

A synopsis of the genus *Beilschmiedia* (Lauraceae) in Madagascar

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ABSTRACT

A review of the species of *Beilschmiedia* occurring in Madagascar is presented. Nine species are recognized, of which two, *B. pedicellata* van der Werff and *B. rugosa* van der Werff, are described as new. Two previously described species are treated as imperfectly known. Several collections with dimerous flowers typical of the related genus *Potameia* are accepted as belonging in *Beilschmiedia*.

KEY WORDS

Beilschmiedia,
Potameia,
Lauraceae,
Madagascar.

RÉSUMÉ

Révision synoptique du genre Beilschmiedia (Lauraceae) à Madagascar.

Une révision des espèces de *Beilschmiedia* vivant à Madagascar est présentée. Neuf espèces sont reconnues dont deux nouvelles, *B. pedicellata* van der Werff et *B. rugosa* van der Werff, décrites ici. Deux espèces demeurent imparfaitement connues. Le rattachement à *Beilschmiedia* de plusieurs spécimens à fleurs dimères, typiques du genre affiné *Potameia*, est proposé.

MOTS CLÉS

Beilschmiedia,
Potameia,
Lauraceae,
Madagascar.

INTRODUCTION

This is the first of a planned series of articles presenting revisions of the genera of Lauraceae in Madagascar. Lauraceae are a rather large, predominantly tropical family of trees and shrubs with 55 genera and about 3000 species. *Cassytha*, a genus of leafless, parasitic vines is the only non-woody genus of Lauraceae. The family is well represented in Madagascar by an estimated 100 species. Lauraceae are common in wet forest from sea level to the highest mountains, but are

poorly represented in areas with a pronounced dry season. KOSTERMANS (1950) wrote a treatment of the family for the "Flore de Madagascar et des Comores", based largely on a manuscript he published in 1939. Several years later, KOSTERMANS (1957 a,b,c,d; 1958) published updates of the various genera with the description of several new species, but he did not provide new keys. As a consequence, Lauraceae in Madagascar remain difficult to identify.

Beilschmiedia is a pantropical genus of about 250 species best represented in tropical Asia and

Africa. Characteristic for the genus are the flowers with nine 2-celled stamens and the fruits, which sit fully exposed on the pedicels. The small tepals rarely persist at the base of the fruits. The inflorescences are cymose-paniculate, but in contrast to many genera of Lauraceae the flowers are not arranged in strict cymes; instead, the lateral flowers of the cymes are somewhat alternate, not strictly opposite (VAN DER WERFF 2001).

Two species reported from Madagascar that are currently placed in *Beilschmiedia* were originally described as monotypic, endemic genera. The first of these was *Bernieria madagascariensis* Baill. (BAILLON 1884). This species was described as having 6 fertile stamens; otherwise, it agrees with *Beilschmiedia*. The fertile fragments of the holotype represent immature flowers; more recent collections with mature flowers show that this species has 9 fertile stamens and does not differ from *Beilschmiedia*. The second endemic genus was *Thouvenotia*, with the single species *T. madagascariensis* Danguy (DANGUY 1920). The generic diagnosis and species description fit the concept of *Beilschmiedia*. Neither *Bernieria* nor *Thouvenotia* was compared with *Beilschmiedia*. KOSTERMANS (1939) transferred these two species to *Apollonias* and described 4 new species in that genus. Later he considered these 6 species better placed in *Beilschmiedia* and published the required transfers (KOSTERMANS 1952). He did not give specific reasons for this transfer, but simply stated that he believed these species should be incorporated in *Beilschmiedia*. In 1957 KOSTERMANS described three additional species of *Beilschmiedia*. VAN DER WERFF (1996) published one more species, thus bringing the total of published *Beilschmiedia* species in Madagascar to ten.

In most species of *Beilschmiedia* the tepals fall off in the old flowers and leave the pistil fully exposed on the pedicel. In some Malagasy species though the tepals persist at the base of the fruits, a character also found in *Apollonias* and which may have led KOSTERMANS to place the Malagasy species initially in *Apollonias*. However, *Apollonias* and *Beilschmiedia* have different inflorescence types (VAN DER WERFF 2001) and the Malagasy species have inflorescences typical of *Beilschmiedia*. Six species of *Beilschmiedia* were included in a recent phylogenetic study of the

genera of Lauraceae based on DNA sequence data (CHANDERBALI et al. 2001), three from Madagascar and three from the Neotropics. These six species formed, together with the two species of *Potameia* and the single species of *Endiandra* included in the study, a strongly supported clade. The single species of *Apollonias* included in the study formed part of a clade consisting of *Persea* (represented by 6 species), *Phoebe*, *Dehaasia* and *Alseodaphne* (each represented by one species). These results confirm that the Malagasy species are correctly placed in *Beilschmiedia* and that they have no close affinity to *Apollonias*.

The Malagasy *Beilschmiedia* species can be divided in three groups. The first includes species with opposite, glabrous leaves; its flowers have a short floral tube, with the tepals deciduous in old flowers (*B. moratii*, *B. opposita*, *B. pedicellata* and *B. sary*). Members of the second group have alternate, pubescent leaves, and rather large flowers with spreading tepals that lack a short floral tube and whose tepals persist in fruit until they become damaged and break off (*B. sericans* and *B. velutina*). Species in the third group also have alternate leaves, but the flowers are small, with erect or incurved tepals. As in the second group the flowers lack a short tube and the tepals persist at the base of the fruits (*B. madagascariensis*, *B. microphylla* and *B. rugosa*). Characters of the cuticle support this division in three groups and will be presented in a separate publication (NISHIDA & VAN DER WERFF, in prep.).

Beilschmiedia and *Potameia*, a genus of about 20 species endemic to Madagascar, are closely related (CHANDERBALI et al. 2001) and can be easily confused in the absence of flowers. When flowers are available, the difference between the two is readily seen: *Beilschmiedia* has trimerous flowers, whereas *Potameia* has dimerous flowers. When tepals persist at the base of fruits, fruiting material can also be identified in conjunction with the following vegetative characters: *Potameia* species have alternate, mostly glabrous leaves and twigs with a pale bark; their tepals are often persistent in fruit, and the fruit is seated on a cushion-like base, whereas in Malagasy *Beilschmiedia* some species have opposite, glabrous leaves, young twigs with a nearly black bark and deciduous tepals in fruit

while others have alternate, pubescent or glabrous leaves, twigs with a brown bark and persistent tepals in fruit; the fruit is directly attached to the pedicel, without a base. I had initially assumed that the Malagasy species with opposite or subopposite, glabrous leaves, dark twigs, dehiscent tepals and fruits not seated on a distinct base all belonged to *Beilschmiedia*, but several collections have come to my attention with these *Beilschmiedia* characters and dimerous flowers typical of *Potameia*. These specimens also have the cuticle characters of the *Beilschmiedia* species with opposite leaves (NISHIDA, pers. comm.). Because most of the characters of these specimens point to *Beilschmiedia*, I have included them in that genus, where they key to *B. pedicellata*. This implies that the presence of dimerous flowers (vs. trimerous flowers) can no longer be regarded as a consistent generic character and that it may even vary within a species. Thus, it is no longer possible to identify specimens without flowers to either *Beilschmiedia* or *Potameia* and consequently one should not describe new species in these genera based on fruiting or sterile type material. Unfortunately, previous authors have described several species based on incomplete material: *B. obovata* was based on a sterile type; three species (*B. cryptocaryoides*, *B. microphylla* and *B. sary*) were based on fruiting types, and two species (*B. madagascariensis* and *B. opposita*) have type material with only buds, leaving only three species described on the basis of flowering material. It is thus not surprising that identification of *Beilschmiedia* collections remains difficult. Although several sterile collections are cited under specimens studied, their placement is highly tentative.

Typically, the stamens are arranged in whorls of three. In the discussions below, the whorls are numbered, with whorl I being the outermost one and whorl IV the innermost one. Usually whorls I and II are difficult to separate from each other and seem to form a whorl of 6 stamens. In this

case, stamens can be assigned to whorl I or II by their position: stamens of whorl I are opposite the outer tepals and those of whorl II opposite the inner tepals.

BEILSCHMIEDIA Nees in Wall.

