



Ficus schwarzii redefined and two new species of *Ficus* (*Moraceae*) from Sulawesi (Indonesia) described

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Key words

Ficus
Moraceae
Sulawesi

Abstract *Ficus sulawesiana* and *F. gorontaloensis* are described as new species and the description of *F. schwarzii* is emended. A modified key is included.

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INTRODUCTION

Attempts to identify collections of *Ficus* subg. *Sycomorus* made in Sulawesi in 2007, led to re-examination of Sulawesi material included in *F. schwarzii* Koord. (Corner 1960). The first result is the decision to exclude the collections made in the area ranging from Myanmar to Borneo and the re-establishment of a new species, *F. rosulata* (Berg 2010), which is a lowland species, occurring at altitudes up to 600 m. The remainder, material collected in Sulawesi at altitudes up to 2000 m (in montane forest), proved to be heterogeneous morphologically.

Notes on the sheets as “hairy styles!” (in contrast to the common state of material to be included in *F. rosulata*) and “close to *F. menadana* Miq.”, a synonym of *F. congesta* Roxb., as well as the published note (Corner 1960), indicate that the situation with regard to the material and species in Sulawesi was not quite clear when Corner decided to apply the name *F. schwarzii* also to collections outside Sulawesi (and by then mostly identified as *F. miquelii* King).

Ficus schwarzii was deficiently treated in Flora Malesiana (Berg & Corner 2005) as Celebes was not included in the distribution and the species not in the regional key.

A closer study of already existing collections and those recently made revealed the existence of three closely related species: *Ficus schwarzii* and two to be described as new.

KEY TO CAULIFLOROUS AND STOLONIFLOROUS SPECIES OF SUBGENUS SYCOMORUS IN SULAWESI

The three species can be accommodated in the regional key for subg. *Sycomorus* in Celebes (Berg & Corner 2005: 328–330, replacing lead 20 ff) as follows; it now includes *F. schwarzii* and the two new species, and excludes the stoloniflorous form of *F. hispida*.

20. Figs on up to 0.3 cm long spurs; waxy glands absent . . .
..... *F. erythrosperma*

20. Figs on longer leafless branchlets; waxy glands in the axils of lateral veins in the middle of the lamina beneath . . . 21
21. Figs on clusters of up to 10 leafless branchlets, often forming woody tubercles 22
21. Figs on up to 30, 50 or 100(–150) cm long non-rooting leafless branchlets 24
22. Leafy twigs and lower surface of lamina glabrous or sparsely white appressed-puberulous; epidermis of fig receptacle persistent *F. fistulosa*
22. Leafy twigs and lamina distinctly hairy, partly brownish; epidermis of fig receptacle flaking off 23
23. Margin of lamina (sub)entire, hairs on upper surface of the lamina absent or confined to the midrib *F. schwarzii*
23. Margin of lamina dentate, hairs on upper surface scattered on the whole surface *F. sulawesiana*
24. Epidermis of the petiole persistent 25
24. Epidermis of the petiole flaking off 27
25. Fig receptacle 0.5–1.2 cm diam when dry, peduncle 0.1–0.4 cm long, and the ostiole 2.5–4 mm diam
..... *F. parvibracteata*
25. Fig receptacle (1–)1.2–2.5 cm diam when dry, peduncle 0.4–3 cm long, and the ostiole 2.5–6 mm diam 26
26. Lateral veins mostly furcated away from the margin or branched; fig receptacle subglabrous, its epidermis flaking off *F. gorontaloensis*
26. Lateral veins rarely or not furcated away from the margin or branched; fig receptacle hairy, its epidermis persistent *F. botryocarpa*
27. Stipules 0.5–1 cm long; petiole up to 2(–2.5) cm long; lamina smooth above *F. congesta*
27. Stipules 1–25 cm long; petiole up to 10(–14) cm long; lamina scabrous above *F. hispida*

Ficus schwarzii Koord. — Fig 1

Ficus schwarzii Koord. (1898) 607, 644. — Type: *Koorders 19252* (holo BO; iso L), Indonesia, Sulawesi, Gunung Langkoan, near Sondei 900 m, 2 May 1895.

