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SPATHOLOBUS (LEGUMINOSAE–PAPILIONOIDEAE): A NEW SPECIES AND SOME TAXONOMIC NOTES

JEANNETTE W.A. RIDDER-NUMAN

Rijksherbarium / Hortus Botanicus, Leiden, The Netherlands

SUMMARY

A new species, *Spatholobus latibractea*, is described here; *S. pallidus* is considered synonymous with *S. acuminatus*, and *S. varians* and *S. biauritus* are both put into synonymy with *S. pottingeri*. *Spatholobus apoensis* and *S. sanguineus* have regained their status as species. Of two species, *S. hirsutus* and *S. latistipulus*, the pod is described. The pod of the latter is nearly wingless in contrast with the usual samaroid pods of the other species of this genus.

INTRODUCTION

About ten years ago the genus *Spatholobus* was revised (Ridder-Numan & Wiriadinata,1985). Together with the genera *Butea* and *Kunstleria* of the same family the genus will now be used for a historical biogeographical study, which is based upon the phylogenetic relationships of the three genera.

The species of *Spatholobus* have been re-examined because the characters and their states as decribed in the revision are generally not useful for a phylogenetic analysis. In a revision neither overlapping character states nor qualitative variation are necessarily a problem to identify species. In a phylogenetic analysis, however, one must pay more attention to the delimitation of the character states or the discontinuity in the variation; otherwise, coding the character states for a data matrix may be doubtful and give incorrect results (see also Stevens, 1991). An additional reason for re-examination is that more material is available than at the time of the revision, and I found some disturbing errors in the revision.

The re-examination of the genus resulted in the recognition of a new species, *S. latibractea*, found on Borneo. In addition I found the pods of *S. hirsutus* and *S. latistipulus*. The pod of the latter species is nearly wingless in contrast to the usual samaroid pods of the other species. I made some taxonomic changes concerning the following species: *S. apoensis* (was synonymous to *S. maingayi*), *S. sanguineus* (was synonymous to *S. gyrocarpus*),*S. pallidus* (= *S. acuminatus*), and *S. varians* and *S. biauritus* (both synonyms of *S. pottingeri*).

The necessary taxonomic changes and descriptions are given in this paper. A revised key to the species of *Spatholobus* will be published in due time together with the results of the phylogenetic analyses.

The other two genera, *Butea* and *Kunstleria*, will be examined in the same way as *Spatholobus*. A revision of the genus *Butea* has been published recently (Sanjappa, 1987). *Kunstleria* is under revision by D. Kornet and myself.

TAXONOMIC NOTES

1. Spatholobus acuminatus Benth.

After re-examination of the material of *Spatholobus pallidus*, consisting of the type-sheet only, I came to the conclusion that this taxon is conspecific with *S. acuminatus* Benth. This results in the following synonyms:

Spatholobus acuminatus (Wall.) Benth. in Miq., Pl. Jungh. (1852) 238; Ridder-Numan & Wiriadinata, Reinwardtia 10 (1985) 161. — *Butea acuminata* (Benth.) Kurz, J. As. Soc. Beng. 45, 2 (1876) 243. — Type: *Wallich 5443* (K, SING).

Spatholobus listeri Prain, J. As. Soc. Beng. 66, 2 (1897) 415. — *Butea listeri* (Prain) Blatter, J. Ind. Bot. Soc.8 (1929) 136. — Types: *Lister 293* (K lecto); *Lister 98, 323, 345* (K syn).

Spatholobus roseus Prain, J. As. Soc. Beng. 66, 2 (1897) 415. — [*Pongamia rosea* Graham ex Wall., Cat. (1831/32) 5907, nom. nud.]. —*Butea roseus* (Prain) Blatter, J. Ind. Bot. Soc. 8 (1929) 137. — Type: *Wallich 5907* (K).

Spatholobus squamiger Prain, J. As. Soc. Beng. 66, 2 (1897) 144. — *Butea squamigera* (Prain) Blatter, J. Ind. Bot. Soc. 8 (1929) 138. — Type: *Kurz 2596* (K).

Spatholobus pallidus Craib, Kew Bull.(1928) 62.— Type: *Kerr 12317* (E, K).

