

## *Prismatomeris khoonmengiana*, a new name for the Peninsular Malaysian *Coffea malayana* (Rubiaceae)

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**Background** – *Coffea malayana*, the only species described under that genus in the Malay Peninsula, is re-assessed with syntypes found in the Singapore Herbarium.

**Methods** – This study is based on herbarium material. Conventional herbarium techniques were applied for taxonomy. The IUCN conservation status was assessed using GeoCAT.

**Results** – *Coffea malayana* is congeneric with *Prismatomeris*. The name is lectotypified but its potential combination as *Prismatomeris* is pre-empted by the validly published binomial *Prismatomeris malayana* for a different taxon. Therefore, *Prismatomeris khoonmengiana* is proposed as a new name for *Coffea malayana*.

**Key words** – *Coffea malayana*, conservation status, lectotypification, Malay Peninsula, new name, *Prismatomeris*, Rubiaceae.

### INTRODUCTION

*Coffea* L. is a large Old World genus that includes more than 100 species, with its diversity centred in Africa, extending to India, Indochina, the Malay Archipelago and northwest Australia (Davis 2011, Davis et al. 2011, Govaerts et al. 2014). Initially considered to be exclusive to Africa, current generic delimitation of the genus based on morphological and molecular results (Davis et al. 2011) has expanded its distribution remarkably. Whereas African *Coffea* has been extensively studied due to its economic importance, Asiatic *Coffea* species are poorly known and require thorough investigation (Ruhsam et al. 2008, Davis 2010, K.M. Wong, Singapore Botanic Gardens, pers. comm.).

Ridley (1912) established the first species named as *Coffea* in Peninsular Malaysia, *Coffea malayana*. Later, in *The Flora of the Malay Peninsula* (Ridley 1923) he further enumerated two cultivated species in his list, namely *Coffea madurensis* Teijsm. & Binn. ex Koord. and *C. viridiflora* Ridl. Based on a taxonomic review of *Coffea* and allied taxa, including Asiatic *Psilanthus* Hook.f., *C. madurensis* is now again considered a species of *Coffea* (Davis et al. 2011), whereas *C. viridiflora* has been placed in *Nostolachma* [*N. viridiflora* (Ridl.) J.-F.Leroy ex A.P.Davis (Ruhsam et al. 2008)]. However, the status of *Coffea malayana* Ridl. remains unresolved due to the lack of material of this taxon in the Kew Herbarium, and the fact that the syntypes were not found for comparison against *Coffea* (Govaerts et al. 2014). Two classical authors on *Coffea* taxonomy (De Wildeman

1941, Chevalier 1942, 1947) kept *C. malayana* in *Coffea*, apparently without having examined material. Bridson (1987) briefly mentioned that materials annotated as *C. malayana* in the Kew Herbarium are not related to the Coffeae tribe. Furthermore, Wong (1989), after examining material in the Singapore Herbarium while preparing for the Rubiaceae account for the Tree Flora of Malaya project, indicated that *C. malayana* could possibly belong to *Prismatomeris* Thwaites. Davis et al. (2006) in an appendix to their taxonomic review of *Coffea*, have listed *C. malayana* as = *Prismatomeris* sp.

Recently, while curating Rubiaceae material in the Singapore Herbarium, specimens annotated as *C. malayana*, including those cited by Ridley (1912), were found to match Ridley's description of *C. malayana*, and the species was found to conform to the delimitation of *Prismatomeris* (Johansson 1987). Table 1 compares both genera for a number of characters. As the two genera even belong to two different subfamilies (Cinchonoideae and Rubioideae respectively; Robbrecht & Manen 2006), the differences are conspicuous. Although both genera typically have opposite and axillary inflorescences, *Prismatomeris* species (subfamily Rubioideae) are characterised by deeply bifid stipules, valvate corolla lobes which have a conspicuous distal longitudinal adaxial ridge, and single-seeded drupes. In contrast, *Coffea* spp. (subfamily Cinchonoideae) have broadly triangular, undivided stipules, contorted corolla lobes that lack any adaxial thickening or ridge, and 2-seeded drupes. A survey of *Prismatomeris* taxa enumerated by Johansson (1987) revealed that this taxon is distinct from all the taxa recognised by him.

