

# Studies in Malesian Gentianaceae, V. The *Fagraea* complex in Borneo: New generic assignments and recombinations

K.M. Wong<sup>1</sup>, M. Sugumaran<sup>2</sup> and J.B. Sugau<sup>3</sup>

<sup>1</sup>Herbarium, Singapore Botanic Gardens, National Parks Board,  
1 Cluny Road, Singapore 259569  
wkm2000@gmail.com (corresponding author)

<sup>2</sup>Rimba Ilmu Botanic Garden, Institute of Biological Sciences,  
University of Malaya, 50603 Kuala Lumpur, Malaysia  
maran@um.edu.my

<sup>3</sup>Forest Research Centre, Forestry Department,  
P.O. Box 1407, 90715 Sandakan, Sabah, Malaysia  
John.Sugau@sabah.gov.my

**ABSTRACT.** A new classification of the *Fagraea* complex (Gentianaceae) based on recent molecular studies and taxonomic considerations now recognises the genera *Cyrtophyllum*, *Fagraea* in the strict sense, *Limahlania*, *Picrophloeus*, and *Utania*. The Bornean species of this complex are listed following the new perspective and the remaining necessary new combinations (seven, in *Utania*) are made.

**Keywords.** Borneo, *Cyrtophyllum*, *Fagraea*, Gentianaceae, *Limahlania*, *Picrophloeus*, *Utania*

## Introduction

Wong & Sugau (1996) revised the Bornean species of the *Fagraea* Thunb. complex. In their work, they reviewed a number of species limits that had previously been masked by the broader concepts adopted by Leenhouts (1962b), and revived a number of names that had been enumerated or described by Cammerloher (1923) and others. In addition, a number of species were also newly recognised. Subsequently, Sugumaran & Wong (2012) demonstrated good support from molecular evidence for reasonably clear lineages that could be identified with genera within the *Fagraea* Complex. Their new classification recognised *Cyrtophyllum* Reinw., *Fagraea* (in the strict sense), *Limahlania* K.M.Wong & M.Sugumaran, *Picrophloeus* Blume, and *Utania* G.Don.

## Genera and sections

Of the three sections of *Fagraea* recognised by Leenhouts (1962b), *F.* section *Cyrtophyllum* (Reinw.) Blume (Blume 1838) is considered to have included two distinct groups, which Wong & Sugau (1996) simply referred to as the “*F. fragrans* complex” (axillary inflorescences) and “*F. elliptica* complex” (terminal inflorescences). There are further differences (e.g., plant architecture) and these groups are now recognised as

*Cyrtophyllum* (five species, revised by Wong & Sugumaran 2012b) and *Picrophloeus* (four species: Wong 2012).

All species of *F.* section *Fagraea* (*sensu* Leenhouts 1962b) remain in *Fagraea sensu stricto*, except for *F. crenulata* Maingay ex Clarke which was transferred to the new monospecific genus, *Limahlania* K.M.Wong & M.Sugumaran (Wong & Sugumaran 2012a). The species of *F.* section *Racemosae* Benth. (Bentham 1856), with a rather distinct inflorescence structure in which the elongate panicle bears condensed branches that are much shorter than the rachis (in the other genera of this complex, the basal cyme branches are similar to the rachis in length), are transferred to the genus *Utania* G.Don.

### Taxonomic assignment of Bornean species in the *Fagraea* Complex

Here we outline the generic designation of 43 known Bornean species from the *Fagraea* Complex according to this new classification. Species distributions have been given in the Bornean enumeration of Wong & Sugau (1996) except that of the newly described *Cyrtophyllum minutiflorum* K.M.Wong, in Wong & Sugumaran (2012b).

#### CYRTOPHYLLUM (4 spp.)

*Fagraea caudata* Ridl. = ***Cyrtophyllum caudatum*** (Ridl.) K.M.Wong, Gard. Bull. Singapore 64: 499 (2012).

*Fagraea fragrans* Roxb. = ***Cyrtophyllum fragrans*** (Roxb.) DC., Prodrumus 9: 31 (1845).

