THE PSYDRAX DICOCCOS COMPLEX (RUBIACEAE) IN MALESIA, WITH THREE NEW SPECIES

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Ridha Mahyuni, Tatik Chikmawati, Nunik Sri Ariyanti & Khoon Meng Wong. 2018. *Psydrax dicoccos* kompleks (*Rubiaceae*) di Malesia, dengan tiga jenis baru. *Floribunda* 5(8): 322–331. —. *Psydrax dicoccos* Gaertn., merupakan jenis tipe dari *Psydrax* Gaertn., hanya mempunyai dua sampel buah sebagai bahan tipenya. Terbatasnya material tipe menghasilkan kesalahan yang menyebabkan jenis yang berbeda diberikan nama *P. dicoccos*. Sebanyak 140 lembar spesimen herbarium yang diidentifikasi sebagai *P. dicoccos* di kawasan Malesia, ditentukan sebagai takson yang berbeda dan ditunjukkan dengan tiga jenis baru yaitu *Psydrax elmerianus, P. koordersianus* dan *P. sumatranus.* Diagnostik karakter masing-masing jenis disediakan.
Kata Kunci: Malesia, jenis baru, *Psydrax.*

Ridha Mahyuni, Tatik Chikmawati, Nunik Sri Ariyanti & Khoon Meng Wong. 2018. *The Psydrax dicoccos* Complex (*Rubiaceae*) in Malesia, with Three New Species. *Floribunda* 5(8): 322–331. — . *Psydrax dicoccos* Gaertn., the type species of *Psydrax* Gaertn., is typified by a specimen consisting of two detached fruits. The limited type material has resulted in a number of distinct species being wrongly referred to that species. Approximately 140 herbarium specimens identified as *P. dicoccos* in the Malesian region are shown to represent three new species, *Psydrax elmerianus, P. koordersianus* and *P. sumatranus.* The diagnostic characteristics of these species are provided.
Keywords: Malesia, new species, *Psydrax.*

Psydrax was first established by Gaertner (1788) in his treatise on plant fruits, seeds and pyrene form. The genus was based on *Psydrax dicoccos* Gaertn., the type species, represented by material from Ceylon (presently Sri Lanka). The name *Psydrax* had long been neglected because it had been considered synonymous with *Canthium* Lam.

It was Bridson (1985) who subsequently reinstated *Psydrax* when sorting out the *Vanguerieae* in Africa and this genus had to be applied to a number of African taxa. Although she did not treat the Malesian taxa, she noted that many specimens from this region had been misidentified and annonated as "*Canthium dicoccum*" or "*C. didymum*". In fact, the names *C. dicoccum* or *P. dicoccos* (using Gaertner's original spelling) had never been directly applied to the Malesian region and only *C. dicoccum* has been variously listed as a synonym of *Vangueria dicocca* Miq. (Miquel 1856), *Plectronia didyma* Benth. & Hook. (Koorders & Valeton 1902, Koorders 1912) in Java, Sumatra and Borneo, *C. dicoccum* (Gaertn.) T. & B. (Backer & Bakhuizen 1963) in Java and *C. dicoccum* Merr. (Merrill 1928) in the Philippines. In India, Wight & Arnott (1834) listed *P. dicoccos* Gaertn. as a synonym of *C. didymum* C.F.Gaertn. Until now, no special studies have been conducted to verify whether material from Malesia and Sri Lanka hitherto identified with *P. dicoccos* are indeed the same species. For the present study, our objective was to clarify the status of *P. dicoccos* Gaertn. and to attempt correct identification of the Malesian material.

MATERIALS AND METHODS

The plant materials investigated in this study consisted of approximately 140 sheets of herbarium specimens kept at various institutions: the Herbarium Bogoriense (BO), Forest Research Institute of Malaysia (KEP), Sarawak Forest Department (SAR) and Singapore Botanic Gardens (SING). In addition, specimen catalogues were checked and specimen images were accessed from the Botanischer Garten und Botanisches Museum

Berlin-Dahlem (B), Bangkok Herbarium of Thailand's Department of Agriculture (BK), Natural History Museum London (BM), Royal Botanic Gardens Kew (K), Naturalis Biodiversity Centre, Leiden (L) and the Natural History Museum at Paris (P). Herbarium acronyms used follow Thiers (continuously updated). The study was carried out using conventional herbarium approaches. Key morphological attributes of both vegetative and reproductive parts (the latter including inflorescences, flowers and fruits) were examined, compared and documented.

RESULTS AND DISCUSSION

Psydrax dicoccos and its distinctive characters

A). **Gender and epithet terminations**

The name *P. dicoccos* is of masculine gender but Bridson (1985), followed by Chen *et al*. (2011), have treated it as feminine. According to the ICN Art. 60.2 (McNeill *et al.* 2012), the original spelling of a name or epithet should be maintained. Here, *Psydrax* is considered as masculine, and the name *P. dicoccos* is retained.

B). **Type material of *Psydrax dicoccos***

In recent treatments, no information was given about where the type of *P. dicoccos* was kept. However, Stafleu (1969), in a monograph on Joseph Gaertner's carpology collection, had stated that the type of *P. dicoccos* was stored in the carpology collection in the Leiden Herbarium (L), now administered under the Naturalis Biodiversity Centre in the Netherlands. Unfortunately, Gaertner's monograph does not describe the vegetative characters for *P. dicoccos* so that the original material for this species is very incomplete, resulting in misidentifications. In addition, specimens of the same provenance, Ceylon, examined by Richard (1830, 1834) in the Paris Herbarium (barcodes P00836633, P00836634, P00836635) and by Ridsdale (1998) can become a reference for this species, although the specimens cited by Richard are not syntypes as indicated by herbarium labels pasted on them.

