

## REVISION OF MILLETTIA SECTION TRUNCATICALYCES (LEGUMINOSAE–PAPILIONOIDEAE)

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### SUMMARY

A revision of *Millettia* sect. *Truncaticalyces* is presented. Five species are recognized. A key to the species and an identification list are included.

**Key words:** *Millettia*, section *Truncaticalyces*, Africa.

### INTRODUCTION

*Millettia* was described by Wight & Arnott (1834: 263) to accommodate two new species: *M. rubiginosa* Wight & Arn. and *M. splendens* Wight & Arn. Since then many species have been added to this genus. Dunn (1912) accepted 127 species in 15 sections. Geesink (1981, 1984) transferred several sections to other genera and united *Pongamia* Vent. with *Millettia* sect. *Fragiliflorae*. In the following treatment sect. *Truncaticalyces* of the genus will be revised. The species of sect. *Truncaticalyces* are found in various habitats in Central and West tropical Africa. Some *Millettia* species are extensively grown in tropical Africa as shade and ornamental trees along roads. Besides timber and ornamental flowers, the genus in general provides other useful products. Certain species in both Africa and Asia are known to native fishermen for a chemical substance (rotenone) in wood, fruits, etc. which has properties to stupefy or kill fish. For example, *M. ferruginea* (Hochst.) Baker is widely known as a fish poison. Similar compounds are found in *Derris*, *Lonchocarpus* and *Paraderris*. The stems of many *Millettia* species are used in Chinese herbal medicines.

### TAXONOMIC TREATMENT

#### MILLETTIA

*Millettia* Wight & Arn. (1834) 263, nom. cons.; Benth. (1852) 247; Baker (1879) 104; Taub. (1894) 270; Dunn (1912) 123; Baker f. (1929) 216; O.N. Allen & E.K. Allen (1981) 435; R. Geesink (1981) 257; (1984) 102. — *Millettia* Wight & Arn. sect. *Typicae* Dunn (1912) 134. — Lectotype (Hutchinson, 1964): *Millettia rubiginosa* Wight & Arn.

Trees, shrubs or lianas, or rarely semi-herbaceous plants with a woody rootstock. *Leaves* imparipinnate, rarely pinnately trifoliolate; petiole with a pulvinus; stipules present, caducous; stipellae present or absent. *Leaflets* entire, opposite to alternate, secondary

nerves not reaching the margin. *Inflorescences* axillary or terminal, racemose, often pseudoracemes. *Bracts* present, caducous; bracteoles present, often caducous. *Calyx* truncate or with short teeth (up to 1.5 mm long), or divided up to two-thirds of its length. *Corolla*: standard with or without basal callosities, rarely with auricles; wings adhering to the keel petals; keel petals slightly shorter than the wings, usually with lateral pockets. *Stamens* mon- or diadelphous, in the former case with basal fenestrae; filaments not widened at the apex; anthers all equal, fertile, basi- or dorsifixed, usually glabrous. *Disc* inconspicuous to annular, or 10-lobed and adnate to the hypanthium. *Ovary* (sub)sessile to stipitate, with (2 or) 3–11 ovules; style straight or incurved at apex; stigma terminal, small, discoid. *Pods* strap- or ‘club’-shaped, dehiscent. *Seeds* flattened ellipsoid, hilum central.

Distribution — Circa 200 species in tropical and subtropical Africa, Asia into the Pacific.

### Section TRUNCATICALYCES

Section *Truncaticalyces* Dunn (1912) 137; Baker f. (1929) 221. — Lectotype (here designated): *Milletia macrophylla* Benth.

Trees or lianas. *Stems* lenticellate, hollow or not. *Leaflets* opposite. *Stipellae* absent. *Inflorescences* axillary, pseudoracemes. *Calyx* truncate or with up to 1.5 mm long, broad triangular teeth. *Petals* glabrous or sericeous outside at the apex; standard without callosities or auricles. *Ovules* 4–8.

Note — For a key to the sections see Dunn (1912) and Baker (1929).

