3.5–9.5 cm long), hyaline and shortly (c. 2mm) ligulate; ligule dolabriform-acute, margins minutely erose; lamina ascending to somewhat spreading, oblong-lanceolate,16–27 x 7–10.5 cm, base acute, apex shortly acuminate, margins smooth, lamina deep glossy green adaxially, paler and less glossy abaxially; mid-rib strongly pronounced abaxially and sunken adaxially; primary lateral veins c. 4 per side, very pronounced abaxially, all arising from the basal half of the mid-rib, interprimary lateral veins absent, secondary veins forming a rather obscure untidy reti-tesellate network and with a weak interprimary collecting vein running through. ***Inflorescence*** solitary; peduncle ± terete, 20 –31 cm tall, pale green lightly to heavily dark purple-mottled, intensifying

Plate 2a. *Tacca bibracteata*. Note the inner involucral bracts nearly indistinguishable from the filiform bracts, the inflorescence giving the impression of only two involucral bracts. **2b**. Close up of flowers.

towards the base; involucral bracts strongly heteromorphic; outer pair dorso-ventrally positioned, ovate, c. 3 x 2 cm, briefly decurrent basally and fused to form a short pocket, mid-green with the primary veins and apical portion stained purple; inner pair laterally positioned, filiform, up to 10.5–14 cm x c. 2 mm, basally mid-purple fading to pale yellow-green at the tips; filiform bracts 8 - 13 per inflorescence, very variable in length with c. 2.5–14 cm lengths in one inflorescence, pale green. ***Flowers*** up to 10 but usually fewer (5 or less) per inflorescence; pedicel triangular in cross-section, 1–3.5 cm long, pale greenish purple; gynoecium obpyramidal, c. 1.5 cm long, strongly 6-ribbed, pale greenish-purple with the ribs dull purple, perianth inserted annularly onto top of gynoecium; outer perianth lobes broadly ovate, 7–12 x 5–14 mm, reflexing at anthesis green purple-stained abaxially, deep velvety purple adaxially; inner perianth lobes ovate, tip notched, 10 x 5 mm, bright green abaxially, deep velvety purple adaxially. ***Infructescence*** declinate by twisting of the peduncle base, almost always solitary fruited, fruit subtended by the persistent outer involucral bracts, ovary obpyramidal, deep c. 2.5 x 1.5 cm, dull purple, topped by the persistent outer and basal half of the inner perianth lobes. ***Seeds*** not observed.

Distribution: NE Sarawak. Endemic.
Habitat: Old or disturbed secondary lowland forest on shales, 30–100 m altitude.

Other specimens examined: SARAWAK. Kapit Division: Pelagus, Jeram Pelagus, 02° 11' 59"; 113° 04' 01", 1 Dec 2004, *Jeland ak Kisai* TA-16 (SAR) & 02° 11' 35.7"; 113° 03' 30.08", 15 Mar 2005 *P.C.Boyce, Jeland ak Kisai & Jepom ak Tisai* TA-21 (SAR); Belaga, Long Kapa, Bukit Dulit, *Richards* 1569 (K). Bintulu Division, Sebauh, Kampung Tubau, Sungai Tubau, *P.Ashton* S.18369 (K, L, SAR, SING); Bintulu, Bukit Satiam, 02° 59' 26.1"; 112° 55' 54.4", 11 Aug 2004, *P.C.Boyce & Jeland ak Kisai* TA-11 (SAR). Limbang Division, Tg. Long Amok, Sungai Ensungei, Ulu Medamit, 19 Sep 1980, *R. George et al.* S.42879 (L, K, KEP, SAN, SAR).

*Note*s: The epithet *bibracteata* is misleading. The inflorescence of *T. bibracteata* has four involucral bracts, as indeed realized and noted by Drenth (1972, 1976). The outer pair is dorso-ventrally positioned and conspicuous, while the inner pair is laterally positioned, filamentous and in the absence of close examination of fresh material easily mistaken for filiform bracts.

The outer perianth and basal parts of the inner perianth are persistent into fruit maturity. This character is shared with *T. reducta* from which *T.*

bibracteata is readily separable by the strongly heteromorphic involucral bracts and a preference for shales; *T. reducta* is limestone associated.

Tacca on Limestone in Sarawak

Fieldwork on the limestone formations of W Sarawak (Bau, Padawan and Serian) has revealed that the common limestone-associated *Tacca* does not have a published name. It is here formally described.