C). **Status of the name *Canthium didymum***

We find that application of the name *C. didymum* is highly problematic. Although Wight & Arnott (1834) listed *P. dicoccos* Gaertn. as a synonym of *C. didymum* C.F.Gaertn., the latter was published later and therefore should not take precedence if they are indeed synonymous. Thus, in the Flora of Ceylon, Ridsdale (1998) placed *C. didymum* in the synonymy of *P. dicoccos*; however, he interpreted the type of *C. didymum* as a specimen found in the Banks herbarium but could not indicate where this was deposited (presumably it had not been found).

The protologue of *C. didymum* C.F.Gaertn., Gaertner (1806), refers to two taxa, the first listed was a plant known by its Indian name *Kandenkara* (page 71 of volume 5) and illustration (Plate 36 in the same volume) in the *Hortus Malabaricus* (Rheede 1685). As the second listed taxon was given as "*Webera cymosa.* Collect. Banksian." and followed by a brief discussion that states "*Planta in collectione Bansiana sub nomine Webera cymosa WILLD. affervata certissime non eadem cum planta Willdevovii...*" (i.e., the plant in Bank's collection is certainly not the same as Willdenow's plant), it would have referred to a specimen. As also recommended by the International Code of Nomenclature (McNeill *et al*. 2012), the preference should have been to choose a specimen rather than an illustration as the type of the taxon concerned. We have attempted searching databases of the BM and K herbaria as well as on JSTOR, and could not find such a specimen. In turning to the illustration in the Hortus Malabaricus, we found that the plant depicted had paired axillary spines in addition to producing cymes in the same leaf axils, which implies it may not be equated with *P. dicoccos*, an unarmed species.

Our conclusion is that while the name *C. didymum* C.F.Gaertn. has been variously regarded as synonymous with *P. dicoccos* in some past accounts, we do not find any firm evidence indicating that this is correct and, therefore, do not list it as such in the present context. Although the assignment of *nomen dubium* by itself is unindicative of the exact reason why a name is of uncertain application, *C. didymum* would be in such a category, with the reasons stated above.

D). **Comparison of *Psydrax dicoccos* with the new species**

After studying all Malesian specimens that had been identified by names considered synonymous with *P. dicoccos*, it became clear that the material was distinct from that species, which is restricted to Sri Lanka and southern India. The Malesian material in fact represents three new species, here named *Psydrax elmerianus*, *P. koordersianus* and *P. sumatranus*. A comparison of the morphological characteristics of these species with *P. dicoccos* Gaertn. is provided in Table 1.

Table1. Morphological comparison of *P. dicoccos*, *P. elmerianus*, *P. koordersianus*, and *P. sumatranus*.

Characters	*P. dicoccos*	*P. elmerianus*	*P. koordersianus*	*P. sumatranus*
Leaf blade shape	elliptic	elliptic-obovate	ovate-elliptic	ovate-elliptic
Leaf texture	coriaceous	coriaceous	subcoriaceous-coriaceous	coriaceous
Petiole length (mm)	5–8(–15)	3–5	3–10	(3–)6–10
Tertiary venation on adaxial leaf surface	inconspicuous	inconspicuous	slightly raised	inconspicuous
Tertiary venation on abaxial leaf surface	inconspicuous	slightly raised	slightly raised	inconspicuous
Adaxial leaf surface reflectance	shiny	shiny	shiny	dull (not shiny)
Peduncle length (mm)	8–17	5–10	2–5(–13)	0–3
Length of inflorescence branches (mm)	6–12	2–3	1–2	0–1
Number of flowers per inflorescence	50–70	20–30	10–30	20–30
Corolla tube length (mm)	5.5–6	2.5–3	3	3
Corolla lobe length (mm)	3.5–4	2.5–3	2.5	2.5

From Table 1, it can be appreciated that all these taxa can hardly be distinguished by leaf shape and texture, as well as petiole length. Individual taxa were different from the others by their slightly raised tertiary venation on the abaxial leaf surface (*P. koordersianus*), or dull instead of shiny adaxial leaf surfaces (*P. sumatranus*). It is therefore not surprising that these taxa may have seemed superficially similar enough to have been confused in the past. Notwithstanding, *P. dicoccos* is distinct from the other three taxa in consistently having distinctly longer inflorescence branches 6–12 mm long (in the others the branches are not longer than 3 mm) and more flowers (50–70) per inflorescence (the other taxa do not have more than 30 flowers per inflorescence).

Descriptions of *Psydrax dicoccos* and three new species

Here we provide descriptions of *P. dicoccos* and the new taxa thus distinguished.

1. *P. dicoccos* Gaertn. (Fig. 1)

P. dicoccos Gaertn., Fruct. Sem. Pl. 1 (1788 [Dec 1788]) 125, t. 26, f. 2. — Type: *Carpology collection no. 5495*, Ceylon (holo L: barcode L0076334).