#### KEY TO THE SPECIES

- 1a. Lianas. Twigs hollow or not . . . . . 2
- b. Trees. Twigs hollow. . . . . 3
- 2a. Twigs hollow. Leaves with 5–8 pairs of leaflets. Lower surface of leaflets velutinous, upper surface sericeous. Standard golden sericeous at apical margins. Keel petals outside golden sericeous in apical part . . . . . **1. *M. aboensis***
- b. Twigs not hollow. Leaves with 2–6 pairs of leaflets. Lower surface of leaflets scabrous, upper surface glabrous. Standard glabrous. Keel petals glabrous . . . . . **4. *M. psilopetala***
- 3a. Lower surface of leaflets sericeous or thinly strigose. Standard outside golden sericeous in apical part. Keel petals outside golden sericeous in apical part. Stamens monadelphous . . . . . 4
- b. Lower surface of leaflets with few appressed, scattered hairs. Standard glabrous. Keel petals glabrous. Stamens diadelphous . . . . . **5. *M. thonneri***
- 4a. Leaves with 7–11 pairs of leaflets. Lower surface of leaflets sericeous . . . . . **3. *M. mannii***
- b. Leaves with 2–6 pairs of leaflets. Lower surface of leaflets strigose . . . . . **2. *M. macrophylla***

**1. *Millettia aboensis*** (Hook. f.) Baker — Fig. 1, 2a, b, 3a–e

*Millettia aboensis* (Hook. f.) Baker (1871) 130; Dunn (1912) 214; Baker f. (1929) 236; Hepper (1958) 505. — *Millettia macrophylla* Benth. var. *aboensis* Hook. f. in Hook. f. & Benth. (1849) 319. — Lectotype (here designated): *Ansell 360* (holo K; iso K), Nigeria, 1841.

Lianas up to 9 m high. *Twigs* hollow, brown velutinous. *Leaves* with 5–8 pairs opposite leaflets. *Petiole* 3.5–8 cm long, brown velutinous; rachis 13–20 cm long, brown velutinous; pulvinus 0.5–1 cm long, strigose. *Stipules* linear-ovate, 6–9 by 1–3 mm, sericeous. *Leaflets*: terminal narrowly obovate, 8.5–15 by 3–5 cm, index 1.9–3.4, base cuneate, apex acuminate, acumen 0.2–0.6 cm long, upper surface brown strigose, lower surface brown velutinous, midrib and nerves flat above, main nerves 9 or 10 pairs per side, 8–15 mm apart, nervation reticulate; lateral mostly as the terminal, (broadly) ovate, 3.5–9 by 2.2–4.5 cm, index 1.4–3, base broadly cuneate or rounded, main nerves 6–9 per side, 6–9 mm apart; pulvinus 0.4–0.7 cm long, brown strigose. *Inflorescences* 16–54 cm long, brown strigose, peduncle up to 16 cm long, brown strigose; brachyblasts 15 to many, c. 12-flowered. *Bracts* to the inflorescence linear-ovate, c. 6 by 2 mm; other bracts ± similar, triangular, c. 4 by 2 mm, outside brown velutinous, inside glabrous. *Pedicels* 6–10 mm long, brown velutinous. *Bracteoles* caducous. *Calyx* 7–8 mm long, truncate, outside brown velutinous, inside glabrous. *Corolla* purple. *Standard*: claw 3–9 mm long; blade ovate to broadly obovate, 15–24 by 10–20 mm, apex emarginate, mostly glabrous, golden sericeous at apical margins. *Wings*: claw 6–12 mm long; blade obliquely obovate, 13–18 by 4–5 mm, upper auricle conspicuous, apex obtuse, glabrous. *Keel petals*: claw 6–12 mm long; blade hatchet-shaped, 12–16 by 5–6 mm, upper auricle inconspicuous, lateral pocket 5–10 mm long, apex obtuse, mostly glabrous, outside golden sericeous in apical part. *Stamens* monadelphous, tube 12–23 mm long, glabrous, free part of filaments 5–7 mm long, curved, glabrous; anthers 1–1.3 by 0.6–1 mm, glabrous. *Ovary* 14–22 mm long, sericeous; ovules 6; style 4–8 mm long, strigose near the base, glabrous above, curved. *Pods* strap- or ‘club’-shaped, flattened, 9–15 by 0.8–2.2 cm, dark brown velutinous.