Emended description:

Tree up to 15 m tall. *Leafy twigs* 1.5–3 mm thick, whitish to brownish strigillose (or also sparsely to rather densely (minutely) white puberulous, with or without nodal glands and mostly with con-

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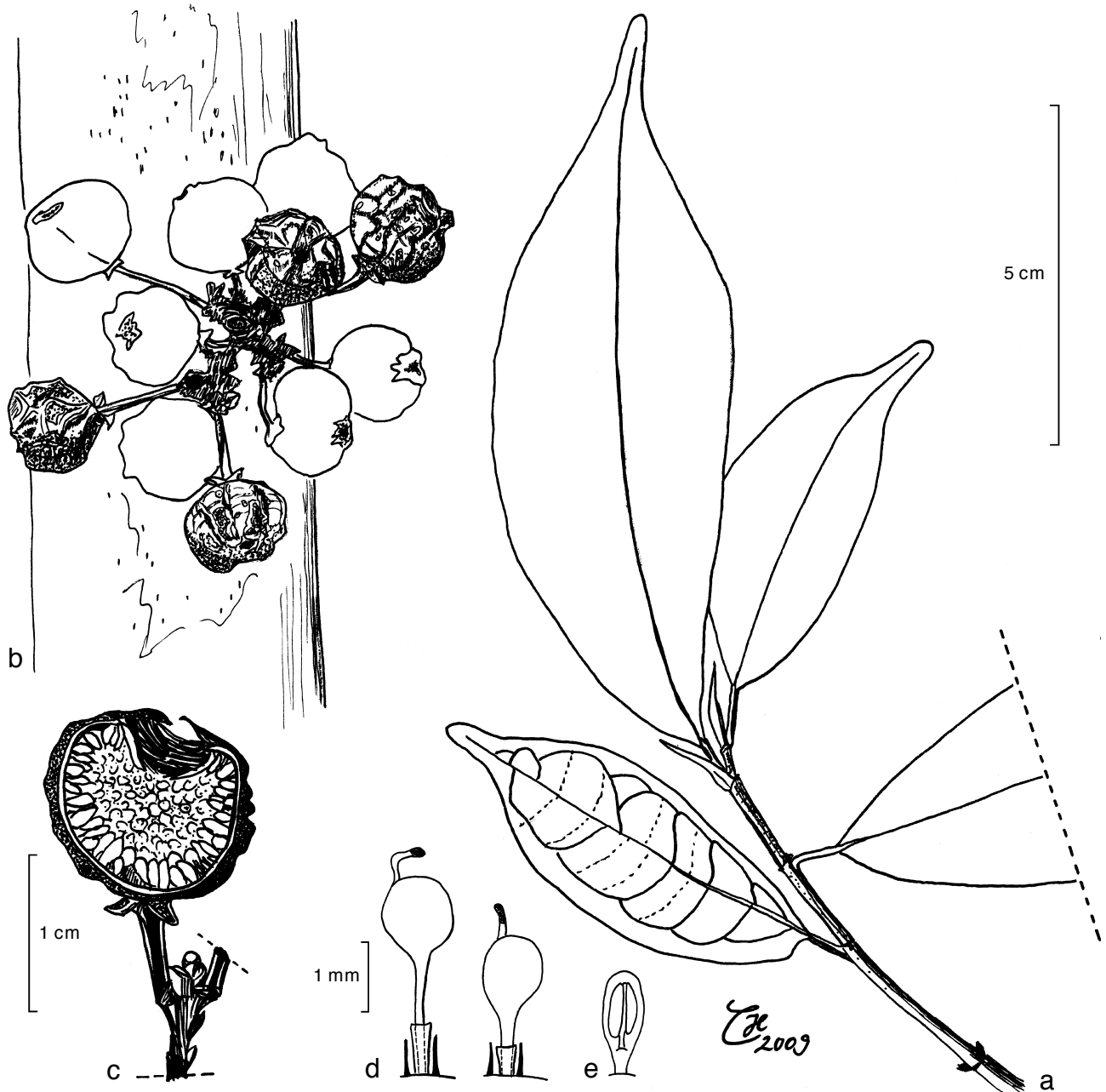


