

A NEW SPECIES OF *SCAPHIUM* (*STERCULIOIDEAE*, *MALVACEAE* / *STERCULIACEAE*) FROM BORNEO

P. WILKIE

Scaphium parviflorum P.Wilkie sp. nov. (*Sterculioideae*, *Malvaceae*/*Sterculiaceae*) is described and illustrated. The flowers are intermediate between the tubular flowers of *Scaphium macropodum* and the deeply lobed ones of *Scaphium affine*. However, *Scaphium parviflorum* differs from these species by its smooth to fissured or dimpled and brown to grey-brown bark, small narrowly ovate to narrowly elliptic leaves and the presence of sparse minute flattened stellate hairs (resembling scales) on the midrib of the lower surface of the lamina.

Keywords. Borneo, *Malvaceae*, *Scaphium*, *Sterculiaceae*, *Sterculioideae*.

INTRODUCTION

Scaphium Schott & Endl. is a genus of tropical trees. Its distribution is centred around Western Malesia but reaches into Indo-China with *Scaphium affine* (Mast.) Pierre found in Thailand and Cambodia and *Scaphium scaphigerum* (Wall. ex G.Don) G.Planch., the most northerly distributed species, found in Burma, Cambodia, Laos and Bangladesh. The genus belongs to the subfamily *Sterculioideae* (*Malvaceae* s.l.) (Bayer *et al.*, 1999), but was first described in *Sterculiaceae* as part of the tribe *Sterculieae* (Schott & Endlicher, 1832).

The generic status of *Scaphium* has been much discussed. Schott & Endlicher (1832) recognised 14 genera in *Sterculieae*, one of which was *Scaphium*. Endlicher (1840), however, considered *Scaphium* to be one of 11 sections in *Sterculia* L. This sectional status was followed by Bentham (1862), Baillon (1872), Masters (1868, 1874) and King (1891). Schumann (1890, 1893, 1900) recognised *Scaphium* (and *Hildegardia* Schott & Endl.) as part of *Firmiana* Marsili. More recent accounts of the subfamily (Ridley, 1922; Hutchinson, 1967; Takhtajan, 1997; Bayer & Kubitzki, 2003) have maintained *Scaphium* as a separate genus although Edlin (1935a, 1935b), in his detailed account of the *Malvales*, still maintained *Scaphium* as a subgenus of *Sterculia*. Phylogenetic studies on the subfamily *Sterculioideae* using the plastid gene *ndhF* (Wilkie *et al.*, 2006) clearly support the separation of *Scaphium* from *Sterculia*. They also support a close relationship between *Pterocymbium* R.Br. and *Scaphium*. More recent research with increased sampling and using both chloroplast and

nuclear markers found the relationship between the genera to be unclear (Wilkie, 2007). Given the moderate to strong support from the chloroplast data for a monophyletic *Scaphium*, the weak support for paraphyly from internal transcribed spacer (ITS) data, and the unique morphological characters which are potential synapomorphies for each genus (morphologically, *Scaphium* is distinguished from *Pterocymbium* by the presence of mucilage cells in the seed wall, lack of a spur to the boat-shaped follicle, smaller flowers, larger fruit, and an irregularly clustered anther arrangement), both genera have been maintained as separate until more conclusive research is available.

Kostermans (1953, 1956, 1957, 1959a, 1959b, 1988) revised most of the Southeast Asian genera of the subfamily and brought order to them, mainly by the reduction of species and genera into synonymy. He treated *Carpophyllum* Miq. as a synonym of *Scaphium* (not *Sterculia* as Hutchinson (1967) still maintained). Species delimitation in *Scaphium* has been problematic, leading to confusion in identification of species. It was last revised by Kostermans (1953) who recognised four species. Since then five new species have been published, and 13 species names are now attributed to the genus by the International Plant Names Index (IPNI) (<http://www.ipni.org/index.html>).