2. Spatholobus apoensis Elmer

Spatholobus apoensis Elmer, Leafl. Philipp. Bot. 2 (1910) 698; Merr., Enum. Philipp. 2 (1923) 310. — *Butea apoensis* (Elmer) Blatter, J. Ind. Bot. Soc. 8 (1929) 135. — Type: *Elmer 11795* (BO, E, K, L, P, U).

After re-examination of the material formerly combined under *S. maingayi* I regard it justified to re-establish the species *S. apoensis* Elmer, because of the constancy of its characteristics such as: larger flowers with a wide calyx cup, very short calyx lobes, and usually broad elliptic-ovate leaflets.

Climber. *Stem* not hollow, glabrescent, sparsely puberulous, with small, light coloured, elongated lenticels. Exudate not known. Bark smooth. *Leaves*: Rachis 2–13 cm long, the ultrajugal part 1–3.5 cm. Stipules 7 by 3 mm, caducous, triangular, pubescent, nerves not visible. Pulvinus 4–10 by 1–3 mm, sparsely pubescent. Stipellae 1–3 mm, caducous. Petiolule 5–12 by 1–2 mm, sparsely pubescent, with an adaxial groove. Terminal leaflet 6.5–14.5 by 3.5–9 cm, elliptic to elliptic-ovate, top acute to abruptly acuminate, mucronate, base acute to rounded to cordate. Lateral leaflets slightly asymmetric. Basiscopic side somewhat more ovate than acroscopic side. Upper and lower surface sparsely puberulous. Main nerve slightly prominent at upper surface, main and secondary nerves raised below. Secondary nerves 6–8 pairs, terminating diffusely towards the margin. Angle of the secondary nerves with the main nerve 40–55°. Venation reticulate. *Inflorescence*. Main axis with side branches and short tertiary branches or fascicles, indument pubescent. Side branches with two bracts, 2–5 by 1–2 mm. Tertiary branches with one bract, 1–2 by 0.25 mm. Fascicles consisting of up to 5 flowers, each with one bract, c. 1 by 0.25 mm. *Flower*. Pedicel 2–3 mm, bracteoles 0.5–1 mm, inserted 0.5–1 mm below the calyx. Calyx cup 2–3 by 2–2.5 mm, sparsely puberulous. Vexillary lobe 0.25–1 by 1.5 mm, top not emarginate, other lobes 0.5–1 by 1 mm, triangular. Standard 4–6 by 5–6 mm, top emarginate, claw 1 by 0.5 mm, decurrent. Wing 3.5–4 by 1.5–2 mm,

claw 1.5–2 by 0.3 mm, with a dorsal auricle, without a lateral pocket. Keel 3–3.5 by 1.5–2 mm, claw 2 by 0.3 mm. Keel petals connate at the apex. Vexillary filament 3.5 mm, other filaments 3.5–4.5 and 4–5.5 mm long, up to about halfway connate. Anthers all equal, c. 0.5–1 mm long. Ovary 2–3 by 0.5–1 mm, densely pubescent up to nearly the whole style, no stipe, ovules 2, in the middle, style 6–7 mm, stigma small, flat. Nectary glands 10, 0.3 mm , glabrous. *Pod* not seen.

Distribution – Philippines: Mindanao; Borneo: Sarawak, and Rejang, Sibu, Kalong.

3. **Spatholobus hirsutus** Wiriadinata & Ridder-Numan.

Spatholobus hirsutus Wiriadinata & Ridder-Numan, Reinwardtia 10 (1985) 175.

In recently collected material and in the material from Bogor I saw the pods of *S. hirsutus*. They look like the pods of *S. macropterus*, which resembles this species in other characters as well.

Pod (7–)11–13 by 3–4.5 cm, brown puberulous, sometimes with a rather short wing, maybe with a short stipe (but all material contained loose pods only). Seed-part thick, wing thin, but strong.