**Table 1 – Morphological comparison between *Coffea* and *Prismatomeris*.**

<i>Coffea</i>	<i>Prismatomeris</i>
stipules broadly triangular, the apices acute to shortly aristate	stipules deeply bifid, the apex distinctly 2-cusped
twigs without longitudinal median ridge along internodes	young twigs with a conspicuous longitudinal median ridge along internodes, and older epidermis frequently flaking off
stamens included to exerted	stamens always included
corolla lobes without a distal longitudinal adaxial ridge	corolla lobes with a conspicuous distal longitudinal adaxial ridge
aestivation of corolla lobes contorted	aestivation of corolla lobes valvate
stigma exerted	stigma included or exerted
drupe 2-seeded	drupe single-seeded

The potential recombination of *C. malayana* into *Prismatomeris* is pre-empted by the use of the epithet for another species, *Prismatomeris malayana* Ridl. (Ridley 1920b), now considered as a subspecies of *Prismatomeris tetrandra* (Roxb.) K.Schum. [subsp. *malayana* (Ridl.) J.T.Johanss.]. Therefore, a new name is required, as recommended by the ICN (Melbourne Code), Art. 11.4 (McNeill et al. 2012). Besides that, as the type was not indicated by Ridley (1912), all the specimens cited by him are considered syntypes, and lectotypification is recommended by the Melbourne Code, Art. 9.2 (McNeill et al. 2012). Proposed here is the new name, *Prismatomeris khoonmengiana* Y.W.Low, accompanied by a detailed description, illustration, distribution map, and a key to the species of *Prismatomeris* of Peninsular Malaysia and Singapore. The name *C. malayana* is lectotypified.

#### MATERIALS AND METHODS

This research is conducted based on dried herbarium material preserved in the Singapore Herbarium (acronym SING, following Thiers 2014). Conventional methods of herbarium taxonomy were applied.

The IUCN conservation status of *P. khoonmengiana* is assessed throughout its range using GeoCAT (Bachman et al. 2011), an IUCN Red List (IUCN 2001) compliant software that generates the IUCN threat categories based on (i) extent of occurrence (EOO), and (ii) area of occupancy (AOO). Data used for the assessment are based on herbarium records present in SING.

#### RESULTS AND DISCUSSION

Peninsular Malaysia and Singapore have four species of *Prismatomeris*. These may be discerned with the key given here.

#### Taxonomy

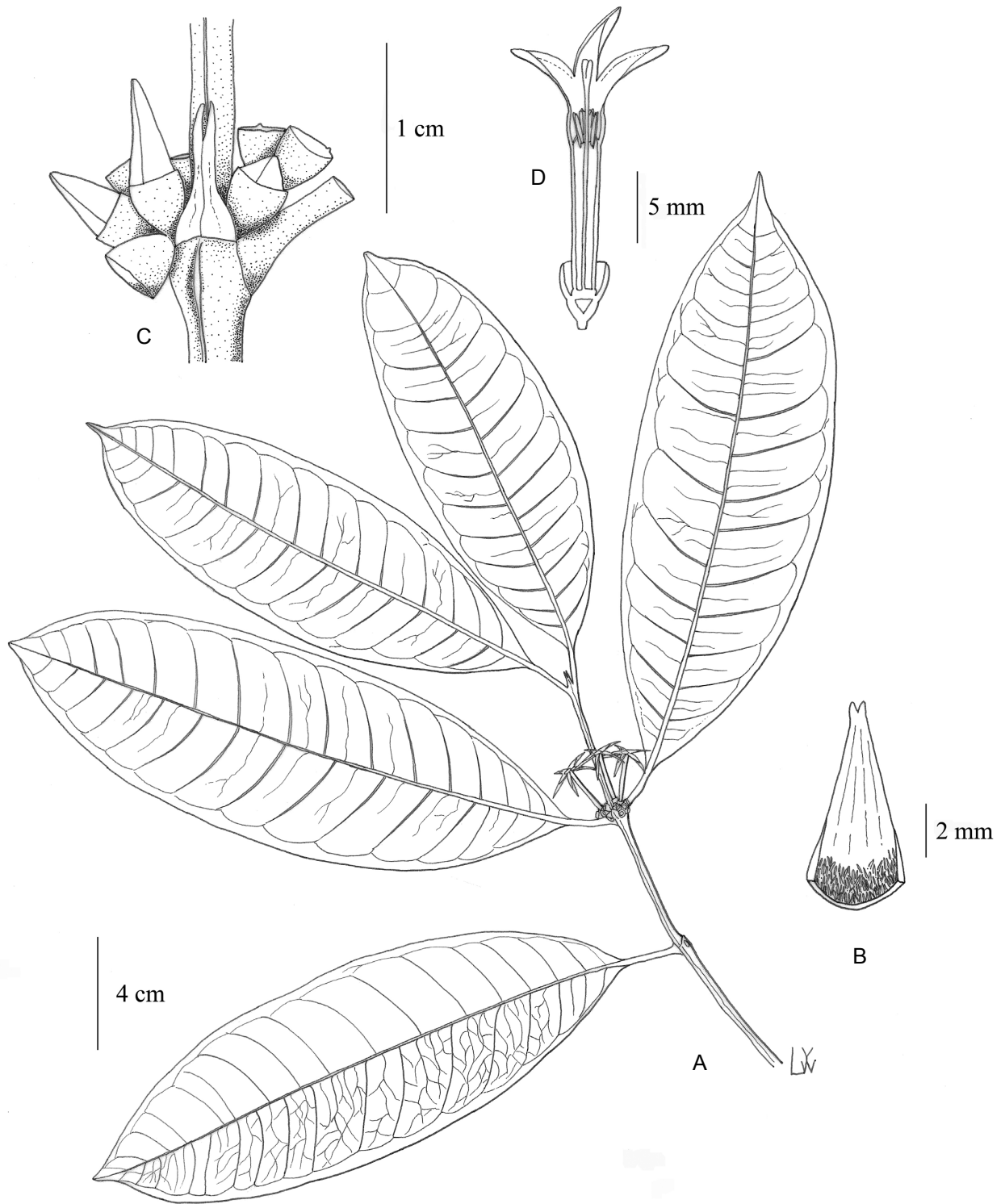
***Prismatomeris khoonmengiana* Y.W.Low, nom. nov.**