While a revision of the genus was being undertaken (Wilkie, in prep.) a distinct set of specimens from Borneo, annotated as *Scaphium parviflorum*, were encountered in several herbaria. The name was also found in the literature. However, the name seems never to have been formally published. Smythies (1965) attributed the name *Scaphium parviflorum* to Kostermans but gave only a very brief description. Ashton (1988), citing it as a synonym of *Scaphium borneensis* (Merr.) Kosterm., also attributed the name to Kostermans but indicated that it was a nomen [nudum]. Cockburn (1976) cited Ridley as the author, noting that it was probably a form of *Scaphium macropodum*, but again gave only the briefest of descriptions. Coode *et al.* (1996) also gave only a very brief description and highlighted *Scaphium parviflorum* Kosterm. as an orthographic variant of *Scaphium parvifolium* Ridl. However, *Scaphium parvifolium* Ridl. is of unknown status. I can find no record of either of these names having been validly published or used by either Kostermans or Ridley. I thus publish the species now.

Morphologically this species belongs to the group containing *Scaphium affine*, *Scaphium longiflorum* Ridl., *Scaphium macropodum* (Miq.) Beumée ex K. Heyne and *Scaphium linearicarpum* (Mast.) Pierre (although no sequence data could be obtained to confirm this relationship). The flowers are intermediate between the tubular *Scaphium macropodum* and deeply lobed *Scaphium affine* and it would appear to be most closely related to these two species in overall morphology. It is, however, distinct from these by its smooth to fissured or diphled and brown to grey-brown bark, small narrowly ovate to narrowly elliptic leaves and the presence of sparse minute flattened stellate hairs (resembling scales) on the midrib of the lower surface of the lamina and sometimes also on the terminal branches, petioles and veins of the lower surface of the lamina. Although male flowers are not known some flowers are

found with less developed carpels and anthers which are not restricted to the base of the carpels. This may represent a hermaphrodite flower.

A conservation assessment is proposed following the criteria set out by IUCN (2001).

***Scaphium parviflorum* P. Wilkie, sp. nov. Figs 1, 2.**

Scaphio macropodo (Miq.) Beumée ex K. Heyne et *S. affine* (Mast.) Pierre affinis, sed foliis minoribus, anguste ellipticis ad anguste ovatis, et in ramunculis terminalibus, in petiolis, foliorum laminae costa paginae inferna, in seminibusque pilis stellatis minutis compressis squamiformibus instructis differt. – Type: Malaysia, Sarawak, Miri, 4th Division, Lambir National Park, 19 vi 1983, Bernard Lee S.46416 (holo SAR; iso K, KEP, L).

Tree, 15–40 m tall, 10–70 cm diameter at breast height, not known if deciduous. *Buttresses* absent or present, if present to 90 cm tall, 2 m long. *Outer bark* brown to grey-brown, smooth to fissured or diphled. *Inner bark* brown-red to orange-brown, fibrous. *Sapwood* white, pink or yellowish. *Terminal branches* brown, smooth to striate, lenticels absent, glabrous but sometimes with sparse minute flattened stellate hairs (resembling scales), leaf scars obvious. *Petiole* brown to pale brown, 1–7(–10) cm long, 1–1.5 mm wide, striate, glabrous but sometimes with sparse minute flattened stellate hairs (resembling scales), more or less thickened at both ends with thickened parts same colour as main petiole. *Stipules* caducous. *Leaves* spirally arranged; *lamina* sub-leathery to papery, narrowly ovate to narrowly elliptic, symmetric to slightly asymmetric, base acute, rounded to shallowly rounded, apex acute to acuminate, 2–5(–8) cm at widest point, 5–11(–19) cm long, (2.2–)2.3–3.5 times as long as wide, upper surface glabrous, drying brown, shiny, lower surface glabrous (or with sparse minute flattened stellate hairs (resembling scales) along midrib), shiny or dull, drying brown; *margin* entire; *midrib* flat, glabrous above, raised, with sparse minute flattened stellate hairs (resembling scales) below; *basal veins* 1 pair, emerging from midrib at 30–50(–60)°, veins flat above, glabrous, veins flat below, glabrous, occasionally with sparse minute flattened stellate hairs (resembling scales); *secondary veins* (excluding basal ones) 4–7(–9) pairs arising from midrib at 40–60°, veins flat above, glabrous, veins slightly raised below, glabrous or with very sparse minute flattened stellate hairs (resembling scales); *tertiary venation* flat above and below, same colour as lamina on both surfaces. *Inflorescence* a lax, erect, axillary panicle, 2–8(–19) cm long, 1–2(–3) mm thick, with dense stellate hairs (hairs larger and more erect than on petiole and lamina), striate, branches in more than one plane, flowers in clusters of 3–5, glabrous. *Bracts* caducous to semi-persistent, 0.5–1.5 mm wide, 1–2 mm long, outer surface with dense stellate hairs, inner surface glabrous, elliptic to lanceolate. *Flower buds* drying brown, obovate and slightly elongated, lobe margin distinct, with dense stellate hairs. *Pedicel* 0.5–1.5 mm long, 0.5–1 mm wide, glabrous to densely stellate hairy. *Male flowers*: not known. *Female flowers*: 5–9 mm long, white to pale yellow when fresh, drying dark brown, (4–)5-lobed, lobes $\frac{1}{2}$ – $\frac{2}{3}$ length of flower, tube 1.5–4 mm long, lobes (0.5–)1–4 mm long, outer and inner