4. **Spatholobus latibractea** Ridder-Numan, *spec. nov.* — Fig. 1

Stipulae persistentes 13–18 mm longae 5–8 mm latae. Folia supra glauca infra puberulioria, costa nervis secundariisque prominentibus 9–11 paribus sub angulo 50–65° abeuntibus, nervis distaliter in arcibus marginalibus distincte anastomosantibus. Foliolum terminale ellipticum basi rotundato ad subcordato apice acuminato; folioli laterales fere symmetrici. Inflorescentia pseudo-paniculata, bracteis 5–11 mm longis 4–12 mm latis, bracteolis 1–2 mm sub calyce insertis. Calyx puberulus, tubo 2.5–3 mm longo 2.5–3 mm diam., lobis triangularibus 0.75–1.5 mm longis, lobo dorsalis distincte emarginato. Antherae uniformes 0.3–0.7 mm longae. Nectarium 10-lobatum glabrum. Legumina n.v. — Typus: *S 45351 (Bernard Lee)*, Sarawak (L, holo).

Climber. *Stem* not hollow, brown pubescent, with elongated lenticels, conspicuous and large in older specimens. Exudate not known. Bark smooth. *Leaves*. Rachis (2–) 3.5–9 cm, the ultrajugal part 0.5–2 cm. Stipules 13–18 by 5–8 mm, persistent, puberulous,with many veins visible. Pulvinus 7–10 by 2–3 mm, puberulous. Stipellae (4–)8 mm, not caducous. Petiolule 4–10 by 1.5–3 mm, puberulous. Terminal leaflet 7–15 by 3–12 cm, elliptic, top acuminate, mucronate, base rounded to slightly cordate. Lateral leaflets ± symmetric. Upper surface glaucish, sparsely pubescent to glabrous, lower surface brown, puberlous. Main nerve prominent above, main and secondary nerves raised at lower surface. Secondary nerves 9–11 pairs, terminating in marginal arches. Angle of the secondary nerves with the main nerve 50–65°. Venation reticulate. *Inflorescence*. Main axis with side branches and fascicles, light brown puberulous. Side branches with one bract, 5–11 by 4–12 mm. Fascicles with one bract, 5 by 2–4 mm. Fascicles consisting of up to 4 flowers, each with a bract 4 by 0.5 mm. *Flower*. Pedicel 1–2 mm, bracteoles 1 mm, inserted 1–2 mm below the calyx. Calyx cup 2.5–3 by 2.5–3 mm, puberulous. Vexillary lobe 1.25–1.5 by 2–2.5 mm, top deeply emarginate, other lobes 0.75 by 1 mm,