Pl. Asiaticae Rar. 2: 69 (1831).
Bernieria Baill., Bull. Mens. Soc. Linn. Paris 1: 434 (1884). — Type: *Bernieria madagascariensis* Baill.
Thouvenotia Danguy, Bull. Mus. Hist. Nat. (Paris) 26: 652 (1920). — Type: *Thouvenotia madagascariensis* Danguy.
Apollonias sensu Kosterm., Notul. Syst. (Paris) 8: 67 (1939); Fl. Madagascar, Fam. 81: 2 (1950).

TYPE. — *Beilschmiedia roxburghiana* Nees.

Trees or shrubs. Leaves alternate or subopposite, sometimes grouped at tips of branches, pinnately veined, entire, petiolate, domatia lacking. Inflorescences axillary, few- to many-flowered, paniculate, the flowers cymosely or racemously arranged along the ultimate branchlets. Flowers bisexual, small, greenish, the tepals frequently incurved and flowers thus globose or depressed globose; rarely tepals spreading and flowers disc-like; tepals 6, in 2 series of 3, very rarely 4, in 2 series of 2, fertile stamens usually 9, in 3 whorls of 3, very rarely 6, in 3 whorls of 2, filaments variously developed, all anthers 2-celled, the outer 6 with cells introrse or rarely lateral, the inner 3 with cells extrorse or latrorse, and with 2 glands attached at or near the base; staminodia 3, usually well-developed. Floral tube short or lacking. Pistil ovoid, glabrous or pubescent, style and stigma variously developed. Fruit seated on the pedicel with tepals sometimes persisting at the base.

In the wide sense employed here, *Beilschmiedia* is a pantropical genus, well represented in Africa, with possibly 250 species. Nine species are recognized from Madagascar, all endemic.

Key to the Malagasy species

- 1. Mature leaves pubescent below (pubescence sometimes sparse); leaf tips acute, acuminate or rounded/obtuse 2
- 1'. Mature leaves glabrous below (rarely with few trichomes along midrib); leaf tips obtuse, rounded or emarginate, never acute or acuminate 5

2. Venation impressed on the upper leaf surface, and prominently raised on the lower surface 6. **B. rugosa**
 2'. Venation immersed on the upper leaf surface, and not or not prominently raised on the lower surface 3
 3. Leaves subopposite or alternate, to 7 cm long and 3 cm wide; inflorescences c. 2 cm long
 2. **B. microphylla**
 3'. Leaves strictly alternate, 9-20(-30) cm long and 2.5-11(-20) cm wide; inflorescences 4-10 cm long 4
 4. Indument of lower leaf surfaces dense or sparse, the trichomes erect 9. **B. velutina**
 4'. Indument of lower leaf surface sericeous, the trichomes appressed 8. **B. sericans**
 5. Leaves alternate, glaucous below; young twigs alternate along older twigs; tepals persisting at base of young fruits 1. **B. madagascariensis**
 5'. Leaves subopposite, at least partly green below; young twigs whorled at tips of older twigs; tepals and short floral tube deciduous in old flowers, not persisting at base of young fruits 6
 6. Leaf bases obtuse to rounded; inflorescences and flowers with sparse, curled and erect trichomes
 3. **B. moratii**
 6'. Leaf bases acute or cuneate; inflorescences and flowers glabrous or with few appressed trichomes 7
 7. Leaves to 6.5 cm long and 2.5 cm wide, the reticulation immersed or raised; flowers with a few appressed trichomes or glabrous 8
 7'. Leaves to 12 cm long and 5 cm wide, the reticulation raised and clearly visible; flowers glabrous 7. **B. sary**
 8. Pedicels to 3 mm long; reticulation immersed 4. **B. opposita**
 8'. Pedicels 5-9 mm long; reticulation raised or weakly raised 5. **B. pedicellata**

1. *Beilschmiedia madagascariensis* (Baill.) Kosterm.

J. Sci. Res. (Jakarta) 1: 115 (1952). — *Bernieria madagascariensis* Baill., Bull. Mens. Soc. Linn. Paris 1: 434 (1884). — *Apollonias madagascariensis* (Baill.) Kosterm., Notul. Syst. (Paris) 8: 68 (1939). — Type: *Chapelier s.n.*, Madagascar, lac Nossi-Ve (holo-, P!). *Cryptocarya glaucosepala* Scott-Elliot, J. Linn. Soc. Bot. 29: 45 (1891). — Type: *Scott-Elliot 2859*, Madagascar, Ft. Dauphin (holo-, K!; iso-, P!).

Trees or shrubs, to 10 cm tall. Twigs terete or slightly angled, minutely puberulous when young, becoming glabrous with age. Terminal buds densely pubescent. Leaves alternate, firmly chartaceous, 6-12 × 1.5-3.5 cm, oblong or oblong-obovate, the base narrowly cuneate, margin thickened, the apex obtuse or emarginate, glabrous or very young leaves with a few hairs, glaucous below, lateral veins 4-8 on each side, midrib, lateral veins and tertiary reticulate venation raised on both surfaces. Petioles flattened, 1-2 cm long. Inflorescences axillary, paniculate, to 6 cm long, somewhat glaucous, sparsely puberulous or subglabrous, bracts usually deciduous, if present ovate, pubescent, c. 2 mm long. Flowers 2.5-3 mm in diameter, pale yellow-green. Tepals 6, equal, slightly glaucous, elliptic or ovate-elliptic, sparsely pubescent, 1-1.2 mm long, erect at anthesis, the inner surface pubescent. Stamens 9 or 6, all 2-celled, the outer 6 with

introrse cells c. 0.7 cm long, filaments much narrower than the anther, pubescent; inner three fertile or sterile, filament about as wide as anther, cells lateral-extrorse, filaments with 2 large, globose glands at the base; staminodia minute, pubescent. Pistil glabrous, ovary globose. Receptacle rather deep, pubescent. Fruit spherical, c. 2.5 cm in diameter, seated on the pedicel, the tepals persisting at the base, and ultimately breaking off.

ECOLOGY. — Littoral forests on sand; as shrubs in dunes.

DISTRIBUTION. — Low altitude forests along the eastern coast from Ft. Dauphin to lac Nossi-Ve, just south of Tamatave. — Fig. 2.

PHENOLOGY. — Flowers in December-April, mostly January-February; fruits throughout the year.

Beilschmiedia madagascariensis can easily be recognized by its glaucous oblong or oblong-obovate leaves with an obtuse or emarginate apex. *Potameia incisa* and *P. rubra* can be quite similar in leaf shape, but differ in having dimerous (vs. trimerous) flowers. *Bernieria madagascariensis* was described by BAILLON as having only six fertile stamens, whereas KOSTERMANS stated the species had nine. The flowers of the type have been dissected, so BAILLON's description can no longer be