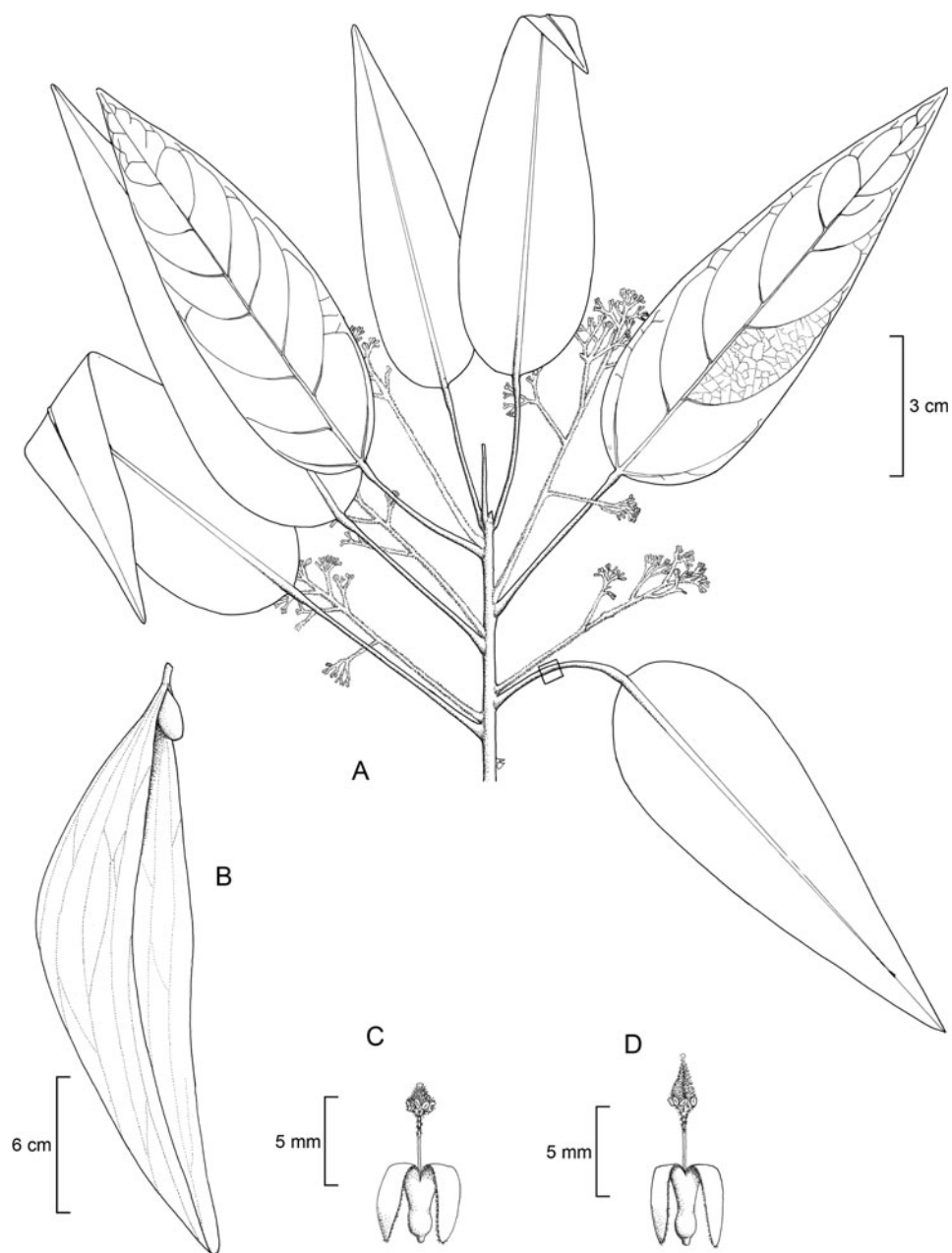


FIG. 1. *Scaphium parviflorum* P. Wilkie. A, habit; B, fruit; C, open female flower; D, very early stage of fruit development (A, C from *Bernard Lee* S.46416; B from *Aban Gibot* SAN 99631; D from *Ashton* BRUN 272). Drawn by Anna Dorward.

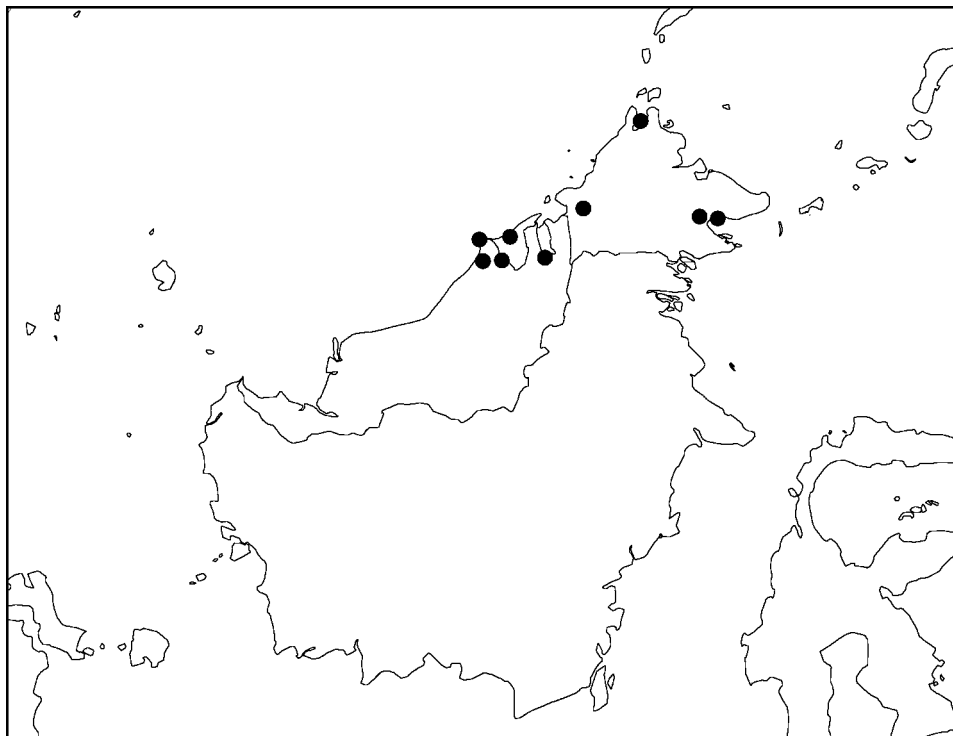


FIG. 2. Distribution of *Scaphium parviflorum* P. Wilkie.

surfaces (including base) glabrous, androgynophore 3–5(–6) mm long, protruding 1–3 mm from calyx tube, not recurved at apex, with dense stellate hairs on upper half (sometimes entire length), anthers arranged around base of carpels, up to 10 pairs (possibly more), glabrous or with sparse stellate hairs, dehiscing longitudinally, carpels 2–5, free or nearly so, ovate and slightly elongated towards apex (occasionally rounded), with dense stellate hairs, style absent or to 0.5 mm long, with dense stellate hairs, stigma glabrous, appearing fused. *Fruit* a papery boat-shaped follicle, 11–12 cm long, inner surface of wing glabrous with red dots, outer surface glabrous or with very sparse stellate hairs, inner surface shiny, outer surface dull, 1–2 follicles per flower, one basal sub-ellipsoid seed per follicle, to 10 mm long, 4–5 mm wide, covered in minute round scales, partially enclosed in hollow of follicle wing, stalk 10 mm long, with dense stellate hairs.