*Fagraea gigantea* Ridl. = ***Cyrtophyllum giganteum*** (Ridl.) Ridl., Fl. Malay Penins. 2: 421 (1923).

***Cyrtophyllum minutiflorum*** K.M.Wong, Gard. Bull. Singapore 64: 507 (2012).

#### FAGRAEA (27 spp.)

***Fagraea acutibracteata*** K.M.Wong & Sugau, Sandakania 8: 49 (1996).

***Fagraea auriculata*** Jack, Malayan Misc. 2, 7: 82 (1822).

***Fagraea blumei*** G.Don, Gen. Hist. 4: 69 (1837) (in Don 1838).

***Fagraea borneensis*** Scheff., Flora 52: 309 (1869).

***Fagraea carnosae*** Jack, Malayan Misc. 2, 7: 81 (1822).

***Fagraea dulitensis*** K.M.Wong & Sugau, Sandakania 8: 59 (1996).

***Fagraea floribunda*** K.M.Wong & Sugau, Sandakania 8: 62 (1996).

***Fagraea havilandii*** K.M.Wong & Sugau, Sandakania 8: 64 (1996).

***Fagraea iliasii*** K.M.Wong & Sugau, Sandakania 8: 66 (1996).

***Fagraea involucreata*** Merrill, J. Straits Branch Roy. Asiat. Soc. 77: 233 (1917).

***Fagraea kalimantanensis*** (Leenh.) K.M.Wong & Sugau, Sandakania 8: 69 (1996).

***Fagraea kinabaluensis*** K.M.Wong & Sugau, Sandakania 8: 69 (1996).

***Fagraea kuminii*** K.M.Wong & Sugau, Sandakania 8: 71 (1996).

- Fagraea littoralis* Blume var. *borneensis* K.M.Wong & Sugau, Sandakania 8: 73 (1996).
- Fagraea longipetiolata* K.M.Wong & Sugau, Sandakania 8: 75 (1996).
- Fagraea macroscypha* Baker, Kew Bull.: 25 (1896).
- Fagraea megalantha* K.M.Wong & Sugau, Sandakania 8: 77 (1996).
- Fagraea oblonga* King & Gamble, J. Asiat. Soc. Bengal 74, 2: 612 (1908).
- Fagraea oreophila* K.M.Wong & Sugau, Sandakania 8: 78 (1996).
- Fagraea rarissima* K.M.Wong & Sugau, Sandakania 8: 82 (1996).
- Fagraea renae* K.M.Wong & Sugau, Sandakania 8: 82 (1996).
- Fagraea resinosa* Leenh., Bull. Jard. Bot. État Bruxelles 32: 429 (1962a).
- Fagraea ridleyi* King & Gamble, J. Asiat. Soc. Bengal 74, 2: 612 (1908).
- Fagraea splendens* Blume, Mus. Bot. 1: 168 (1850).
- Fagraea stonei* K.M.Wong & Sugau, Sandakania 8: 88 (1996).
- Fagraea tuyukii* K.M.Wong & Sugau, Sandakania 8: 90 (1996).
- Fagraea* sp. A., K.M.Wong & Sugau, Sandakania 8: 92 (1996).

## LIMAHLANIA (1 sp.)

- Fagraea crenulata* Maingay ex Clarke in Hooker f., Fl. Brit. India 4 (1883) 83 = *Limahlania crenulata* (Maingay ex Clarke) K.M.Wong & M.Sugumaran, Gard. Bull. Singapore 64: 492 (2012).

## PICROPHLOEUS (4 spp.)

- Fagraea belukar* K.M.Wong & Sugau = *Picrophloeus belukar* (K.M.Wong & Sugau) K.M.Wong, Gard. Bull. Singapore 64: 513 (2012).
- Fagraea collina* K.M.Wong & Sugau = *Picrophloeus collinus* (K.M.Wong & Sugau) K.M.Wong, Gard. Bull. Singapore 64: 514 (2012).
- Fagraea elliptica* auctt. incl. Wong & Sugau, Sandakania 8 (1996) 21 = *Picrophloeus javanensis* Blume, Bijdr. Fl. Ned. Ind. 16: 1020 (1826).
- Fagraea rugulosa* K.M.Wong & Sugau = *Picrophloeus rugulosus* (K.M.Wong & Sugau) K.M.Wong, Gard. Bull. Singapore 64: 520 (2012).