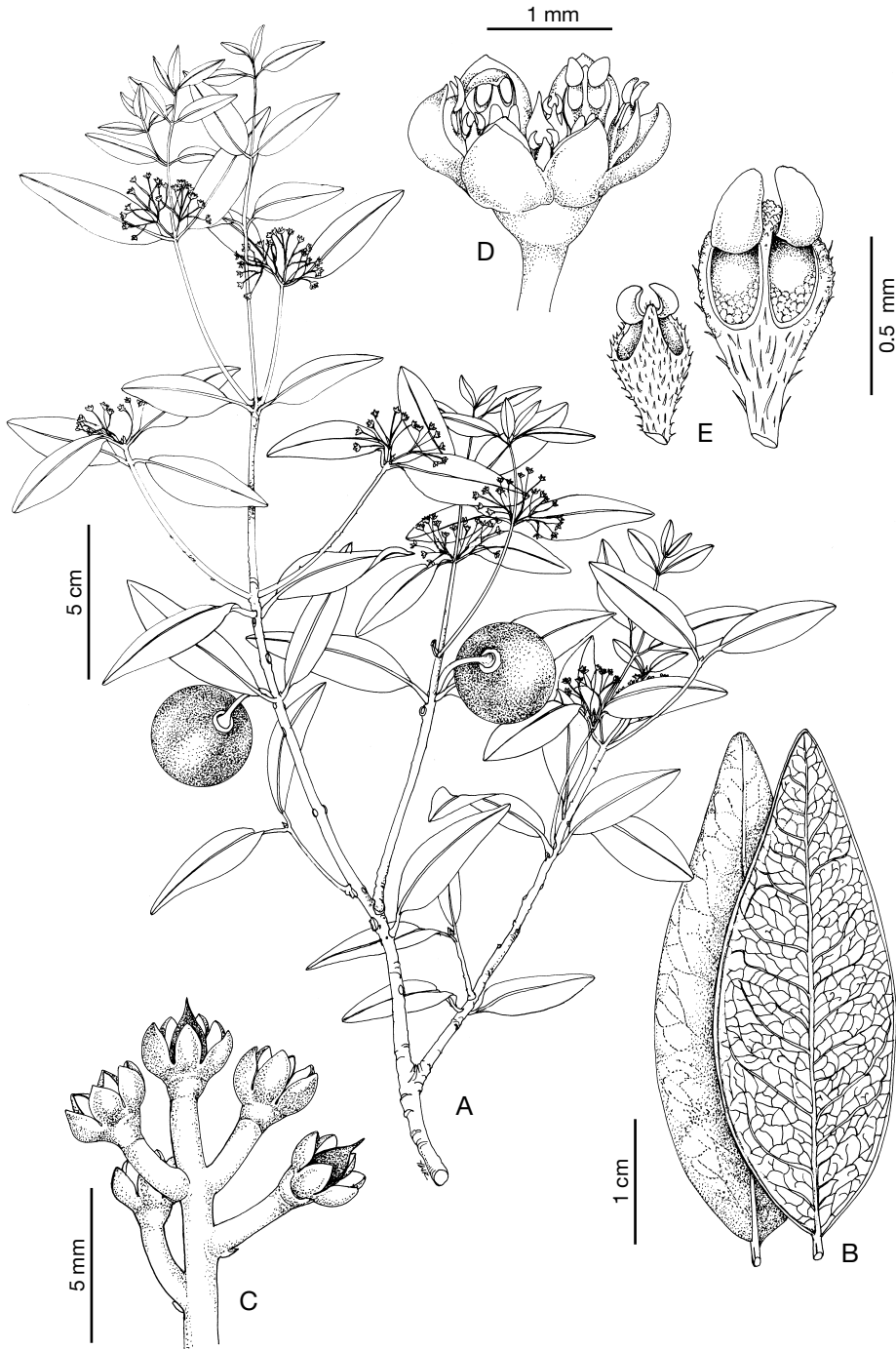


Fig. 1. — *Beilschmiedia pedicellata*: **A**, habit; **B**, details of leaf; **C**, inflorescence, showing short pedicels; **D**, flower; **E**, stamens. (A, B, D, E, Miller et al. 8779; C, Service Forestier (Capuron) 26807).

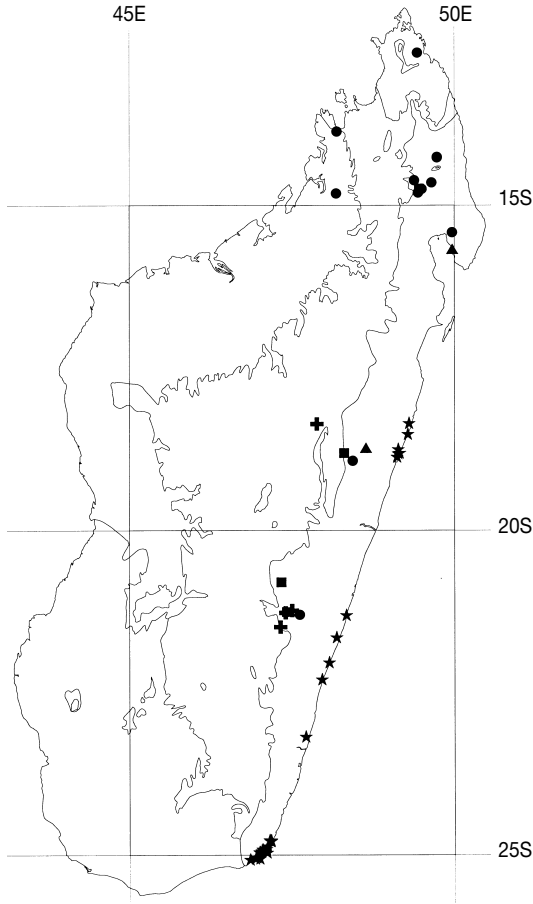


Fig. 2. — Distribution of *Beilschmiedia* in Madagascar: *B. madagascariensis* (★); *B. pedicellata* (⊠); *B. pedicellata* with dimerous flowers (■); *B. sericans* (▲); *B. velutina* (●).

verified. However, recent collections of this species from the Fort Dauphin area have flowers with both six and nine fertile stamens, sometimes on the same inflorescence. Such a variation is unusual in Lauraceae, but in the present case, I regard this difference as having no taxonomic value.

COMMON NAMES. — Saka, hazosonjo, kangy, kangina, resonjo, tavaratra, hazotsonjo, hazousary.

SPECIMENS STUDIED. — MADAGASCAR: *Chapelier s.n.*, lac Nossi-Ve, fl. (P); *Dorr 4034*, Ft. Dauphin,

road to airport, fl. (MO, TAN); *Decary 6486*, Ambila, au sud de Tamatave, fl. (P); *McPherson et al. 14840, 14882*, Ft. Dauphin, Mandena forest, fl. (MO, TAN); *Rabevohitra & Rabenantoandro 3840*, 13 km au nord de Manakara, fl. (MO, P, TEF); *Randrianaivo et al. 539*, Ambila Lemaitso, fr. (MO); *Scott-Elliot 2859*, Ft. Dauphin, fl. (P); *Service Forestier 1135*, Ambila, Brickaville, fl. (P); *Service Forestier 1564*, Ambila-Lemaitso, fr. (P, TEF); *Service Forestier 2853*, Ft. Dauphin, Mandena, fl. (P, TEF); *Service Forestier 2946*, Ambila-Lemaitso, fl. (P, TEF); *Service Forestier 2986*, Ambila-Lemaitso, fl. (P, TEF); *Service Forestier 3363*, Ft. Dauphin, fr. (P, TEF); *Service Forestier 3757*, Ambila-Lemaitso, fr. (P, TAN, TEF); *Service Forestier 4703*, Ambila-Lemaitso, fl. (P, TEF); *Service Forestier 6451*, Ambila-Lemaitso, fr. (P, TEF); *Service Forestier 7267*, Ambila-Lemaitso, fl. (P, TEF); *Service Forestier 7769*, Ft. Dauphin, fl. (P); *Service Forestier 9510*, Mananjary, fl. (P, TEF); *Service Forestier 9931*, Vatomasina, Vohipeno, fl. (P, TEF); *Service Forestier 13503*, Ft. Dauphin, Mandena, fr. (P, TEF); *Service Forestier (Capuron) 20527*, Ft. Dauphin, Vinanibe forest, fr. (MO, P, TEF); *Service Forestier (Capuron) 29010*, Ft. Dauphin, Vinanibe forest, fl. (P, TEF).

2. *Beilschmiedia microphylla* (Kosterm.) Kosterm.

J. Sci. Res. (Jakarta) 1: 115 (1952). — *Apollonia microphylla* Kosterm., Notul. Syst. (Paris) 8: 69 (1939). — Type: *Perrier de la Bâthie 12418*, Madagascar, Ambatofinandrahana (holo-, P!; iso-, U!).

Shrubs or small trees to 4 m tall. Twigs terete or sharply angular, brown or grey tomentose, becoming glabrous with age. Terminal bud brown-tomentose. Leaves subopposite, or alternate, rarely in threes (then twigs sharply triangular), coriaceous, 3.5-7 × 1-3 cm, lanceolate or elliptic, the base acute, the margin slightly recurved, the apex obtuse, upper surface glabrous or sparsely pubescent with curved hairs, lower surface brown-tomentose or glaucous and with some appressed hairs, rarely becoming glabrous, lateral veins 6-10 or very weakly developed, fine reticulation weakly raised on both surfaces, lateral veins and midrib mostly raised on lower surface and immersed on upper surface. Petioles 3-6 mm long, with similar indument as twigs. Inflorescences axillary, to 2 cm long, panicle, brown-pubescent. Flowers c. 2.5 mm in diameter, brown. Tepals 6, equal, incurved, brown-pubescent, somewhat glaucous on the outside, triangular, c. 1.5 mm long, pubes-

cent inside. Fertile stamens 9, 2-celled, the outer 6 c. 0.7 mm long, glabrous, with very short filaments, the cells large, introrse; inner 3 stamens c. 0.9 mm long, glabrous, the cells lateral-extrorse, with 2 large globose glands at the base of filaments, the anthers slightly longer than the filaments; staminodia 3, c. 0.4 mm long, with a few hairs near the base. Pistil glabrous, c. 1 mm long, ovary globose and rather abruptly narrowed in the style. Receptacle pubescent inside. Fruit ellipsoid, 3 × 2 cm, with short stalk at the base; tepals persisting in fruiting stage.