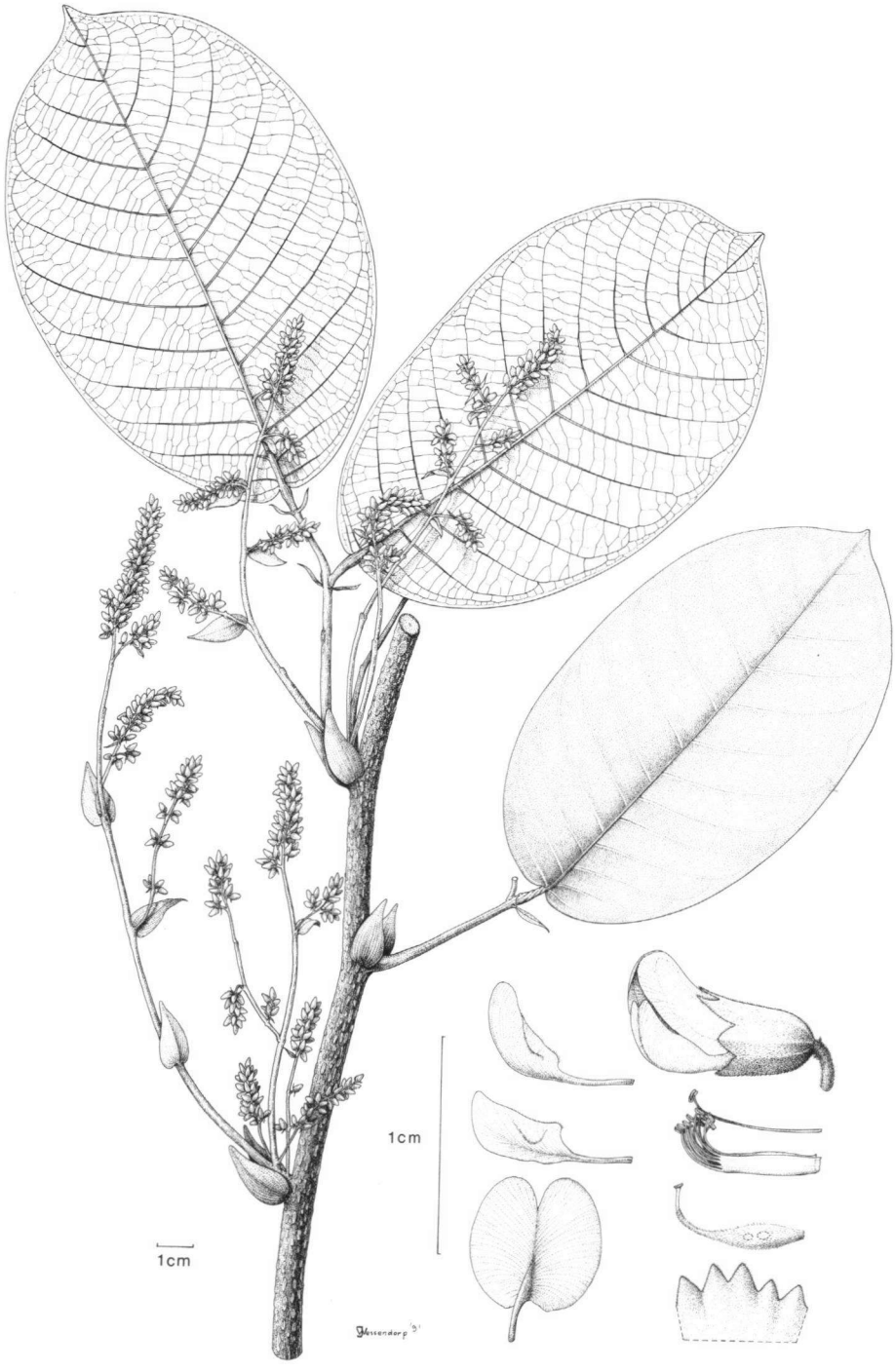

Fig. 1. *Spatholobus latibractea* Ridder-Numan (*S 45351*, L).

triangular. Standard 5 by 5.5 mm, top emarginate, claw 2 mm. Wing 4.5 by 2.5 mm, claw 3.5 mm, with a lateral pocket and sometimes hairy at dorsal and ventral part. Keel 4 by 3 mm, claw 3.5 mm, with sometimes hairs at the dorsal margin. Keel petals connate at the apex. Vexillary filament 4–5 mm, other filaments 5–6 and 6–7 mm, 1/2–2/3 part connate. Anthers all equal, 0.3–0.75 mm long. Ovary 3 by 1 mm, densely pubescent up to halfway the style, no stipe, ovules 2, in the middle, style 4 mm, stigma flat. Nectary glands 8–10, glabrous, dark coloured. *Pod* not seen.

Field notes – Woody climber to 13 m high. Stem brown tomentose. Flowers whitish yellow. Young flowers pinkish turning white or whitish green while unopened.

Distribution – Borneo (Sandakan, Sarawak).

Habitat & Ecology – Near stream bank, logged over area, hill side, belukar muda. Black soil. Altitude 1300 m.

Note – The species is characterized by large stipules and bracts. The leaves, stipules, and bracts look very similar to those of *S. persicinus* Ridley and *S. latistipulus*. However, the flower and inflorescence are different. In this species the calyx has very distinct teeth, and the wing and keel petals are sometimes hairy on the outside. The flowers are set in very dense fascicles. This species also resembles *S.viridis*, but it differs in having a browner indument, a larger flower, a clearly two-topped vexillary calyx lobe, and larger and thicker stipules, stipellae and bracts.

5. Spatholobus latistipulus Merr. — Fig. 2

The description of this species is completed by that of the nearly wingless pod. The type material, on which my earlier description was based, consists of leaves and a rather young inflorescence. The additional material contains older flowers and pods. The revised description is as follows :

Spatholobus latistipulus Merr., Pl. Elmer. Born. (1929) 110. — Type: *Elmer 21439* (BO, BR, C, K, L, P, SING, U).