Tree; internodes 3–4.5(–6.8) cm; twigs terete, glabrous; stipules triangular, 2–2.5 mm wide at base, 5–7 mm long. Leaves: blade elliptic, (7–)8.5–12(–15) cm × 2.6–3.6 cm, glabrous, coriaceous, shiny on adaxial side, apex acute to acuminate, base acute and slightly attenuated down to the petiole; lateral nerves 4–5 pairs, tertiary venation not apparent on both sides; petiole glabrous, 5–8(–15) mm long. Inflorescence a 2-branched cyme; peduncle puberulous, 8–17 mm long; branch axes 6–9.5 mm long; 50–70-flowered. Flowers 5-merous; pedicels puberulous, 5–6 mm long; calyx campanulate, limb 5-dentate, glabrous, 1.5 mm × 1.5 mm; corolla tube 5.5–6 mm long, lobes 3.5–4 mm long; stamens 5, exerted, filaments 1.5 mm long; anthers 1–1.5 mm long, reflexed; style 7–8

mm long, stigma cylindrical, bifid at apex, 0.8 mm × 0.6 mm; disc hairy. Fruit a drupe, ellipsoid to globose, 5–7.2 mm × 5–6.4 mm; pedicels glabrous, 7.8–8.8 mm long. Pyrenes 1–2 with solitary seeds within.

Distribution: Sri Lanka and southern India.

Additional specimens examined:
SRI LANKA: *J.B.L.T. Leschenault, s.n., Ceylon* (P: barcodes P00836633, P00836634, P00836635) 00836635).

Figure 1. *P. dicoccos* from Sri Lanka (P00836634)

2. *Psydrax elmerianus* Mahyuni, *spec. nov.* (Fig. 2)

Like *P. koordersianus* Mahyuni, except that the leaves are obovate-elliptic and coriaceous, and the corolla lobes are about the same length as the tube (in *P. koordersianus* the leaves are ovate-elliptic and subcoriaceous, and the corolla lobes are shorter than the tube). — Type: *A.D.E. Elmer 6365*, Philippines, Luzon, Benguet, Twin Peaks (holo BO).

Shrub or tree; twigs terete, glabrous, internodes (2–)4–4.5 cm long; stipules ovate to triangular, 2.5–3 mm long. Leaves: blade elliptic-obovate, 5.5–8.5 × 3.7–4.2 cm, glabrous, coriaceous, attenuate at apex, acuminate to cuspidate at apex; lateral nerves 4–5 pairs, slightly raised; tertiary venation inconspicuous on adaxial side, slightly raised on abaxial side; domatia inconspicuous in axils of lateral nerves; petioles 3–5 mm long. Inflorescence a 2-branched cyme; peduncle 5–10 mm long, puberulous, branch axes 2–3 mm long, 20–30 flowered. Flowers 5-merous; pedicels 5.5–8 mm long; calyx campanulate, limb 5-dentate, 2 mm × 1.5 mm, puberulous; corolla tube 2.5–3 mm long, lobes c. 2.5–3 mm long; disc hairy; stamens 5, exerted from corolla tube, filaments 2 mm long, anthers c. 1.5–2 mm long; style 6.5–7 mm long; stigma cylindrical, bifid at apex, 9 mm × 6 mm. Fruit unknown.

Distribution: Philippines (Luzon, Palawan) (Fig. 3).

Note: Elmer had previously identified this as *Plectronia didyma.*

Additional specimens examined:
PHILIPPINES: *A.D.E. Elmer, 13180,* Palawan, Puerto Princesa (Mt. Pulgar) May 1911 (BO); *A.D.E. Merrill, 1399,* May 1913 (BO)**.**

Figure 2. *P. elmerianus*. (*Elmer 6365*)

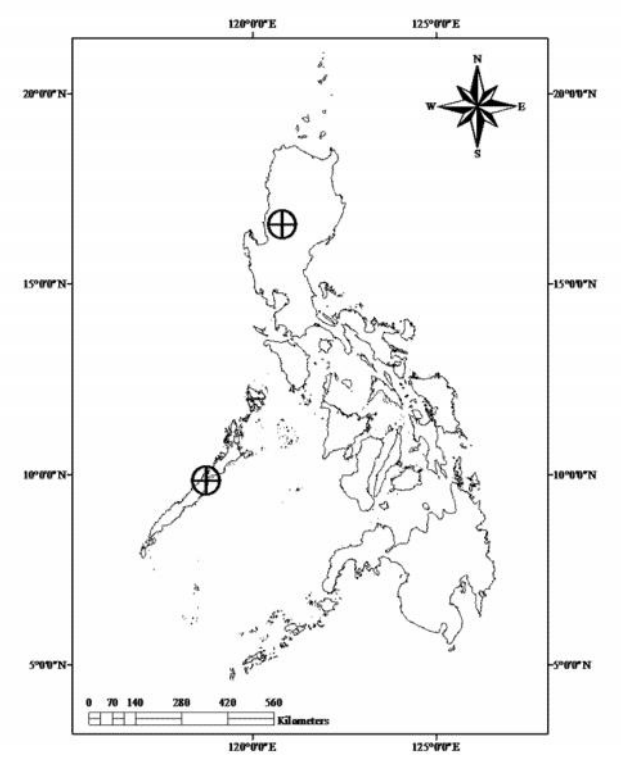

Figure 3. Known distribution of *P. elmerianus*.

3. *Psydrax koordersianus* Mahyuni, *spec. nov.* (Fig. 4)

Plectronia didyma auct. non Benth. & Hook.: Koorders, Bijdrage no. 8 (1902) 134–137; Koorders & Valeton, Exkursionsflora von Java (1912) 259–261.

Canthium dicoccum auct. non Gaertn.: Backer & Bakhuizen *f.*, Flora of Java 2 (1965) 320.

Resembling *P. dicoccos* Gaertn. except in its much shorter (1–2 mm long) inflorescence branches and slightly raised tertiary vein reticulations on both leaf surfaces. —Type: *S.H. Koorders*, *Kds 27259 β*, Java, Semarang, Kedong Jati, 29 April 1897 (holo BO).

