A revision of *Weinmannia* (Cunoniaceae) in Malesia and the Pacific. 2. Sulawesi and the Philippines

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ABSTRACT
Eleven species of *Weinmannia* occur in Sulawesi and the Philippines, but only one (*W. negrosensis*) is common to both regions. All species are placed in sect. *Fasciculata* although *W. descombesiana* shows some characteristics of sect. *Leiospermum*. Of the seven species from Sulawesi, four are described here as new: *W. devogelii* is closely related to *W. fraxinea*, the most widespread Malesian species which is absent from both Sulawesi and the Philippines; *W. furfuracea* also occurs in Seram; *W. coodei* and *W. eymaeana* are both endemic. The seventh species from Sulawesi, *W. celebica*, is rather poorly known. In the Philippines, five species are recognised, none of them new. *Weinmannia hutchinsonii*, *W. luzoniensis* and *W. lucida* are all endemic, *W. urdanetensis* occurs in both the Philippines and New Guinea, and the fifth species is *W. negrosensis*. Keys, illustrations and distribution maps are given.

KEY WORDS
Weinmannia,
Cunoniaceae,
Sulawesi,
Philippines.

RÉSUMÉ
Onze espèces de *Weinmannia* existent aux Célèbes et aux Philippines, mais une seule (*W. negrosensis*) est commune aux deux régions. Toutes les espèces appartiennent à la sect. *Fasciculata*, bien que *W. descombesiana* présente certaines affinités avec la sect. *Leiospermum*. Parmi les sept espèces des Célèbes, quatre sont nouvelles et décrites ici : *W. devogelii*, très affine de *W. fraxinea* qui est l'espèce la plus répandue en Malésie mais absente des Célèbes et des Philippines ; *W. furfuracea* qui existe aussi à Seram ; *W. coodei* et *W. eymaeana*, toutes deux endémiques. La septième espèce, des Célèbes, *W. celebica*, est assez peu connue. Cinq espèces existent aux Philippines, mais aucune n'est nouvelle. *Weinmannia hutchinsonii*, *W. luzoniensis* et *W. lucida* sont endémiques, *W. urdanetensis* se trouve à la fois aux Philippines et en Nouvelle-Guinée, la cinquième espèce étant *W. negrosensis*. Des clés de détermination, des illustrations et des cartes de distribution sont présentées.

MOTS CLÉS
Weinmannia,
Cunoniaceae,
Célèbes,
Philippines.

This is the second part of a revision of the Malesian-Pacific species of *Weinmannia*. Part 1 (HOPKINS 1998a) gives a general introduction, including definitions of the terms used for the structure of the inflorescence, and describes the species of western Malesia. Parts 3 and 4 (HOPKINS 1998b; HOPKINS & FLORENCE 1998) deal with the species of the western and central Pacific respectively.

Most of the *Weinmannia* species found in Sulawesi and the Philippines are clearly defined and monomorphic. Most are also endemic to one or other of these regions, though there is a marked difference in that all the taxa recognised here from the Philippines have been known for some time, while for Sulawesi, four species are described here as new, and incomplete material probably represents a fifth. Sulawesi has the highest number of sympatric *Weinmannia* species of any island (or island group) in Malesia, and further exploration of its montane forests might well be rewarding. Although all the species dealt with here belong to sect. *Fasciculata*, *W. descombesiana* from Sulawesi is noteworthy because it shows some characteristics of sect. *Leiospermum* (see below).

WEINMANNIA IN SULAWESI

Seven species are recognised from Sulawesi (Celebes), five of which are endemic (*Weinmannia celebica*, *W. coodei*, *W. descombesiana*, *W. devogelii* and *W. eymaeana)*. All occur in montane forest with the exception of *W. devogelii*, which occurs in lowland forest up to 700 m. Two species have bisexual flowers (*W. descombesiana* and *W. furfuracea*), four have unisexual ones and for *W. coodei*, the breeding system is undetermined.

Key to the species in Sulawesi

1. Leaves simple (unifoliolate); flowers inserted singly in the axils of the bracts on the inflorescence axes ..... **1. W. descombesiana**
1'. Leaves trifoliolate or imparipinnate (or rarely unifoliolate); flowers inserted in fascicles in the axils of the bracts on the inflorescence axes 2
2. Leaves 1-3 foliolate, coriaceous ..... **7. W. negrosensis**
2'. Leaves usually with 5 or more leaflets, chartaceous to subcoriaceous 3
3. Lateral leaflets in 3-20 pairs, the largest per leaf 0.7-1.9 × 0.2-0.5 cm ..... **4. W. eymaeana**
3'. Lateral leaflets in (0-)1-6 pairs, the largest per leaf ≥ 3 × 1 cm 4
4. Lateral leaflets elliptical to ovate, apex acuminate 5
4'. Lateral leaflets narrowly elliptical to obovate, apex obtuse or rounded 6
5. Pedicels 0.2-0.5 mm long at anthesis; lateral leaflets 4.5-10 × 1-3 cm; indumentum on young stems sparse and never pilose ..... **2. W. devogelii**
5'. Pedicels 1.8-2 mm long at anthesis; lateral leaflets 3-5 × 1-1.6 cm; indumentum on young stems at least partly pilose ..... **6. W. celebica**
6. Young stems and leaves, stipules, leaf rachises and inflorescence axes bearing a rusty or golden brown villous-tomentose indumentum ..... **3. W. furfuracea**
6'. Young stems glabrous; leaf rachises glabrous or tomentose on adaxial side, inflorescence axes puberulous; indumentum neither rusty nor golden brown ..... **5. W. coodei**

1. Weinmannia descombesiana Bernardi

Bot. Jahrb. Syst. 83: 190, t. 33 (1964).—Type: *Kjellberg 1618*, SW Sulawesi, Pasoei-Rante Lemo, 1000 m, fl., 9 June 1929 (holo-, S!; iso-, BO).

Shrub or tree, 2.6-30 m high, up to 30 cm dbh. Young stems glabrous or puberulous, black, shiny, older ones with numerous white lenticels; branching sometimes dichotomous. Stipules usually caducous, obovate, ligulate or spathulate, ca. 0.7 × 0.4 cm, apex rounded, abaxial surface shortly strigose especially towards the base, otherwise glabrous, adaxial surface glabrous. Leaves unifoliolate usually with an articulation between blade and petiole; petiole 0.5-1 cm long, semiterete and somewhat channelled, rarely winged, almost glabrous; leaf blades elliptical,

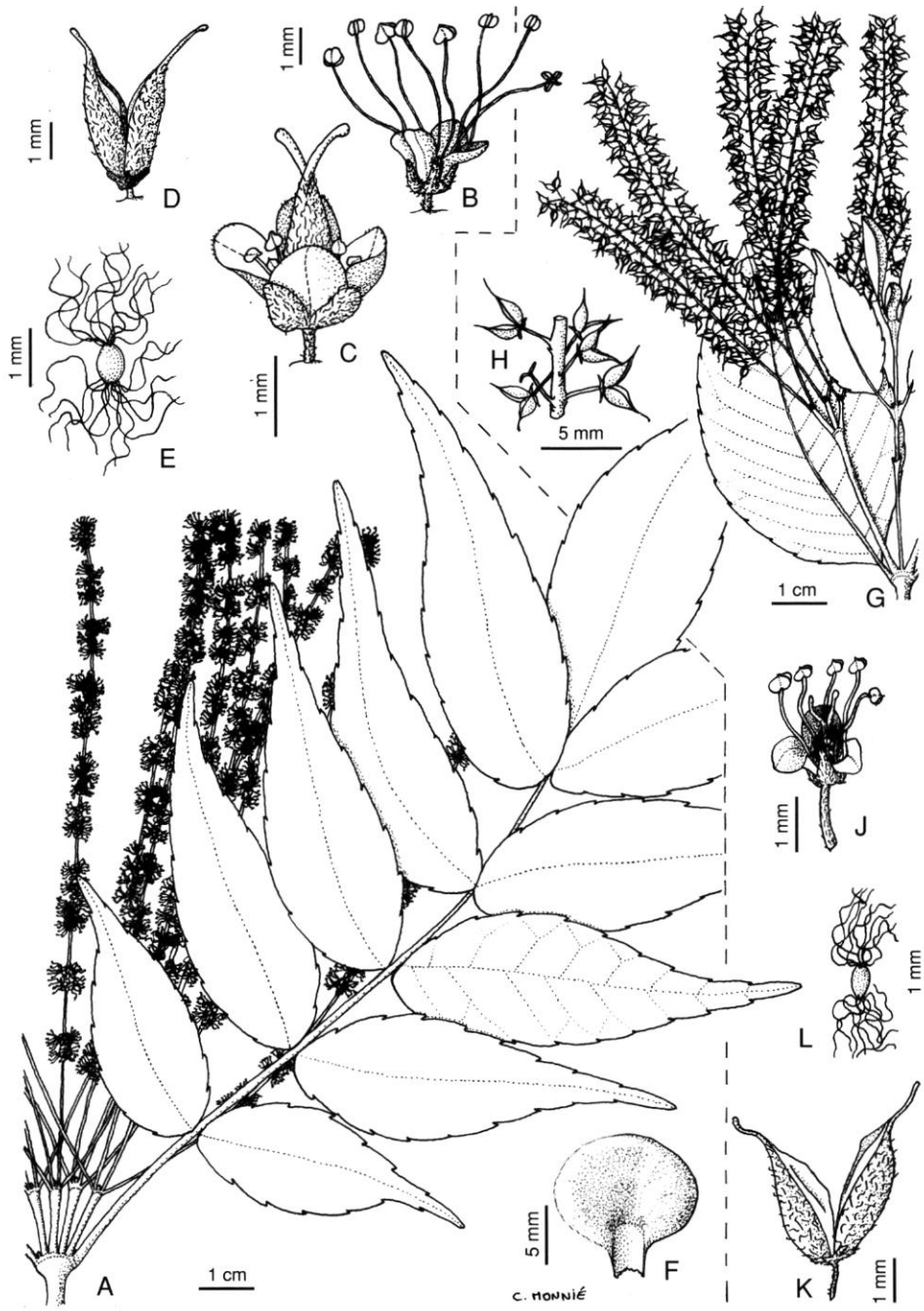

Fig. 1.—**A-F**, ***Weinmannia devogelii***: **A**, flowering shoot with one of a pair of imparipinnate leaves and an inflorescence of 4 pairs of tetrads; note minute buds in angle between the central racemes of each tetrad; **B**, male flower, styles too short to be visible; **C**, female flower with very short filaments; **D**, dehisced capsule; **E**, seed; **F**, stipule. (A, B, *Meijer 11147*; C, *de Vogel 5682*; D-F, *de Vogel 5959*).—**G-L**, ***Weinmannia descombesiana***: **G**, shoot showing infructescence developed from an axillary shoot bearing 3 dyads, the apical bud continuing to grow vegetatively; **H**, section of axis of a raceme showing pedicels of capsules inserted singly; **J**, bisexual flower; **K**, dehisced capsule; **L**, seed. (G, H, J, *bb 20870*; K, L, *bb 22981*).—Drawn by C. MONNIÉ.

4-9.5(-11) × 1.7-4.4(-4.8) cm, base acute, apex acuminate, subcoriaceous or chartaceous, glabrous on both surfaces, not punctate below; margin sometimes minutely thickened and revolute, crenate, ca. 8-19 crenations on each side; midrib flat or slightly depressed above, glabrous, prominent below with sparse indumentum, secondary and tertiary venation flat above and below, reticulum dense.

Inflorescence usually a pair of dyads, sometimes a few successive nodes producing partial inflorescences simultaneously; peduncles 0.2-1.6 cm long, sparsely puberulent; when inflorescence is at most distal node of stem, apical bud between the central pair of peduncles usually present and sericeous or rarely developed into a partial inflorescence; buds at apex of peduncle in angle between central pair of racemes sericeous, minute; axes of racemes puberulent, up to ca. 8.5 cm long. Floral buds inserted singly; floral bracts carinate, ca. 0.7 mm long, strigose-pubescent. Flowers bisexual; pedicel 1-1.2 mm long in flower, 1.4-2.6 mm long in fruit, almost glabrous; calyx lobes 0.5 × 0.4 mm, sparsely hairy on outer surface, ciliate; petals oblong, apex rounded, 1.2 × 0.6 mm, minutely ciliate; disc lobes 0.2-0.3 mm long, oblong, minutely strigose; filaments ca. 2.2 mm long; ovary ca. 1 mm long, densely pubescent; styles ca. 1 mm long, diverging; stigmas capitate, papillose.

Capsule 2-2.5 × 1.2-1.6 mm at dehiscence, the styles ca. 1 mm long, the exocarp strigose-pubescent; calyx lobes persistent; central column present and as long as valves. Seeds 0.5-0.6 mm long, ca. 8 per capsule, often persisting in capsules after dehiscence, comose at both ends, the hairs to 1.5 mm long, hairs almost "sticky".—Fig. 1G-L, 2.

JUVENILE FOLIAGE.—Stipules suborbicular, not amplexicaul, up to 1.5 × 1.3 cm, persistent. Leaves elliptical, the petiole up to 1 cm long, the blade up to 17.5 × 6.3 cm, chartaceous, the margin with up to 20 notches on each side.