Climber. *Stem* not hollow, glabrous, with small wart-like lenticels. For exudate see below, under field notes. Bark with small ridges, descending from the stipules. *Leaves*. Rachis 6.5–11 cm, the ultrajugal part 1.5–3 cm. Stipules 3 by 1 mm, caducous. Pulvinus 4–7 by 2 mm, glabrous, black. Stipellae 1–2 mm, caducous, probably longer when young. Petiolule 6–8 by 2 mm, glabrous, black. Terminal leaflet c. 9 by 6 cm, elliptic, top abruptly acuminate, mucronate, base rounded. Lateral leaflets slightly asymmetric. Basiscopic side somewhat wider than acroscopic side. Upper surface glaucish, glabrous, lower surface dull brown, glabrous. Main nerve prominent and secondary nerves slightly raised above, all raised below. Secondary nerves c. 7 pairs, terminating diffusely towards the margin. Angle of the secondary nerves with the main nerve c. 55°. Venation reticulate. *Inflorescence*. Main axis with side branches and fascicles, tomentose. Side branches with two bracts, 2.5 by 1 mm. Fascicles on a short stalk with one bract, 2 by 0.25 mm. Fascicles consisting of c. 3 flowers, each with one bract. *Flower*. Pedicel 3–4 mm, bracteoles 1 mm, inserted 0.75 mm below the calyx. Calyx cup c. 2 by 3 mm, sparsely puberulous. Vexillary