Distribution — Nigeria, Cameroon.

Habitat & Ecology — Secondary forest. Altitude 50 m (from 1 record). Flowering: June to February; fruiting: August to February.

**2. *Millettia macrophylla*** Benth. — Fig. 2c, d

*Millettia macrophylla* Benth. (1848) 788, 789; Hook. f. in Hook. f. & Benth. (1849) 318, t. 32, 33; Baker (1871) 127; Harms (1909) 68; Dunn (1912) 212; Baker f. (1929) 236; Hepper (1958) 505. — *Millettia hookeriana* Taub. (1894) 271. — Lectotype (here designated): *Vogel 117* (holo K; iso K), Nigeria, 1841.

Tree up to 12 m high. *Twigs* hollow, brown strigose. *Leaves* with 2–6 pairs opposite leaflets. *Petiole* 2–12.7 cm long, thinly brown strigose, grooved; rachis as the petiole, 5.2–40 cm long; pulvinus 1–1.5 cm long, scabrous. *Stipules* caducous. *Leaflets*: terminal (narrowly) obovate, 8.4–19.5 by 4–9.5 cm, index 1.9–3, base (broadly) cuneate, apex acuminate, acumen 3–10 mm long, upper surface glabrous, lower surface brown strigose, midrib and nerves raised in a furrow or ± flat above, main nerves 6–11 per side, 12–25 mm apart, nervation reticulate; lateral mostly as the terminal, obovate, 6.7–23 by 3–8.6 cm, index 1.3–2.8, base (broadly) cuneate; pulvinus 5–8 mm long, glabrous.



Fig. 1. *Millettia aboensis* (Hook.f.) Baker. a. Habit; b. flower; c. standard from inside; d. standard from outside; e. wing from outside; f. keel petal from outside; g. stamens; h. pistil; i. pod; j. seed (all: Ansell 360).