BREEDING SYSTEM.—Hermaphroditic.

FIELD CHARACTERS.—Young leaves red or reddish purple. Buds pink or green, flowers white or pale green, smell faint; fruits yellow or green, turning red with age.

DISTRIBUTION AND ECOLOGY.—Mountains of South and Central Sulawesi, at 1000-1800 m. In primary and secondary forest on a variety of soil types.

MATERIAL EXAMINED.—**SOUTH SULAWESI**: *bb 20870*, Ond. afd. Mamasa, nabij Tandoeng, 1400 m, buds, fl., fr., 13 July 1936 (A, K, L); *bb 22981*, Ond. afd. Makale-Ratepao, nabij Tandoeng, 1150 m, fr., 17 July 1937 (A, BISH, BM, L, P); *bb 24206*, Ond. afd. Mamasa, nabij Limbong, 1500 m, yfr., 7 Apr. 1938 (A, L); *bb 26643*, Ond. afd. Masamba, nabij Tedeboë, 1800 m, fr., 25 Nov. 1938 (A, L); *Mamakit bb s.n.*, Ond. afd. Mamasa, nabij Mamasa, 1150 m, st., 2 Aug. 1941 (L); *Eyma 432*, Ond. afd. Enrekang, between Pasoei-Rante Lemo, 1330 m, st., juv., 14 June 1937 (L); *Eyma 3590*, Rec. Menado, Ond. afd. Poso, between Biv. III - Biv. IV, top Gn. Loemoet, fr., 4 Sep. 1938 (A, K, L).

LOCAL NAMES.—Paseh (language Toradja, dialect Tai), Panessean (Passe) (language Toradja), Londong (languages Toradja & Rongkong), Malètoea (language Rampi). Local uses: firewood.

This species was placed in sect. *Leiospermum* (*sub nom.* sect. *Racemosae*) by BERNARDI (1964) because the flowers are arranged singly in the axils of the bracts on the axes of the racemes. However, it shows a mixture of characters of both sect. *Leiospermum* and *Fasciculata* as they are circumscribed in part 1 (HOPKINS 1998a). Besides the insertion of the flowers, those characters seen in *Weinmannia descombesiana* that are indicative of sect. *Leiospermum* are: branching sometimes dichotomous; stipules ovate-ligulate-spathulate in adult foliage; free central column of capsules well developed.

However, the inflorescence structure is typical of sect. *Fasciculata*, and usually consists of a pair of dyads or tetrads with short, laterally flattened peduncles, that develop from axillary buds. When the dyads are at the most distal vegetative node of a shoot, there is usually an apical bud between them or rarely it may develop into a third dyad (see Fig. 1G); in some other cases the partial inflorescences are inserted in the axils of leaves at subdistal nodes. Other characters that suggest an affinity with sect. *Fasciculata* are the pubescent (not strigose) indumentum on the capsules, the calyx lobes persistent in fruit, and

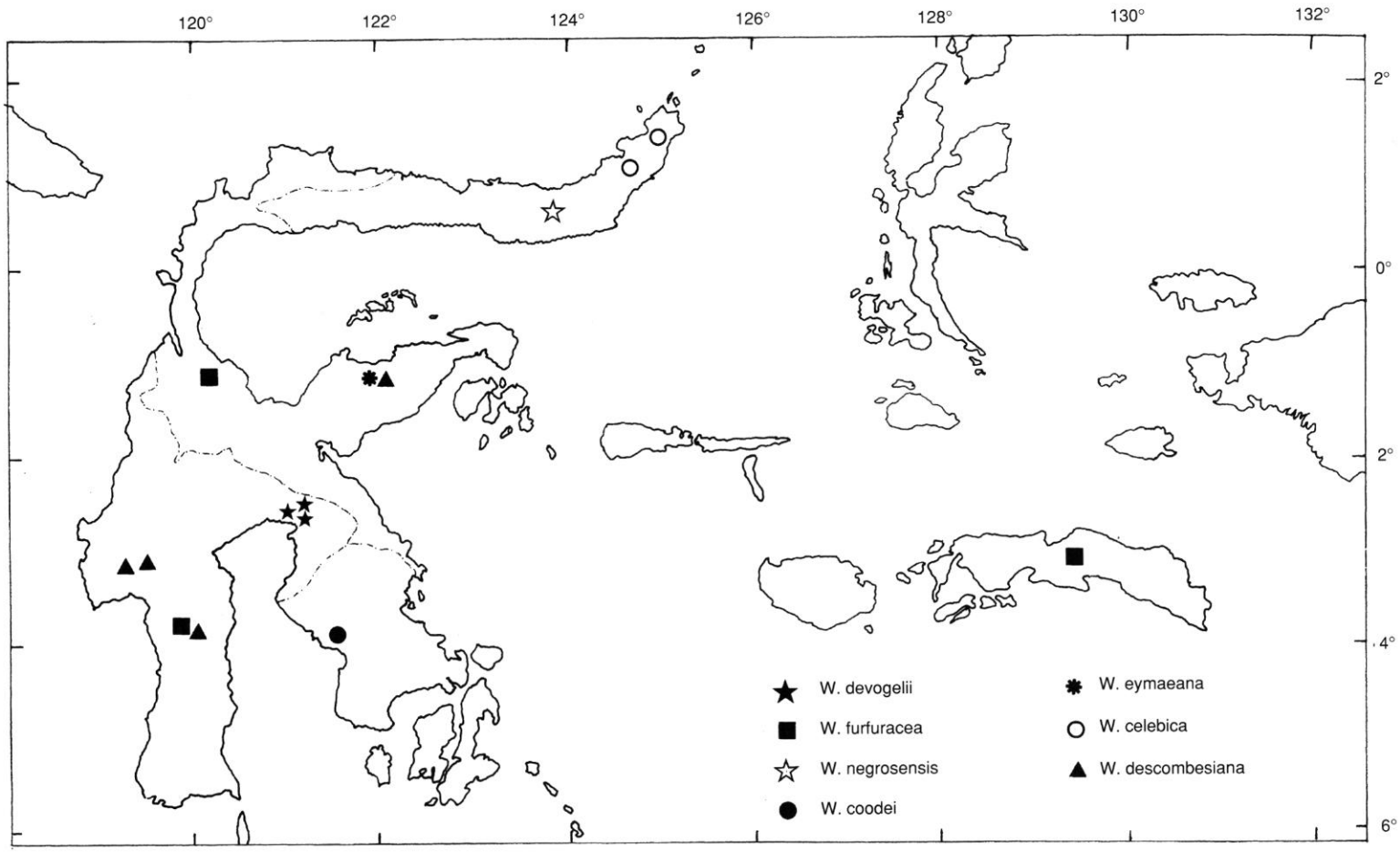

Fig. 2.—Distribution of ***Weinmannia*** in Sulawesi and Seram.

the absence of "collars", which are the remnants of a pair of partially fused, protective stipules, on the axes of the partial inflorescences, and which are seen frequently in sect. *Leiospermum*. A cladistic analysis based on morphology suggests that this species belongs in sect. *Fasciculata* (BRADFORD in press).

2. **Weinmannia devogelii** H.C. Hopkins, **sp. nov.**

A Weinmannia fraxinea (D. Don) Miq. *floribus subsessilibus (pedicellis 0.2-0.5 mm longis non (1.1-)1.5-3 mm) attingentibus roseis non albidis differt.*

TYPE.—*de Vogel 6122*, (South Sulawesi) Sulawesi Selatan, N shore of Lake Matano, Bonemaitu, E of Nuha, 2°20'S-121°27'E, 400 m, fl., 5 July 1979 (holo-, L!; iso-, K!).

Tree 5-20 m, up to 40 cm dbh. Young stems woody with sparse indumentum, older ones glabrescent with minute longitudinal fissures and numerous lenticels; branching not dichotomous. Stipules caducous or not, ± orbicular or larger ones amplexicaul, up to 1.4 × 1.6 cm, base usually constricted, apex rounded, adaxial surface glabrous, scurfy or puberulent, abaxial surface shortly strigose or glabrescent. Leaves imparipinnate, lateral leaflets (0-)2-6 pairs, total length up to 22 cm; petiole 1.5-3.5 cm long, rachis segments 1.2-2.5 cm long, petiole and rachis segments terete to semiterete, somewhat flattened and densely pubescent on adaxial side, indumentum sparse on abaxial side; lateral leaflets lanceolate, narrowly ovate or narrowly elliptical, the largest 4.5-10 × 1-3 cm, the base unequal, ± sessile or shortly petiolulate, apex acuminate; apical leaflet narrowly elliptical, ca. 5.5-9.5 × 1.5-2 cm, base attenuate into a petiolule ca. 0.7 cm long, apex acuminate; leaflet blades chartaceous to subcoriaceous, glabrous above and below, not punctate; margin almost entire to crenulate, 10-15 notches on each side of the largest lateral leaflets; midrib slightly depressed above, puberulent at base, prominent below and sparsely strigose, secondary and tertiary venation slightly raised on both surfaces, reticulum not dense.

Inflorescence of 1-3 pairs of dyads or tetrads, sometimes a few successive nodes producing partial inflorescences simultaneously; peduncles laterally flattened, 0.2-1.3 cm long, puberulous; bud(s) between the central pair of peduncles sericeous; buds at apex of peduncle in angle between central pair of racemes sericeous, minute; axes of racemes densely puberulous, up to 11.5 cm long. Floral buds inserted in fascicles; floral bracts ± carinate, ca. 0.8 mm long, minutely strigose, caducous. Flowers unisexual; pedicel 0.2-0.5 mm long, minutely strigose or puberulous; calyx lobes 0.5-0.7 × 0.4-0.5 mm, minutely strigose on outer surface; corolla obovate, 1.1-1.5 × 0.7-1.1 mm, apex rounded or irregularly emarginate, ciliate; disc lobes 0.2-0.3 mm long, oblong; in male flowers: filaments 3.3-3.7 mm long, ovary 0.4-0.5 mm long, pubescent, styles 0.1-0.2 mm long, incurved; in female flowers: filaments 0.6-0.9 mm long, ovary 0.9-1.1 mm long, densely pubescent, styles 0.9-1.1 mm long, straight, stigmas papillose.

Capsule 1.9-2.5 × 1.2-1.5 mm at dehiscence, the styles up to 1 mm long, the exocarp pubescent; calyx lobes persistent; central column present. Seeds ellipsoid to broadly ellipsoid, 0.5-0.7 mm long, 4 per capsule, comose at both ends, the hairs to 2 mm long.—Fig. 1A-F, 2.

BREEDING SYSTEM.—Dioecious.

FIELD CHARACTERS.—Buttresses few or absent. Outer bark ochre-grey, fissured or not; inner bark reddish; sapwood cream coloured; heartwood very hard, reddish. Young leaves red. Flower buds red; flowers usually given as pink, rarely white and fragrant (*Waturandang 18*); young fruit reddish green, old ones dark red.

DISTRIBUTION AND ECOLOGY.—Eastern South Sulawesi near Malili and Lake Matano at 0.5-700 m. In primary and secondary forest, including disturbed primary forest with an undergrowth of sedges and ferns. On peridotite and ultrabasic laterite; also in patches of coastal vegetation along the lake on limestone and alluvium derived from limestone and schist, and on red clayey soil derived from conglomerate bedrock. Locally common.

PARATYPES.—**SOUTH SULAWESI**: *van Balgooy 3625*, Soroako-Wasuponda road, 2°15'-3°S, 121°-121°45'E,

600 m, fl., 9 July 1979 (A, K, L); *van Balgooy 3809*, Soroako-Malili road nr. junction with road to Larona Hydroelectric plant, 2°15'S-121°45'E, 100 m, fl., 29 June 1979 (A, K, L); *Darnaedi 2236*, 2°15'-3°S, 121°-121°45'E, 500 m, fl., 14 July 1979 (A, K, L); *Meijer 11147*, Matano Lake nr. Soroako, NE of Malili, E of Nuha village, 2°35'S-121°20'E, fl., 15 July 1976 (L); *Meijer 11181*, Matano Lake nr. Soroako, NE of Malili, nr. old Mining office, 2°35'S-121°20'E, yfr., 16 July 1976 (L); *Ramlanto 138*, Wae Atue, Manurung 7 km from Malili, 5 m, fl., 10 Apr. 1984 (A, K, L); *Reppie 392*, *Cel./III-18*, Ond. afd. Malili; nabij Oesoe, fr., 11 Mar. 1935 (A, BO); *Schmid 5512*, Soroako, 500 m, buds, Jan. 1979 (L, P); *de Vogel 5682*, S of Lake Matano, ca. halfway between Soroako and Wasupondo, 2°31'S-121°21'E, 700 m, fl., 10 June 1979 (K, L); *de Vogel 5959*, S shore of Lake Matano W of Soroako and Taipa, on and nr. Pulau Lintu, 2°29'S-121°15'E, 400 m, fr., 23 July 1979 (K, L); *Waturandang 18*, *Cel./III-18*, Ond. afd. Malili, nabij Oesoe, 0.5 m, st., 14 Oct. 1931 (BO, K, L).