ECOLOGY. — Scrub or forest on quartzite at high elevation, 1300-1800 m.

DISTRIBUTION. — Only known from the Itremo massif. — Fig. 3.

PHENOLOGY. — Flowers in September-October; fruits in January-February.

Beilschmiedia microphylla, as treated here, is an unusually variable species. The type has small, lanceolate leaves with a glaucous, sparsely appressed-pubescent lower surface. Although flowers are described in the protologue, the type specimen has only a detached fruit, which does not show floral characters. Nearly all other collections have elliptic leaves with a brown-tomentose lower leaf surface. If it were not for the collection *Decary 17390*, which has lanceolate leaves, some of which are brown-tomentose, but others glaucous and appressed pubescent on lower leaf surface, I would not place these collections in the same species, something I do now with considerable hesitation. The description of the flowers given above is based on specimens with elliptic, tomentose leaves. None of the material with lanceolate leaves contains the information needed for a generic identification; their fruits are detached and dissected or broken. Several collections with elliptic leaves have some leaves arranged in whorls of three and have branchlets that are strongly triangular, a very unusual feature for Lauraceae.

COMMON NAMES. — Voamahfamaimailela (Betsileo; for specimens with elliptic, tomentose leaves).

SPECIMENS STUDIED. — MADAGASCAR: *Bosser 10066*, Itremo, fl. (MO, P, TAN); *Decary 13085*, Ambatofinandrahana, fr. (P); *Decary 17390*, Ambatofinandrahana, fr. (P); *Morat 906*, Itremo, fl. (P); *Morat 4206*, massif d'Itremo, fr. (MO, P); *Perrier de la Bâthie 12418*, environs d'Ambatofinandrahana, fr. (P); *Randrianasolo 235*, Ambatofinandrahana, fl. (MO); *Service Forestier 4725*, forêt d'Antamimena, Itremo, fl. (P, TEF); *Service Forestier (Capuron) 11568*, Monts Ambatomenaloha, Itremo, fr. (P, TEF); *Service Forestier 14219*, Fatihita, Ambinda, Itremo, fr. (P, TEF); *Service Forestier (Capuron) 28901*, Itremo, st. (MO, TEF).

3. *Beilschmiedia moratii* van der Werff

Novon 6: 463 (1996). — Type: *Service Forestier (Capuron) 24985*, Madagascar, massif de Tsaratanana (holo-, MO!; iso-, P, n.v.).

Shrubs or trees, to 15 m tall. Twigs terete, glabrous, the young ones black, older ones with grey, corky bark. Terminal bud glabrous. Leaves subopposite, coriaceous, 2.5-4 × 1.5-3 cm, broadly elliptic, shiny, base and apex obtuse to rounded, the margin often incurved, glabrous, lateral veins 4-7 on each side, poorly differentiated from the tertiary venation, midrib weakly raised on both surfaces, lateral veins and reticulation prominently raised. Petioles 4-7 mm long, glabrous. Inflorescences axillary, paniculate, to 2.5 cm long, puberulous, the hairs curled, more or less erect, base of the flower often with a glabrous bract with ciliate margin, this c. 2 mm long. Flowers depressed globose, 3-4 mm wide, reddish green. Tepals 6, equal, broadly elliptic to ovate, the margin thinner than the center, outside sparsely puberulous, inside glabrous, the bases fused, tepals deciduous in old flowers and leaving a circular scar at the base of the very young fruit. Stamens 9, 2-celled, the outer 6 broadly ovate, c. 2 mm long, pubescent along margin, cells large, introrse, filament very short; inner 3 narrowly triangular, densely pubescent, 1.5-2 mm long, cells lateral, 2 large globose glands present at base of filaments; staminodia of Whorl IV small, triangular, pubescent; bases of filaments of Whorls III and IV fused into a narrow, pubescent ring. Pistil glabrous, ovary turbinate, gradually narrowed into the short style. Fruit obovoid or roundish, 4.5 × 3.5 cm, a little warty.

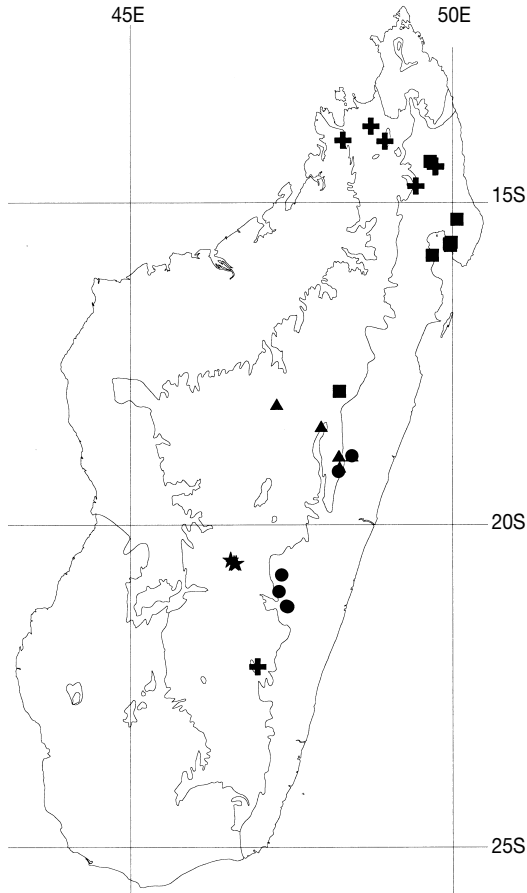


Fig. 3. — Distribution of *Beilschmiedia microphylla* (★); *B. moratii* (+); *B. opposita* (▲); *B. rugosa* (●); *B. sary* (■).

ECOLOGY. — Forest at mid and high elevation (1300-2100 m).

DISTRIBUTION. — Mountains in northern Madagascar (Manongarivo, Tsaratanana, Marojejy). A fruiting collection from Fianarantsoa (Andringitra) is provisionally placed here. — Fig. 3.

PHENOLOGY. — Flowers in November.

Beilschmiedia moratii is closely related to *B. opposita* and *B. sary*; these species are characterized by their subopposite leaves, black young twigs, dehiscent tepals in old flowers and their (nearly) glabrous condition. *Beilschmiedia moratii* differs from both species in its obtuse to rounded

leaf bases and the sparse, erect hairs on the inflorescences; from *B. opposita* it also differs in its raised reticulation and from *B. sary* in its smaller leaves.

COMMON NAMES. — Maitsovavina, Voantsilana.

SPECIMENS STUDIED. — MADAGASCAR: *Antilabimena et al.* 657, Tsaratanana massif, fr. (G, MO, P, TAN); *Gautier & Derleth LG 2577*, Manongarivo, sommet du Bekolosy, fr. (MO); *Gautier et al. LG 3342*, Manongarivo, fr. (MO); *Gautier et al. LG 3658*, Manongarivo, old fl. (MO); *Lewis et al. 1085*, Andringitra, Camp IV, fr. (MO); *Morat 2284*, Tsaratanana, fl. (P); *Rakotomalaza et al. 825*, RNI Marojejy, buds (MO); *Rakotomalaza et al. 951*, same location, fr. (MO); *Service Forestier (Capuron) 24985*, massif du Tsaratanana, haut bassin de la Maevarano, fl. (MO); *Service Forestier (Capuron) 27013*, massif du Tsaratanana, fr. (P).

4. *Beilschmiedia opposita* Kosterm.

J. Sci. Res. (Jakarta) 1: 115 (1952). — *Apollonia oppositifolia* Kosterm., Notul. Syst. (Paris) 8: 71 (1939), non *Beilschmiedia oppositifolia* (Meisn.) Hook.f., *nom. illeg.* — Type: *Perrier de la Bâthie 10182*, Madagascar, forêt d'Analamazaotra (holo-, P!). *Potameia lucida* Kosterm., Commun. Forest, Res. Inst. 55: 8 (1957). — Type: *Service Forestier 10995*, Madagascar, Ambohitantely (holo-, P), *syn. nov.*

Tree to 25 m tall. Twigs terete, glabrous, the older ones often with a grey, corky bark, the younger ones smooth, black, young branchlets often fascicled. Terminal bud with some appressed hairs or glabrous. Leaves subopposite, coriaceous, 4-6.5 × 1.5-2.5 cm, elliptic, glabrous, the base acute, the apex obtuse, margin sometimes inrolled, venation immersed and scarcely discernible, lateral veins scarcely or not at all visible. Petioles glabrous, 3-7 mm long. Inflorescences axillary, glabrous or sparsely appressed pubescent, to 2 cm long, paniculate, few-flowered. Flowers with a few appressed hairs or almost glabrous, with a short floral tube and incurved tepals, often closely subtended by a nearly glabrous bract, this c. 1.5 mm long and dehiscing with the tepals. Tepals 6, equal, united at the base into a short floral tube, the free part c.