Shrub or tree, 10–48 m high, stem or trunk 20–46 cm diameter; bark grey to dark brown; twigs quadrangular or terete, glabrous, internodes 2.2–5 cm long; stipules ovate to triangular, 6–7 mm long. Leaves: blade elliptic, (6–)7.7–11.6 × (2–)3.5–6 (–6.5) cm, glabrous, coriaceous, attenuate at apex, acuminate to cuspidate at apex; lateral nerves 3–5 pairs, slightly raised; tertiary venation slightly raised on both sides; domatia present in axils of lateral nerves; petioles 3–10 mm long. Inflorescence a 2-branched cyme; peduncle 2–5(10–13) mm long, puberulous, branch axes 1–2 mm long, 10–30 flowered. Flowers 5-merous, green; pedicels 5–15 mm long; calyx campanulate, limb 5-dentate, 1.5–2 mm × 1–1.5 mm, puberulous; corolla tube 3 mm long, lobes c. 2.5 mm long; disc hairy; stamens 5, exerted from corolla tube, filaments 1 mm long, anthers c. 1 mm long; style 6–8(–10) mm long; stigma cylindrical, bifid at apex, 1.5 mm × 1 mm. Fruit a drupe, ellipsoid to obovoid, 6–8 mm × 5–6 mm, pedicel glabrous 8–17 mm long. Pyrenes 1–2 with solitary seeds within.

Vernacular names: *kikopi*, *kopen*, *kijanjoan* (Sunda-West Java), *rengit* (Ujung Kulon) and *kendal gamprit*.

Distribution: Java and south Sumatra (Fig. 5).

Etymology: The specific epithet honours Dr. S.H. Koorders for his many contributions, including interesting collections made during his expeditions in Java from 1888 to 1910.

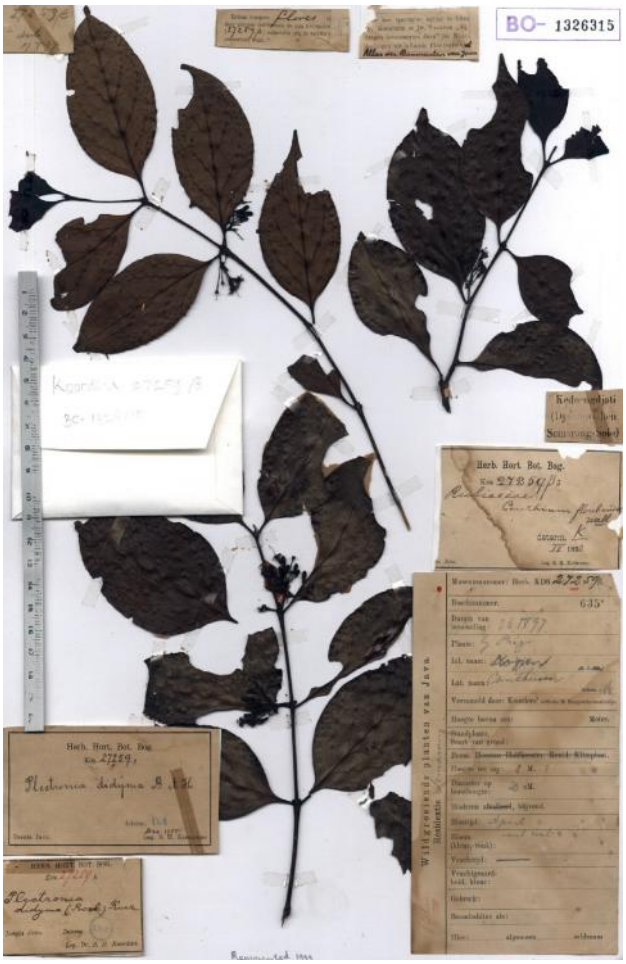

Figure 4. *P. koordersianus* Mahyuni. (*Koorders 27259 β*)

Notes: Most specimens of this species were collected by Koorders. We know from one of the collections that this taxon was once cultivated in the Kebun Raya Bogor (Bogor Botanical Garden), but now it does not exist anymore.