LOCAL NAMES.—Poémé (Tobela language, dialect To Pado E).

Weinmannia devogelii is a satellite of the widespread and variable *W. fraxinea*. While the differences between the two are not great, the first is considered here to be more than a mere variety of the second because it has a unique morphological feature (the very short pedicel) that is not seen in *W. fraxinea*, a distinctive ecology, and an allopatric distribution. However, the leaf characters of *W. devogelii* fall within the range for *W. fraxinea* and sterile specimens cannot be distinguished; the latter species is assumed to be absent from Sulawesi as no fertile material can be identified as belonging to it (unless *Kjellberg 2950* (BO) [Todjamboe, 700 m, tree 10 m; flowers male; leaflets 3-5 per leaf] proves to be it). The flowers are usually pink in *W. devogelii* and usually white in *W. fraxinea* at low altitude.

This species is named after E.F. DE VOGEL who collected the type. The prefix "de" is included in the epithet on purpose.

3. **Weinmannia furfuracea** H.C. Hopkins, **sp. nov.**

Weinmannia devogelii H.C. Hopkins *affinis, sed foliolorum indumento furfuraceo, nunquam glabra, apicibus juvenalibus indumento villoso-tomentoso, non breviter pubescente et foliolis ellipticis vel obovatis apice rotundato vel obtuso, non ovatis apice acuminato, praecipue differt.*

TYPE.—*Tantra 1595*, Central Sulawesi, 0°30'-1°30'S, 119°30'-120°30'E, W slope Mt. Roroka Timbu, SE of Palu, primary forest, 2000 m, fl., 5 May 1979 (holo-, L!; iso-, BO).

Tree 16-45 m high, up to 60 cm dbh. Young stems and leaves, stipules, leaf rachises and inflorescence axes covered with dense rusty or golden brown villous-tomentose indumentum, the longest hairs up to 1 mm; older stems tomentose or puberulous, finally glabrescent with longitudinal fissures and numerous lenticels; branching not dichotomous. Stipules caducous except at growing tips and in immature foliage, ± orbicular, recurved, up to ca. 0.9 × 1.1 cm, base constricted, apex rounded, abaxial surface tomentose-villous, adaxial one velutinous. Leaves imparipinnate with (1-)2-4 pairs of lateral leaflets, total length up to 20 cm; petiole 1-4 cm long, rachis segments 1-3.2 cm long, petiole and rachis segments terete to semiterete at point of insertion of leaflets where somewhat flattened on adaxial side, villous-tomentose; lateral leaflets elliptical to obovate, the largest per leaf 4-7.8 × 1.9-3 cm, the base almost equal, ± sessile or shortly petiolulate, apex rounded or obtuse (acute in immature foliage); apical leaflet elliptical to obovate, 5-9 (-11) × 1.9-3.6(-4.8) cm including base attenuate into a petiolule ca. 1 cm long, apex rounded or obtuse; leaflet blades subcoriaceous, glabrous above, with an indumentum of short, scurfy hairs below, sometimes glabrescent, not punctate; margin subentire to crenulate, 20-25 notches on each side of the largest lateral leaflets; midrib ± flat above, prominent below and bearing villous to scurfy hairs, secondary and tertiary venation ± flat above and somewhat raised below, reticulum fairly dense.

Inflorescence 1 or 2 pairs of dyads or tetrads, the apical bud between the central peduncles often continuing to grow vegetatively during flowering, sometimes a few successive nodes producing partial inflorescences simultaneously; peduncles laterally flattened towards apex, 0.6-2.5 cm long, villous-tomentose; apical buds between the central pair of peduncles and buds at

apex of peduncles in angle between central pair of racemes sericeous; axes of racemes tomentose, up to 11.5 cm long. Floral buds inserted in fascicles; floral bracts not seen. Flowers bisexual; pedicel 1-1.7 mm long, tomentose; calyx lobes 0.7 × 0.5-0.6 mm, tomentose on outer surface; corolla irregularly obovate to almost circular, 1-1.2 × 0.8-1 mm, apex rounded or irregularly emarginate, puberulous on outer surface, margin ciliate; disc lobes 0.3-0.4 mm long, oblong, sometimes with thin flanges on either side to form an almost continuous disc; filaments 2.2-2.4 mm long; ovary 1.1-1.8 mm long, densely pubescent; styles 1.1-1.8 mm long, divergent then later straight; stigmas capitate, papillose.

Capsule 3-4 × 1.5 mm before dehiscence, the styles up to 1.5 mm long, the exocarp densely pubescent; calyx lobes persistent. Immature seeds 0.6-0.8 mm long, comose at both ends.—Fig. 2, 3A-D.

BREEDING SYSTEM.—Hermaphroditic.

FIELD CHARACTERS.—Tree without buttresses. Living bark dark brown, wood yellowish, heart wood light brown. Leaves golden from below, young leaves brown, old ones glaucous below. Flower buds greenish white, flowers white, fragrant, full of bees (*Tantra 1595*). Immature fruits yellowish green.

DISTRIBUTION AND ECOLOGY.—Mountains of Sulawesi and Seram. Primary forest at 1700-2000 m, including montane forest dominated by *Agathis* (up to 40 m tall) and in forest dominated by *Castanopsis* with *Trimenia*, *Eugenia*, *Phyllocladus*, Ericaceae and *Pandanus*. Locally common.

PARATYPES.—**CENTRAL SULAWESI**: *van Balgooy 3255*, 0°30'-1°30'S, 119°30'-120°30'E, Mt. Roroka Timbu, W slope, 2000 m, fl., 10 May 1979 (A, L); *van Balgooy 3464*, 0°30'-1°30'S, 119°30'-120°30'E, Danau Tambing, 1700 m, fr., 23 May 1979 (A, L); *Tantra 1587*, W slope Mt. Roroka Timbu, SE of Palu, 0°30'-1°30'S, 119°30'-120°30'E, 2000 m, st., juv., 5 May 1979 (L); *Zijll de Jong 114/V2, bb 20787*, Ond. afd. Enrekang, Sawito, 1000 m, fl., 14 June 1936 (BO).—**SERAM**: *Rutten 2231*, Mid Seram, Brongebergte Makina, ± 1000-1100 m, buds, 18 May 1919 (BO, L).

LOCAL NAMES.—Boeloean laki (language Buegin, Dialect Maiwa), Ula (language Uma).

Another specimen from western Seram with much smaller leaflets is close to this species (Tanah goyang, *Eyma 3008* [K, L, P]) but differs by being a large shrub rather than a tree, with unisexual not bisexual flowers. It also resembles *W. fraxinea* but that species lacks long, coarse, dense hairs.

4. **Weinmannia eymaeana** H.C. Hopkins, **sp. nov.**

Weinmannia urdanetensis Elmer *affinis, sed petiolis rhachidibusque canaliculatis anguste alatis et glabris, nec teretibus nec dense velutinis, foliolis ellipticis basi cuneato non oblongis basi truncato vel cordato et seminibus comosis utrinque, non hirsutis ubique, praecipue differt.*

TYPE.—*Eyma 3578*, Central Sulawesi, Res. Menado; Ond. afd. Poso, Tusschen, Biv. II-III, op N uitlooper van Gn. Loemoet, fl., fr., 3 Sep. 1938 (holo-, L!; iso-, A!, BO!, K!, U).

Shrub? Stems glabrous, bearing numerous pale lenticels. Branching not dichotomous. Stipules often persistent especially at flowering nodes, ± orbicular, up to 0.8 × 0.8 cm, narrowing at base, apex rounded, glabrous on both surfaces. Leaves imparipinnate, 3-20 pairs of lateral leaflets, total length up to 6 cm long; petiole and rachis segments 0.3-0.6 cm long, glabrous, channelled above, narrowly winged, the wings extending 0.5 mm on either side of midline and incurved; lateral leaflets narrowly elliptical or elliptical, (0.45-)0.7-1.9 × 0.2-0.5 cm, of ± equal size in one leaf, the largest often near the midpoint of the rachis, base sessile, ± equal, cuneate, apex acute; terminal leaflet narrowly elliptical to elliptical, 0.7-2.3 × 0.25-0.8 cm, scarcely larger than the largest laterals, base sessile or petiolulate, the petiolule ca. 0.3 cm long, apex acute; blade glabrous, coriaceous, cuticle on upper surface thick and shiny, not punctate below; margin recurved, entire or sparsely crenate-dentate with 0-7 notches on each side in the lateral leaflets; on upper surface, midrib and secondary veins depressed into cuticle and tertiary venation obscure; on lower surface, midrib somewhat prominent.

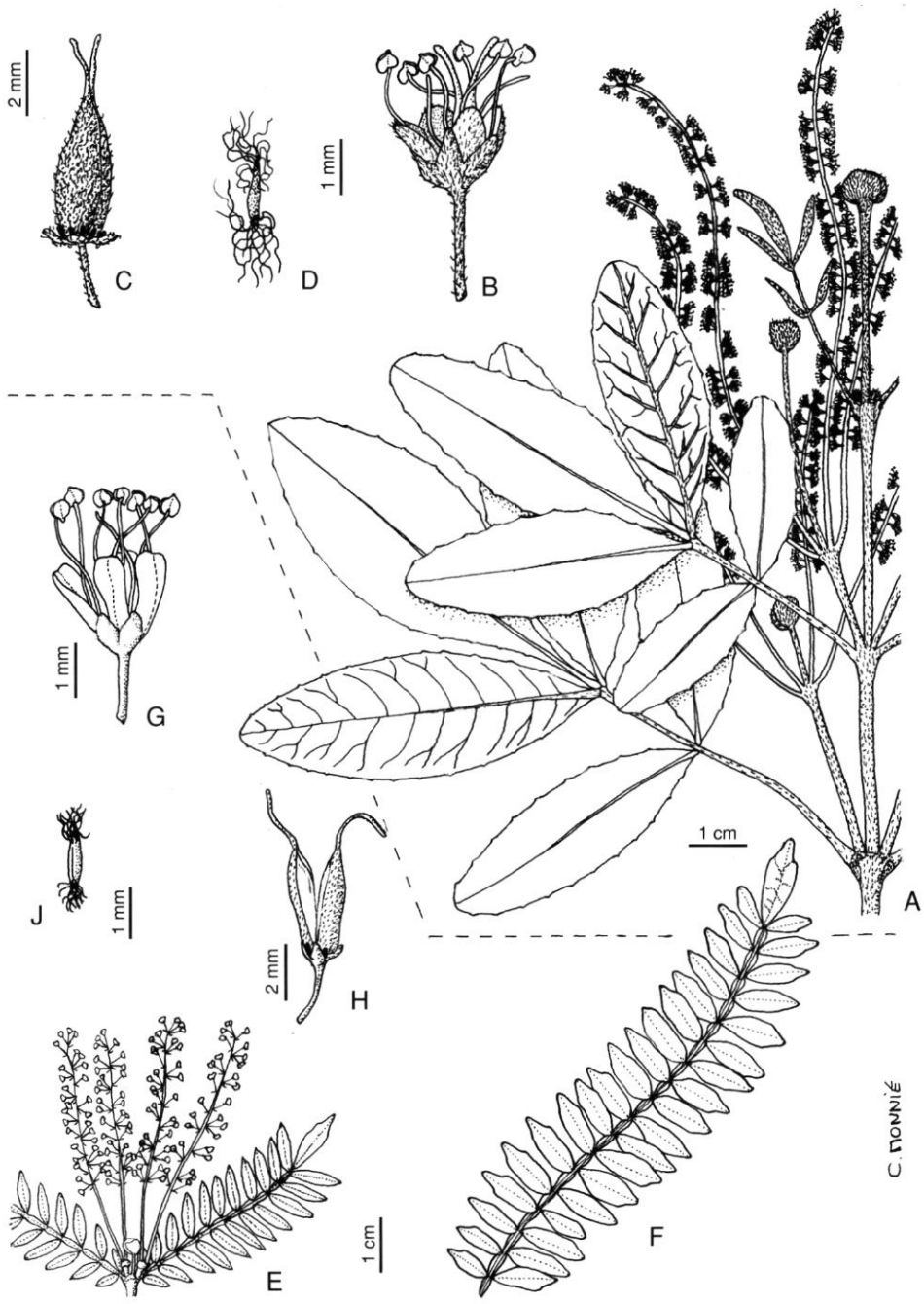

Fig. 3.—**A-D *Weinmannia furfuracea***: **A**, flowering shoot showing 2 lateral tetrads in sequential leaf axils where in both cases, the bud between the central racemes is continuing to grow vegetatively; the apical bud of the shoot is also continuing to grow vegetatively; **B**, bisexual flower; **C**, fruit just before dehiscence; **D**, seed. (A, B, *Tantra 1595*; C, D, *van Balgooy 3464*).—**E-J**, ***Weinmannia eymaeana***: **E**, flowering shoot showing an inflorescence of a pair of dyads; note apical bud between peduncles of dyads starting to develop; **F**, leaf with narrowly winged rachis; **G**, male flower; **H**, dehisced capsule; **J**, immature seed. (E-J, *Eyma 3578*).—Drawn by C. MONNIÉ.