## UTANIA (7 spp.)

- Fagraea cuspidata* Blume, Mus. Bot. 1: 170 (1850); Wong & Sugau, Sandakania 8: 28, f. 9 (1996) = *Utania cuspidata* (Blume) K.M.Wong, M.Sugumaran & Sugau, **comb. nov.**  
TYPE: *Blume*, s.n., Borneo, Tanjong Java (iso L).
- Fagraea montana* K.M.Wong & Sugau, Sandakania 8: 31, f. 10 (1996) = *Utania montana* (K.M.Wong & Sugau) K.M.Wong, M.Sugumaran & Sugau, **comb. nov.**  
TYPE: *Aban SAN 50722*, Sabah, Ranau, Mamut, copper mining area (holo SAN; iso K, L).
- Fagraea philippinensis* K.M.Wong & Sugau, Sandakania 8: 35, f. 12 (1996) = *Utania philippinensis* (K.M.Wong & Sugau) K.M.Wong, M.Sugumaran & Sugau, **comb. nov.**  
TYPE: *Ahern's Coll. For. Bur. 3270*, Philippines, Luzon, Rizal (holo K).

- Fagraea spicata* Baker, Kew Bull. (1896) 25; Wong & Sugau, Sandakania 8: 38 (1996) = *Utania spicata* (Baker) K.M.Wong, M.Sugumaran & Sugau, **comb. nov.**  
TYPE: *Creagh*, s.n., British North Borneo, east coast (holo K).
- Fagraea stenophylla* Becc. ex Merrill, J. Straits Branch Roy. Asiat. Soc. 77: 236 (1917); Wong & Sugau, Sandakania 8: 38, f. 13 (1996) = *Utania stenophylla* (Becc. ex Merrill) K.M.Wong, M.Sugumaran & Sugau, **comb. nov.**  
TYPE: *Native Coll. Bur. Sci.* 2828, Sarawak, Upper Baram, Selungo (iso A, UC).
- Fagraea teysmannii* Cammerloher, Bull. Jard. Bot. Buitenzorg, ser. 3, 5: 314, f. 3 (1923); Wong & Sugau, Sandakania 8 (1996) 40 = *Utania teysmannii* (Cammerloher) K.M.Wong, M.Sugumaran & Sugau, **comb. nov.**  
TYPE: *Teysmann*, s.n., Karimata, Soengai Tajan (lecto L; chosen by Wong & Sugau 1996).
- Fagraea volubilis* Wall. in Roxb., Fl. Ind. 2: 36 (1824); Wong & Sugau, Sandakania 8: 40 (1996) = *Utania volubilis* (Wall.) M.Sugumaran, Gard. Bull. Singapore 64: 493 (2012).  
TYPE: *Jack*, E. Bencoolen (sheet marked "1600. E. Bencoolen" on bottom left) (holo K-W).
- Fagraea volubilis* var. *microcalyx* K.M.Wong & Sugau, Sandakania 8: 43, f. 14 (1996) = *Utania volubilis* var. *microcalyx* (K.M.Wong & Sugau) K.M.Wong, M.Sugumaran & Sugau, **comb. nov.**  
TYPE: *Burley, Tukirin et al.* 372, Kalimantan, 5 km NE of Haruwu village (holo KEP; iso A, BO).

ACKNOWLEDGEMENTS. We thank the Keepers and Curators of the A, BO, K, KEP, KLU, L, NY, US, SAN, SAR and SING herbaria for permission to consult reference materials and loans of specimens.