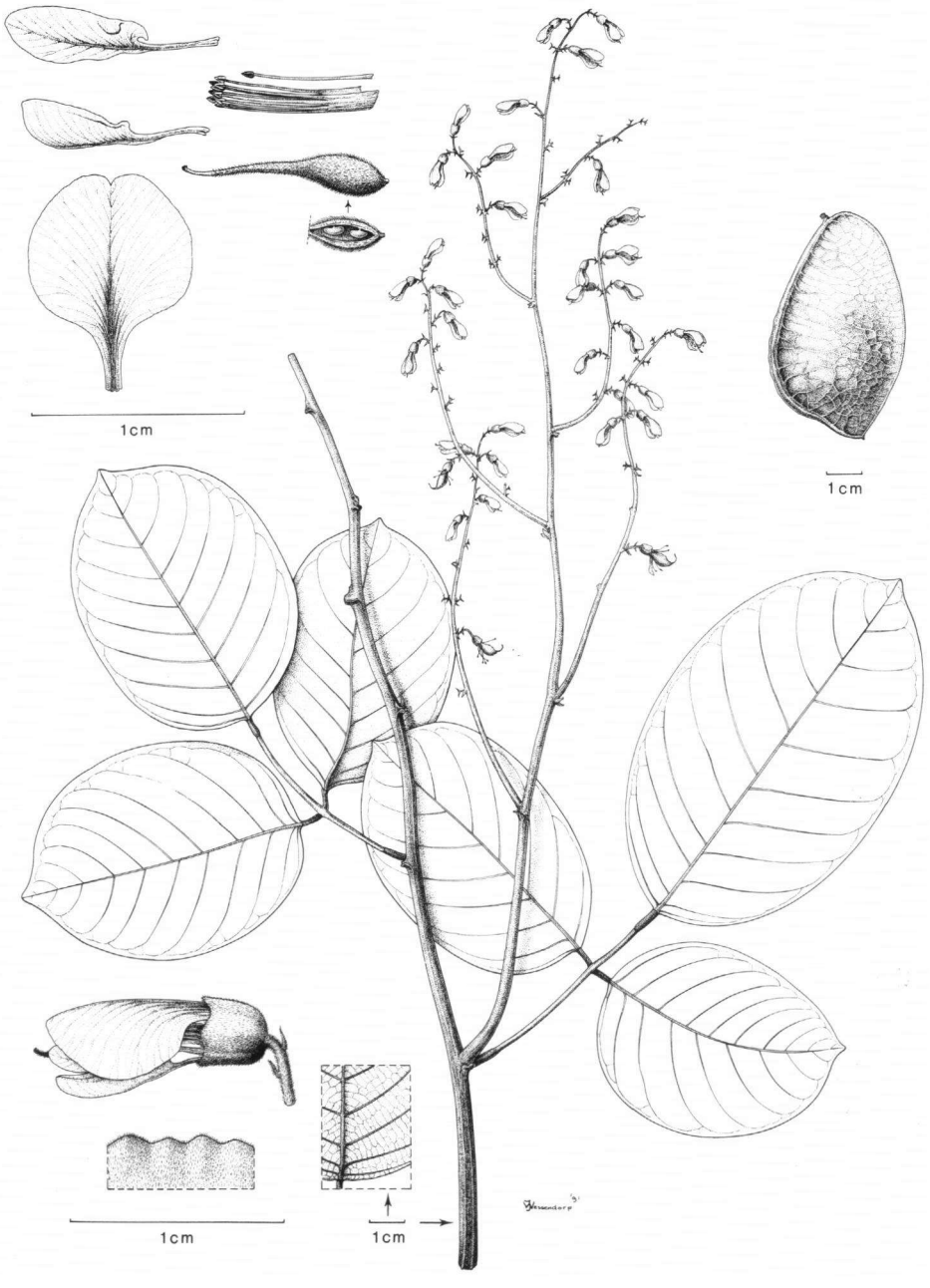

Fig. 2. *Spatholobus latistipulus* Merr. (*Wiriadinata 3397*, L).

lobe 0.25–0.5 by 3 mm, top truncate, other lobes 0.25–0.5 by 1–1.25 mm, rounded truncate. Standard 7 by 8 mm, top emarginate, claw 2 mm, decurrent. Wing 6 by 2 mm, claw 2 mm, with a dorsal auricle and a lateral pocket. Keel 5.5 by 2 mm, claw 1.5 mm, with a dorsal auricle. Keel petals strongly connate at the apex. Vexillary filament 5–6 mm, other filaments 7–8 mm, 1/4 part connate. Anthers all equal, c. 0.75 mm long. Ovary 2 by 1.5 mm, puberulous up to nearly the whole style, stipe 0.5 mm, ovules 2, in the middle, style 6–7 mm, stigma small, capitate. Nectary glands 10, 2 mm high, glabrous, dark coloured. *Pod* c. 6.5 by 4 cm, pubescent, later on glabrescent, stipe 1 mm, wing very short, just extending the seed-bearing part.

Field notes – Liana, stem 25 cm diameter, lenticellate, outer bark brownish, inner bark orangish, latex colourless. Inflorescence a panicle, peduncle green, pedicels red. Flowers white or pink, calyx pink, vexillum pink with green coloured inside. Pod green.

Distribution – North Borneo.

Habitat & Ecology – Primary forest, disturbed Dipterocarp forest. On yellow-brownish stony ridge, sandy loam soil ridge. Altitude up to 450 m.

Vernacular name – Pagota.

6. Spatholobus pottingeri Prain

Only after a first attempt at a phylogenetic analysis I realized that the differences between *S. pottingeri* and *S. varians* are of minor importance, e.g., the pubescence of the inflorescence. *Spatholobus varians*, being the most recent name, is thus synonymous to *S. pottingeri*.

Wei (1985) described four new species, which all resemble each other according to the – detailed Latin – descriptions and the drawings. I was able to study the type specimen of one of the species, *S. biauritus*, which I gratefully received for examination. I consider this species synonymous with *S. pottingeri*. This resulted in the following list of synonyms:

Spatholobus pottingeri Prain, J. As. Soc. Beng. 67, 2 (1898) 286; Ridder-Numan & Wiriadinata, Reinwardtia 10 (1985) 190. — *Butea pottingeri* (Prain) Blatter, J. Ind. Bot. Soc. 8 (1929) 137 — Type: *Pottinger s.n.* (K).

Spatholobus varians Dunn, J. Linn. Soc. 35 (1903) 490. — *Butea varians* (Dunn) Blatter, J. Ind. Bot. Soc. 8 (1929) 138; Ridder-Numan & Wiriadinata, Reinwardtia 10 (1985) 196. — Types: *Henry 11771A* (E, K, L lecto), *Henry 1177 B* (E, K syn), *Henry 11771C* (K syn).