Additional specimens examined:
(All specimens cited BO)
JAVA: West Java, *S.H. Koorders, Kds 12327 β,* Sukabumi, Pelabuhan Ratu, 2 May 1893; *Kds 6496 β,* 11 July 1890; *Kds 6486 β,* 17 August 1891; *Kds 34230 β,* 15 April 1899; *Kds 1099 β*; *S.H. Koorders, Kds 34303 β,* 13 April 1899; *S.H. Koorders, Kds 6488 β,* August 1899; Panoembahan, Jampang Kulon, *Kds 6490 β,* August 1899; *Kds 6489* β, 2 August 2,1891; *C.A. Backer, 13944,* Purwakarta, 18 January 1914; *Beumêe, 6804,* Depok, 1927; *J. G.B. Bumée,* 6858, 1 May 1930; *J.G.B. Bumée,* 6804, Tjabak, 22 February 1914; *Kds 42292 β,* 1 May 1930; *s.leg. 18635,* cult. in Hort. Bogor; *S.H. Kooders, Kds 25253 β,* 16 November 1896. — Central Java: *S.H Koorders, Kds 6526 β,* Nusakambangan, Cilacap, Banyumas, 5 December 1891; *Kds 6227 β,* 6 December 1891; *Kds 24567 β,* 11 November 1896; *S.H. Koorders, Kds 34109 β,* 10 March 1910; *S.H. Koorders, Kds 22029 β,* 30 September 1895; *Kds 24812 β,* October 1896; *S.H. Koorders, Kds 21957 β,* August 1899; *Soepadmo, 294 β,* Ujung Kulon, Peutjang Island, 18 December 1961; *S.H. Koorders, Kds 6480β,* Semarang, Kedongdjati, 20 November 1888; *Kds 6500 β,* 4 September 1892; *Kds 6501 β,* August 1899*; Kds 6502 β,* 24 June 1889; *Kds 6509 β* ;*S.H. Koorders, Kds 6510 β,* July 1899; *Kds 6511 β,* 1 April 1898; *Kds 6513 β,* 23 November 1888; *Kds 6515 β,* August 1899; *Kds 6517 β,* 3 March 1892*; Kds 6518 β,* Karangasem, 3 March 1892; *S.H. Koorders, Kds 28391 β,* Karangasem, December 1900; *Kds 26168 β,* 27 October 1896; *Kds 34776 β,* 1 August 1899; *Kds 28379 β,* 14 June 1897; *J.G.B Beumée,* 5127, 17 March 1920; *A.C. Noldie,* 4632, May 1920; *Kds 25447 β,* 27 October 1896; *S.H. Koorders,* Kds 34777 β, Jepara, 1932; *S.H. Koorders, Kds 13469 β,* Pekalongan, August 1899; *S.H. Koorders, Kds 22465 β,* 16 May 1896; *Hofmam,* 6540, 2 August 1923; *Kds 34852 β,* Rembang, 21 June 1899; Legon *T. Djarwaningsih, M. Amir & Supriatna, TD 433* Moto: TN. Karimun Jawa, 29 April 2004. — East Java *Kds 23042 β,* Kediri: 16 June 1896; Jember: Nusa Barong, 1899, *Kds 6530 β.*
SUMATRA: *W.Grashoff,* 946, Palembang, Banyuasin, January 22, 1916; *Herb. Bot. Var.* 173, 22 February 1992.

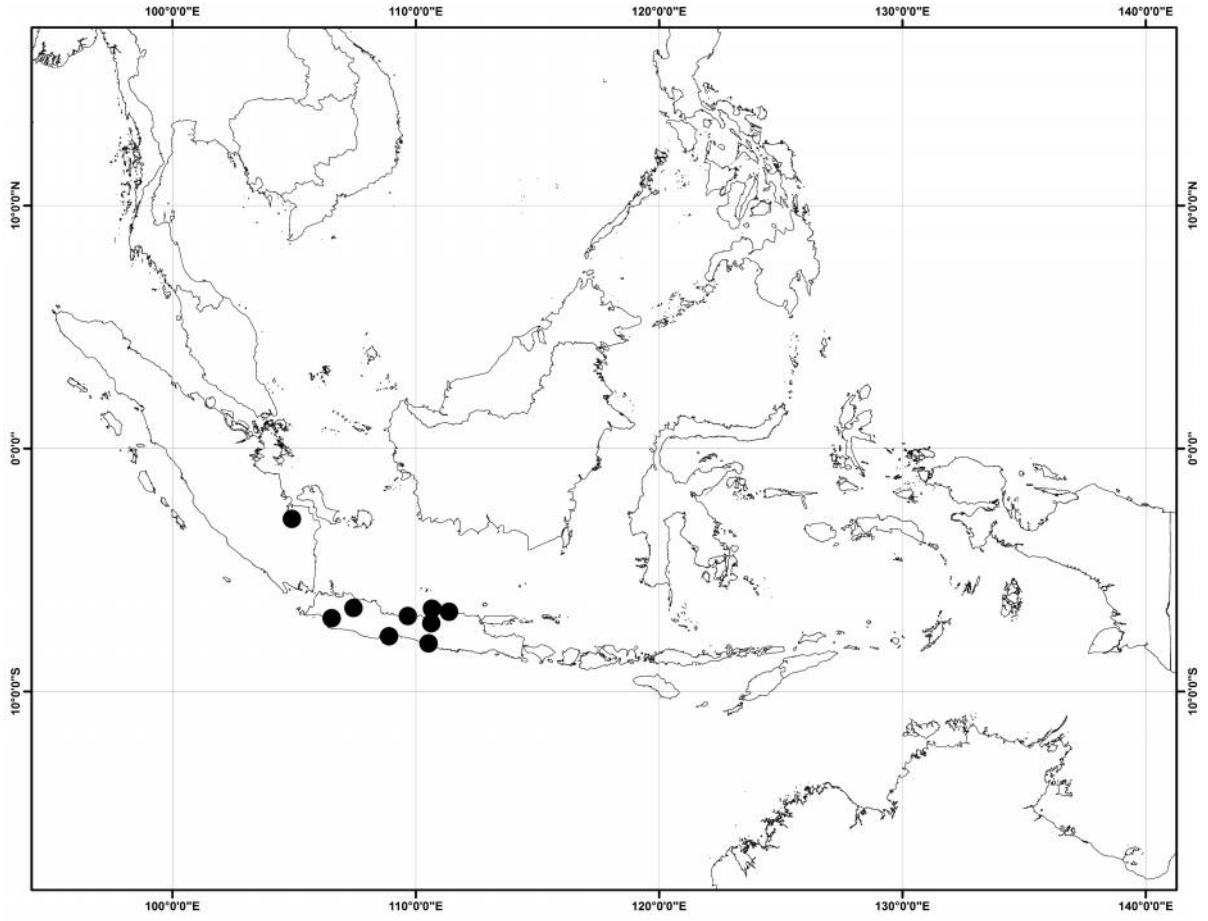

Figure 5. Distribution of *P. koordersianus* based on specimen localities.