1.5 mm long, erect and incurved at the upper half. Stamens 6, representing the outer 2 whorls, covered by the incurved tepals, c. 1 mm long, pubescent, 2-celled, the cells introrse. Whorl III usually staminodial, pubescent, with 2 globose glands at the base, infrequently 1 or 2 locelli present, in size intermediate between staminodia of Whorl IV and the stamens. Whorl IV represented by 3 triangular, pubescent staminodia, c. 0.5 mm long. Pistil glabrous, ovary globose, seated in the cupshaped, pubescent receptacle. Fruit globose, c. 3 cm in diameter; petals and floral tube soon deciduous in old flowers and leaving a conspicuous, circular scar at base of very young fruit.

ECOLOGY. — Mossy forest at higher elevations (800-1600 m).

DISTRIBUTION. — Upper parts of the eastern slope in the center of Madagascar. — Fig. 3.

PHENOLOGY. — Flowers in June, October; fruits in December.

Beilschmiedia opposita is a poorly known species. The type has only a few buds. Most other collections attributed to this species are sterile. The description of the flowers presented above is based on two recent collections [*Service Forestier* 26807 and *Service Forestier (Capuron)* 28427], which have slightly smaller, less coriaceous leaves than the type and which have a plane, rather than inrolled leaf margin. The concept of *B. opposita* here accepted includes all collections with subopposite, elliptic, small leaves with an acute base, immersed venation and smooth, black young twigs. The type of *Potameia lucida*, which has no flowers, only immature fruits, fits very well in this concept. KOSTERMANS mentioned in his discussion of *P. lucida* that the tepals were completely deciduous in the fruiting stage, a character more commonly found in *Beilschmiedia* than in *Potameia*. Flowering material can be easily recognized by the nearly glabrous inflorescences and flowers and by the deciduous floral tube and tepals. Several collections were identified as *B. oppositifolia* (Kosterm.) Kosterm., a combination never published by KOSTERMANS, because of the earlier name *B. oppositifolia* (Meisn.) Hook.f., an illegitimate, but validly published name.

Instead, KOSTERMANS created the new name *B. opposita* for *Apollonias oppositifolia*.

COMMON NAMES. — Sary, voa-koromanga, tavolo-sary, sary mena.

The identifications of the sterile specimens cited below are tentative.

SPECIMENS STUDIED. — MADAGASCAR: *Perrier de la Bâthie* 5261, forêt d'Analamazaotra, fr. (P); *Perrier de la Bâthie* 10182, forêt d'Analamazaotra, fr. (P); *Service Forestier* 10984, Moramanga, st. (P); *Service Forestier* 10995, Ambohitantely, fr. (P, TEF); *Service Forestier* 21277bis, Ambohimalaza, Périnet, st. (P); *Service Forestier* 25740, Analamazaotra, Périnet, st. (P); *Service Forestier* 25741, Analamazaotra, Périnet, st. (P); *Service Forestier* 25742, Analamazaotra, Périnet, st. (P); *Service Forestier* 26020, Analamazaotra, Périnet, st. (P); *Service Forestier* 26021, Analamazaotra, Périnet, st. (P); *Service Forestier* 26180, Analamazaotra, Périnet, st. (P); *Service Forestier* 26807, Ankazomanitra, Anosibe, Moramanga, fl. (MO, TEF); *Service Forestier (Capuron)* 28427, W of Antanandava, km 45 route Moramanga-Anosibe, fl. (MO, TEF); *Service Forestier* 25-B-R-172, Ambodivoasary, Périnet, st. (P); *Service Forestier* 94-B-R-172, Sahamaloto, st. (P); *Service Forestier* 149-R-212, St. Pierre, st. (P); *Service Forestier* 189-R-212, St. Pierre, st. (P); *Service Forestier* 191-R-212, St. Pierre, st. (P); *Service Forestier* 200-R-212, St. Pierre, st. (P); *Service Forestier* 201-R-212, St. Pierre, st. (P); *Service Forestier* 205-R-212, St. Pierre, st. (P); *Service Forestier* 209-R-212, St. Pierre, st. (P); *Service Forestier* 240-R-212, St. Pierre, st. (P); *Service Forestier* 251-R-212, St. Pierre, st. (P); *Service Forestier* 403-R-212, St. Pierre, st. (P); *Herb. Station Forestière d'Analamazaotra* 21-E, Ambohimalaza, Périnet, st. (P).

5. *Beilschmiedia pedicellata* van der Werff, sp. nov.

Beilschmiediae oppositae similis, sed pedicellis longioribus et nervatione in superficiebus ambabus foliorum elevata recedit.

TYPUS. — *Miller, Bradford, Rakontonasolo & Randrianasolo* 8779, Madagascar, Prov. Anatanarivo, Anjozorobe, 18°22'S, 47°53'E, 1320 m, 22 Oct. 1996, fl., fr. (holo-, MO!; iso-, P!, TAN) .

Shrub or small tree, to 5 m. Twigs round, glabrous, often blackish when young, older ones

with a grey, lenticellate bark, terminal buds nearly glabrous or sparsely appressed pubescent. Leaves 4-7 × 1.8-2.5 cm, glabrous, opposite, firmly chartaceous, narrowly elliptic to oblong, the base obtuse to acute, the apex obtuse to bluntly acute, midrib raised on both surfaces, secondary veins difficult to distinguish, 6-10 on each side, venation forming a reticulate pattern visible on both surfaces, slightly raised on the upper surface, more prominently on the lower surface; lateral veins, petioles c. 5 mm long, shallowly canaliculate on the upper side. Inflorescences to 3 cm long, with a few lateral branchlets near the base or racemose, with usually up to 10 flowers, very sparsely pubescent with the hairs erect or ascending, in the axils of the distal leaves. Flowers green, 2.5 mm in diameter, pedicels (5-)6-7(-9) mm long. Tepals 6, 1-1.3 mm long, ovate elliptic, equal, with a few hairs on the outer surface, inner surface glabrous or nearly so, erect at anthesis; stamens 9, all 2-celled, the outer six 0.8 mm long, broad, without a distinct filament, dorsally with some short, papillose hairs, the anther cells opening introrse, inner 3 about the same length, columnar, moderately pubescent with papillose hairs, the cells lateral, glands present at the base of the inner stamens, pistil glabrous, c. 0.7 mm long, receptacle bowl-shaped, densely pubescent inside. Fruits roundish, c. 3 cm in diameter, tepals not persistent in fruit, infructescences 2-2.5 cm long. — Fig. 1.

ECOLOGY. — Montane forests, 600-1600 m.

DISTRIBUTION. — Forests on the eastern slope, from Anjozorobe to Ranomafana National Park. Collections with dimerous flowers are known from the Special Reserve Anjaribe-Sud to the Ranomafana National Park. — Fig. 2.

PHENOLOGY. — Flowers in October; fruits in May-October.

Beilschmiedia pedicellata, named for its relatively long pedicels, is closely related to *B. opposita*. It differs mainly in pedicel length (to 3 mm long in *B. opposita*, 5-9 mm long in *B. pedicellata*); and the slightly raised reticulate venation on both leaf surfaces (immersed in *B. opposita*). In addition the inflorescences and flowers of *B. pedicellata* are sparsely pubescent,

whereas they are glabrous in *B. opposita*. *Beilschmiedia moratii* has a raised reticulation on both leaf surfaces, but differs from *B. pedicellata* in its shorter (c. 3 mm long) pedicels, broadly elliptic leaves and the presence of indument on inflorescences and flowers. However, very few flowering collections are known of these species and identification of sterile or fruiting specimens remains difficult. Five collections are placed in *B. pedicellata* with hesitation. They differ from *Beilschmiedia* in their dimerous flowers (as in *Potameia*), but share the opposite leaves, deciduous tepals, fruits not seated in a distinct pedicel, the blackish young twigs and cuticle characters with the type of *B. pedicellata*.