Replaced synonym: *Coffea malayana* Ridl. (Ridley 1912: 19). – non *Prismatomeris malayana* Ridl. (Ridley 1920a: 96), *nomen nudum*; Ridley 1920b: 142; Ridley 1923: 116, *pro parte*; Craib 1934: 183, *pro parte*. – Type: Malaysia, Peninsular Malaysia, Negeri Sembilan, Bukit Tampin, May 1894, flowers & fruits, *Goodenough* 1864 (lecto-: SING, barcode 0166263, **designated here**).

Shrub to small tree, c. 5 m high. Twigs pale-coloured, internodes slightly compressed with a median longitudinal ridge on each interpetiolar side. **Stipules** interpetiolar, narrowly triangular, 5–8 mm long, persistent, apex bifid, outside glabrous, inside largely glabrous except for a dense covering of dark-coloured colleters at the base. **Petiole** (1–)1.5–2(–2.3) cm long, 2–3 mm in diam., glabrous. **Leaf** lamina broadly to oblong elliptic; (15–)18–21(–24) cm long, (4–)6–7(–8.5) cm wide, thinly coriaceous; base cuneate; apex acute to acuminate to long-cuspidate; midrib prominent and glabrous on both sides; secondary veins 9–12 pairs, slightly raised on upper side, prominent on lower side, glabrous, vein axils without domatia; tertiary venation reticulate. **Flowers** in axillary compact cymes (sometimes at the apex giving a

#### Key to *Prismatomeris* species of Peninsular Malaysia and Singapore

1. Petioles less than 1 cm long; flowers and fruits stalked (pedicels 0.4–2.6 cm long).....2
1. Petioles more than 1 cm long; flowers and fruits sessile.....3
2. Calyx tube margin without stalked colleters.....*P. tetrandra* subsp. *malayana* (Ridl.) J.T.Johanss.
2. Calyx tube margin with stalked colleters.....*P. glabra* (Korth.) Valetton
3. Stipules 1–3.5 mm long; leaf elliptic to ovate, lamina to 12 cm long, with 5–8 pairs of secondary veins; inflorescence lax, with 1–4 flowers.....*P. griffithii* Ridl.
3. Stipules 5–8 mm long; leaf broadly to oblong elliptic, lamina 15–24 cm long, with 9–12 pairs of secondary veins; inflorescence compact, with 5–13 flowers.....*P. khoonmengiana* Y.W.Low