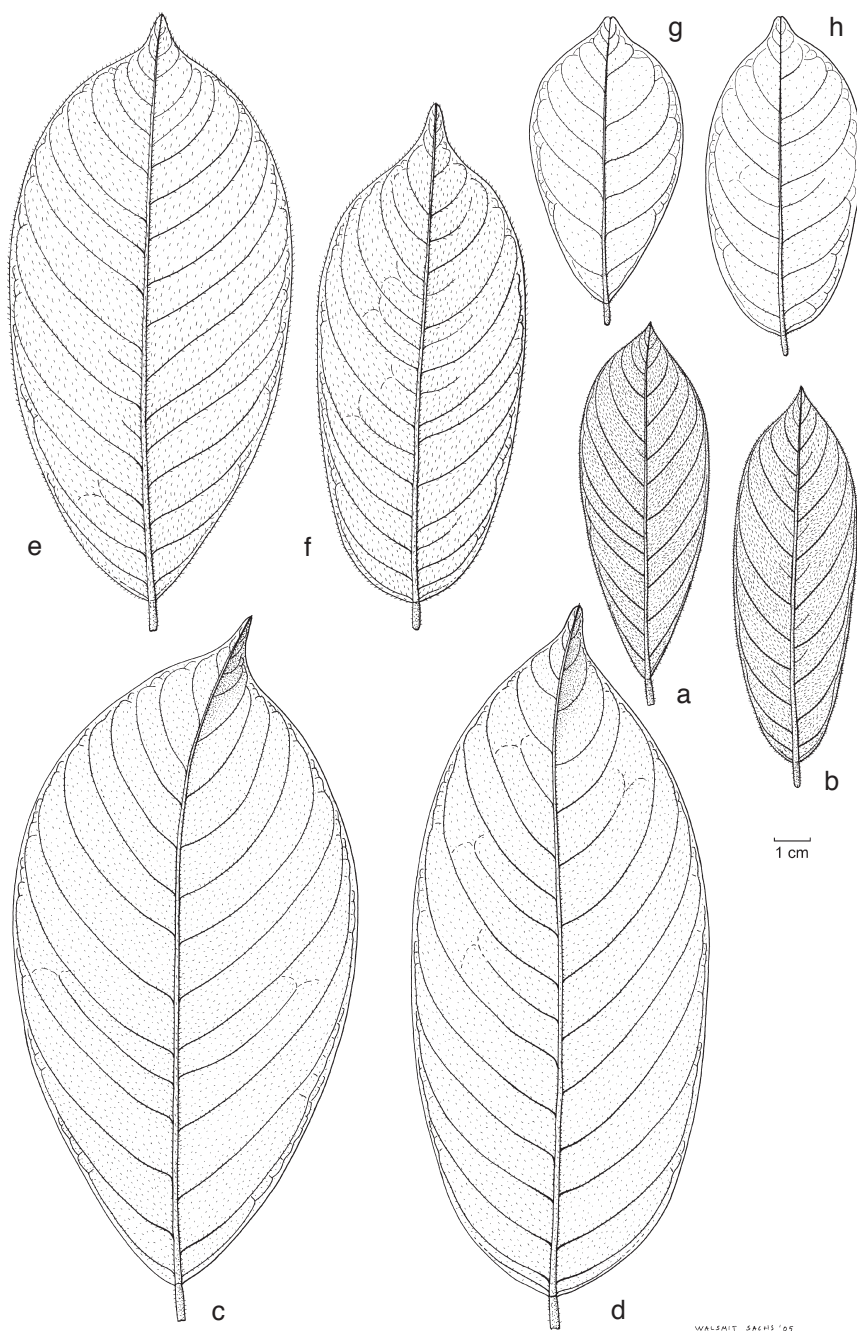


Fig. 2. *Millettia* Wight & Arn. sect. *Truncaticalyces* Dunn. Leaflets from below: a, c, e, g: terminal; b, d, f, h: lateral. a, b. *M. aboensis* (Hook.f.) Baker; c, d. *M. macrophylla* Benth.; e, f. *M. mannii* Baker; g, h. *M. thonneri* De Wild. (a, b: Ansell 360; c, d: Carvalho 10341; e, f: Champluvier 5110; g, h: Thonner 268).