Fig. 1 *Ficus schwarzii* Koord. a. Leafy twig; b. branched fig-bearing branchlet with cluster of figs; c. fig receptacle in longitudinal section; d. long-styled pistillate flowers; e. staminate flower (a–d: *Culmsee* 3165; e: *Sands* 401).

spicuous (warty) lenticels below the (scars of the) stipules, with small abortive axillary buds, the scars of the leaves prominent; internodes hollow or solid; periderm persistent or flaking off. *Leaves* laxly spirally arranged to subdistichous to partly subopposite; lamina oblong to elliptic or to (sub)obovate, 3–15(–18) by (1–)2–5(–7) cm, (almost) symmetric, chartaceous to subcoriaceous, apex acuminate to subcaudate (or to obtuse), base equilateral to slightly inequilateral, cuneate to rounded, margin (sub)entire; upper surface sparsely whitish to brownish strigillose, mainly on the midrib (or glabrous), smooth, lower surface sparsely brownish to whitish strigillose on the main veins, smooth, cystoliths only beneath; lateral veins (4–)6–10 pairs, none of them furcate away from the margin, tertiary venation reticulate or towards the margin (sub)scalariform; waxy glands in the axils of some of the lateral veins in the middle part of the lamina; petiole 0.3–1.5(–3.5) cm long, sparsely brownish to whitish strigillose, the epidermis flaking off; stipules 0.5–1.8 cm long, subglabrous or strigillose mainly on the keel, caducous or (sub)persistent (when juvenile). *Figs* on (the lower part of)

the trunk, in (clusters of) up to 8 cm long, branched leafless branchlets with terminally c. 3 mm long scale-like persistent stipules; peduncle 0.4–1.2 cm long, minutely puberulous; basal bracts 3, verticillate, 2–3 mm long; receptacle subglobose to depressed-globose, 1–1.5(–1.8) cm diam when dry, minutely puberulous to glabrous, non-stipitate, ribbed, without lateral bracts, with (warty) lenticels and the epidermis flaking off, pinkish to brick-red to red-brown, turning (finally?) black at maturity, apex slightly convex to flat to concave, ostiole 3–4 mm diam, with the upper ostiolar bracts horizontal, surrounded by 4–5 short erect to inflexed apical bracts; internal hairs sparse and brown or absent. *Staminate flower* with one stamen. *Style of the long-styled flower* glabrous or minutely hairy, the stigma often distinctly papillate.

Distribution — Indonesia, Southern and Central Sulawesi. *Habitat* — Forest at altitudes up to 1900 m.

Additional collections from Indonesia, Sulawesi. G. Brown et al. 9 (L), Latimojon Ranges, Lombasang, 950 m; *Culmsee* 744 (GOET), 759 (L), 855 (GOET, L), 933 (L) and 984 (L), Lore-Lindu National Park, Pono valley, Toro,