4. *Psydrax sumatranus* (Miq.) Mahyuni, *comb. nov*. (Fig. 6)

Canthium sumatranum Miq., Fl. Ned. Ind. 2 (1857) 254. — Type: *F.W. Junghuhn, s.n.*, Sumatra (holo L: barcode L00001931).

Canthium dicoccum auct. non Merrill: Craib, Fl. Siam. Enum. 2 (1932) 137. Type: *Kerr. 15593*, Thailand (BK).

Canthium dicoccum var. *impolitum* Craib, Fl. Siam. Enum. 2 (1932) 138. Type: *Kerr 14759*, Thailand (BK, BM, K).

Shrub to tree, up to 15 m tall and 5–20 cm girth; bark smooth, cracked or fissured, purplish to greyish brown; inner bark fibrous, greyish brown to pale yellow; cambium yellow; sapwood cream, pink to pale yellow, very hard; twigs terete to quadrangular, glabrous, internodes 4.5–8(–12) cm long; stipules with a basal triangular portion 3–6 mm long, ending in a pointed apex or a short narrow apical lobe 1–2 times as long. Leaves: blades ovate to elliptic, 5–15 cm × 2.3–6.2(–7.5) cm, glabrous, coriaceous and shagreen, with apex acute to acuminate, base acute to attenuated down to the petiole, lateral nerves (3–)4–6 pairs; tertiary venation not conspicuous on both sides; domatia present or absent in axils of lateral nerves; drying dull pale green to dark brown; petioles glabrous, (3–)6–10 mm long. Inflorescences a cyme, main peduncle 0–3 mm long, branches 0–1 mm long, puberulous; 20–30 flowered. Flowers 5-merous, white to light yellow green, pedicels puberulous, 4–8 mm long; calyx campanulate, limb 5-dentate, puberulous, 1–2 mm × 1–1.5 mm; corolla tube c. 3 mm long, lobes c. 2.5 mm long; stamens 5 exerted from corolla tube, filaments c. 1 mm long, anthers 1–1.5 mm long; disc hairy; style 6–8 mm long; stigma cylindrical, bifid at apex, 1 mm × 0.8 mm. Fruit a drupe, obovoid, green to blue green, strongly bilobed, 4–10 mm × 4–8 mm, pedicels 10–15 mm long. Pyrenes 1–2, exceedingly rugose on surface, with solitary seeds within.

Distribution: Peninsular Thailand, Peninsular Malaysia, Singapore, Sumatera and Borneo (Fig. 7).

Ecology: Primary to secondary mixed dipterocarp forest, also heath forest including in white-sandy sites, at elevations up to c. 1500 m a.s.l.

Vernacular names: *janti kering* (Palembang, Sumatra), *pirangk*a (Borneo), *kayu tulang* (Banjarmasin), *kopi-kopi* (Sabah), *bintan* (Sampit, Borneo), *janang* (Sarawak), *tulang ular* (Pulau Bruit-Sarawak, Borneo).

Note: *P. sumatranus* is characterised by ovate to elliptic blades with a dull shagreen texture on the adaxial surface and cymes with short peduncles 0–3 mm long and 20–30 flowers. Craib (1932) listed *C. dicoccum* Merrill for Thailand citing the specimen *Kerr 15593* and also published *C. dicoccum* var. *impolitum* Craib. Both are not different. This is the same as *Psydrax s*p. 5 of Wong (1989) and *Psydrax* sp. 3 of Coode *et al.* (1996).

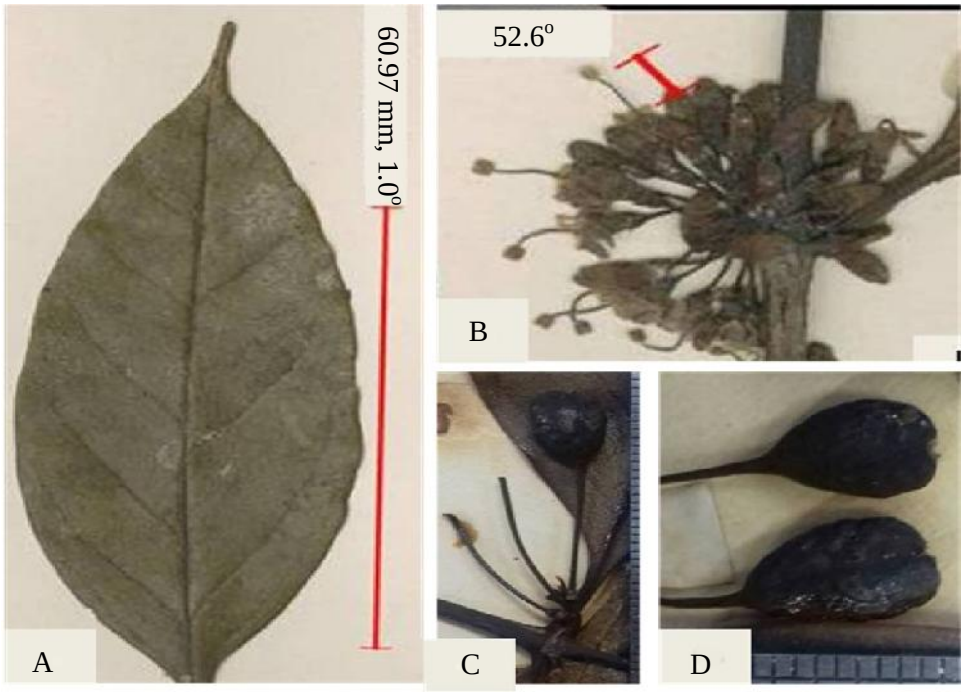

Figure 6. *P. sumatranus.* A. leaf blade, B. inflorescence, C. infructescence, D. fruits. (*Kerr 14759*)