COMMON NAME. — Voasapoka.

PARATYPES. — MADAGASCAR: *Rakoto 137*, Prov. Fianarantsoa, Parc National de Ranomafana, 21°16'S, 47°24'E, 1300 m, fr. (MO, P, TAN); *Service Forestier (Capuron) 14303*, Prov. Fianarantsoa, Ampamaherana, 21°29'S, 47°19'E, 900-1100 m, fr. (P); *Turk & Marolahy 601*, Prov. Fianarantsoa, Ranomafana National Park, 21°14'S, 47°30'E, 600 m, fr. (MO).

The following collections differ from *B. pedicellata* in having dimerous flowers and are tentatively placed here: *Ravelonarivo & Rabesonina 481 & 500*, Prov. Antsiranana, Réserve Spéciale d'Anjaribe-Sud, 14°44'42''S, 49°27'42''E, 1185-1335 m, fl., fr. (MO, P, TAN); *Service Forestier (Capuron) 23854*, massif du Vohibe-Antoatra, 1600-1869 m, fl. (MO, P); *Service Forestier (Capuron) 28371*, Ambatovy, au NE de Moramanga, fl. (MO, P); *Turk & Randrianasolo 570*, Prov. Fianarantsoa, Ranomafana National Park, 21°15'30''S, 47°25'00''E, 950-1150 m, fl. (MO, P).

6. *Beilschmiedia rugosa* van der Werff, **sp. nov.**

A congeneris madagascariensibus foliis rugosis facile distinguenda est.

TYPUS. — *Turk, Randrianasolo & Solo 288*, Madagascar, Prov. Fianarantsoa, Ranomafana National Park, 21°15'30''S, 47°25'00''E, 950-1150 m, 9 Feb. 1993, fl. (holo-, MO; iso-, TAN).

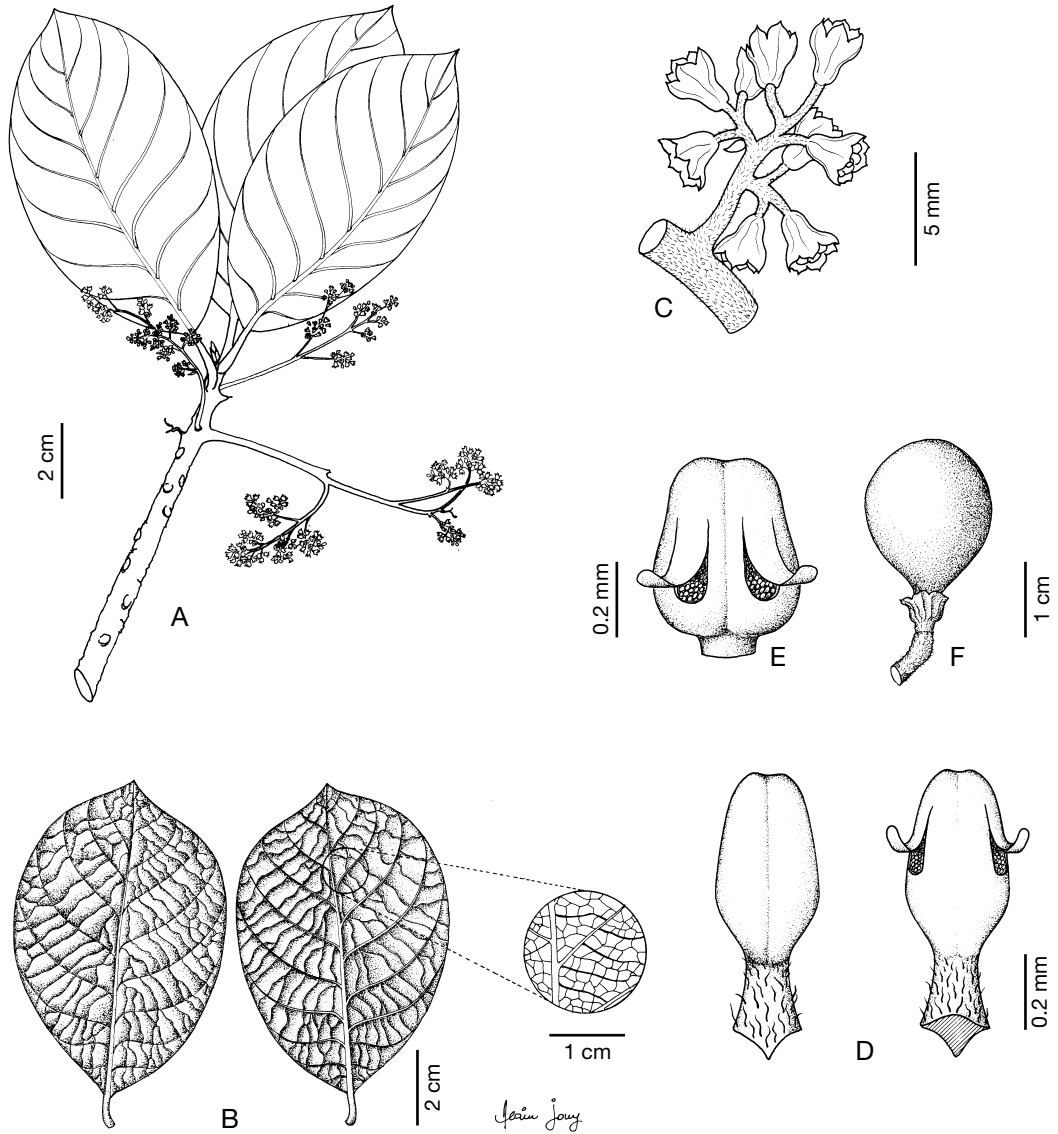


Fig. 4. — *Beilschmiedia rugosa*: A, habit; B, details of leaf; C, inflorescence; D, inner stamen; E, outer stamen; F, fruit. (A, C, D, E, Turk et al. 288; B, F, Turk et al. 205).

Tree, to 20 m. Twigs terete, densely brown-tomentose when young, glabrous and with pale bark on older twigs, terminal buds densely tomentellous. Leaves 9-15 × 5.5-9.5 cm, coriaceous, alternate and clustered near the tips of the branches, broadly obovate or broadly elliptic, the base acute, obtuse or rounded, the margin flat, the

apex rounded or with a short tip, the upper surface shiny, the venation clearly impressed, the lower surface dull, glaucous, all veins prominently raised, the upper surface of mature leaves glabrous or with some remnants of a tomentellous indument near the base of the midrib, lower surface with tomentellous midrib and lateral veins, minor

veins with a sparser indument, the lamina glabrous or nearly so; lateral veins 7-9 on each side; petioles 8-13 mm long, with a similar indument as the twigs. Inflorescences 3-8 cm long, paniculate, densely brown-tomentellous, in the axils of leaves or cataphylls. Flowers light green, c. 2 mm in diameter, pedicels 1-2 mm long. Tepals 6, c. 1.3 mm long, ovate, erect or curved upwards, pubescent on both surfaces; stamens 9, all 2-celled, the outer 6 c. 0.8 mm, filaments very short or lacking, the anther cells lateral-introrse, the inner 3 c. 1.2 mm, the pubescent filaments as long as the anthers, anther cells extrorse or extrorse-lateral, globose glands present at the base of the inner filaments; pistil 1.2 mm, glabrous, the ovary gradually narrowed in the style; receptacle deeply cup-shaped, pubescent inside. Fruits ellipsoid, 2.5×1.8 cm, the pedicel slightly thickened, tepals initially persisting at the base of the fruit, but ultimately falling off. — Fig. 4.

ECOLOGY. — Montane forests on the eastern slopes, 900-1150 m.

DISTRIBUTION. — Flowering and fruiting collections from the Ranomafana National Park; additional sterile collections from Antoetra near Ivato, Moramanga and along the road Anosibe-Moramanga. — Fig. 3.

PHENOLOGY. — Flowers in February; fruits in December.