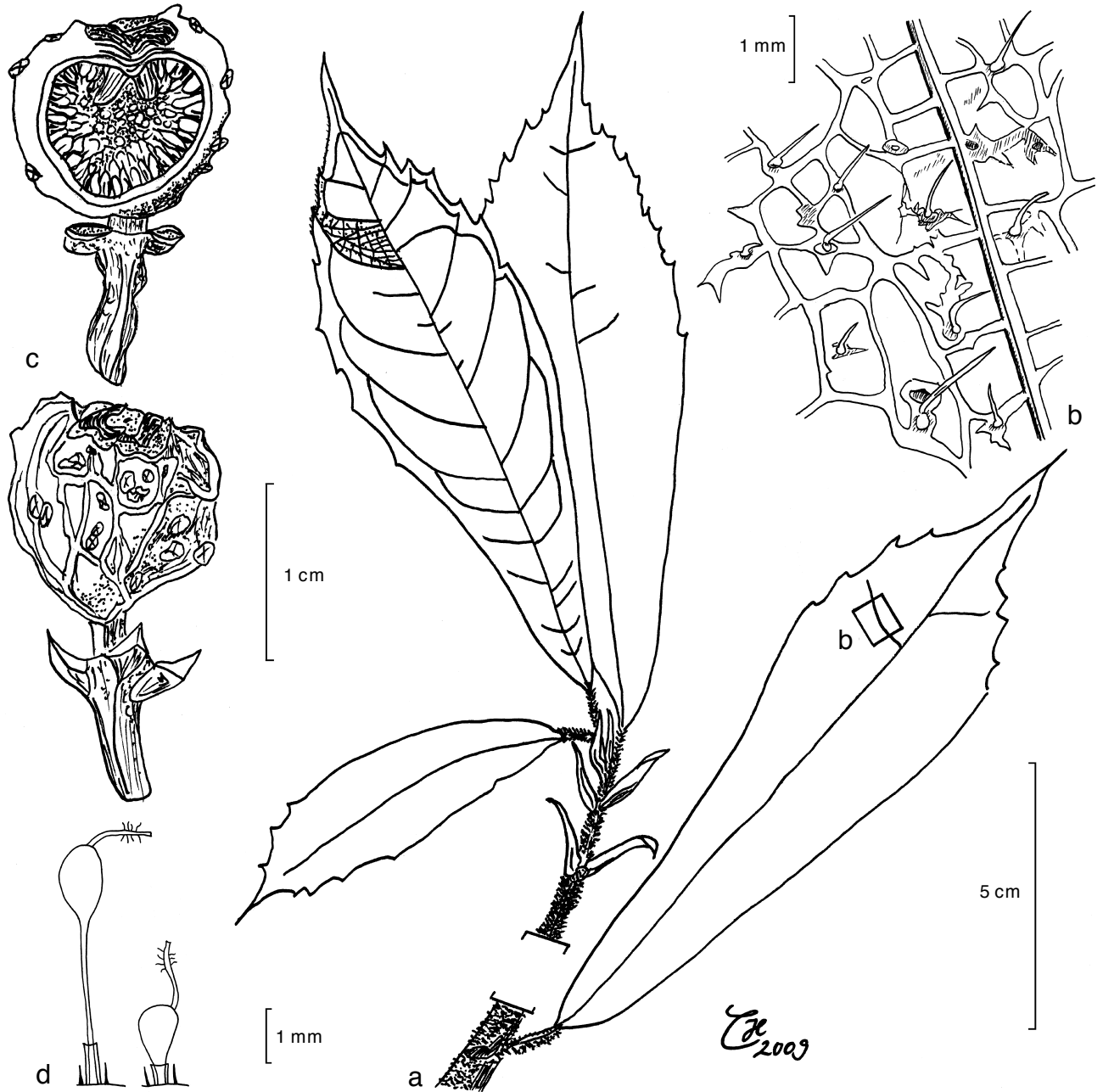


Fig. 2 *Ficus sulawesiana* C.C.Berg & Culmsee. a. Leafy twig; b. upper surface of lamina; c. figs, closed and in longitudinal section; d. long-styled pistillate flowers (a, b: Culmsee 3037; c, d: Bünnemeyer 12056).

1050 m, July–Sept. 2006; *Culmsee 3165* (L), Lore-Lindu National Park, Mt Nokilalaki, 1800 m, Aug. 2007; *Keßler et al. PK 3058* (L), Lore-Lindu National Park, 1600 m; *Kofman 2134* (L), G. Rantemario, 1850 m; *Meijer 10730* (L) and *10871* (L); NE of Makassar; *Prawiroatmodjo et al. 1306* (L), Ladongi, 50 m, 18 Oct. 1978; *Sands 400* (L) and *401* (L), Ladongi.

Notes — A photograph of the figs shows that the apex of the receptacle is concave in fresh state and that apparently mature figs are black, an unusual colour in subg. *Sycomorus*.

This species is more variable than the closely related *F. sulawesiana*.

In juvenile material, the stipules are subpersistent.

Ficus sulawesiana C.C.Berg & Culmsee, *sp. nov.* — Fig. 2

Ficu schwarzii similis, laminae margine dentato, supra toto indumento partim (sub)patenti distincta. — **Typus:** *Bünnemeyer 12059* (holo L; iso BO n.v.), Indonesia, Sulawesi, G. Bonthain, 2000 m, 11 June 1921.