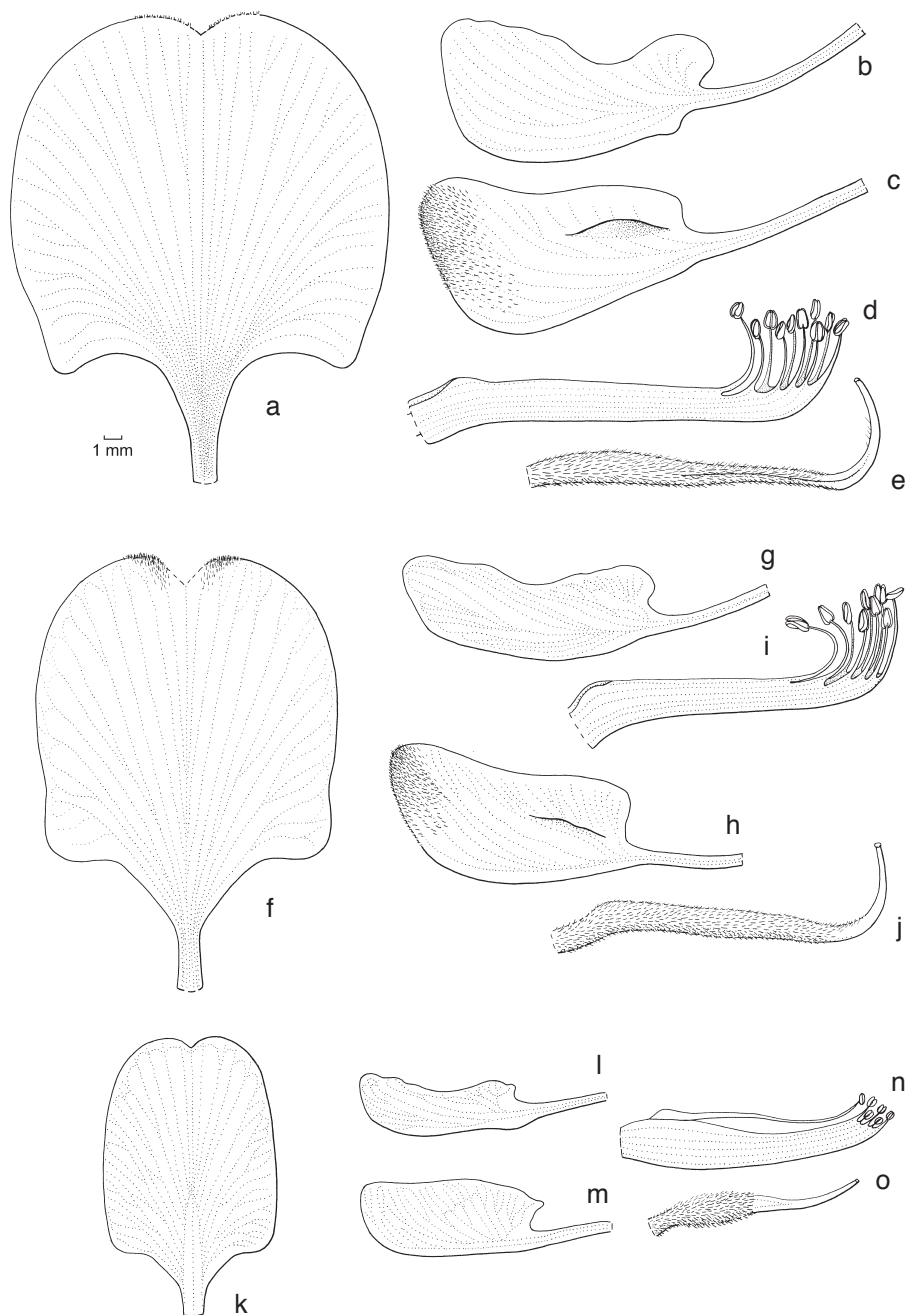


Fig. 3. *Millettia* Wight & Arn. sect. *Truncaticalyces* Dunn. Corolla parts, stamens and pistil of: a–e. *M. aboensis* (Hook.f.) Baker; f–j. *M. mannii* Baker; k–o. *M. thonneri* De Wild. a, f, k. standard from outside; b, g, l. wing from outside; c, h, m. keel petal from outside; d, i, n. stamens; e, j, o. pistil (a–e: Ansell 360; f–j: Champluvier 5110; k–o: Thonner 268).



*Inflorescences* 3–35 cm long, brown strigose, peduncle 3–15 cm long, brown strigose; brachyblasts 9–30, c. 8-flowered. *Bracts* to the inflorescence caducous; other bracts  $\pm$  similar, semi-circular, 1–2 by 0.8–1.8 mm, outside brown sericeous, inside glabrous. *Pedicels* 3–6 mm long, brown sericeous. *Bracteoles* at top of pedicel,  $\pm$  triangular to semi-circular, 1–1.2 by 0.8–1.1 mm, outside brown sericeous, inside glabrous. *Calyx* 3–8 mm long, truncate or with 0.3–0.5 mm long, broad-triangular teeth, outside brown sericeous, inside glabrous. Corolla violet to purple. *Standard*: claw 3–5 mm long; blade broadly ovate or broadly obovate, 13–18 by 6–15, apex retuse, mostly glabrous, outside golden sericeous in apical part. *Wings*: claw 3–9 mm long; blade obliquely ovate or obovate, 11–17 by 4–5 mm, upper auricle conspicuous, apex obtuse, glabrous. *Keel petals*: claw 4–10 mm long; blade hatchet-shaped, 10–14 by 4–5 mm, lateral pocket 5–7 mm long, apex obtuse, mostly glabrous, outside brown to golden sericeous in apical part. *Stamens* monadelphous, tube 10–15 mm long, glabrous, free part of filaments 3–5 mm long, curved, glabrous; anthers 1.1 by 0.5 mm. *Ovary* 8–15 mm long, golden sericeous; ovules 4; style 5 mm long, curved, strigose at base, glabrous above. *Pods* ‘club’-shaped, flattened, 12–15 by 3 cm, brown sericeous. *Seeds* flattened ellipsoid, 10 by 10 mm; hilum c. 3 mm long.