Additional specimens examined:
BORNEO: *Brunei Darusalam*: *B.E. Smythies et al., SAN 17455,* Kuala Belait, Badas State Land, 14 April 1957 (KEP, SAN); *s.leg. S.880,* 1932 (SING). *Kalimantan*: *Dr. P. Buwalda7657,* West Kalimantan, Sampit, 23 August 1940 (BO); *Dr. P. Buwalda 7697,* 2 September 1940 (BO); *G. Argent & Amiril Saridan 9394,* Km 67 from Sangai, 6 February 1993 (BO); *Mohd. Dahlan, 149,* Banjarmansin, 5 October 1921 (BO); *Jaheri, s.n.* (BO). *Mandi 38,* Pontianak, Sei Raja, 14 March 1931 (BO). *Sabah*: *Talib Bidin, SAN 80714,* Beaufort, 7 July 1976 (SAN); *Talib Bidin & Marsal H, SAN 86112,* 28 July 1980 (SAN); *Talib Bidin, SAN 80566,* Sungai Damit, Membakut, 17 May 1976 (SAN, SING); *J. Singh, SAN 24332,* Lumat, 17 May 1961 (SAN, SING); *L. Madani, 36889,* Beaufort Hills, 6 November 1963 (SAN); *F.R. Kinted, SAN 19053,* Lupak camp 230 chains from Padas river, 1 January 1961 (SAN); *J. Singh, SAN 24318,* Lumat, 10 May 1965 (KEP, SAN); *Francis Sadau, 50370,* 25 June 1966 (SAN); *J. Ampuria, 41426,* Papar, Kimanis F.R., 21 April 1964 (SAN); *Aban Gibot, 34127,* Tawau, Gading, 6 March 1963 (SAN): *A. Buntar, SAN 25807,* Saratok Klias, 19 April 1966 (SAN); *Ahmad Talip 50913,* 13 May 1967 (SAN); *F. Sadau 49611,* Keningau, 3 June 1965 (SAN, SAR); *Ahmad Talip, 50954,* 10 August 1967 (BO, SAN); *Ahmad Talip, 55577,* 13 October 1967 (SAN, SING); *Dewol Sundaling, SAN 80795,* 20 May 1976 (SAN); *P.F. Cockburn, J. Chow & Aban, SAN 64827,* Penampang, 4th mile path from Kg. Babagon Ulu Terian, 18 October 1969 (SAN); *P.F. Cockburn, SAN 66002,* 5 52' N, 116 11 E, 16 February 1969 (SAN); *Fedilis Krispinus, SAN 105300,* Keningau, Sungai Tobou Sepulut Forest Reserve, 24 July 1984 (SAN); *Aban & Nicholas, SAN 65392,* Sook Plain, Plot No.2, 17 April 1969 (SAN); *E.J.H. Corner, 5342,* Andulau Forest Reserve, 22 February 1959 (BO); *Bongsu Ahmad, 63042,* Tawau, Tinagat FR, 16 July 1968 (SAN); Telupid, Tagkulap Road, 1October 1993 (SAN); *A. Cuadra, A2451,* Selangan Island, 13 October 1949 (SING); *G.H.S. Wood, SAN 17192,* Tawau, 7 November 1955 (BO). *Sarawak*: *Haviland, G. s.n.,* Kuching, 17 April 1989 (SING); *Charles Hose, s.n.,* Marudi, Baram, 1894–1895 (SING); *H. Jacqualine, R.S. Shalih et al. S.90217,* 3°44'141" N, 115°30'23', 11 September 2006 (SAR); *s.leg. s.n.,* Maliau Basin, 18 April 1996; *Muin Chai, SAN 29399,* Lahat Datu, N.T. Silam, 23 April 1962 (KEP, SAN); *Ahmad & Sabirin, 52315,* Virgin Jungle Res. Mt. Silam, 18 May 1965 (SAN); *s.leg., S.1560,* 17 August 1959, (KEP, SAR); *s.leg, S. 0485, Loba Karang Suih* (KEP, SING).
PENINSULAR MALAYSIA: *H.C. Robinson & C.B. Kloss, 6132,* Kedah, Kedah Peak, December 1915 (SING); *E. Seimund, s.n.,* Malaka, Pulau Rumbia, Strait of Malacca, 10 March 1926 (SING); R.E. *Holtum 31265,* Pahang, Cameron Highlands, 47th mile Telom road,15 May 1936 (BO, SING); *Rahim Ismail, KEP 98921,* Pahang, Rompin, Menchali F.R, Compt. 6, 2 September 1966 (KEP, SING); *Aw Bun Mendora, 306,* 14 June 1914 (SING); *T.C. Whitmore, FRI 4769,* Pahang, Tahan Woods, Kuala Teku, 20 February 1968 (KEP); *K. Ogata, KEP 110332,* Fraser's Hill, 8 March 1968 (KEP, SING); *Bidin, 15450,* Pahang, Rompin 31 August 1929 (SING); *Khairuddin, 31759,* Menchali F.R. May 5 1952 (SING); *Rosdi M, et al., FRI 59761,* Temerluh, Tasik Bera, 3°.50' N, 102°40.60', 102°40.60'E, January 8, 2008 (KEP, SING); *Ding Hou, 751,* Balok F.R. near Kg. Balok, September 3, 1966 (BO, KEP); *C. Curtis, 219,* Penang, May 1885 (SING); *T.C. Whitmore, FRI 20522,* October 20, 1971 (SING); *leg. s. n.,* Penang, Batu Ferringhi, 1896 (BO); *S. Cheliah, KEP 98145,* Penang, Pantai Acheh, F.R., Telok Bahang, 15 September 1966 (KEP); *Mat s.n.,* Good Hill, May 1989 (SING); *M.R. Henderson, 662,* April 1938 (SING); *I.H. Burkill, SFN 4151,* 7 May 1989 (BO, SING); *M. Ando et al., AKK 76,* Selangor, August-September 1968(KEP); *K.M. Kochummen KMK 8,* Trengganu, Bukit Bujok, Pak Khancil, July 17, 1979 (KEP).
SINGAPORE: *H.N. Ridley, 358,* Chan Chu Kang, 1889 (SING); *H.N. Ridley, 271,* November 1889 (SING).
SUMATRA: *Teysmann, 4522HB,* Lampung, Tarabangi Agong (BO); *A de Voogel 86,* Palembang, Kajoe Agoeng, 9 February 1928 (BO); *Chr. Versteegh & Noerkamal, 141,* Lematang Hilir, 24 June 1940 (BO); North Sumatra: *W. Takeuchi & E. Sambas, 18080,* Tapanuli Selatan, Batang Toru, 01°30'47" N, 99°04'05" E, 1 June 2003 (BO): *Achmad 490,* Simeloe, 13 June 1918 (BO); *Teysmann 18730,* Bangka, Sungai Liat, no date (BO); *H.A.B. Bünnemeijer 1907,* 8 November 1907 (BO); *Kostemans & Anta, 1334,* Gunung Maras, 27 October 1949 (BO); *H.A.B. Bünnemeijer 1768,* Gunung Panjok, 27 October 1907 (BO).