Tree with height unknown. **Leafy twigs** 1.5–3 mm thick, brown to whitish strigillose to partly subhirtellous or also sparsely to

rather densely (minutely white puberulous, with or without nodal glands and mostly with conspicuous (warty) lenticels below the (scars of the) stipules, with few abortive axillary buds, the scars of the leaves prominent; internodes hollow or solid; periderm persistent. **Leaves** laxly spirally arranged to subdistichous to partly subopposite; lamina obovate to (sub)obovate, 5–17 by 1.5–5 cm, (almost) symmetric, chartaceous to subcoriaceous, apex acuminate to subcaudate, base equilateral to slightly inequilateral, cuneate to obtuse, margin crenate-dentate (and with brown hairs), upper surface sparsely brown to whitish (sub)strigillose, the hairs scattered on the whole surface, smooth, lower surface sparsely brown to whitish strigillose to subhirtellous on most veins, smooth, cystoliths only beneath; lateral veins 6–10 pairs, none of them furcate away from the margin, tertiary venation reticulate or towards the margin (sub)scalariform; waxy glands in the axils of some of the lateral veins in the middle part of the lamina; petiole 0.5–1.5 cm long, sparsely brown to whitish strigillose, partly subhirtellous, the epidermis persistent; stipules 0.5–1.5 cm long, (sub)glabrous,

caducous or (sub)persistent. *Figs* on the trunk, in (clusters? of) up to 4 cm long, branched leafless branchlets with terminally c. 3 mm long scale-like persistent stipules; peduncle 0.5–3.5 cm long, glabrous; basal bracts 3, verticillate, 2–3 mm long; receptacle subglobose, 1–1.5 cm diam when dry, glabrous, 0.2–0.3 cm long stipitate or non-stipitate, faintly ribbed, without lateral bracts, with (warty) lenticels and the epidermis flaking off, colour at maturity unknown, apex flat to concave, ostiole 2–3 mm diam, with the upper ostiolar bracts horizontal, surrounded by 4–5 short erect to inflexed apical bracts; internal hairs sparse and brown. *Staminate flower* not seen. *Style of the long-styled flower* with relatively long patent hairs.

Distribution — Central and South-western Sulawesi.

Habitat — Humid (sub)montane forest, at altitudes between 1800 and 2000 m (cf. Culmsee et al. 2011).

Additional collections. Bünnemeyer 12056 (L), G. Bonthain, 2000 m; Culmsee 2344 (GOET, L), 2635 (L), 2665 (L), 3037 (L) and 3038 (L), Lore-Lindu National Park, Mt Nokilalaki, 1800 m, Aug. 2007.

Notes — This species differs from *F. schwarzii* in the crenate-dentate (and hairy) margin of the lamina, the partly ± patent

indumentum on leafy twigs, petiole and surfaces of the lamina, the scattered hairs on the lamina above, the absence of sub-persistent stipules, in the (sub)juvenile state, and the relatively long patent hairs of the style of the long-styled flower.

This species strongly resembles *F. ternatana* Miq., an endemic of the island of Ternate (Moluccas), which mainly differs in features of the fig receptacle: ribbed, brown strigillose to puberulous and with persistent epidermis.

In the crenate-dentate margin of the lamina, this species also resembles part of the material of *F. benguetensis*, namely the cauliflorous form (see Berg 2011).

Ficus gorontaloensis C.C.Berg & Culmsee, *sp. nov.* — Fig. 3

Ficus fistuloso similis, ramulis longis ficiferibus, receptaculo maiore non-stipitato epidermide exfolianti differt. — *Typus:* Mendum et al. 24 (holo BO; iso E), Sulawesi, Distr. Gorontalo, near Pinogu, 275 m, 6 Apr. 2002.