Distribution — Nigeria, Cameroon, Equatorial Guinea.

Habitat & Ecology — Mangrove to upland forest. Altitude up to 1100 m. Flowering: June to December; fruiting: September to March.

### 3. *Millettia mannii* Baker — Fig. 2e, f, 3f–j

*Millettia mannii* Baker (1871) 127; De Wild. & T. Durand (1900) 62; (1907) 147; (1911) 323; Dunn (1912) 212; Baker f. (1929) 236; Hepper (1958) 505. — Type: *Mann s.n.* (holo K), 1861.

*Lonchocarpus zenkeri* Taub. (1896) 193. — Type: *Zenker (& Staudt) 100* (holo K), Cameroon, 1896.

*Millettia aboensis* (Hook. f.) Baker var. *glabrescens* Dunn (1912) 214; Baker f. (1929) 236. — Type: *Zenker & Staudt 100* (holo K), Cameroon, Yaunde.

Tree up to 11 m high. Bark smooth, dark brown. *Stems* hollow, brown strigose. *Leaves* with 7–11 pairs opposite leaflets. *Petiole* 5–12 cm long, thinly brown strigose; rachis 16–39 cm long, brown strigose; pulvinus 0.5–1.5 cm long, strigose. *Stipules* caducous. *Leaflets*: terminal (narrowly) ovate, 5.5–17.5 by 2.8–7 cm, index 1.7–2.7, base acute to cuneate, apex acuminate, acumen 3–15 mm long, upper surface scabrous, lower surface sericeous, midrib and nerves sunken, main nerves 6–13 per side, 6–25 mm apart, nervation reticulate; lateral mostly as the terminal, obovate, 3.5–10 by 2.5–5.5 cm, index 1.4–2.5, base (broadly) acute; pulvinus 3–10 mm long, brown strigose. *Inflorescences* 8–47.5 cm long, brown sericeous, peduncle 4–27 cm long, brown sericeous; brachyblasts c. 30, 7–10-flowered. *Bracts* to the inflorescence linear-ovate 5–7 by 1–2 mm, both sides sericeous; other bracts  $\pm$  similar, semi-circular 1–1.5 by 1–1.5 cm, outside brown sericeous, inside glabrous. *Pedicels* 3–4 mm long, brown sericeous. *Bracteoles* at top of pedicel,  $\pm$  triangular to semi-circular, 1–2 mm long, outside sericeous, inside glabrous. *Calyx* 5–7 mm long, truncate, outside brown sericeous, inside glabrous. Corolla red violet to purple. *Standard*: claw 3–8 mm long; blade broadly ovate to broadly obovate, 10–20 by 10–18 mm, apex retuse to emarginate, mostly glabrous, outside golden sericeous in apical part. *Wings*: claw 3–11 mm long; blade obliquely ovate, narrower at the centre or clavate, 13–17 by 2–4 mm, apex

obtuse, upper auricle conspicuous, both sides glabrous. *Keel petals*: claw 3–8 mm long; blade hatchet-shaped, 10–16 by 4–5 mm, apex obtuse, lateral pocket 2–5 mm long, mostly glabrous, outside brown to golden sericeous in apical part. *Stamens* monadelphous, white, purple tinged, tube 10–20 mm long, glabrous, free part of filaments 3–7 mm long, glabrous; anthers pale yellow, 1–1.2 by 0.1–1 mm. *Ovary* 10–22 mm long, golden sericeous; ovule 3–8; style pale green, 3–10 mm long, curved, strigose at base, glabrous above. *Pods* strap- to ‘club’-shaped, ± narrower at base than at apex, flattened, 11–15 by 1.2–2.2 cm, brown sericeous. *Seeds* flattened ellipsoid, 10–13 by 9–13 mm, hilum 1–5 mm long.