Distribution. Endemic to northern Borneo: Sarawak, Brunei, Sabah (Fig. 2).

Habitat. Primary non-flooded lowland rain forest, often on hillsides, below 300 m altitude.

Proposed IUCN conservation status. Although this species is found in forest which is under threat from logging and other human disturbance, its wide distribution and

occurrence in forest reserves has led to a proposed conservation status of Least Concern (LC). Most collections were made between 1955 and 1966, with the last collection in 1983. As major forest conversions continue to take place in Borneo this status should be re-assessed regularly.

Additional specimens examined. MALAYSIA. **Sabah:** Beaufort, Pangi, 5 miles WNW of Tenam at mile 79 on North Borneo railway, 15 vi 1955, *Wood* SAN 16901 (BO, KEP, L, SING); Kudat, Kota Marudu, Side of Sg. Torintidon, 13 viii 1983, *Aban Gibot* SAN 99631 (K, KEP, L, SAR, SING); Lahad Datu, Mile 1 Silam, 26 viii 1966, *Ahmad Talip* 54981 (K, L); Pulau Sakar, Look Magulang, 30 v 1961, *Muin Chai* SAN 21693 (K, KEP, L). **Sarawak:** Miri: 30 km South of Miri, N crest of Bukit Lambir above Bakam village, 16 viii 1963, *Ashton* 21309 (A, K, SAR); Baram District, Mount Trekan, vi 1895, *Hose* 633 (K); Marudi Forest Reserve, 21 vi 1955, *Sahari* S.1482 (1901) (KEP, SAR, SING); Limbang, vi 1905, *Hewitt Series* 63 (SAR).

BRUNEI. Andulau Forest Reserve, 8 x 1958, *Ashton* BRUN 2620 (K, KEP, L, SAR, SING), 15 vii 1957, BRUN 272 (BO, K, KEP, L, SAR, SING).

ACKNOWLEDGEMENTS

I thank Anna Dorward for preparing the illustration and Dr Robert Mill for checking my Latin diagnosis. I should also like to thank the staff of the herbaria at BO, E, K, KEP, L, SAN, SAR and SING and the anonymous reviewers of this paper.

REFERENCES

- ASHTON, P. S. (1988). Sterculiaceae. In: *Manual of the Non-Dipterocarp Trees of Sarawak*, pp. 382–425. Kuala Lumpur: Dewan Bahasa dan Pustaka.
- BAILLON, H. (1872). *Histoire des Plantes*. Paris: Librairie Hachette & Cie.
- BAYER, C., FAY, M. F., DE BRUIJN, P. Y., SAVOLAINEN, V., MORTON, C. M., KUBITZKI, K., ALVERSON, W. S. & CHASE, M. W. (1999). Support for an expanded family concept of Malvaceae within a recircumscribed order Malvales: a combined analysis of plastid *atpB* and *rbcL* DNA sequences. *Bot. J. Linn. Soc.* 129(4): 267–303.
- BAYER, C. & KUBITZKI, K. (2003). Malvaceae. In: KUBITZKI, K. & BAYER, C. (eds) *The Families and Genera of Vascular Plants, Flowering Plants, Dicotyledons* 5: 225–311. Berlin, Heidelberg: Springer Press.
- BENTHAM, G. (1862). Sterculiaceae. In: BENTHAM, G. & HOOKER, J. D. (eds) *Genera Plantarum*, pp. 214–228. London: Reeve and Co.
- COCKBURN, P. F. (1976). *Trees of Sabah*. Kuching: Borneo Literature Bureau.
- COODE, M. J. E., DRANSFIELD, J., FORMAN, L. L., KIRKUP, D. W. & SAID, I. M. (1996). *A Checklist of the Flowering Plants and Gymnosperms of Brunei Darussalam*. Brunei Darussalam: Ministry of Industry and Primary Resources.
- EDLIN, H. L. (1935a). A critical revision of certain taxonomic groups of the Malvales. *New Phytol.* 34: 1–20.
- EDLIN, H. L. (1935b). A critical revision of certain taxonomic groups of the Malvales Part II. *New Phytol.* 34: 123–143.
- ENDLICHER, S. L. (1840). *Genera Plantarum Secundum Ordines Naturales Disposita*. Vienna: Vindobonae.
- HUTCHINSON, J. (1967). *The Genera of Flowering Plants (Angiospermae)*. Oxford: Clarendon Press.