Tree up to 25 m tall. *Leafy twigs* 3–8 mm thick, (sub)glabrous or very sparsely whitish appressed-puberulous, with nodal waxy glands; internodes hollow or solid; periderm persistent. *Leaves*

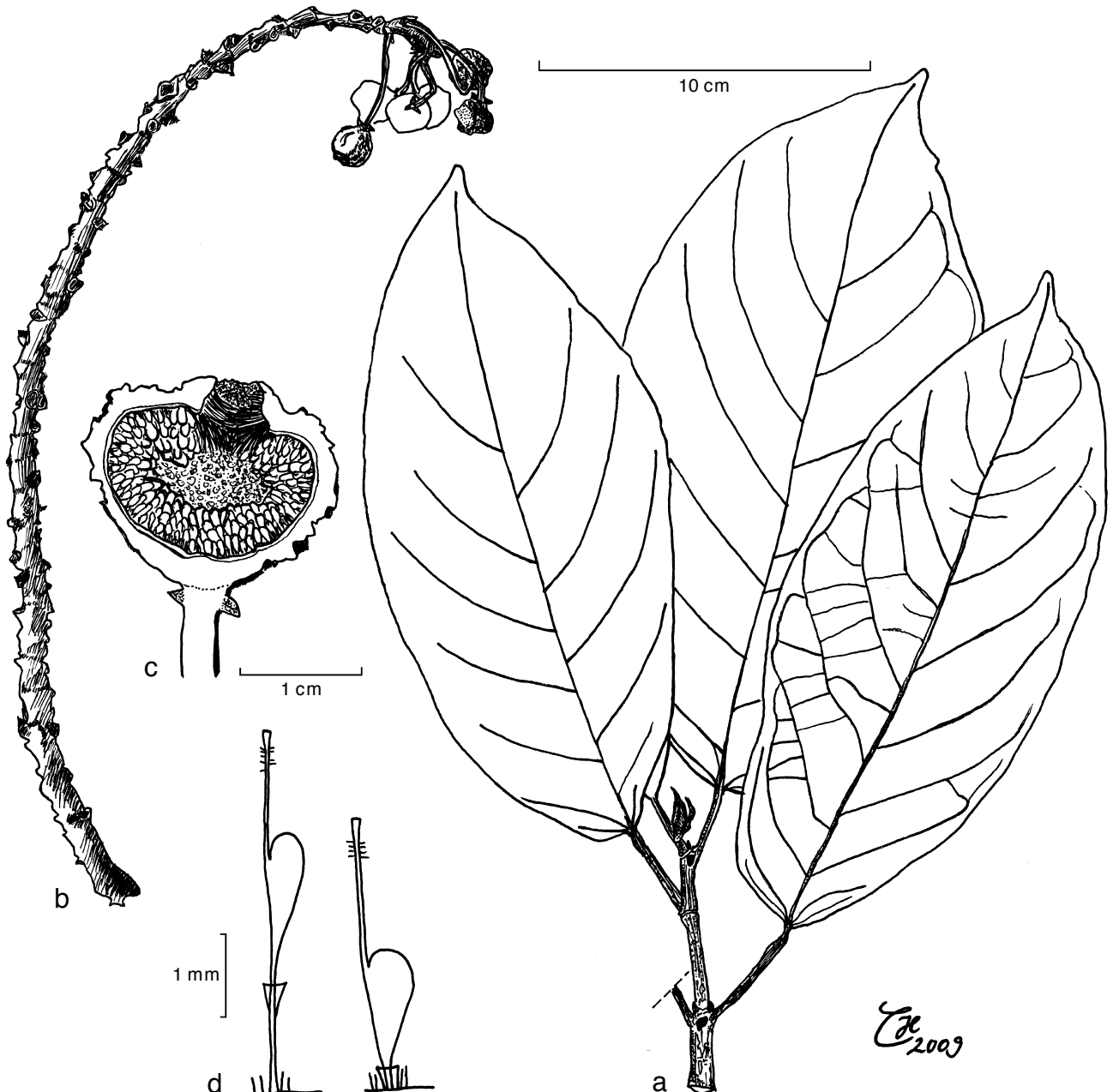


Fig. 3 *Ficus gorontaloensis* C.C.Berg & Culmsee. a. Leafy twig; b. unbranched fig-bearing branchlet; c. fig in longitudinal section; d. long-styled pistillate flowers (a, c, d: Milliken 879; b: Mendum 24).