Distribution — Cameroon, Gabon, Congo.

Habitat & Ecology — Secondary disturbed forest. Altitude 200–700 m. Flowering: August to April; fruiting: October to April.

Note — Dunn annotated the Kew specimen of *Zenker & Staudt 100* as the type of his var. *glabrescens* of *M. aboensis*. Another duplicate of this collection, cited as *Zenker 100*, was used by Taubert (1896) to describe *Lonchocarpus zenkeri*. As this specimen (*Zenker (& Staudt) 100*) belongs to *M. mannii*, both names are synonyms of *M. mannii*.

#### 4. *Millettia psilopetala* Harms

*Millettia psilopetala* Harms (1911) 256; Dunn (1912) 213; Baker f. (1929) 235; Robijns (1948) 314; Eggeling (1952) 307, t. 1; Hauman (1954) 20, t. 1; J.B. Gillett (1971) 19. — Lectotype (Gillett, 1971): *Mildbraed 2290* (holo B<sup>+</sup>; iso BR, K, drawing and fragments), E Congo, Beni, 1908. *Craibia bequaerti* De Wild. (1925) 362; Baker f. (1929) 247. — Lectotype (here designated): *Bequaert 6647* (holo BR), Congo, 1915.

Lianas up to 12 m high. *Twigs* brown strigose. *Leaves* with 2–6 pairs opposite or alternate leaflets. *Petiole* 0.3–12 cm long, thinly brown strigose; rachis 0.4–28 cm long, thinly brown strigose; pulvinus 0.5–1 cm long, glabrous. *Stipules* caducous. *Leaflets*: terminal (narrowly) obovate, 7.3–19 by 2.3–8 cm, index 1.7–3.3, base acute to cuneate, apex acuminate to cuspidate, acumen 0.5–3 cm long, upper surface scabrous to glabrous, lower surface scabrous, midrib and nerves sunken, main nerves 4–9 per side, 8–25 mm apart, nervation reticulate; lateral mostly as the terminal (broadly) obovate, 4–7.8 by 3.8–4.8 cm, index 1.1–2.5, base (broadly) acute; pulvinus 5–12 mm long, brown strigose. *Inflorescences* 13–47 cm long, brown strigose, peduncle up to 8.5 cm long, brown strigose; brachyblasts 20 to many, 10- to many-flowered. *Bracts* ± similar, triangular, 0.5–5 mm long, outside brown sericeous, inside glabrous. *Pedicels* 3–4 mm long, brown strigose. *Bracteoles* ± triangular, 1–2 mm long, outside sericeous, inside glabrous. *Calyx* 4–5 mm long, truncate or with 0.2–1.5 mm long broad-triangular teeth, outside thinly brown strigose, inside glabrous. Corolla purple to magenta. *Standard*: 2–3 mm long; blade broadly ovate, 6–10 by 6–10 mm, apex retuse, both sides glabrous. *Wings*: claw 2–4 mm long; blade narrowly ovate, 7–10 by 2–4 mm, apex obtuse, auricles conspicuous, both sides glabrous. *Keel petals*: claw 3–5 mm long; blade narrowly obovate or elliptic, 7–10 by 2–4 mm, upper auricle conspicuous, lateral pocket 1–4 mm long, both sides glabrous. *Stamens* diadelphous, tube 2–9 mm long, glabrous, free part of filaments 2–4 mm long, glabrous; anthers 0.4–1.5 by 0.2–1.3 mm. *Ovary* 2–8 mm long, sericeous; ovules 3 or 4; style 2–4 mm long, curved or bending



towards the ovary, glabrous. *Pods* strap-shaped, flattened, sometimes narrower at the centre, 12–13 by 3.3–3.5 cm, brown sericeous. *Seeds* flattened ellipsoid, black, 18 by 20 mm; hilum 10 mm long.