***Tacca reducta* P.C. Boyce & S. Julia,** *sp. nov.*

Ab omnibus speciebus Tacca borneensibus combinatio bractiorum involucralis idem et valde minoribus et in habitu calcicola differt. – TYPUS: Malaysia, Sarawak, Kuching Division, Bau, Kuching – Bau road, Gunung Serambu, 1 Sep 1976, *P.J. Martin* S.37798 (holo, SAR). **Plate 3 a –c.**

Slender to moderately robust terrestrial ***herb*** to 50 cm tall. ***Stem*** rhizomatous, hypogeal, creeping with the active apex ascending, c. 1.5 cm thick, clothed with persistent leaf bases and frequently rooting through these. ***Leaves*** 7–10 together; petioles ascending, up to 11 cm long, c. 5 mm diam, D-shaped in overall cross-section, shallowly to rather pronounced canaliculate, sharply 2-keeled on the dorsal side, mid-green variously speckled and stained deep purple-brown notably at the base and along the dorsal keels; petiolar sheath c. $^1/_5$ length of petiole, hyaline; lamina ascending to recurved, lanceolate, 23–30 x 5–9 cm, base acute, decurrent c. 3 cm along petiole, apex acute to acuminate, margins smooth to very slightly crenulate-dentate, lamina mid-green, slightly glossy adaxially, paler and less glossy abaxially; midrib strongly subterete to raised abaxially, sunken adaxially, primary lateral veins 3–5 per side, slightly sunken adaxially, interprimary lateral veins much less prominent than primaries, secondary veins forming a rather prominent tessellate network with a obscure interprimary collecting vein running through the middle of each trans-interprimary tessellate area. ***Inflorescence*** solitary to 3 at different developmental stages per plant; peduncle terete to weakly 3–5 angled, up to 20 cm tall, pale green more-or-less wholly stained and speckled deep purple-brown; involucral bract homeomorphic: outer pair dorso-ventrally positioned, linear-triangular to linear ovate, 2.5–3.5 cm x 5–7 mm, slightly lustrous very deep purple-black; inner pair laterally positioned, linear-triangular to linear ovate, 3.5–4 cm x 0.5–10 mm, deep lustrous purple-black; filiform bracts c. 8 per inflorescence, very variable in length with 12–15 cm long, deep purple basally, fading to pale green at the tip. ***Flowers*** 2–4 (-5) per inflorescence; pedicel triangular in cross-section,

1.5–2 cm long, mid-purple, initially erect, later in anthesis reflexing, thence pendent; gynoecium broadly obpyramidal, c. 1 cm long x c. 1 cm wide at apex, strongly 6-ribbed, dull greenish-purple with the ribs darker purple, perianth inserted annularly onto top of gynoecium; outer perianth lobes oblong, rounded with a brief acumen, c. 12 x 7 mm, reflexing at anthesis, purple with a darker purple reticulations, deep velvety purple adaxially; inner perianth lobes ovate, 15 x 10 mm, deep velvety purple on both surfaces. ***Infructescence*** declinate by twisting of the peduncle base, few- fruited, involucral bracts marcescent well-prior to fruit maturation; fruit obpyramidal, deep slightly glossy purple c. 2.5 x 1.5 cm, dull purple, topped by the persistent whole outer perianth and basal half of the inner perianth lobes. *Seeds* weakly laterally compressed-reniform, c. 3.5 x 1.5–2 mm, pale brown.

Distribution: W Sarawak. Based on known herbarium collections, it is an endemic, but probably (based on plants observed for sale at border markets) also occurring on limestone in Kalimantan Barat.

Habitat: Primary to disturbed secondary lowland forest on limestone, 35–220 m altitude.