spirally arranged or (partly) subopposite; lamina oblong to elliptic, 20–24 by 9–11, \pm asymmetric, (sub)coriaceous, apex acuminate, base rounded to subcordate (or to subcuneate), margin entire or (in particular towards the apex) \pm irregularly dentate, subcordate to subcuneate, flat; upper surface very sparsely whitish appressed-puberulous on the midrib to glabrous, smooth, lower surface sparsely whitish appressed-puberulous on the main veins to glabrous, smooth, cystoliths only beneath; lateral veins 8–9 pairs, most of them branched or furcate away from the margin, the basal pair relatively weakly developed, tertiary venation largely scalariform; waxy glands in the axils of the lateral veins in the middle part of the lamina and in furcations of lateral veins; petiole 1.3–5.5 cm long, c. 2 mm thick, appressed-puberulous to glabrous, the epidermis persistent; stipules 1–1.5 cm long, very sparsely appressed-puberulous, caducous. *Figs* on up to 50 cm long leafless branchlets with prominent scars of (pairs) of figs, without persistent stipules on the older wood down to the trunk; peduncle 1.5–3 cm long; basal bracts 3, verticillate, 2–3 mm long; receptacle subglobose, 1.5–2 cm diam when dry, non-stipitate, (sub)glabrous, the epidermis flaking off, lateral bracts absent, sometimes obscurely ribbed, colour at maturity unknown, apex \pm convex, ostiole 4–6 mm diam, prominent, with numerous bracts visible; internal hairs present, short and sparse. *Style of long-styled flower* sparsely hairy.

Distribution — Indonesia, Northern Sulawesi.

Habitat — Forest at low altitudes.

Additional collection. *Milikken 879* (E), Sulawesi, Distr. Gorontalo, Dumoga Bone National Park, Sungai Olama, 300 m, 10 Aug. 1991.

It is possible that collection *Eyma 1710* (L), Sulawesi, Res. Manado, S Koro, 1000 m, 10 Aug. 1937, belongs to this species, in spite of the small size of the lamina (2.5–7.5 cm long) and the c. 1 cm long petiole. The dimensions can be related to the fact that they developed terminally on fig-bearing branchlets.

Notes — This species resembles somewhat *Ficus fistulosa* Reinw. ex Blume, until now represented by two collections from Sulawesi: *Coode 6030* (K) from the Luwuk area, and *Mendum 216* (E) from Gorontalo, being distinct in the much shorter fig-bearing branchlets, the stipitate fig receptacle, the exfoliating epidermis of the petiole, the smaller ostiole, and the persistent epidermis of the receptacle.

This species is related to *F. schwarzii* and *F. sulawesiana*, but is distinct in the larger leaves, the long fig-bearing branchlets, the wide ostiole, and the presence of nodal glands.

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REFERENCES

- Berg CC. 2010. Redefinition of *Ficus schwarzii* Koord. and two new species of *Ficus* (Moraceae). *Blumea* 55: 115–117.
- Berg CC. 2011. Corrective notes on the Malesian members of the genus *Ficus* (Moraceae). *Blumea* 56: 161–164.
- Berg CC, Corner E.J.H. 2005. Moraceae, *Ficus*. Flora Malesiana, Ser. I, 17/2. Nationaal Herbarium Nederland, Leiden.
- Corner E.J.H. 1960. Taxonomic notes in *Ficus* Linn., Asia and Australasia, VI. Subg. *Ficus* sect. *Sycocarpus* Miq. *Gardens Bulletin Singapore* 18: 36–64.
- Culmsee H, Pitopang R, Mangopo H, Sabir S. 2011. Tree diversity and phyto-geographical patterns of tropical high mountain rain forests in Central Sulawesi, Indonesia. *Biodiversity and Conservation* 20: 1103–1123.
- Koorders SH. 1898. Verslag eener botanische dienstreis door de Minahassa tevens eerste overzicht der flora van N.O. Celebes uit een wetenschappelijk en praktisch oogpunt. G. Kolff & Co, Batavia / 's-Gravenhage.