Inflorescence a pair of opposite dyads; apical bud glabrous, sometimes continuing to grow vegetatively during flowering and sometimes more than one node on a shoot producing dyads simultaneously; peduncles 0.1-0.3 cm long, racemes up to 8 cm long, small bud present in angle between racemes at apex of peduncle, glabrous; peduncles ± glabrous, axes of racemes puberulent; bracts at apex of peduncle persistent, ± triangular. Flowers inserted in fascicles; floral bracts carinate, sparsely hairy on abaxial surface, up to 1 mm long, sometimes persistent; flowers apparently unisexual, only male flowers seen: pedicel 1-2.3 mm long, glabrous or puberulent; calyx lobes 0.7 × 0.5 mm, glabrous; petals oblong, 1.4-1.6 × 0.6 mm, ± emarginate at apex; disc lobes 0.3 mm long, narrowly oblong; filaments up to 2.9 mm long; ovary ca. 0.4 mm long, pubescent; styles 0.1 mm long, incurved.

Capsules 3.5-4 × 1.8 mm plus style up to 2.2 mm long (just prior to dehiscence), the exocarp densely pubescent; calyx lobes and disc lobes persistent; central column about half the length of the valves and weakly developed. Seeds immature, flat, ca. 0.6 mm long, comose at both ends.—Fig. 2, 3E-J.

BREEDING SYSTEM.—Polygamodioecious? Male flowers and fruits present on *Eyma 3578* but not on the same twig.

FIELD CHARACTERS.—Stems and pedicels red, flowers pinkish white.

DISTRIBUTION AND ECOLOGY.—Endemic to Sulawesi and known from only 2 collections, both from Gn. Lumut (Loemoet). *Eyma 3607a* was collected on the top of Gn. Loemoet, and therefore at about 2200 m.

PARATYPE.—**SULAWESI**: *Eyma 3607a*, Res. Menado, Ond. afd. Poso, Tusschen Biv. III-Biv. IV, top Gn. Loemoet, fl., 4 Sep. 1938 (BO).

Eyma 3578 was included by BERNARDI (1964) in *Weinmannia urdanetensis* and appears to be the basis for his Tab. 29 (except g), but its similarity to *W. urdanetensis* is only superficial. The leaves of *W. eymaeana* are in fact more similar to those of *Pancheria multijuga* Guillaumin from New Caledonia. As sometimes occurs in other species of *Weinmannia*, the leaflet blades and calyx lobes are pustulate.

5. **Weinmannia coodei** H.C. Hopkins, **sp. nov.**

A Weinmannia furfuracea H.C. Hopkins *caulibus juvenibus glabris, non villosis-tomentosis, et foliolorum pagine abaxiali glabra non furfuracea recedit.*

TYPE.—*Coode 6197*, Sulawesi Tenggara (SE Sulawesi), Koaka area, 3°34'S-121°40'E, Gn. Watuwila foothills above Sanggona, Gn. Sopura, 1600 m, fr., 5 Nov. 1989 (holo-, L!; iso-, A!, K!).

Small tree 6 m high, 35 cm dbh. Young stems glabrous, ridged, nodes thickened with annular leaf scars prominent, older stems with longitudinal fissures and numerous white lenticels; branching not dichotomous. Stipules not seen, caducous. Leaves imparipinnate, with (1-)2 pairs of lateral leaflets, total length up to 13 cm; petiole 1.4-2 cm long, rachis segments 1-1.5 cm long, petiole and rachis segments semiterete and flattened or channelled and glabrous or tomentose on adaxial surface; lateral leaflets narrowly elliptical, distal leaflets larger than proximal ones, the largest per leaf 4.8-6.4 × 1.4-2.1 cm, the base unequal, ± sessile, acute, apex acute to obtuse; apical leaflet elliptical to obovate, 5-6.2 × 1.4-2.3 cm including base attenuate into a petiolule ca. 1 cm long, apex obtuse; blades subcoriaceous, glabrous above and below, not punctate; margin crenulate, 9-18 notches on each side of the largest lateral leaflets; midrib indented above, prominent below and glabrous, secondary and tertiary venation ± flat above and somewhat raised below, reticulum ± dense.

Inflorescence a pairs of dyads; peduncles up to 1 mm long, glabrous, the pair of stipules at the apex of the peduncle sericeous and persistent, and partially fused at their lateral margins to form a cup-shaped structure (Fig. 4A'), each stipule rounded at apex, abaxial surface strigose, adaxial surface glabrous; buds at apex of peduncles in angle between central pair of racemes not seen; axes of racemes puberulous, up to 7.5 cm long. Floral buds inserted in small fascicles; floral bracts ca. 0.7 mm long, carinate, pilose on outer surface. Flowers with pedicel 1-

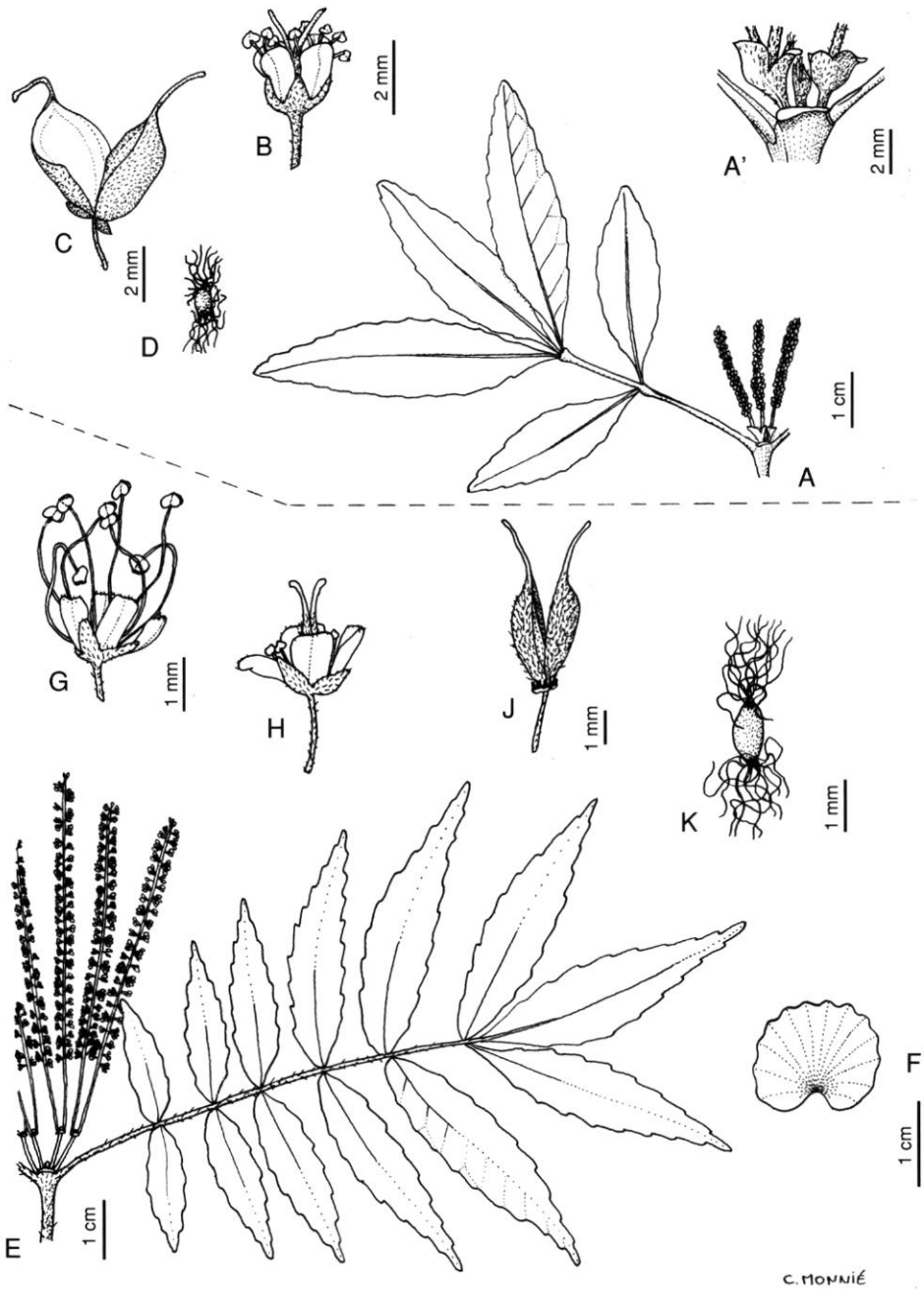

Fig. 4.—**A-D**, ***Weinmannia coodei***: **A**, shoot with one of a pair of opposite leaves and a developing inflorescence of 3 racemes; **A'**, enlargement of shoot apex (A) showing opposite petioles and scar from base of interpetiolar stipules, dormant apical bud in centre, and in axillary positions, between the apical bud and the petioles, the cupped bracts from within which the racemes arise (as 2 dyads with one raceme missing?); **B**, flower; **C**, capsule at dehiscence; **D**, seed. (A-D, *Coode 6197*).—**E-K**, ***Weinmannia hutchinsonii***: **E**, flowering shoot showing an inflorescence of 4 dyads; **F**, stipule; **G**, male flower; **H**, female flower; **J**, capsule at dehiscence, note persistent disc lobes but calyx lobes fallen; **K**, seed. (E, F, J, K, *Sulit PNH 2781*; G, *Elmer 14228*; H, *Elmer 17293*).—Drawn by C. MONNIÉ.

1.5 mm long, puberulous; calyx lobes 0.7 × 0.6 mm, pubescent on outer surface; corolla irregularly obovate to oblong, 1.4 × 0.8 mm, apex rounded, margin minutely ciliate; disc lobes 0.3-0.4 mm long, oblong or sometimes fused into an almost continuous disc; filaments up to 1.6 mm long; ovary 0.5-0.7 mm long, densely pubescent; styles 1.3 mm long, straight; stigmas capitate, papillose.

Capsule 3.5-4 × 2 mm at dehiscence, the styles 1.5-1.8 mm long, the exocarp densely pubescent; calyx lobes persistent. Immature seeds 0.6-0.8 mm long, either comose at both ends or with hairs all over surface, longest at ends.—Fig. 2, 4A-D.

BREEDING SYSTEM.—Not determined.

FIELD CHARACTERS.—Flowers pink with white stamens.

DISTRIBUTION AND ECOLOGY.—Known only from the type, from the SE peninsula of Sulawesi, from mossy ridge forest at 1600 m, on schist substrate with deep leaf-litter, canopy at 6 m; associates include *Pandanus*.

This species is named after Mark J.E. COODE who collected the type.

6. **Weinmannia celebica** Koord.

Meded. Lands Plantentuin. 19: 640 [450] (1898); Koord.-Schum., Syst. Verz. 3: 51 (1914); Engl., Nat. Pflanzenfam., ed. 2, 18a: 256 (1930); Bernardi, Bot. Jahrb. Syst. 83: 165 (1964).—Type: *Koorders 18022b*, North Sulawesi, Residentie Menado, Loeloemboelan nr. Pahoe oere, 700 m, 8 Apr. 1895 (lecto-, here designated, BO!; isolecto-, BO!, L!).

Tree 5-27 m, up to 45 cm dbh. Young stems woody, pilose, the hairs up to 0.5 mm long, older stems more sparsely pilose to glabrescent with minute longitudinal fissures and numerous lenticels. Stipules few in mature foliage, suborbicular, up to 0.45 cm diameter, base constricted, abaxial surface strigose especially at base. Leaves imparipinnate with 3-6 pairs of lateral leaflets, total length up to 14 cm; petiole 1.5-2 cm long, rachis segments 0.8-1.1 cm long, petiole and rachis segments semiterete, somewhat flattened on adaxial side, pilose and/or puberulent, often densely so on adaxial side; lateral leaflets lanceolate or narrowly elliptical, the largest 3-5 × 1-1.6 cm, the base unequal, ± sessile, apex acuminate; apical leaflet narrowly elliptical, 5.2-7 × 1.4-2 cm, base attenuate into a petiolule ca. 0.7 cm long, apex acuminate; leaflet blades chartaceous to subcoriaceous, glabrous above, pilose below, not punctate; margin crenulate, 11-14 notches on each side of the largest lateral leaflets; midrib slightly depressed above, puberulent at base, prominent below and pilose, secondary and tertiary venation slightly raised on both surfaces, reticulum not dense.

Inflorescence a pair of dyads; peduncles laterally flattened, ca. 1 cm long, strigose-puberulous; apical bud between the central pair of peduncles sericeous; bud at apex of peduncle in angle between central pair of racemes sericeous, minute; axes of racemes puberulous, up to 11 cm long. Flowers inserted in fascicles; floral bracts ± ligulate, ca. 1.3 × 1 mm, minutely strigose, mostly caducous; flowers probably unisexual; pedicel 1.8-2 mm long, puberulous to glabrous; in old female flowers/young fruit: calyx lobes 0.8 × 0.6 mm, glabrous; corolla oblong, ca. 1.5 × 0.8 mm, apex rounded; disc lobes 0.2 mm long, oblong; filaments 1.6 mm long; ovary 1.2 mm long, densely pubescent; styles 1.3 mm long, straight or divergent; stigmas papillose. Mature fruits not seen.—Fig. 2.