Distribution — RD Congo, Burundi, Rwanda, Uganda.

Habitat & Ecology — Moist forest. Altitude 470–800 m. Flowering: throughout the year; fruiting: October to June.

### 5. *Millettia thonneri* De Wild. — Fig. 2g, h, 3k–o

*Millettia thonneri* De Wild. (1911) 218, t. 1; Dunn (1912) 213; Baker f. (1929) 235. — Lectotype (here designated): *Thonner 268* (holo K; iso BR, K), Congo, 16.01.1909.

Tree c. 3 m high. *Twigs* hollow, brown strigose. *Leaves* with 1–4 pairs opposite leaflets. *Petiole* 4.5–16 cm long, grooved, thinly brown strigose; rachis as the petiole, 2–9 cm long; pulvinus 0.8–1 cm long, scabrous. *Stipules* caducous. *Leaflets*: terminal (broadly) obovate, 7.5–9.5 by 3.5–5.5 cm, index 1.7–2.1, base acute, apex acuminate, acumen, 5–6 mm long, retuse, upper surface glabrous, lower surface with few appressed hairs along midrib and some scattered appressed hairs elsewhere, midrib and nerves flat or  $\pm$  sunken, main nerves 7–9 per side, 10–15 mm apart, nervation reticulate; lateral mostly as the terminal, obovate, 5–10.5 by 3.5–5 cm, index 1.4–2; pulvinus 8–10 mm long, thinly strigose. *Inflorescences* 12–24 mm long, brown strigose, peduncle 11–19.5 cm long, brown strigose; brachyblasts many. *Bracts* to the inflorescences caducous; other bracts  $\pm$  similar, semi-circular, 1 by 1 mm, outside brown sericeous, inside glabrous. *Pedicels* 2–4 mm long, brown sericeous. *Bracteoles* at top of pedicel, semi-circular, 1 by 1 mm, outside sericeous, inside glabrous. *Calyx* 2–3 mm long, truncate or with 0.5 mm long broad-triangular teeth, outside brown sericeous, inside glabrous. Corolla purple. *Standard*: claw 2–3 mm long; blade broadly obovate, 12–13 by 8–10 mm, apex retuse, both sides glabrous. *Wings*: claw 5 mm long; blade obliquely ovate, 9–10 by 2 mm, apex obtuse, upper auricle conspicuous, both sides glabrous. *Keel petals*: claw 5 mm long; blade hatchet-shaped 10 by 3 mm, apex obtuse, both sides glabrous. *Stamens* diadelphous, tube 12–18 mm long, glabrous, free part of filaments 2 mm long, curved, glabrous; anthers 0.3 by 0.3 mm. *Ovary* 7–10 mm long, inflated, brown sericeous; ovules 6; style 4–5 mm long, curved near the stigma, glabrous.

Distribution — RD Congo.

Habitat & Ecology — Rare, once collected. River bank. Altitude 410 m. Flowering: March.

Note — *Millettia thonneri* is known from only one collection with in total five sheets in the Brussels and Kew herbaria. Apparently it has not been collected again since 1909. However, we have not seen material from African herbaria, so we are not totally certain whether or not the species still can be found. But as Kew and Wageningen receive duplicates from most African collections, this species is probably not collected again. It is impossible to ascertain its conservation status, or propose strategies for its conservation. A search at the original locality or similar habitats is needed to ascertain its present-day status.

## ACKNOWLEDGEMENTS

The loan of material from BR, K, L, WAG used in this study is highly appreciated. The first author likes to thank the IFP-Ford Foundation for financial support and Dr. M.C. Roos (L), coordinator of the MSC program.

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## IDENTIFICATION LIST

The numbers after the collection numbers refer to the following species:

- 1 = *M. aboensis*
- 2 = *M. macrophylla*
- 3 = *M. mannii*
- 4 = *M. psilopetala*
- 5 = *M. thonneri*

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