**Figure 1** – *Pristomeris khoonmengiana*: A, flowering leafy branch with conspicuous median ridge along the internodes; B, stipule inner surface with a dense covering of colleters at the basal part; C, detail of axillary compact inflorescences (note also bifid apex of stipule); D, flower in longitudinal section (note the slightly distended upper portion of the corolla tube around the stamens). A from *Hume* 9486 (SING); B from *Ridley* 7413 (SING); C & D from *Alvins* 1022 (SING). Drawing by Yee Wen Low.

terminal impression), (5–)6–8(–13), sessile. **Calyx** cupuliform, the calyx mouth truncate to denticulate with up to 6 triangular teeth c. 0.2 mm long; tube 1.5–2 mm long, 2–2.5 mm wide at the apex, inner and outer surfaces glabrous. **Corolla** hypocrateriform, white to cream; tube 12–21 mm long, 0.7–1 mm wide at the mid-portion, 1.5–2.5 mm wide at the throat, inner and outer surfaces glabrous; aestivation valvate; lobes (4–)5, narrowly oblanceolate with a distal adaxial ridge, 7–10 mm long, 1–1.9 mm wide, inner and outer surfaces glabrous. **Stamens** (4–)5, inserted c. 8 mm below the corolla throat, introrse, dorsifixed with filament attachment below the middle; filaments c. 0.8 mm long; anthers c. 2.5 mm long, included. **Gynoecium**: style 12–21 mm long, glabrous; stigma bilobate, c. 2 mm long, c. 0.5 mm wide, exerted; ovary bilocular; locules uniovular. **Fruits** globose to subglobose, 6–7 mm long, 6–6.5 mm wide; calyx persistent at fruit apex, c. 1.5 mm long; black when ripe (*vide* Burkill 3522). **Seeds** 1, globose, 4.7 mm long, 5 mm wide; testa smooth, dark brown. Fig. 1.

**Distribution and habitat** – Lowland and hill mixed dipterocarp forest, as well as on limestone in Perak. Fig. 2.

**Etymology** – This species is named after Dr. Wong Khoo Meng, Principal Researcher at the Singapore Botanic Gardens, rubiologist and bamboo specialist, whose preliminary investigation in the mid-1980s recognised that *C. malayana* could be congeneric with *Prismatomeris*.

**Proposed IUCN Conservation Assessment** – The IUCN conservation status assessed using GeoCAT categorised *Prismatomeris khoonmengiana* as Endangered (EN) (IUCN

2001), with the designation B2ab(iii,iv). The ‘B2’ designation results from an area of occupancy (AOO) estimated to be less than 500 km<sup>2</sup> (about 48 km<sup>2</sup> for *Prismatomeris khoonmengiana*). *Prismatomeris khoonmengiana* is a rare species, endemic to Peninsular Malaysia with an extent of occurrence (EOO) estimated at 36,139.59 km<sup>2</sup>, but with only a dozen collections made since its discovery in 1885. The species was last collected from Gunung Pantii Forest Reserve in 1982; ‘a’ is due to a severely fragmented distribution and occurrence in six locations after considering current landscape changes in Peninsular Malaysia, namely Perak (Piah Forest Reserve), Selangor (Ayer Hitam Forest Reserve and Ulu Gombak), Negeri Sembilan (Gunung Berembun and Gunung Tampin), and Johor (Gunung Pantii Forest Reserve); and ‘b(iii, iv)’ considers likely continuing decline in the area and quality of habitat, and number of locations. Habitat loss is a major concern for the species as Peninsular Malaysia undergoes rapid economic transformation for modernisation. However, the proposed status for the species may require future reassessment as more effort is underway to systematically document the flora of Peninsular Malaysia.