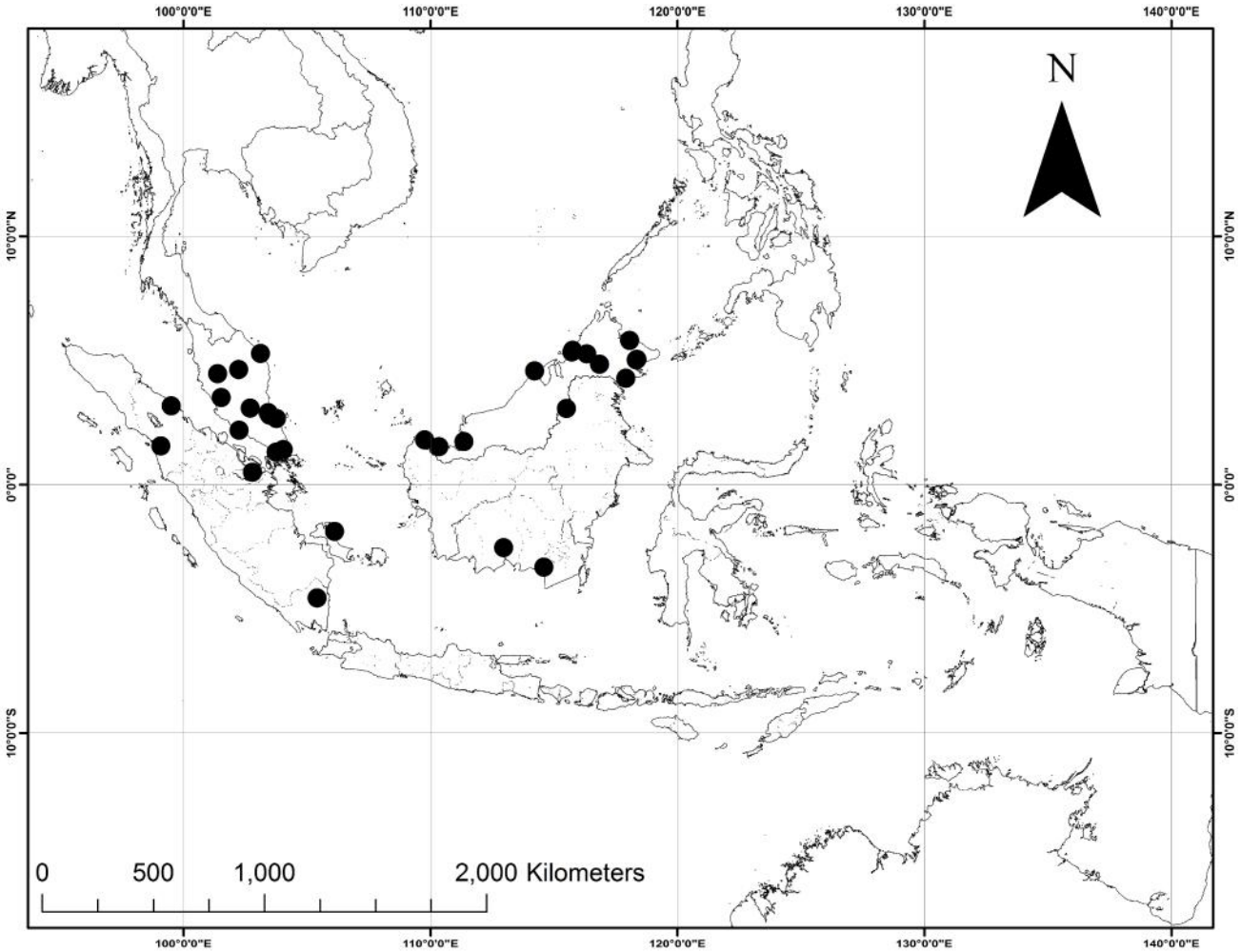

Figure 7. Distribution of *P. sumatranus* based on specimen localities.

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