Beilschmiedia rugosa is distinctive in its rugose leaves, with the veins impressed on the upper surface and prominently raised on the lower surface. Additional distinguishing characters are the tomentellous/tomentose indument on the young twigs and inflorescences, the glaucous lower leaf surface and the pubescent flowers with erect or ascending tepals. The alternate leaves, persistent tepals in fruit and erect tepals indicate that this species belongs in the group with *B. madagascariensis* and *B. microphylla*. *Beilschmiedia velutina* also has tomentose twigs and rather large leaves, but that species has larger flowers (8-10 mm in diameter vs. 2 mm in *B. rugosa*) with spreading tepals and lacks rugose leaves. The deep receptacle that encloses the pistil is a noteworthy feature of *B. rugosa* and approaches the condition found in *Cryptocarya*; however, the

fruits with the tepals at the base leave no doubt that this species belongs in *Beilschmiedia*. Two sterile collections from Ranomafana (*Kotozafy & Rasabo* 564, 565) are provisionally included here; they have larger leaves that are only weakly rugose. Such leaves may well be shade leaves; the common name (Sarivana) suggests *B. rugosa*. Several of the sterile collections had been previously identified as *B. cf. cryptocaryoides*, a species only known from the fruiting type collected in the basin of the Fananahana River near the Bay of Antongil. I consider *B. cryptocaryoides* an imperfectly known species; it differs from *B. rugosa* in its longer petioles (2-2.5 cm vs. 0.8-1.3 cm in *B. rugosa*) and it does not have rugose leaves.

COMMON NAMES. — Sarivana, Sarivanana vaventiravina, Voakoromanga, Tavolompinengo, Voasary ala.

PARATYPES. — MADAGASCAR: *Kotozafy & Rasabo* 564, 565, Prov. Fianarantsoa, Parc National de Ranomafana, $21^{\circ}16'S$, $47^{\circ}26'E$, 900-1100 m, st. (MO); *Service Forestier* 26355, Fianarantsoa, Ranomafana, st. (P); *Service Forestier* 26337, Moramanga, Périnet, st. (P); *Service Forestier* 26642, 26646, Ambositra, Antoetra, st. (P); *Service Forestier* 26857, route Anosibe-Moramanga, PK 43, 700, 950-1000 m, st. (P); *Turk & Bernardin* 205, Fianarantsoa, Ranomafana National Park, $21^{\circ}15'30''S$, $47^{\circ}25'00''E$, 950-1150 m, fr. (MO, P, TAN).

7. *Beilschmiedia sary* Kosterm.

Commun. Forest Res. Inst. 56: 6 (1957). — Type: *Service Forestier (Capuron)* 8758, Madagascar, piste Maroantsetra-Antalaha (holo-, P!).

Large tree, to 25 m tall. Twigs glabrous, terete, the young ones smooth, black, older ones grey-corky. Terminal buds glabrous or nearly so. Leaves subopposite, coriaceous, $8-12 \times 3-5$ cm, glabrous, elliptic or elliptic-obovate, tip obtuse or emarginate, base acute or cuneate, lateral veins weakly developed, 7-12 on each side, poorly differentiated from the tertiary venation; midrib immersed on upper surface, raised on lower surfaces; lateral veins and tertiary venation raised on both surfaces. Petioles glabrous, 6-10 mm long.

Inflorescences axillary, glabrous, to 1.5 cm long, racemose, rarely paniculate, 5-7 flowered. Flowers glabrous, with a short funnel-shaped floral tube, the tepals erect to incurved, often with a glabrous bract at the base of the floral tube. Tepals 6, equal erect or incurved, ovate, c. 1.5 mm long. Stamens 6, representing the outer 2 whorls, pubescent, 2-celled, the filament very short, anther large with large locelli, c. 1 mm long; Whorl III represented by 3 stamens with rudimentary(?) locelli and 2 globose glands at the base; staminodia representing Whorl IV not seen. Receptacle broad, shallow, densely pubescent. Ovary globose, glabrous, well differentiated from the glabrous style. Fruit broadly ellipsoid, 3 × 2 cm, tepals and receptacle dehiscent in older flowers and leaving a circular scar at base of young fruit.

ECOLOGY. — Forest at low elevation (100-500 m).

DISTRIBUTION. — Most collections are from the area around the Baie d'Antongil; one sterile collection provisionally placed here is from Andilanatoby, much further south. — Fig. 3.

PHENOLOGY. — Flowers in September; fruits in December.

Beilschmiedia sary is similar to *B. opposita*, but is larger and coarser, growing at lower elevation and with a noticeably raised reticulate venation on both leaf surfaces. The inflorescences are as small as in *B. opposita*; the flowers of *B. sary* seem to lack staminodia representing Whorl IV, while the stamens of Whorl III are poorly developed and likely sterile. However, only one flowering specimen with few flowers is known. The tepals are deciduous in older flowers exactly as in *B. opposita*.

COMMON NAME. — Sary.

SPECIMENS STUDIED. — MADAGASCAR: *Schatz & Modeste 3081*, Masoala Peninsula, hills E. of Ambanizana, fr. (MO); *Service Forestier (Capuron) 8758*, piste Maroantsetra-Antalaha, fr. (P, TEF); *Service Forestier 10935*, Bemavo, Andilanatoby, Ambatondrazaka st. (P, TEF); *Service Forestier (Capuron) 18231*, environs de la Baie d'Antongil, fl. (P, TEF); *van der Werff et al. 12800*, Masoala Peninsula, c. 11 km S. of Ambanizana fl., fr. (MO).

8. *Beilschmiedia sericans* Kosterm.

J. Sci. Res. (Jakarta) 1: 115 (1952). — *Apollonias sericea* Kosterm., Notul. Syst. (Paris) 8: 70 (1939), non *Beilschmiedia sericea* Teschn. — TYPE: *Louvel 218*, Madagascar, forêts côtières et forêts montagneuses (holo-, P!; iso- U!).

Tree. Twigs roundly angled, densely appressed-tomentellous, glabrescent with age. Terminal buds densely brown pubescent. Leaves alternate, chartaceous, 9-20 × 2.5-7 cm, narrowly elliptic or narrowly obovate to elliptic or obovate, the base acute, the tip acute or acuminate, the upper surface glabrous or with appressed pubescence on the main veins, lower surface densely sericeous pubescent, in older leaves sericeous and glaucous, lateral veins 7-10 on each side; veins immersed on upper surface, midrib and lateral veins raised, tertiary venation immersed on lower surface. Petioles 1-2.5 cm long, with similar indument as twigs. Inflorescences axillary, paniculate, brown-tomentellous, c. 10 cm long, bracts frequently present, those near the base of the inflorescence c. 5 mm long, ovate-elliptic, brown-tomentellous, those on the distal part of the inflorescence smaller. Pedicels 5-10-(15) mm long. Flowers depressed globose, brown-tomentellous. Tepals 6, equal, incurved, 2-3 mm long, densely tomentellous inside. Stamens 9, 2-celled, glabrous, the outer 6 with lateral-introrse cells, c. 0.7 mm long, the inner 3 columnar, the cells lateral, glands inconspicuous. Staminodia 3, small, glabrous. Pistil with basal 1/3 pubescent, otherwise glabrous. Receptacle shallow, pubescent. Fruit roundish, c. 3 cm in diameter, tepals not deciduous, but persisting and ultimately wearing off.

ECOLOGY. — Coastal forests.

DISTRIBUTION. — Only known from 3 collections, one from Ampasimanolotra, one from the Masoala Peninsula and one without locality data. — Fig. 2.

PHENOLOGY. — Flowers in June; fruits in November.

Beilschmiedia sericans is closely related to *B. velutina*, from which it differs by its sericeous indument of the leaves and by its longer pedicels. The floral structure is very similar to that of *B. velutina*.

KOSTERMANS (1957) gave a description of the fruits based on two fruiting collections [*Service Forestier (Capuron) 843* and *Humbert & Capuron 24277*]. However, leaves of these specimens lack the sericeous indument; instead, the glaucous lower leaf surface carries some erect trichomes and I therefore include these collections in *B. velutina*. The holotype of *B. sericans* in P does not give the collector's name, but the octagonal label with a blue margin is identical to those found on other Louvel collections, and Louvel is indicated as the collector on the isotype in U. KOSTERMANS gave as type locality Analamazaotra, but the types only state "forêts côtières et forêts montagneuses". Because the other two collections of this species are both from coastal localities, I assume that the type also comes from coastal forests and that KOSTERMANS mistakenly indicated Analamazaotra as type locality.

COMMON NAMES. — Voakoromanga, sary.

SPECIMENS STUDIED. — MADAGASCAR: *Louvel 218*, coastal and montane forests, fl. (P, U); *Service Forestier 10969*, Andriantantely, Brickaville, st. (MO, P, TEF); *Vasey & Velo 153*, Masoala Peninsula, south of Ambanizana, fr. (MO).