JUVENILE FOLIAGE.—Stipules orbicular to amplexicaul, up to 1.2 × 1.1 cm, persistent. Leaves imparipinnate, up to 30 cm long, lateral leaflets in up to 16 pairs, to 5.2 × 1.4 cm, blades chartaceous, margin distinctly serrate.

BREEDING SYSTEM.—Probably dioecious.

FIELD CHARACTERS.—Young leaves red; flowers dirty white.

DISTRIBUTION AND ECOLOGY.—Known from the northern peninsula of Sulawesi around Menado in forest at 600-1500 m. Scarce to locally common.

MATERIAL EXAMINED.—**NORTH SULAWESI**: *Koorders 18017b*, Residentie Menado, Lolomboelan, 900 m, st., 12 Mar. 1895 (BO, L); *Koorders 18021b*, Gn. Klabat, 600 m?, st., juv., 19 Jan. 1895 (BO); *Koorders 18023b*, Oerwoud Lolomboelan bij Pakoe-Oere, 700 m, st., juv., 6 Apr. 1895 (BO); *Koorders 18025b*, Sapoetan-

gebergte, 1500 m, st., juv., 5 May 1895 (BO).

LOCAL NAMES.—Teregkoese.

Of the five collections cited by KOORDERS-SCHUMACHER, only one is fertile and three are of juvenile foliage. This species is distinguished from *W. fraxinea* by the pilose indumentum on the underside of the leaflets and from *W. devogelii* by the longer pedicels. Its affinities seem to be with *W. hutchinsonii* and *W. luzoniensis* from the Philippines but better collections are needed to determine whether it is in fact worthy of specific rank.

BERNARDI (1964) cited 2 collections for this species [*Neth. Ind. For. Serv. bb 20787* (A) from Sulawesi and *Rutten 2231* (U) from Seram] but did not see the type. Both of these specimens are now placed in *W. furfuracea*.

7. **Weinmannia negrosensis** Elmer

For synonomy and description, see under Philippines (p. 62).

MATERIAL EXAMINED.—**NORTH SULAWESI**: *Milliken 1034X*, Dumoga Bone National Park, Distr. Bolaang-Mongondow, nr. Gn. Sinombayuga, 0°28'N-123°44'E, 1970 m, fl., 25 Sep. 1991 (K).

FIELD NOTES.—Common, multi-stemmed tree in mossy montane forest; bark white, inner bark orange-brown turning bright orange; wood white. Petals and anthers white; pedicel, calyx and pistil pink.

Uncertain and little known species

Weinmannia sp. (Sulawesi A)

Monod de Froideville 119, South Sulawesi, afd. Mandur, Mt. Mamboeliling, N of Mamasa, 2700 m, st. (BO, L). Although placed by LAM (1945) in *Weinmannia urdanetensis*, its leaves are quite different, the leaflets being broader, petiolulate, and with the margin more sinuate.

Shrub or small tree; young stems densely pubescent, branching not dichotomous. Stipules ± orbicular, up to 0.6 mm wide, apex rounded, adaxial surface glabrous, abaxial one strigose, especially towards the base. Leaves imparipinnate with 9-11 pairs of leaflets, leaves up to 6 cm long; petiole and rachis segments terete, densely pubescent. Leaflets oblong or somewhat ovate, 0.7-1.1 × 0.5-0.6 cm, the terminal leaflet not markedly differing from the laterals in size or shape, base petiolulate, the petiolule ca. 0.5 mm long, apex obtuse; blades subcoriaceous, glabrous above and below except for strigose indumentum on midrib below; margin crenate-sinuate with 3-4 notches on each side of a leaflet. Flowers and fruits not known.

WEINMANNIA IN THE PHILIPPINES

Five species occur in the Philippines, three of which are endemic. The two which also occur outside the Philippines are *Weinmannia negrosensis* (also in Sulawesi) and *W. urdanetensis* (also in New Guinea). The most widespread Malesian species, *W. fraxinea*, has not been recorded from this region. Except for a small number of recent collections, field notes are often poor and thus it is difficult to judge whether the apparent ecological differences between species have any significance.

For several of the names published by ELMER and by MERRILL, the protologues do not specify where the holotype is located. According to VAN STEENIS-KRUSEMAN (1950), the first sets for these authors should be in Manilla. However, although the herbarium at PNH was destroyed during the Second World War (HOLMGREN et al. 1990), some ELMER types for names in *Weinmannia* are still extant there (unpublished notes of R.D. HOOGLAND at P). In these instances, the sheets at PNH are provisionally cited as holotypes. Where a specimen is not known from PNH, the collections seen or known to exist are listed as isotypes, and I have refrained from designating lectotypes because I have not had the opportunity to visit PNH and verify that no other type material is there.

The four species with medium-sized leaflets (*Weinmannia hutchinsonii*, *W. negrosensis*, *W.*

luzoniensis and *W. lucida*) appear closely related to one another. Characters that they share include: calyx lobes frequently falling in fruit (which is unusual in sect. *Fasciculata*); disc lobes short, broad and persistent in the fruiting stage; flowers unisexual; capsules densely pubescent; inflorescences often richly developed; stipules often persistent.

Key to the species in the Philippines

1. Leaves imparipinnate, the lateral leaflets 5-11 pairs, small (0.7-1.5 × 0.25-0.45 cm) ..... **5. W. urdanetensis**
1'. Leaves simple, trifoliolate or imparipinnate, the lateral leaflets up to 7 pairs, the leaves or largest lateral leaflets per leaf 2-15.5 × 0.6-6.5 cm 2
2. Young stems and leaf axes pilose 3
2'. Young stems and leaf axes usually glabrous or if indumentum present, puberulent not pilose 4
3. Lateral leaflets (3-)5-7(-8) pairs, terminal leaflet 4.1-8.3 × 0.9-2.3 cm; length : breadth ratio for largest lateral leaflets per leaf 1 : 0.2-0.3 ..... **1. W. hutchinsonii**
3'. Lateral leaflets 2-3(-4) pairs, terminal leaflet 6.7-12 × 2.2-5 cm; length : breadth ratio for largest lateral leaflets per leaf 1 : 0.33-0.52 ..... **2. W. luzoniensis**
4. Leaves simple or trifoliolate, the blades coriaceous, elliptical or obovate, reticulum often dense ..... **3. W. negrosensis**
4'. Leaves imparipinnate, (1-)2-3 pairs of lateral leaflets, blades subcoriaceous, elliptical, reticulum lax ..... **4. W. lucida**

1. Weinmannia hutchinsonii Merr.

Philipp. J. Sci. Bot. 2: 275 (1907); Merr., Enum. Philipp. Fl. Pl. 2: 224 (1923); Engl., Nat. Pflanzenfam., ed. 2, 18a: 256 (1930); Bernardi, Bot. Jahbr. Syst. 83: 169, t. 20 (1964).—Type: *Merrill 5753*, Philippines, Mindoro, Mt. Halcon, Nov. 1906 (iso-, FI, K!, NY, P!, US).

Weinmannia camiguinensis Elmer, Leafl. Philipp. Bot. 7: 2607 (1915); Merr., Enum. Philipp. Fl. Pl. 2: 224 (1923); Engl., Nat. Pflanzenfam., ed. 2, 18a: 256 (1930).—Type: *Elmer 14228*, Philippines, Mindanao, Island of Camiguin, Mambajao, densely wooded gulches or ravines at 3500 ft. (holo-, PNH, seen by R.D. HOOGLAND; iso-, A!, BM!, BO!, GH!, K!, L!, P! and numerous others cited by BERNARDI).

Weinmannia bulusanensis Elmer, Leafl. Philipp. Bot. 10: 3723 (1939); nom. illeg., description in English. Collection cited: *Elmer 17293*, Philippines, Luzon, Prov. Sorsogon, Irosin (Mt. Bulusan), 1000 ft., Sep. 1916 (A!, BM!, BO!, GH!, L!, P! and others).

Weinmannia irosinensis Elmer, Leafl. Philipp. Bot. 10: 3725 (1939); nom. illeg., description in English. Collection cited: *Elmer 14918*, Philippines, Luzon, Prov. Sorsogon, Irosin (Mt. Bulusan), 1500 ft., Nov. 1915 (BM!, BO!, GH!, L!, P! and others).

Tree 7-12 m high, 12-40 cm dbh. Young stems woody, pilose, the hairs up to 0.8 mm long, older ones more sparsely pilose to glabrescent or puberulous, with minute longitudinal fissures and numerous lenticels; branching not dichotomous. Stipules caducous or not, suborbicular or reniform, up to 1.2 × 1.9 cm, base usually constricted, apex rounded, wavy or coarsely toothed, adaxial surface glabrous except at base, abaxial surface puberulous especially at base. Leaves imparipinnate with (3-)5-7(-8) pairs of lateral leaflets, total length up to 14 cm including a petiole 1.3-2.5 cm long; rachis segments 0.6-1.5 cm long; petiole and rachis segments semiterete, flattened on adaxial side, pilose and/or puberulent, often densely so on adaxial side; lateral leaflets narrowly elliptical, increasing in size distally along the rachis, the largest per leaf 2-6.5 × 0.6-1.4 cm, the base unequal, ± sessile, apex narrowly acute; apical leaflet narrowly elliptical, (2.2-)4.1-8.3 × (0.7-)0.9-2.3 cm, base shortly attenuate to petiolulate, apex narrowly acute; leaflet blades chartaceous to subcoriaceous, glabrous above, sparsely pilose below, not punctate; margin crenate to serrate, 7-11 notches on each side of the largest lateral leaflets; midrib slightly depressed above, puberulent at base, prominent below and pilose, secondary and tertiary venation slightly raised on both surfaces, reticulum not dense.

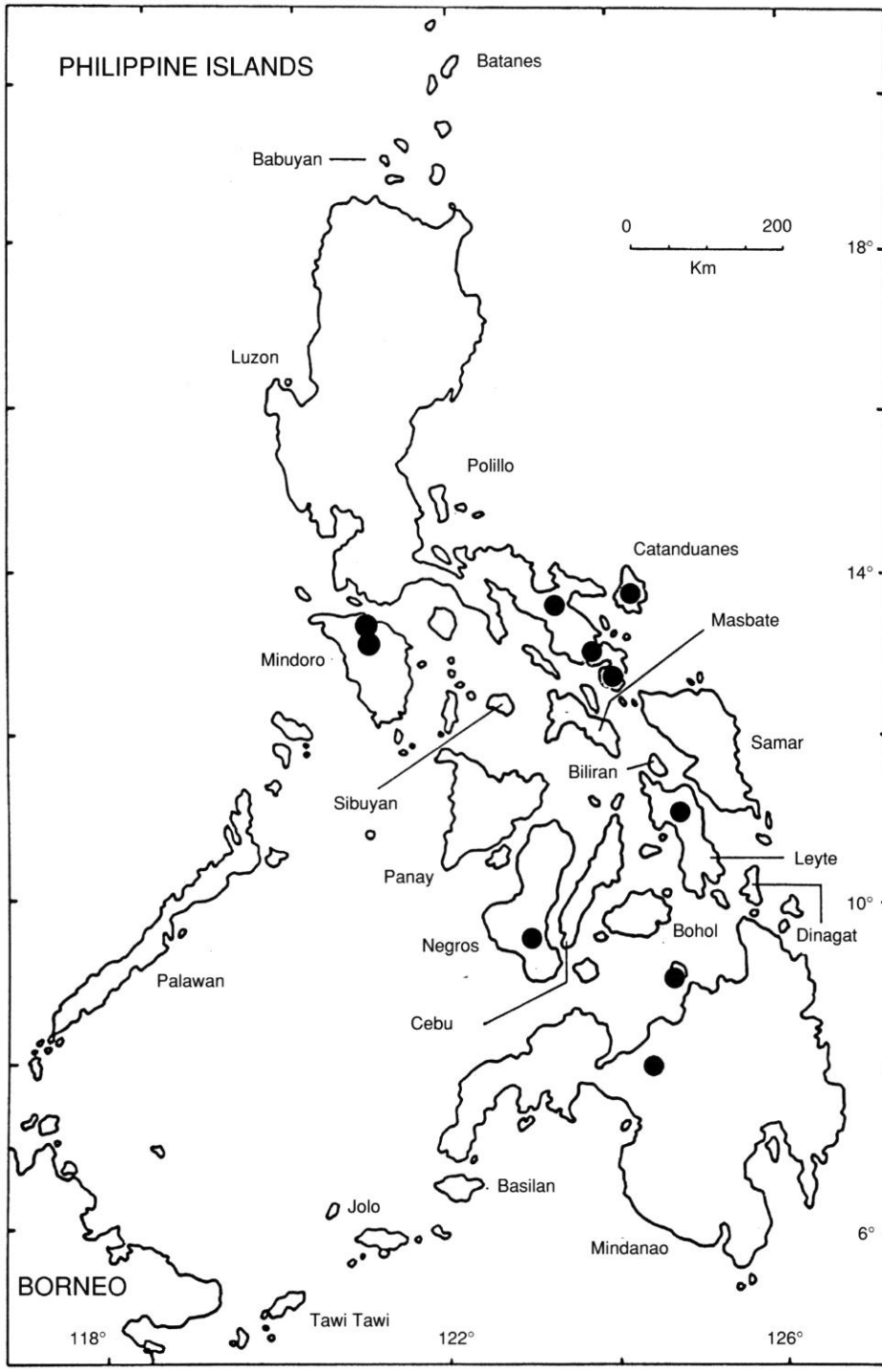

Fig. 5.—Distribution of ***Weinmannia hutchinsonii***.