Spatholobus balansae Gagnep., Not. Syst. 2 (1911) 368. — *Butea balansae* (Gagnep.) Blatter, J Ind. Bot. Soc. 8 (1929) 135. — Type: *Balansa 3141* (K, P).

Spatholobus spirei Gagnep., Not. Syst. 2 (1911) 370. — *Butea spirei* (Gagnep.) Blatter, J. Ind. Bot. Soc. 8 (1929) 137. — Type: *Spire 1067* (P).

Spatholobus biauritus Wei, Bull. Bot. Res. N.-E. Forest Inst. 5 (2) (1985) 51, 58. — Type: *M.K. Li 3268*, Yunnan, Ching-dong, 11-04-1940 (SCBI).

7. Spatholobus sanguineus Elmer

Spatholobus sanguineus Elmer, Leafl. Philipp. Bot. 8 (1910) 3087; Merr., Enum. Philipp. 2 (1923) 310. — *Butea sanguinea* (Elmer) Blatter, J. Ind. Bot. Soc. 8 (1929) 137. — Types: *Elmer 17560* (C, K, L, U, lecto), *18250* (C, K, L, syn).

Because there is more material available than at the time of the revision it is now obvious that *Spatholobus sanguineus* differs from *S. gyrocarpus*. In *S. sanguineus*, the inflorescences are without fascicles, and the leaflets have an acuminate to caudate apex and a yellowish-brown pubescence. The leaflets of *S. gyrocarpus* are coarser and the flowers are arranged in fascicles.

Climber. *Stem* hollow or not, yellowish-brown tomentose or pubescent, lenticels elongated, not conspicuous. For exudate see below, under field notes. Bark smooth. *Leaves*. Rachis 6–18 cm long, the ultrajugal part (0.2–)2–4.5 cm. Stipules 7–12 by 4–7 mm, caducous, triangular, yellowish-brown pubescent, nerves not visible. Pulvinus 7–10 by 2–4 mm, yellowish-brown pubescent. Stipellae (2–)4–8 mm, caducous. Petiolule 4–8 by 1.5–2.5 mm, yellowish-brown pubescent. Terminal leaflet 11–17 by 4.5–11 cm, (obovate-)elliptic to ovate, top acuminate to caudate, mucronate, base acute to rounded. Lateral leaflets asymmetric. Basiscopic side ovate, acroscopic side elliptic. Upper surface glabrescent, lower surface yellowish-brown tomentose-strigose. Main nerve prominent at upper surface, main and secondary nerves and venation raised below. Secondary nerves 6–11 pairs, terminating near the marginal nerve into each other. Angle of the secondary nerves with the main nerve 30–45°. Venation reticulate-scalariform. *Inflorescence*. Main axis with side and tertiary branches, yellowish pubescent. Side branches with two bracts, 5–9 by 2–4 mm. Tertiary branches with one bract, 3–6 by 0.5–2 mm. Flowers each with one bract, c. 1–2 mm long. *Flower*. Pedicel 1–1.5 or 0.25–0.5 mm, bracteoles 0.5–1 mm, inserted immediately below the calyx. Calyx cup 1.5–2 by 1.5–2.5 mm or 1–1.5 by 1–1.5 mm, puberulous. Vexillary lobe 1–1.5 by 1.5–2 mm or 1 by 0.75 mm, top emarginate, other lobes 0.75–1 by 1–1.25 mm or 1–0.75 by 0.5–0.75 mm, triangular, acuminate. Standard 2.5–3.5 by 3–4.5 mm or 1.5–2 by 2.5–3.5 mm, top emarginate, claw 0.5–1.25 by 0.25–0.5 mm or 0.25–1 by 0.25 mm, obtuse or decurrent. Wing 2.5 by 1.5 mm or 1.5–2 by 0.5–1 mm, claw 1.5–2.5 mm or 0.5–1 mm, with a dorsal auricle, and a lateral pocket. Keel 2–2.5 by 1–1.5 mm or 1.5–0.75 by 1 mm, claw 1.5–2 mm or 1–1.5 mm, sometimes with a small dorsal auricle, always a lateral pocket, petals connate at the apex. Vexillary filament 2–3 mm, other filaments 2–3 and 3–4.5 mm, up to about 1/3 connate. Anthers alternately fertile and sterile, fertile anthers 0.25 mm long. Ovary 2 by 0.5 mm or 0.75–1 by 0.5 mm, sparsely pubescent, no stipe, ovules 2, in the middle, style 2 mm or 1–1.5 mm, glabrous, stigma small capitate. Nectary glands 5, 0.3 mm, glabrous, only at the foot of the fertile stamina. *Pod* 4–8 by 1.2–2.5 cm, yellowish-brown pubescent, no stipe.