9. *Beilschmiedia velutina* (Kosterm.) Kosterm.

J. Sci. Res. (Jakarta) 1: 115 (1952). — *Apollonias velutina* Kosterm., Notul. Syst. (Paris) 8: 69 (1939). — *Thouvenotia madagascariensis* Danguy, Bull. Mus. Hist. Nat. (Paris) 26: 652 (1920), non *Beilschmiedia madagascariensis* (Baill.) Kosterm. — Type: *Thouvenot 102*, Madagascar, Analamazaotra (holo-, P!; iso-, K!, U!).

Beilschmiedia grandiflora (Kosterm.) Kosterm., J. Sci. Res. (Jakarta) 1: 115 (1952). — *Apollonias grandiflora* Kosterm., Notul. Syst. (Paris) 8: 70 (1939). — Type: *Decary 5522*, Madagascar, haute vallée de la Rienana (holo-, P!; iso-, U!), *syn. nov.*

Trees, to 30 m tall. Twigs terete or slightly angled, subglabrous or minutely tomentellous to brown tomentose. Terminal bud tomentellous or brown tomentose. Leaves alternate, chartaceous, 9-20(-28) × 4-11(-20) cm, (broadly) elliptic or (broadly) ovate, the base obtuse to acute, rarely rounded, the tip acute or shortly acuminate, the

upper surface glabrous or somewhat tomentose on the major veins, the lower surface sparsely tomentellous and glaucous to densely brown-tomentose, lateral veins 7-12 on each side, midrib, lateral veins and tertiary venation immersed on upper surface, midrib, and lateral veins clearly raised on lower surface, tertiary venation slightly raised. Petioles 10-25(-30) mm long, subglabrous to brown-tomentose. Inflorescences axillary, brown-tomentellous or brown-tomentose, paniculate, multiflowered, 4-10 cm long; elliptic, brown-pubescent bracts to 2.5 mm long frequently present at anthesis. Flowers with spreading tepals, to 8(-10) mm in diameter. Tepals 6, equal, brown tomentellous on both surfaces, to 4 mm long. Stamens 9, 2-celled, the outer 6, c. 0.7 mm long, glabrous, the filament short to very short, the anther with large, sometimes narrow, lateral or lateral-introrse cells; inner 3 as outer 6, more columnar, cells lateral or lateral-extrorse, with 2 globose glands at or near the base of the filament, staminodia 3, small, glabrous. Pistil glabrous or pubescent, the ovary gradually narrowed into the short style. Receptacle shallow, densely pubescent. Fruit ellipsoid to roundish, c. 3 cm in diameter, when young with persistent tepals at the base, the tepals eventually breaking off.

ECOLOGY. — Montane forests, 700-1200 m.

DISTRIBUTION. — Most collections come from two localities: midaltitude mountains in the NE (Anjanaharibe, Betsomanga, north to Ankarangana) and Périnet/Analamazaotra, with a single collection from Ranomafana National Park. — Fig. 2.

PHENOLOGY. — Flowers and fruits year-round.

Beilschmiedia velutina, as here accepted, is a very variable species and includes specimens previously placed in *B. grandiflora*. KOSTERMANS separated these two species on the following characters: *B. velutina* included material with densely pubescent leaves and a densely tomentellous pistil whereas specimens of *B. grandiflora* had sparsely tomentellous, glaucous leaves and a glabrous ovary. These differences would be quite adequate for the recognition of two species were there not so many intermediate specimens. Many collec-

tions, both fertile and sterile, have a pubescence which is intermediate between the indument of the type specimens of *B. velutina* and *B. grandiflora*. Moreover, *Service Forestier (Capuron) 27801* has a very glabrous pistil and densely pubescent leaves. One could possibly maintain *B. grandiflora* as distinct based solely on its glabrous pistil, but then these two species, differing in only one character, would be sympatric throughout most of their ranges. Label data do not suggest any ecological separation between the two and it would be impossible to identify sterile or fruiting specimens. Such a separation does not seem meaningful and I therefore place *B. grandiflora* in synonymy under *B. velutina*. The difference between glabrous and tomentellous pistils is nevertheless striking and appears to be correlated with spreading versus incurved tepals, although this might reflect whether the material was freshly pressed or not.

COMMON NAMES. — Demoka, tavolo, vakoromanga, vazanga, voakoromanga, voananasina, voatsipoake.

SPECIMENS STUDIED. — MADAGASCAR: *Cours 3677*, Anjanaharibe, fr. (MO, P); *Cours 3912*, camp 2, Anjanaharibe, fl. (MO, P); *Decary 5522*, Farafangana, haute vallée de la Rienana, fl. (P); *Humbert 24277*, vallée inférieure de l'Androranga, environs d'Antongondriha, massif du Betsomanga, fr. (MO, P); *Humbert 24589*, massif de l'Anjanaharibe, fr. (P). *McPherson 17303*, SW of Andapa, fl., fr. (MO); *McPherson 17304*, SW of Andapa, fl. (MO); *Perrier de la Bâthie 5265*, forêt d'Analamazaotra, fr. (P); *Perrier de la Bâthie 5267*, forêt d'Analamazaotra, buds (P); *Ravelonarivo et al. 380, 450*, Andapa, Anjanaharibe-Sud, fr. (MO); *Réserves Naturelles 42*, Analamazaotra, fl. (K, MO, P); *Service Forestier (Capuron) 843*, massif du Betsomanga, fr. (P, TEF); *Service Forestier (Capuron) 907*, massif de l'Anjanaharibe, vallée de l'Andramoata, fr. (MO, P, TEF); *Service Forestier 2520*, Périnet, fr. (P, TEF); *Service Forestier 3659*, Ampanantonampingotra, Andapa, fl. (P, TEF); *Service Forestier 7162*, Antsirabe, Ambanje, fr. (P, TEF); *Service Forestier (Capuron) 8680*, massif de l'Ambohitsitondroina, nord de la presqu'île de Masoala, fr. (P, TEF); *Service Forestier 10949* Périnet, st. (P, TEF); *Service Forestier 10964*, Périnet, st. (P, TEF); *Service Forestier 10974*, Andapa, st. (P, TEF); *Service Forestier 11099*, Ankarangana, Ambanja, fl., fr. (K, P, TEF); *Service Forestier 13404*, Ifanadiana, fl. (P, TEF); *Service Forestier (Capuron) 18492*, massif de Bora, environs d'Amponbilava, fr. (P, TEF); *Service*

Forestier 25681, Analamazaotra, st. (P); *Service Forestier 25682*, Analamazaotra, st. (P); *Service Forestier 25683*, Analamazaotra, st. (P); *Service Forestier 26317*, s.loc., st. (P); *Service Forestier 26629*, Analamazaotra, fr. (P); *Service Forestier 26908*, Analamazaotra, st., (P, TEF); *Service Forestier (Capuron) 27801*, Ouest d'Andapa, fl. (MO, P, TEF); *Thouvenot 102*, Analamazaotra, fl. (P, U); *Thouvenot s.n.*, Analamazaotra, fr. (P, U); *Service Forestier 41-231*, Ambalabe, st. (P).

IMPERFECTLY KNOWN SPECIES:

Beilschmiedia obovata Kosterm.

Comm. Forest Res. Inst. 56: 6 (1957). — Type: *Service Forestier 13509*, Madagascar, Ft. Dauphin, forêt d'Androgoly (holo-, P!; iso-, TEF).

The type collection of this species is sterile and cannot be identified to genus (or even to family) with certainty. The second collection cited by KOSTERMANS (*Service Forestier 13561*, P) consists of three elements: a twig with 3 leaves of *B. obovata*, a small twig with one leaf and two detached fruits of *B. velutina* (this is a fragment of *Service Forestier Capuron 18492*) and a small twig with 3 leaves identified as *Ravensara* (= *Cryptocarya*).

Beilschmiedia cryptocaryoides Kosterm.

Comm. Forest, Res. Inst. 56: 3 (1957). — Type: *Service Forestier (Capuron) 8985*, Madagascar, massif de l'Androrona (holo-, P!).

The type specimen is in fruit and, as KOSTERMANS (1957c) already indicated, it is either a *Beilschmiedia* or a *Potameia*. No other collections with similar characters (minutely, but densely tomentellous twigs and petioles; leaves 13 × 9 cm) have been found. Until flowers are available, it seems best to include this under the imperfectly known species.

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