Inflorescence of 1-3 pairs of dyads, sometimes a few sequential nodes producing inflorescences simultaneously; peduncles laterally flattened, 0.4-1.5 cm long, puberulous; buds at apex between the central pair of peduncles 1 or 3, sericeous; buds at apex of peduncle in angle between central pair of racemes sericeous, minute; axes of racemes densely puberulous, up to 12 cm long. Floral buds inserted in fascicles; floral bracts not seen, caducous. Flowers unisexual; pedicel 0.8-1.5 mm long, puberulous; calyx lobes 0.5-0.7 × 0.4-0.5 mm, hirsute on outer surface; corolla obovate or almost circular, 1-1.3 × 0.7-0.9 mm, rounded at apex, ciliate; disc lobes 0.2-0.3 mm long, broadly oblong; in male flowers: filaments 2.8-3 mm long, ovary 0.4 mm long, pubescent, styles 0.1 mm long, incurved; in female flowers: filaments ca. 0.9 mm long, ovary ca. 1 mm long, densely pubescent, styles ca. 0.9 mm long, straight, stigmas papillose.

Capsule 2-2.5 × 1.4-2 mm at dehiscence, the styles up to 1.5 mm long, the exocarp pubescent; calyx lobes often caducous, disc lobes persistent; central column present but shorter than valves. Seeds ca. 0.6 mm long, comose at both ends, the hairs to 1.7 mm long.—Fig. 4E-K, 5.

BREEDING SYSTEM.—Dioecious.

FIELD CHARACTERS.—Bark grey-brown, vertically cracked and with ± vertical lines of corky lenticels; outer bark soft and somewhat flaky in patches, elsewhere thin and not detaching; inner bark pinkish straw; wood distinctly reddish or pinkish. Young leaves reddish. Flowers cream, light brown, whitish orange, or pinkish; immature fruit pinkish red or violet.

DISTRIBUTION AND ECOLOGY.—Philippines: Luzon, Catanduanes, Leyte, Negros and Mindanao. In forest on ridges and slopes, including open, disturbed areas from 325-1150 m; common (*Mendoza PNH 18409*).

MATERIAL EXAMINED.—**LUZON**: *Edaño BS 76206*, Prov. Camarines Sur, Mt. Isarog, Dec. 1928 (K); *Edaño PNH 34508*, Albay Prov., Mt. Malinao, fr., 3 Feb. 1956 (A, BM, K, KEP, L); *Elmer 17293*, Prov. of Sorsogon, Irosin, Mt. Bulusan, fl., Sep. 1916 (A, BM, BO, GH, K, L, P); *Mendoza 1366, PNH 18409*, Albay Prov., Mayon Volcano, 760 m, fr., May-June 1953 (A, K, L); *Ramos BS 23494*, Prov. of Sorsogon, yfr., July-Aug. 1915 (A, BISH, BM, BO, GH, K, L, SING); *Ramos BS 23695*, Prov. of Sorsogon, Bulusan Volcano, fr., Sep. 1915 (BM, K, P); *Sulit PNH 2717*, Sorsogon Prov., Mt. Bulusan, 380 m, fl., yfr., July-Aug. 1947 (A, BO, K, L, SING); *Sulit PNH 2781*, ibid., 390 m, yfr., July-Aug. 1947 (A, BO, L, SING); *Vidal 2717*, Prov. Camarines, Mt. Isarog, fr., Mar. 1886 (A, K).—**CATANDUANES**: *Ramos BS 30537*, yfr., 14 Nov-11 Dec. 1917 (A, K).—**MINDORO**: *Coode 5393*, N coast, Subaan R. inland from San Teodoro, 450 m, yfr., 18 Apr. 1986 (A, K, L).—**NEGROS**: *Edaño PNH 6811*, Oriental, Inalacan R., W of Tanjay, 500 m, fr., Sep. 1948 (A, BO, SING).—**LEYTE**: *Wenzel 997*, fl., 19 Aug. 1914 (GH); *Wenzel 1088*, fl., 1 Oct. 1914 (A, BM, GH).—**MINDANAO**: *M.S. Clemens 519*, Camp Keithley, Lake Lanao, fl., May 1906 (BO, K, P).

LOCAL NAMES.—Torog-torig (dialect Bic); Payvagta (dialect Bir).

Weinmannia celebica may be close to this species but better collections of the former are needed to determine whether they are distinct.

2. **Weinmannia luzoniensis** S. Vidal

Revis. Pl. Vasc. Filip.: 125 (1886); Merr., Enum. Philipp. Fl. Pl. 2: 225 (1923); Engl., Nat. Pflanzenfam., ed. 2, 18a: 256 (1930); Bernardi, Bot. Jahrb. Syst. 83: 172 (1964).—Type: *Vidal y Soler 314*, Philippines, Prov. Tayabas, Lucban (lecto-, here designated, MA, photo at P!; isolecto-, A!, FI, L!, MA [photos at P!]).

Weinmannia luzoniensis S. Vidal var. *puberula* Elmer, Leafl. Philipp. Bot. 8: 3078 (1919).—Type: *Elmer 18066*, Philippines, Prov. Laguna, Luzon, Mt. Maquiling, Los Banos, June-July 1917 (holo-, PNH, seen by R.D. HOOGLAND; iso-, A, BM!, BO!, K!, L!, P! and others).

Tree 8-20 m high, 10-50 cm dbh. Young woody stems pilose, the hairs up to 0.8 mm long, older ones more sparsely pilose to glabrescent or puberulous, with minute longitudinal fissures and numerous lenticels; branching not dichotomous. Stipules caducous or not, suborbicular, up to 1.7 × 2.2 cm, base constricted, apex rounded, both surfaces puberulous especially towards the base. Leaves imparipinnate, with 2-3(-4) pairs of lateral leaflets, total length up to 19 cm including petiole of 2-2.5 cm; rachis segments 0.5-1.5 cm long, petiole and rachis seg-

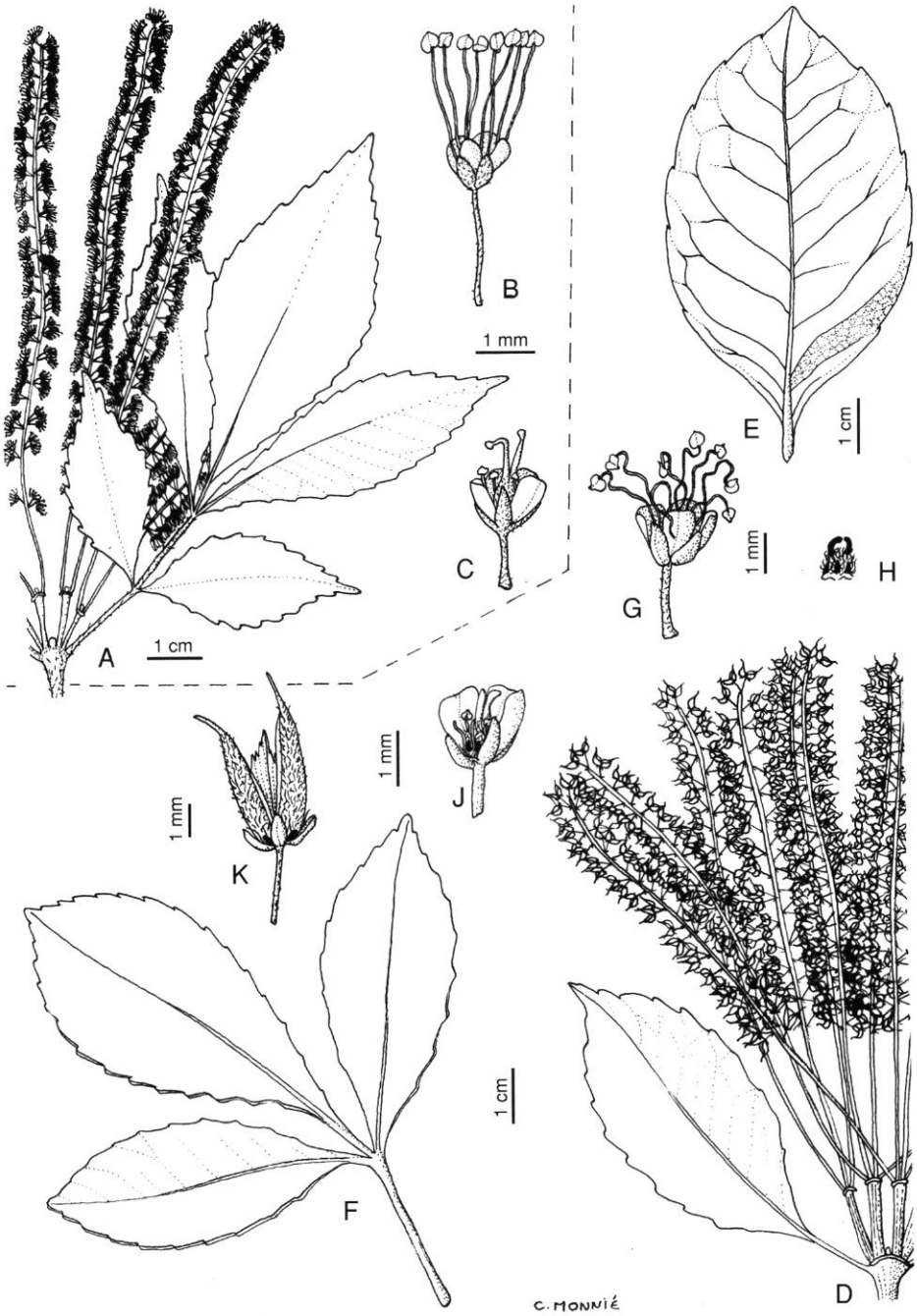

Fig. 6.—**A-C**, ***Weinmannia luzoniensis***: **A**, flowering shoot with an inflorescence of 4 dyads; **B**, male flower; **C**, female flower. (A, *Elmer 9093*; B, *Elmer 18066*; C, *Vanoverbergh 1253*).—**D-K**, ***Weinmannia negrosensis***: **D**, shoot with an infructescence of 4 tetrads; **E**, simple leaf; **F**, trifoliolate leaf; **G**, male flower; **H**, detail of G with corolla removed to show ovary, styles and disc lobes; **J**, female flower, one petal removed; **K**, capsule at dehiscence, the calyx lobes and disc lobes persistent. (D, K, *Ramos Phil. Pl. 1287*; E, G, H, *Quisumbing & Sulit BS 82442*; F, *Robinson BS 9399*; J, *Celestino PNH 7894*).—Drawn by C. MONNIÉ.

ments semiterete, flattened on adaxial side, usually somewhat pubescent or pilose at least on the adaxial side; lateral leaflets elliptical, increasing in size distally along the rachis, the largest 4.5-8.4 × 1.5-3.5 cm, the base unequal, ± sessile, apex acuminate; apical leaflet elliptical or usually markedly rhomboidal, 6.7-12 × 2.2-5 cm, base shortly attenuate to form a winged petiolule up to 1 cm long, apex acuminate; leaflet blades chartaceous to subcoriaceous, glabrous and sometimes shiny above, sparsely pilose below, not punctate; margin markedly crenate, 13-17 notches on each side of the largest lateral leaflets; midrib slightly depressed above, puberulent at base, prominent and pilose below, secondary and tertiary venation slightly raised on both surfaces, reticulum not dense.

Inflorescence usually 4 dyads or tetrads, sometimes a few successive nodes producing partial inflorescences simultaneously; peduncles laterally flattened, puberulous; buds at apex of main stem between the central pair of peduncles 1 or 3, sericeous; buds at apex of peduncle in angle between central pair of racemes sericeous, minute; axes of racemes densely puberulous, up to 9 cm long. Floral buds inserted in fascicles; floral bracts not seen, caducous. Flowers unisexual; pedicel 0.8-1.5 mm long, puberulous; calyx lobes 0.6-0.7 × 0.4-0.6 mm, hirsute on outer surface; corolla oblong or irregularly obovate, 1-1.2 × 0.6-0.8 mm, rounded or emarginate at apex, ciliate; disc lobes ca. 0.3 mm long, broadly oblong; in male flowers: filaments 2.2-3.4 mm long, ovary 0.4-0.6 mm long, pubescent, styles 0.1-0.4 mm long, incurved; in female flowers: filaments 0.7-1.2 mm long, ovary 1-1.2 mm long, densely pubescent, styles 0.9-1.1 mm long, straight, stigmas capitate, papillose.