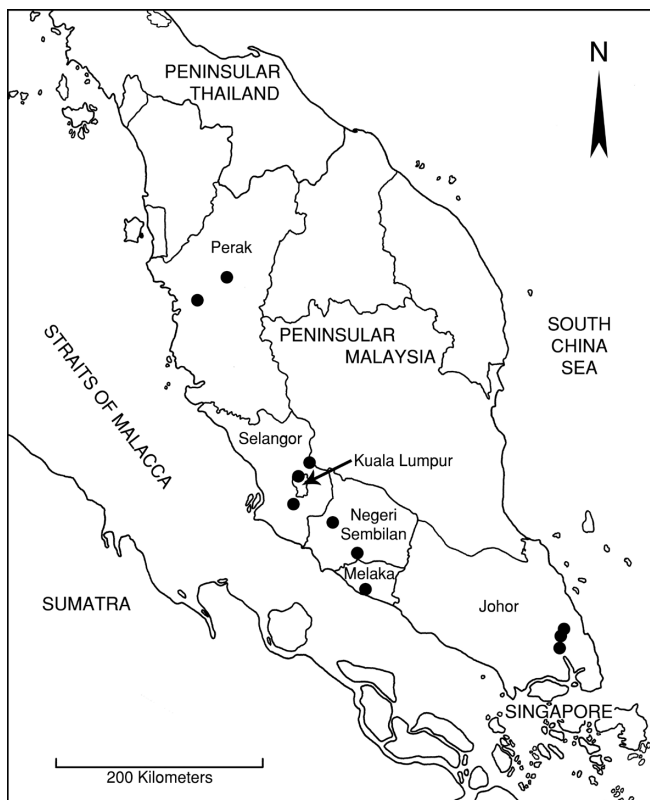
**Comments** – Ridley (1912) described *C. malayana* based on six specimens, namely *Cantley* (Gunung Berembun), *Cantley* (Bukit Kandang), *Goodenough* 1864 (Bukit Tampin), *Ridley* 4177 (Gunung Pantii), *Ridley* 7413 (Bukit Hitam), and *Ridley* 10217 (Kuala Lumpur). In SING, these two *Cantley* specimens were not found, but two other sheets from the same localities were encountered, namely *Alvins* 3033 (Gunung Berembun) and *Alvins* 1022 (Bukit Kandang). Steenis-Kruseman (1950) indicated that *Alvins*’ collections have been mostly quoted under *Cantley* or as *Cantley*’s Collectors, as *Alvins* was collecting under the supervision of *Cantley* at that time.

Johansson (1987) also recorded heterodistyly for almost all *Prismatomeris* species examined, however, this could not be verified for *P. khoonmengiana* due to a lack of well-preserved flowering material.

**Additional specimens examined** – **Malaysia**: Peninsular Malaysia: **Perak**: Gunung Pondok, 7 Jun. 1930, flower buds, *Henderson* SFN 23808 (SING, 2 sheets); Piah Forest Reserve, 9 Feb. 1935, flower buds, *Ja’amat* Forest Department F.M.S. 39219 (SING). **Selangor**: Bukit Hitam, May 1894, open flowers, *Ridley* 7413 (SING); Ulu Gombak, Nov. 1921, open flowers, *Hume* 9486 (SING). **Kuala Lumpur**: Kuala Lumpur, 1899, fruits, *Ridley* 10217 (SING). **Negeri Sembilan**: Gunung Berembun, 27 Jun. 1885, young fruits, *Alvins* 3033 (SING); Bukit Kandang, 25 Mar. 1885, open flowers & young fruits, *Alvins* 1022 (SING); Tampin Hill, 31 Oct. 1918, fruit, *Burkill* SFN 3522 (SING). **Melaka**: Melaka, s.d., fruits, *Alvins* s.n. (SING). **Johor**: Gunung Pantii, 9 Dec. 1892, open flowers & young fruits, *Ridley* 4177, (SING), summit of Gunung Pantii, 14 Jun. 1981, fruits, *Maxwell* 81-130 (SING), Kota Tinggi Falls, 10 Apr. 1982, flower buds, *Maxwell* 82-120 (SING); Mawai, Sungai Kayu, Jemaluang Road, 14 Apr. 1935, open flowers, *Corner* s.n. (SING).

## CONCLUSION

Johansson (1987) revised *Prismatomeris*, and defined a suite of morphological characters for generic delimitation (table 1). Specimens cited by Ridley (1912) as *C. malayana* matched all the morphological characters for generic delimitation defined by Johansson (1987) for *Prismatomeris*, rather



**Figure 2** – Distribution of *Prismatomeris khoonmengiana* in the Malay Peninsula, indicated by dots.

than morphological characters defined for *Coffea* (Bridson 1982, Bridson 1987, Davis et al. 2011).

The existence of the name *P. malayana* Ridl. for another species (Ridley 1920b) necessitates a new name for *C. malayana* when transferred to *Prismatomeris*, here provided as *P. khoonmengiana*.

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