Other specimens examined: SARAWAK. Kuching Division: Bau, Seburan, 6 Aug 1961, *J.A.R.Anderson* S.2411 (SAR); Bau, Seburan, 31 Oct 1964, *J.A.R.Anderson* S.26854 (SAR); Bau, south of Bukit Seburan, 30 Apr 1966, *J.A.R.Anderson* S.25140 (SAR); Bau, Seburan, gully between Seburan and Bukit Krian, 15 Jul 1964, *J.A.R.Anderson & N.G.Bisset* S.20261 (SAR); Bau, Gunung Juita, 01° 23' 48.7"; 110° 08' 07.2", 28 Oct 2005, *P.C.Boyce, Jeland ak Kisai, Angeline anak Simon & Wong Sin Yeng* (SAR); Padawan, Kampung Danu, Gunung Temuang, Sungai Abang, 01° 15' 38.6"; 110° 15' 31.4", 16 Feb 2006, *P.C.Boyce, Jeland ak Kisai & Wong Sin Yeng* TA-38 (SAR); Bau, Kampung Bogag, Gunung Tibugai, 01° 21' 31.1"; 110° 03' 48.7", 31 Mar 2005, *P.C.Boyce, R.Kneer & Jeland ak Kisai* TA-22 (SAR); Serian, Kampung Selabi, Sungai Mawang, 2 Feb 2006, *P.C.Boyce & Simon Kutuh ak Paru* TA-35 (SAR); Bau, Gunung Poing, 13 May 2002, *Malcom D. et al.* SBC 1548 (SAR, SBC); Padawan, Bukit Manok, mile 38 old Padawan road, 2 Sep 1979, *J.P.Mamit* S41074 (L, SAR, USA); Bau, Jambusan, Gunung Batu, 20 Feb 2002, *K.Meekiong et al.* SBC 1681 (SAR, SBC);); Bau, Jambusan, Gunung Jebong, 6 Mar 2002, *K.Meekiong et al.* SBC 1965 (SBC); Bau, Krokong, Gunung Tabai, 12 March 2002, *J.S.Steven et al.* SBC 1995 (SAR, SBC). Samarahan Division: Serian, Pichin, Umon Murut, Tiab Belanting, 01° 08' 03.7"; 110° 27' 00.3", 28 Jun 2005, *P.C.Boyce, Jeland ak Kisai & A.Shafreena* TA-24 (SAR); Samarahan, Kuap, Pangkalan Kuap, 01° 26' 16.7"; 110° 22' 18.9", 25 Oct 2004, *P.C.Boyce, Jeland ak Kisai, Angeline anak Simon & Wong Sin*

Plate 3a. *Tacca reducta*. Note the stellate arrangement of the small homeomorphic involucral bracts. **3b.** close up of flowers. **3c.** Nearly ripe fruit. Note the persistent perianth.

Yeng TA-28 (SAR); Serian, Pichin, Bung Biringan, 28 Oct 2005, *P.C.Boyce & Simon Kutuh ak Paru* TA-14 (SAR); Serian, Pichin, Ampan Pichin, 25 May 2005, *P.C.Boyce & Simon Kutuh ak Paru* TA-23 (SAR).

Notes: The small homeomorphic black stellate involucral bracts are immediately diagnostic. Fruiting plants are recognizable by the persistent perianth, a character otherwise found only in *T. bibracteata* from NE Sarawak.

Tacca reducta bears some resemblance to W Malaysian *T. minor* Ridl. (treated by Drenth (1972) as a synonym of *T. chantrieri*) in the narrowly triangular homeomorphic involucral bracts, but is readily separable by the pronounced tessellate secondary veins.

The epithet comes from the Latin, *reductus*, reduced, in allusion to the small involucral bracts and generally few-flowered inflorescence.

Key to *Tacca* in Sarawak

1a. Mature leaf lamina palmate or dracontioid (elaborated forms of sagittate, hastate or trisect leaves in which the anterior and posterior divisions are highly dissected and subdivided) 2

1b. Mature leaf lamina entire 3

2a. Mature leaves dracontioid. Ripe fruits green, ribbed. Plants of coastal forest on almost pure sand ..... **T. leontopetaloides**

2b. Mature leaves palmate. Ripe fruits red, smooth. Plants of a variety of habitats, but never in coastal forest on sand ..... **T. palmata**

3a. Involucral bracts strongly heteromorphic 4

3b. Involucral bracts ± homeomorphic 5

4a. Outer involucral bracts ovate; inner filiform and not readily distinguished from filiform floral bracts (i.e., inflorescence with the appearance of only one pair of involucral bracts). Perianth persistent until fruit maturity. Plants of shale ..... **T. bibracteata**

4b. Outer involucral bracts ovate; inner spathulate, ascending. Perianth marcescent early in fruit development. Plants of sandstone and (rarely)

limestone ..... **T. integrifolia**

5a. Involucral bracts broadly ovate. Leaf base rounded, oblique, truncate. Perianth marcescent early in fruit development. Plants of sandstone .... **T. borneensis**

5b. Involucral bracts linear-triangular to narrowly ovate-triangular. Leaf base acute, decurrent. Perianth persistent until fruit maturity. Plants of limestone ..... **T. reducta**

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