Capsule 2-2.7 × 1.3-1.5 mm at dehiscence, the styles up to 1.5 mm long, the exocarp densely pubescent to velutinous; calyx lobes caducous or not, disc lobes persistent; central column present but shorter than valves. Seeds ca. 0.7 mm long, comose at both ends, the hairs to 1 mm long.—Fig. 6A-C, 7.

BREEDING SYSTEM.—Dioecious.

FIELD CHARACTERS.—Flowers yellowish or red (*Conklin & Buwaya PNH 80387*).

DISTRIBUTION AND ECOLOGY.—Luzon and one record from Mindanao. In mid-mountain and ridge forest, and secondary forest, from 500 to 2000 m, on clay soil. BROWN (1919) records it on Mt. Maquiling in mid-mountain forest at 700 m as amongst the more prominent first story species in the *Quercus-Neolitsea* association, and says it also occurs in dipterocarp forest and is fairly common in some localities in the mountains of Luzon.

MATERIAL EXAMINED.—**LUZON**: *Brown BS 18999*, Laguna Prov., Mt. Makiling, fl., Apr.-May 1913 (A, K); *Conklin & Rosario, PNH 72666*, Mountain Prov., Mt. Ibukakan, Banaue, buds, fl., 1 Aug. 1961 (A, K, L); *Conklin & Buwaya PNH 80387*, Mountain Prov., Bayninan, Banaue, Ifugao, 4000 ft., fl., 29 Mar. 1963 (A, K, L); *Curran FB 5070*, Benguet Prov., Baguio, fl., yfr., Aug. 1906 (BO, SING); *Elmer 8831*, ibid., fl., Mar. 1907 (A, BO, K, L); *Elmer 9093*, Prov. Tayabas, Lucaban, fl., May 1907 (A, BO, K, L); *Elmer 18024*, Prov. Laguna, Los Banos, Mt. Maquiling, fl., June-July 1917 (BM, BO, K, L, P); *Gacad FB 27274*, Benguet Subprov., Irisan, fr., May 1918 (BO, L, SING); *Hancock 82*, nr. Baguio, st., Aug. 1935 (K); *Lagasca FB 30194*, Benguet Prov., fl., July-Oct. 1925 (BO, P); *Langlassé 70*, Foot of Mt. Banajao, fr., 26 Oct. 1894 (P); *Leano FB 21846*, Benguet Subprov., fl., yfr., Jan.-May 1914 (BM, K, P); *Loher 5114*, Benguet (K); *Loher 5125*, ibid. (K); *Merrill Phil. Pl. 830*, Benguet Subprov., fl., May 1911 (K); *Merrill Phil. Pl. 1739*, Benguet Subprov., fl., May 1914 (BM, BO, GH, L, P, SING); *Meyer FB 3123*, Prov. Bataan, Lamao R., Mt. Mariveles, fl., May 1905 (K, SING); *Ramos BS 20533*, Prov. Laguna, San Antonio, fr., Feb. 1913 (BM, K, P); *Ramos BS 23673*, Prov. Sorsogon, Bulusan volcano, yfr., Sep. 1915 (K); *Sankuhl 376*, Benguet Subprov., st., Feb. 1916 (A); *Sulit PNH 6989*, Laguna Prov., Mt. Makiling, Nat. Park, 500-700 m, fr., 11 Nov. 1946 (A); *Vanoverbergh 1253*, Bontoc Subprov., fl., 25 July 1914 (A, L, P); *Vidal y Soler 2002*, Benguet (K).—**MINDANAO**: *Clemens s.n.*, Camp Keithley, Lake Lanao, yfr., Sep.-Oct. 1907 (BO).

LOCAL NAMES.—Tabangawon (dialect Ifugao); Tabangawon an pahitong, Bani (Tagalog); Itangan (Igorot); Saiu (Igorot); Sayo (*Vidal y Soler 314*). Local uses: good tanbark (BROWN 1954).

TYPIFICATION.—In the protologue, VIDAL Y SOLER cites two collections, *314* Lucban, Pr. Tayabas, and *2002* Distr. Benguet. His original set of material in Manila was destroyed by fire and the remainder of his herbarium and types are

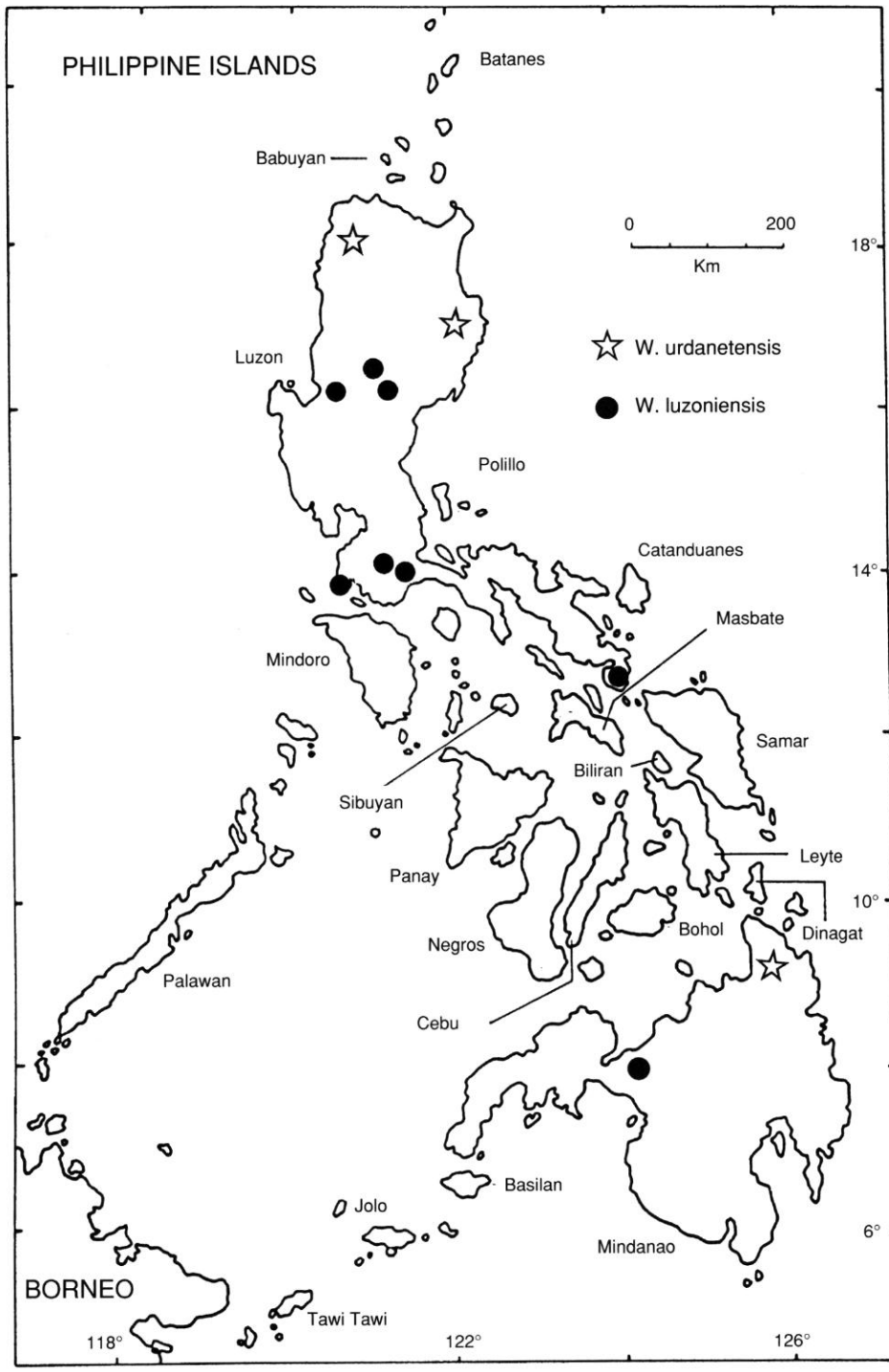

Fig. 7.—Distribution of ***Weinmannia luzoniensis*** and ***W. urdanetensis***.

at MA (STAFLEU & COWAN 1986). There are nine sheets of *314* at MA, and the one bearing a fruiting specimen and two labels with the inscription "Inspeccion Gral de Montes de Filipinas" is here designated as the lectotype.

I agree with BERNARDI (1964: 172) that var. *puberula* does not merit recognition.

3. Weinmannia negrosensis Elmer

Leafl. Philipp. Bot. 2: 577 (1909); Merr., Enum. Philipp. Fl. Pl. 2: 225 (1923); Engl., Nat. Pflanzenfam., ed. 2, 18a: 256 (1930); Bernardi, Bot. Jahrb. Syst. 83: 174, t. 23 var. *negrosensis* (1964).—Type: *Elmer 9656*, Philippines, Prov. of Negros Oriental, Dumaguete, Cuernos Mts., ridge at 4250 ft., Mar. 1908 (iso-, BM!; also A, E, FI, G, LE, and Z fide BERNARDI).

Weinmannia simplicifolia Merr., Philipp. J. Sci. Bot. 12: 268 (1917); Merr., Enum. Philipp. Fl. Pl. 2: 225 (1923); Engl., Nat. Pflanzenfam., ed. 2, 18a: 256 (1930).—*Weinmannia negrosensis* var. *simplicifolia* (Merr.) Bernardi, Bot. Jahrb. Syst. 83: 175, t. 24 (1964).—Type: *Ramos & Edaño BS 26531*, Philippines, Tayabas Prov., Mt. Dingalan, 300 m, 9 Sep. 1916 (iso-, A, K!, US).

Weinmannia cuneatifolia Engl., Nat. Pflanzenfam., ed. 2, 18a: 252 (1930).—Type: *Ramos Philipp. Pl. 1287*, Philippines, Mindanao (holo-, B, seen by R.D. HOOGLAND; iso-, BM!, L!, P! and others).

Shrub or tree 3-25 m high, up to 30 cm dbh when 12 m high. Young stems glabrous, older ones with numerous white lenticels; branching not usually dichotomous. Stipules caducous or not, suborbicular, up to 1.5 × 1.7 cm, base constricted, apex rounded, abaxial surface glabrous or shortly strigose especially towards the base, adaxial surface glabrous. Leaves simple or trifoliolate; total length up to 19 cm in trifoliolate leaves, including petiole of 1-4 cm; petiole subterete, slightly flattened or channelled on adaxial side, glabrous or puberulent; leaf(let) blades elliptical to obovate; in trifoliolate leaves, lateral leaflets 4.5-11.5 × 1.6-3.4 cm, base shortly attenuate, apex acute or acuminate; apical leaflet 6-15.5 × 2.4-6 cm, base long attenuate (constricted region up to 1.7 cm long), apex acute or acuminate; unifoliolate leaves 4.5-13 × 1.7-6.5 cm, base attenuate (constricted region 0.6-1.5 cm long); leaflet blades coriaceous, glabrous on both surfaces, not punctate below; margin sometimes minutely thickened and revolute, crenate, 11-15 crenations on each side of a leaflet; midrib sometimes slightly depressed above, prominent below, glabrous, secondary and tertiary venation flat or raised above and raised below, reticulum dense.

Inflorescence usually 4 dyads or tetrads, sometimes a few successive nodes producing partial inflorescences simultaneously; peduncles 0.3-1.3(-3) cm long, puberulent; buds at apex of main stem between central pair of peduncles 1 or 3, sericeous; buds at apex of peduncle in angle between central pair of racemes sericeous, minute; axes of racemes puberulent, up to 12 cm long. Floral buds inserted in fascicles; floral bracts ligulate, 1.5 mm long, ciliate. Flowers unisexual; pedicel 1-1.7 mm long, puberulent; calyx lobes 0.6-1 × 0.6-0.8 mm, glabrous on outer surface, ciliate; petals obovate, apex rounded, 1-1.4 × 0.7-0.9 mm, ciliate; disc lobes 0.3-0.4 mm long, broadly oblong; in male flowers: filaments 2.7-3.2 mm long, ovary ca. 0.5 mm long, pubescent, styles 0.1-0.2 mm long, incurved; in female flowers: filaments 0.9-1.7 mm long, ovary 1.1-1.4 mm long, pubescent, styles 1.3-1.9 mm long, straight, stigmas capitate, papillose.

Capsule 2-2.5 × 1.3-1.5 mm at dehiscence, the styles 1-1.5 mm, the exocarp pubescent or densely so; calyx lobes usually but not always persistent, disc lobes persistent; central column present. Seeds 0.8-0.9 mm long, comose at both ends, the hairs to ca. 1 mm long.—Fig. 6D-K, 8.

BREEDING SYSTEM.—Dioecious.

FIELD CHARACTERS.—Bark greyish or light yellow-brown; smooth or finely cracked. Inner bark red-brown; wood pale straw or "sappy" red, moderately hard, odourless. Young leaves reddish; old leaves bright red. Inflorescence axes reddish; flowers fragrant; corolla white tinged with red, filaments reddish towards the base; or flowers yellowish white.