Field notes – Woody climber reaching the canopy. Bark pale reddish brown to brownish. Inner bark light reddish brown. Sapwood soft, sap translucent turning reddish on exposure, sticky, pale brown to yellow brown. Twigs and flowers brown hairy. Flowers pale yellow, yellow green, or dark red. Fruit translucent, greenish.

Distribution – Philippines: Luzon, Leyte; Borneo: Sabah, E Borneo (Berau).

Habitat & Ecology – Primary forest, montane Dipterocarp forest, logged-over area, roadside, slopes of the hill near stream, along river. Altitude from less than 30 m up to 1100 m.

Note – The specimens from the Philippines are slightly different from those of Borneo. The flowers from the Philippine specimens are larger and the tip of the pod

is wider than it is in the material from Borneo. In the description the larger flower-measures are given first.

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Stevens, P.F. 1991. Character states, morphological variation, and phylogenetic analysis: a review. Syst. Bot. 16: 553–583.

IDENTIFICATION LIST

This list includes the material used for this article. Some specimens listed in the revision (Ridder-Numan & Wiriadinata, 1985) are not included here.

Spatholobus
1. *acuminatus*
2. *apoensis*
3. *hirsutus*
4. *latibractea*
5. *latistipulus*
6. *pottingeri*
7. *sanguineus*

Amdjah (exp. Nieuwenhuis) 404: 3.
Balansa 3141: 6 — Beaman 7042: 7 — Beccari 2723 (P.B.): 2 — BKF series 37401: 6.
Chew Wee Lek 1081: 7 — Clemens s.n. (Aug./Sep. 1931): 3 — Cuming 945: 7.
Elmer 9337: 7; 11795: 2; 13300: 2; 17560: 7; 18250: 7; 19874: 7; 21439: 5 — Endert 5162: 3.
FB series 26840: 7 — Forrest 12251: 6.
Haviland 2897: 2 — Henry 11771A, C, D: 6.
Jaheri (exp. Nieuwenhuis) 948: 3; 1079: 3; 1317: 3; 1440: 3; 1444: 3.
Kato & Wiriadinata B-7001: 3 — Kerr 8744, A, B: 6; 12317: 1 — Kostermans 6586: 5; 13652: 3; 21244: 7.
Li, M.K. 3268: 6.
Maxwell 89-236: 6; 89-246: 6 — Mogea 4085: 3.
Poilane 20341: 6; 20366: 6; 25459: 6 — Pottinger s.n.(Namli, Kachin): 6.
S series: 41420 (Othman Ismawi): 3; 45351 (Bernard Lee): 4 — SAN series 26771 (Mujin): 4; 32504 (Aban Bebop): 7; 37132 (Aban Gibot): 3; 65877: 5; 69888 (Lee & Dewol): 7; 74457: 7; 76943 (Shea & Aban): 3; 77125 (Shea & Aban): 3; 77623 (Dewol & Karim): 7; 83594 (Leopold & Tana): 7; 88852 (Mandani): 7; 95924 (Fedilis Krispinus): 7; 97466 (Amin Gambating): 4; 97540 (Sigin et al.): 7; 100240 (Amin & Good): 7; 110263 (Sumbing Jimpin): 4 — Spire 1067: 6.
Thakur Rup Chand 6853a: 6.
van Welzen 878: 3 — Wiriadinata 3397: 5.