## References

- Baker, J.G. (1896) Decades Kewensis. Plantarum novarum in Herbario Horti Regii Conservatarum. Decas XXIII–XXV. *Kew Bull.* (1896): 16–26.
- Bentham, G. (1856) Notes on Loganiaceae. *J. Linn. Soc., Bot.* 1: 52–114.
- Blume, C.L. (1826) *Bijdragen tot de Flora van Nederlandsch Indië*. Part 14, pp. 731–850; Part 16, pp. 943–1066. Batavia: Lands Drukkerij.
- Blume, C.L. (1838) *Rumphia*. Vol. 2. 176 pp., 105 pl. Amstelodam: C.G. Sulpke.
- Blume, C.L. (1850) *Museum Botanicum Lugduno-Batavum*. Vol. 1. 396 pp., 59 fig. Lugduni-Batavorum: E.J. Brill.
- Cammerloher, H. (1923) Die Loganiaceen und Buddleiaceen Niederländisch-Indiens. *Bull. Jard. Bot. Buitenzorg*, ser. III 5(4): 295–338.
- Candolle, A.L.P.P. de (1845) *Prodromus Systematis Naturalis Regni Vegetabilis*. Vol. 9. 573 pp. Paris: Sumptibus Sociorum Treuttel et Würtz.
- Don, G. (1838) *A General System of Gardening and Botany*. Vol. 4. viii + 908 pp. London: J.G. & F. Rivington, etc.

- Hooker, J.D. (1883) *The Flora of British India*. Vol. 4. 780 pp. London: L. Reeve & Co.
- Jack, W. (1822) *Descriptions of Malayan Plants*. Malayan Miscellanies 2(7). iii + 96 pp. Bencoolen: Sumatran Mission Press.
- King, G. & Gamble, J.S. (1908) Materials for a Flora of the Malayan Peninsula. *J. Asiat. Soc. Bengal* 74(2): 603–612.
- Leenhouts, P.W. (1962a) Notes on some species of *Fagraea* Thunb. *Bull. Jard. Bot. État Bruxelles* 32: 418–458.
- Leenhouts, P.W. (1962b) Loganiaceae. In: Steenis, C.G.G.J. van (ed) *Flora Malesiana*. Series 1, vol. 6. Pp. 293–336. Groningen: Wolters-Noordhoff Publishing.
- Merrill, E.D. (1917) Alabastra Borneensia. *J. Straits Branch Roy. Asiat. Soc.* 77: 189–247.
- Ridley, H.N. (1923) *The Flora of the Malay Peninsula*. Vol. 2. vi + 672 pp. London L. Reeve & Co.
- Roxburgh, W. (1824) *Flora indica; or, Descriptions of Indian plants*. Vol. 2. 583 pp. Serampore: Mission Press.
- Scheffer, R.H.C.C. (1869) Observationes phytographicae. *Flora; oder, (allgemeine) botanische Zeitung* 52: 305–310.
- Sugumaran, M. & Wong, K.M. (2012) Studies in Malesian Gentianaceae, I. *Fagraea* sensu lato—complex genus or several genera? A molecular phylogenetic study. *Gard. Bull. Singapore* 64(2): 301–332.
- Wong, K.M. (2012) Studies in Malesian Gentianaceae, IV. A revision of *Picrophloeus*. *Gard. Bull. Singapore* 64(2): 511–522.
- Wong, K.M. & Sugau, J.B. (1996) A revision of *Fagraea* (Loganiaceae) in Borneo, with notes on related Malesian species and 21 new species. *Sandakania* 8: 1–93.
- Wong, K.M. & Sugumaran, M. (2012a) Studies in Malesian Gentianaceae, II. A taxonomic framework for the *Fagraea* complex, including the new genus *Limahlania*. *Gard. Bull. Singapore* 64(2): 481–495.
- Wong, K.M. & Sugumaran, M. (2012b) Studies in Malesian Gentianaceae, III. *Cyrtophyllum* reapplied to the *Fagraea fragrans* alliance. *Gard. Bull. Singapore* 64(2): 497–510.