DISTRIBUTION AND ECOLOGY.—Sulawesi (1 collection) and Philippines (Luzon, Mindoro, Sibuyan, Negros, Leyte and Mindoro). Recorded from upper montane forest and mossy forest at 1200-1960 m. In the type description, ELMER

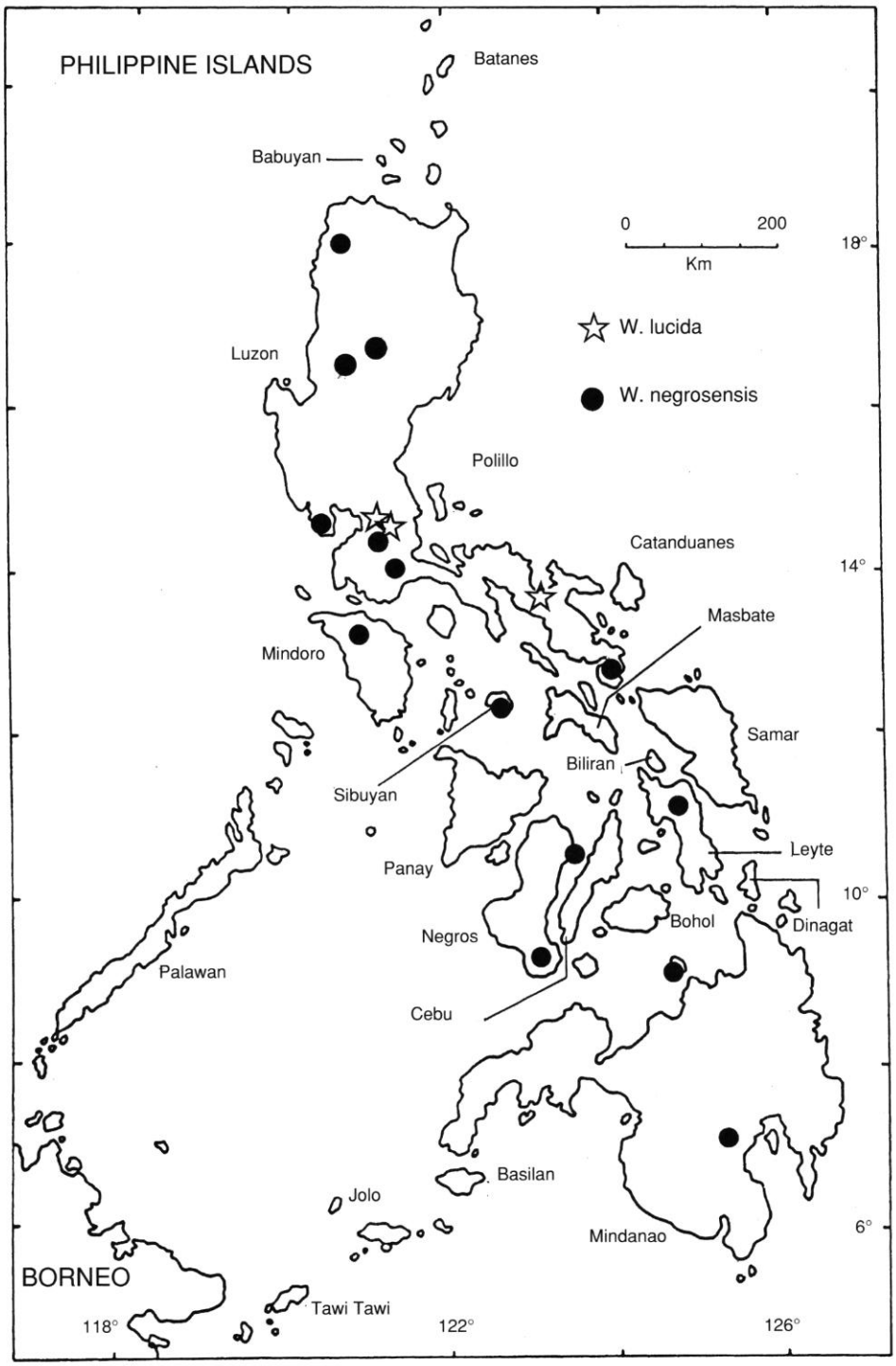

Fig. 8.—Distribution of ***Weinmannia negrosensis*** and ***W. lucida***.

records it from dense shrubberies on a windswept ridge at 4250 ft. (= 1400 m).

MATERIAL EXAMINED.—**LUZON**: *Borden FB 789*, Prov. Bataan, Lamao R., Mt. Mariveles, buds, May 1904 (BM, K); *Borden FB 1227*, ibid., fl., June 1904 (BM, K, P); *Celestino PNH 7894*, Mountain Prov., Mt. Polis, Ifugao, 2042 m?, fl., Mar. 1948 (A, L); *Loher 5989*, Rizal Prov., Montalban, fr., July 1905 (K); *Loher 5990*, Rizal, Orind?, fl., 5 Oct. 1906 (K); *Loher 12219*, Rizal Prov., fr., Dec. 1910 (A, BM, P); *Loher 12816*, ibid., fl., Mar. 1909 (BM); *Meyer FB 2756*, Prov. Bataan, Lamao R., Mt. Mariveles, fl., fr., Feb. 1904 (K); *Quisumbing & Sulit BS 82442*, Benguet Subprov., Mt. Singakalsa, Mar. 1931 (A); *Ramos BS 23500*, Prov. Sorsogon, fr., July-Aug. 1915 (A, K, P); *Ramos BS 23666*, Prov. Sorsogon, Bulusan Volcano, fl., Sep. 1915 (BM); *Ramos BS 33366*, Ilocos Norte Prov., Mt. Palimlim, fl., Aug. 1918 (A); *Robinson BS 9399*, Prov. Tayabas, Infanta, fr., Aug. 1909 (L, P); *Whitford 420*, Prov. Bataan, Lamao R., Mt. Mariveles, fl., June 1904 (K, P); *Whitford s.n.*, Prov. Bataan, Lamao R., st., May 1905 (K).—**MINDORO**: *Coode 5717*, NE Mindoro, Ramayan, Mt. Halcon complex above Paitan on Dulangan R., 1200 m, st., 8 May 1986 (L).—**SIBUYAN**: *Argent & Reynoso 89125*, Romblon Prov., above Magdiwang on ridge leading to Mayos Peak, 1350 m, fl., 27 Aug. 1989 (K).—**NEGROS**: *Edaño PNH 21958*, Negros Occidental, Mt. Canlaon, 1960 m, st., 10 Apr. 1954 (K, L).—**LEYTE**: *Wenzel 1057*, fr., 14 Aug. 1914 (A, BM).—**MINDANAO**: *Co 3135*, N Cotabato Prov., Kidapawan Muncip., Mt. Apo, NW slope, trail between Lake Ago and Apo Geothermal project site B, 1320 m, buds, 24 Oct. 1990 (A); *Ramos Phil. Pl. 1287*, Camiguin, fr., Apr. 1912 (BM, L, P).

LOCAL NAMES.—Basikong (Bagobo language); Tangolamos-itum (Visayan).

TYPIFICATION.—ENGLER did not cite a particular collection in the protologue of *Weinmannia cuneatifolia*, but only the locality, Mindanao. On the basis of this, the RAMOS collection at B is considered to be the holotype.

BERNARDI (1964) recognised two varieties which had either simple or trifoliolate leaves: var. *simplicifolia* and var. *negrosensis*. However, several specimens have both types of leaves so var. *simplicifolia* is not maintained here.

4. **Weinmannia lucida** Merr.

Philipp. J. Sci. Bot. 10: 7 (1915); Merr., Enum. Philipp. Fl. Pl. 2: 225 (1923); Engl., Nat. Pflanzenfam., ed. 2, 18a: 256 (1930); Bernardi, Bot. Jahrb. Syst. 83: 170, t. 21 (1964).—Type: *Ramos Philipp. Pl. 1109*, Philippines, Luzon, Prov. Laguna, Dahican, in forest along river, 17 Sep. 1912 (iso-, US!; also FI, G, JE, M, U and Z, fide BERNARDI).

Shrub or small tree 3-10 m high. Young stems ± glabrous, older ones glabrous with minute longitudinal fissures; branching not dichotomous. Stipules caducous or not, suborbicular, up to 0.7 × 0.9 cm, base constricted and puberulous on abaxial surface, glabrous on adaxial side, apex rounded. Leaves imparipinnate, lateral leaflets (1-)2-3 pairs, total length up to 18 cm including petiole of 1.5-3.5 cm; rachis segments 1.2-3 cm long, petiole and rachis segments subterete, slightly flattened or channelled on adaxial side, sometimes densely puberulent; leaflets elliptical to broadly elliptical, often conduplicate when dry; lateral leaflets 5-8.5 × 2-3.7 cm, the blade narrowing unequally at the base into a petiolule ca. 0.5 cm long, apex acuminate; apical leaflet 7-9.5 × 2.5-3.5 cm, not markedly larger than the largest laterals, base attenuate to form a petiolule ca. 1 cm long, apex acuminate; leaflet blades subcoriaceous, glabrous and shiny on both sides, drying dark brown above and reddish brown below, not punctate; margin sometimes minutely revolute, crenate, 8-10 notches on each side of a leaflet; midrib slightly depressed above, prominent below, secondary and tertiary venation slightly raised on both surfaces, reticulum not dense.

Inflorescence usually 4 dyads or tetrads, sometimes a few successive nodes producing partial inflorescences simultaneously; peduncles 0.5-1 cm long, shortly puberulous; buds at apex of main stem between central pair of peduncles 1 or 3, sericeous; buds at apex of peduncle in angle between central pair of racemes sericeous, minute; rachises puberulous, up to 12 cm long. Floral buds inserted in fascicles; floral bracts caducous. Female flowers (*Sulit PNH 6329*): pedicel 3 mm long, puberulous; calyx lobes 0.6 × 0.5 mm, glabrous; corolla oblong, 1.1 × 0.8 mm; disc lobes 0.3 mm long, broadly oblong; filaments 1 mm long; ovary 1.1 mm long, densely pubescent; styles 1.4 mm long, straight; stigmas capitate, papillose.

Capsules 2.5 × 1.5 mm at dehiscence, the styles

ca. 1 mm, the exocarp densely pubescent; calyx lobes caducous, disc lobes persistent; central column present but shorter than valves. Seeds ca. 0.8 mm long, comose at both ends, the hairs to 1.5-2 mm long.—Fig. 8.

BREEDING SYSTEM.—Apparently dioecious.

DISTRIBUTION AND ECOLOGY.—Luzon and ?Samar. *Edaño BS 76049* gives "summit of forest at 2000 ft. [= 650 m], plant 3 m × 12 cm dbh, flower whitish pink". *Sulit PNH 6329* (*W.* cf. *lucida*) is from dipterocarp forest at ca. 230 m on the island of Samar and is omitted from the distribution map.

MATERIAL EXAMINED.—**LUZON**: *Edaño BS 76049*, Camarines Sur, Mt. Madooy, 2000 ft., fr., 10 Nov. 1928 (A, SING); *Loher 5991*, Montalban, Rizal, fr., 5 Nov. 1906 (BO, K); *Ramos BS 23806*, Prov. Laguna, San Antonio, yfl., Oct. 1915 (A).
W. cf. **lucida**.— **SAMAR**: *Sulit PNH 6329*, Bagacay, Concord, 230 m, fl., Apr.-May 1948 (A, L).

This is a poorly defined species intermediate between *Weinmannia negrosensis* (from which it differs by having less coriaceous leaves, the reticulum of tertiary and quaternary venation never as strongly pronounced, and the leaves never simple) and *W. luzoniensis* (which has pilose indumentum on the stems and leaf rachises, the terminal leaflet are ± rhomboidal, and the margin is more distinctly crenate). However, field observations and better ecological information are required before *W. lucida* can either be equated with another taxon or more clearly distinguished.

5. **Weinmannia urdanetensis** Elmer

Leafl. Philipp. Bot. 7: 2608 (1915); Merr., Enum. Philipp. Fl. Pl. 2: 225 (1923); Engl., Nat. Pflanzenfam., ed. 2, 18a: 256 (1930); L.M. Perry, J. Arnold Arbor. 30: 160 (1949); Bernardi, Bot. Jahrb. Syst. 83: 181 (1964) excl. t. 29.—Type: *Elmer 13701*, Philippines, Mindanao, Prov. of Agusan, Cabadbaran (Mt. Urdaneta), Sep. 1912 (iso-, A, BM!, BO!, BISH!, K!, L! and others).

For synonomy, description and illustration, see New Guinea (Part 3, HOPKINS 1998b p. 74). Material from the Philippines closely resembles some collections from Irian Jaya.

DISTRIBUTION AND ECOLOGY (Fig. 7).—Philippines (Luzon and Mindanao) and New Guinea. In Philippines, known from only three collections. *Clemens 16904* describes it as a "summit tree or high shrub". In New Guinea, it grows in montane forest at 1000-3250 m, at higher altitude in the Central Highlands.

MATERIAL EXAMINED.—**LUZON**: *Clemens 16904*, Isabela Prov., Mt. Moises, st., Apr. 1926 (SING); *Ramos BS 33268*, Ilocos Norte Prov., Mt. Palimlin, yfr., Aug. 1918 (A, K, P).

Acknowledgements

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