- IUCN (2001). *IUCN Red List Categories and Criteria, Version 3.1*. IUCN Species Survival Commission. Gland, Switzerland and Cambridge, UK: IUCN.
- KING, G. (1891). Materials for a Flora of the Malay Peninsula. *J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist.* 60: 57–95.
- KOSTERMANS, A. J. G. H. (1953). The genera *Scaphium* Schott & Endl. and *Hildegardia* Schott & Endl. (Sterculiaceae). *Journal of Science Research Indonesia* 2(1): 13–23.
- KOSTERMANS, A. J. G. H. (1956). The genus *Firmiana* Marsili (Sterculiaceae). *Communication of the Forest Research Institute, Indonesia* 54: 3–33.
- KOSTERMANS, A. J. G. H. (1957). The genus *Firmiana* Marsili (Sterculiaceae). *Reinwardtia* 4(2): 281–310.
- KOSTERMANS, A. J. G. H. (1959a). A monograph of the genus *Heritiera* Aiton (Sterculiaceae) (including *Argyrodendron* F.v.M. and *Tarrietia* Bl.). *Reinwardtia* 4(4): 465–583.
- KOSTERMANS, A. J. G. H. (1959b). A monograph of the genus *Heritiera* Dry. (Sterculiaceae) (including *Argyrodendron* F. v. M. and *Tarrietia* Bl.). *Penerbitan, Madjelis Ilmu Pengetahuan Indonesia* 1: 465–583.
- KOSTERMANS, A. J. G. H. (1988). A note on *Franciscodendron* Hyland & Steenis (Sterculiaceae). *Reinwardtia* 10(5): 475.
- MASTERS, M. T. (1868). Sterculiaceae. In: OLIVER, D. (ed.) *Flora of Tropical Africa*, pp. 214–239. London: L. Reeve and Co.
- MASTERS, M. T. (1874). Sterculiaceae. In: HOOKER, J. D. (ed.) *Flora of British India*, pp. 353–379. London: L. Reeve and Co.
- RIDLEY, H. N. (1922). *Flora of the Malay Peninsula*. London: L. Reeve and Co.
- SCHOTT, H. W. & ENDLICHER, S. F. L. (1832). *Meletemata Botanica*. Vienna: Caroli Gerold.
- SCHUMANN, K. (1890). Sterculiaceae. In: ENGLER, A. & PRANTL, K. (eds) *Die Natürlichen Pflanzenfamilien* 3(6): 69–96. Leipzig: Engelmann.
- SCHUMANN, K. (1893). Sterculiaceae. In: ENGLER, A. & PRANTL, K. (eds) *Die Natürlichen Pflanzenfamilien* 3(6): 97–99. Leipzig: Engelmann.
- SCHUMANN, K. (1900). Sterculiaceae africanae. In: ENGLER, A. (ed.) *Monographien afrikanischer Pflanzen-familien und-Gattungen*, pp. 1–140. Leipzig: Engelmann.
- SMYTHIES, B. E. (1965). *Common Sarawak Trees*. Kuching: Borneo Literature Bureau.
- TAKHTAJAN, A. L. (1997). *Diversity and Classification of Flowering Plants*. New York: Columbia University Press.
- WILKIE, P. (2007). *Systematic Studies in South East Asian Malvaceae, Subfamily Sterculioideae*. PhD thesis, Aberdeen University.
- WILKIE, P., CLARK, A., PENNINGTON, R. T., CHEEK, M., BAYER, C. & WILCOCK, C. C. (2006). Phylogenetic relationships within the subfamily Sterculioideae (Malvaceae/Sterculiaceae-Sterculieae) using the chloroplast gene *ndhF*. *Syst. Bot.* 31(1): 160–170.

Received 7 May 2008; accepted for publication 6 June 2008